FOREIGN DIRECT INVESTMENT, TRADE AND MIGRATION IN A DEVELOPING COUNTRY- PAKISTAN

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Abstract

This dissertation explores the relationship and the determinants of FDI, trade and migration in three empirical studies.

The first study estimate the Knowledge Capital model (KK) to explore the determinants and types of FDI in a small developing country, Pakistan. The results indicate that the model fits the data at aggregate and manufacturing sector reasonably well as signs on most of the explanatory variables related to the vertical and horizontal FDI are in line with the predictions of the model. However, there is strong evidence of vertical FDI as the endowment difference variable is positive and significant in most of the specifications suggesting that large countries invest to have factor cost advantage in Pakistan.

We also modify the model by using dummy variables for the reform and period of instability. The results provide evidence that liberalization of trade and investment has positive effects on the inflows of both types of FDI and that political and economic instabilities negatively affect FDI inflows.

The second essay explores the role of Pakistani migrants in facilitating FDI inflows by reducing informal barriers of trade and investment. In an augmented gravity model based on the new trade theory of the multinational we find significant positive impacts of migrants on FDI inflows in Pakistan both at the aggregate and sectoral levels.

We also find that Pakistani immigrants in distant countries are more effective in reducing transaction costs. Among the Commonwealth countries, Pakistani immigrants in the UK have a significant positive impact on FDI inflows in Pakistan. Finally, this study finds that immigrants are effective in promoting FDI from both developed and developing countries, the effects being larger for immigrants in the former.

In the third study we estimate the determinants of migration from Pakistan. The unique feature of this research is that we study migration in both OECD and non-OECD countries which is particularly relevant in the case of Pakistan as large number of migrants go to the Middle East countries.

Using a modified gravity model, we explain the emigration rate from Pakistan by the income, population density, dependency rate and tertiary rate of education in the host countries. The findings of this study suggest that income in the host country is an important determinant of migration from Pakistan and that high population density and an increase in the rate of tertiary education in the host country discourage migration. The main objective of this study is to look at the impact of previous migrant stock on potential emigration rate from Pakistan. The positive and significant coefficients on lagged migration stock for both OECD and the Middle East countries support the view of the network theory that family and friends who have migrated previously help in migration of potential migrants by providing information and reducing logistics and other costs of migration.

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Chapter 1: Introduction

1.1 Motivations for the Study

The basic motivation of this study is a very old and intriguing question in the field of international economics which has long interested numerous economists since the pioneering work of Mundell (1957): Are trade, foreign direct investment (FDI) and migration substitutes or complements? This is an important question to be addressed as the relationship between these flows has important implications on real and relative factor prices and the distribution of income and welfare.

While Mundell's work showed that these flows are substitutes, the latest theoretical developments in the new trade theory models of the multinationals developed in the last three decades by Helpman (1984), Helpman and Krugman (1985) Markusen (1984) and Markusen et al. (1996) and Markusen (1997, 2002) illustrate that FDI and trade could be substitute as well as complements. Moreover, recent research on the network theory of migration indicates that migrants facilitate trade and FDI flows (Rauch and Casella, 1998) and future migration (Carrington et al. 1996) and thus these flows are complementary.

Despite the above rapid theoretical developments, there are still very few empirical studies to test the predictions of new trade theory models and network theory. The reason is the unavailability of data on some of these global flows. Although data on bilateral trade on goods and services are readily available, data on bilateral FDI and migration are still lacking for most of the countries. Therefore, most of the research has been done on the US or other OECD countries and studies on developing countries are hard to come by. This challenge to work on developing countries and extend the existing literature has motivated our work.

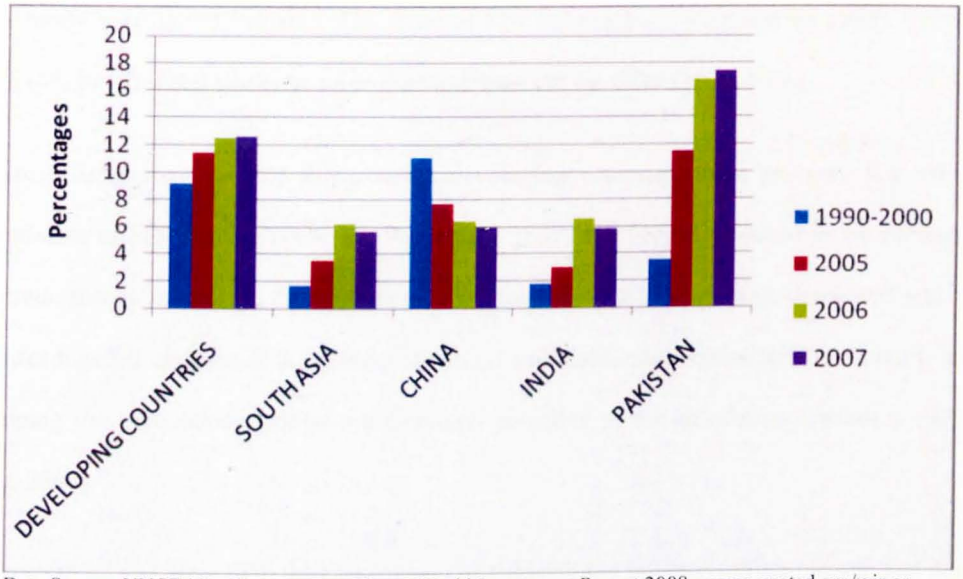
This thesis is an empirical study from the perspective of a small developing country - Pakistan. Using data on Pakistan, our objective is to explore the relationship between trade, FDI and migration in the context of new trade theory models and the network theory of migration. But before outlining our thesis some back ground information on FDI, trade and migration in the context of developing countries and particularly related to Pakistan would be useful.

Interest in FDI has grown considerably in recent years for two main reasons. First, flows of FDI have grown at substantial rates over the last two decades, out stripping the rate of growth of both world output and international trade. During the period of 1985- 1999, FDI grew much faster than world trade and income. In this period, while world real GDP rose by 2.5 percent per annum and exports by 5.6 percent, the real FDI inflows increased by 17.7 percent (Navaretti and Venables, 2004).

More recently, the inflows of FDI in developing countries have grown dramatically from an average of $131 billion per year in the 1990s to $500 billion in 2007 World Bank, (2008). Inflows of FDI gave relief to these countries facing chronic debt crises in the 1980's, providing them with a reliable source of finance and facilitated in transferring knowledge, capital, technology and skills. With this increase in FDI, there is also an increased interest in exploring the determinants and the effects of FDI on trade, employment, income distribution, growth and welfare in the developing economies.

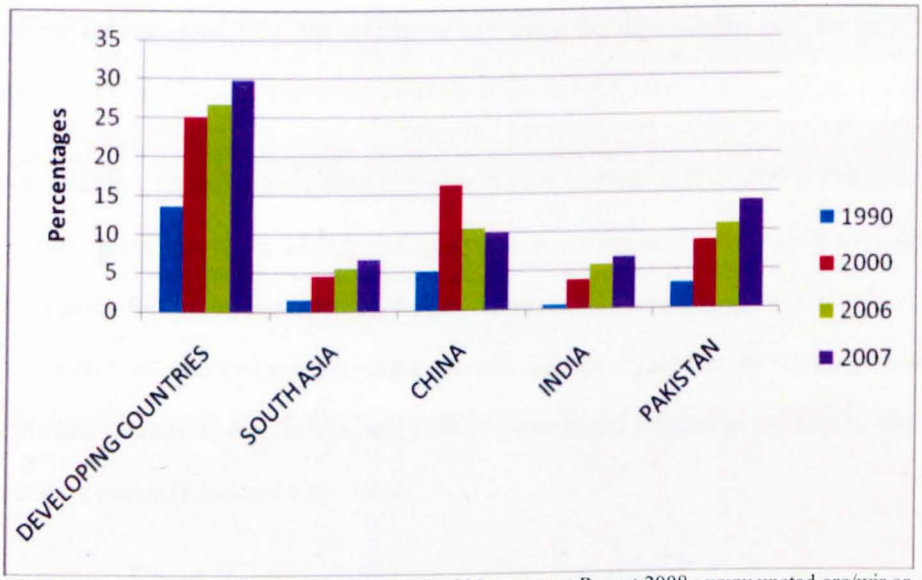
The charts (1.1 and 1.2) below indicate the trends in FDI inflows and stocks in the developing countries for 1990 to 2007. The importance of FDI has grown significantly in the economies of these countries over time as shown, the share of inflows of FDI as percentage of gross fixed capital formation has risen from 9 percent to 13 percent and the share of stock of FDI in the GDP more than 50 percent from 1990 to 2007. Pakistan being a relatively small developing country by geography compared to other large countries like China and India is more reliant and interconnected to the global economy with the largest share of FDI inflows and stocks in its Gross Fixed Capital Formation and GDP.

Chart 1.1: Inflows of FDI as Percentage of Gross Fixed Capital Formation



Data Source: UNCTAD, (Country Fact Sheet) World Investment Report 2008 ; www.unctad.org/wir or www.unctad.org/fdistatistics

Chart 1.2: FDI Stocks as Percentage of GDP



Data Source: UNCTAD, (Country Fact Sheet) World Investment Report 2008 ; www.unctad.org/wir or www.unctad.org/fdistatistics

respectively. Additionally, while these shares in China and India reflect a declining trend they have risen significantly overtime in Pakistan. The share of FDI inflows have increased by nearly five times in its GFCF (4% to 17%) and stocks by more than four times in the GDP (3% to 14%).

Despite a rising trend in FDI flows in the developing countries, there are very few studies on the determinants of FDI in these countries. Particularly they have been overlooked in the estimations of the new trade theory models of the multinationals. Most of these studies pool developed and developing countries together and ignore the distinct structural and institutional characteristics that are important in explaining the motivations behind multinational activities in the developing countries (Blonigen and Wang, 2004).[1]

To attract more and more FDI, the Government of Pakistan has initiated reform measures of deregulation, privatization and liberalization since 1989-90. In the 1990's the government further liberalized the policy and opened the sectors of agriculture, telecommunications, energy and insurance for foreign investment. In the quest for increased FDI, the questions regarding the determinants and the effect of FDI on economic growth have become important concerns at the national level.

Moreover, after this liberalization period there has been a sectoral shift of FDI in Pakistan. On a broad basis, manufacturing industries, mining and quarrying and commerce have traditionally dominated the preferences of the foreign investors during the pre-reform period, accounting for over 83% of total inflow of FDI. However, the share of manufacturing, mining, and quarrying sectors registered a sharp decline and sectors like commerce, construction and utilities experienced substantial increase in total FDI during the post-reform period (Khan and Kim, 1999).

It is even more surprising that, despite political instabilities and security issues, Pakistan's economy has managed to sustain a large proportion of FDI in its GDP and GFCF. It would be interesting to study and

[1] All of these studies have ignored Pakistan except for Tanaka (2006) which studies the determinants of US and Japanese FDI using panel data for 50 countries.

analyze the determinants and the motives behind FDI in Pakistan.

Pakistan is an interesting case study, being located at a strategically important geographical region near energy abundant Central Asian countries and with large neighbouring competitors such as India and China, the competition for FDI will be more intense for Pakistan. On the other hand, as the outflows of FDI from China and India are also increasing, Pakistan could also gain from its proximity to these large growing economies.

Furthermore, Pakistan's big trading partners like US, Japan and UK and the Middle East countries are also largely the main source of its FDI. This indicates that FDI from these countries has not displaced trade but in fact seems to be complementing it as suggested by the new trade theories of a multinational. However, the predictions of these theories could only be verified by empirically testing them. This is the subject matter of the second chapter.

In view of the importance of FDI for Pakistan, the third chapter is motivated by the recent research on the positive role of migrant networks on trade and FDI. The network theory is based on the view that there are many informal barriers to trade and FDI which arise due to lack of information and knowledge of languages, customs and cultures in foreign countries and migrants help to facilitate these flows by overcoming these barriers. Despite a higher rate of migration of the labour force from the developing countries, little knowledge exists about the effects of migration on trade and FDI in these countries. A few studies on this aspect of migrants' role are on Chinese networks. Pakistan has experienced large outflows of migrants over decades and is one of the top ten emigration countries amongst these countries, with an emigration stock of 3,415952, which was 2.2 percent of the population in 2005. The emigration rate of tertiary educated labour is fairly high at 9.2 percent in 2000 (For both India and China these rates are 4.2 percent) (The World Bank, 2005). Pakistan is also the eleventh top remittances receiving country.

Although a fairly good number of studies have been done on the role of remittances on various aspects of the economy, [2] little is known about the role of migrants in facilitating trade and FDI and on the overall economy. Therefore, we explore the effects of Pakistani migrants on the inflows of FDI in Pakistan in the third chapter.

The motivation for the fourth chapter on the determinants of migration from Pakistan comes from the results obtained from our third chapter which suggest significant positive effects of Pakistani migrants on the inflows of FDI in Pakistan.

Given the broad diversity of migration patterns in Pakistan both with regard to the characteristics of migrants and of the countries of their destination in both OECD and non OECD region, it would be interesting to identify the determinants of migration and to extend the literature on developing countries. Earlier data on migration was only available for OECD countries, but recently a more comprehensive data set prepared by the World Bank which contains information on immigrants in both OECD and non-OECD countries. This data is used in this study which is relevant in Pakistan's case as large majority of migrants go to Middle East countries.[3]

1.2 Outline of the Thesis

This dissertation is comprised of three empirical chapters. These chapters study interconnected aspects of international linkages namely FDI, trade and migration. However, each of them is based on the distinct theoretical developments which are considered the frontiers of research in the field of international economics. We provide the context, objectives and contributions of our study in this section.

The second chapter explores the relationship of FDI and trade based on the theoretical work of the new trade theory of the multinationals. We provide in some detail the theoretical developments of these

[2] See Iqbal and Sattar (2005) for the survey of literature on remittances in Pakistan.

[3] The data was unpublished and provided by Chris Parsons.. Recently, this data has been published.

models and estimate the Knowledge Capital Model (KK) developed by Markusen (1997, 2002). This model explains the endogenous determination of multinational firms based on bilateral country characteristics like differences in their relative sizes and factor endowments, bilateral trade and investment costs and distances in a general equilibrium framework. The model incorporates and distinguishes both vertical and horizontal FDI. The former is done by fragmenting the production process between dissimilar countries to take advantage of factor costs and encourage intra firm trade and the latter is conducted mainly in large similar countries to gain firm and plant level scale economies and to save on trade costs and thus substitute for trade.

Earlier empirical research on this model is done for developed countries and developing countries are pooled in the analyses with these countries. They ignore the institutional and structural characteristics of the developing countries which determine FDI (Blonigen and Wang 2004).

This dissertation contributes to the literature by estimating the KK model for a small developing country-Pakistan. More specifically, we estimate the specification of the KK model developed by Carr et al. (2001) for Pakistan using panel data on net FDI inflows at aggregate level for 1986-2007 and disaggregate levels for services and manufacturing sub sectors for 2002-2007. We chose this specification as it is the first "theory driven empirical specification for FDI" [4] and is a basis of analysis in much subsequent research.

We also strive to extend the model by including dummy variables for large source countries of FDI to see the cultural, proximity and historical links effects on FDI inflows and to check the robustness of the model.

Furthermore, we extend this model to explore the impacts of trade and financial sector reforms. We expect that lower tariff rates would lead to more vertical FDI and the opening of services sector for foreign direct investment would attract horizontal FDI in Pakistan. Therefore, we hypothesize that the KK

[4] Davies (2008 pp 257).

model would better explain the determinants of FDI in the post reform period. In addition, during this reform period Pakistan faced political and economic instabilities due to incidents of nuclear explosion in 1998 (Pakistan faced an economic embargo), and in the aftermath of 9/11, 2001. We attempt to investigate effects of these instabilities on the inflows of FDI.

Finally, as we find by our extensive regression exercises that though the vertical aspect of the model is more evident in the estimates of our models, there is weak evidence of the horizontal aspect. Therefore, in the last section of the second chapter we attempt to modify the KK model. However, at this stage we acknowledge like Davies (2008, pp 265) does, when he states in his conclusion "Please note that I am not suggesting that this is the "correct" specification of the KK model; instead, I interpret my results as indicating the need for continued refinement....."

The third chapter investigates the issues of missing trade and foreign investment which have led researchers to search for other explanations like informal barriers of trade and investment, which arise due to lack of trust, information and knowledge of languages, customs and cultures in foreign countries. Recent theoretical literature has established that migrants help in overcoming informal barriers of trade and investment through contract enforcement (Greif, 1993) and providing information to foreign investors about the business climate in their country of origin (Rauch and Casella, 1998, 2003). Thus by reducing transaction costs they facilitate trade and investment between countries.

In a modified gravity model based on the new trade theory, we empirically explore the role of Pakistani immigrants in 32 countries on aggregate FDI inflows in Pakistan from these countries for the period 2002-07. In addition, using data on FDI inflows in the services and manufacturing sectors from 16 countries the effect of migration on sectoral FDI is also investigated for the same period. We also attempt to distinguish the effects of migrants living in distant countries and in different regions. In line with our expectations, the results indicate that migrants living in distant countries play a significant positive role on FDI inflows by providing information to the foreign investors in their host countries. We also look at

the distinct effects of migrants living in Commonwealth/non-Commonwealth and OECD/non-OECD countries. However, contrary to our hypothesis that migrants living in Commonwealth countries have less to contribute because of already familiar institutions and shared historical past of these countries we find a mixed evidence. For example, while migrants living in the UK have a positive significant effect, the migrants in Canada have negative and significant effect on FDI inflows at both aggregate and disaggregate level. This seems to suggest that there are more country effects than the 'common past' or 'colonial effects' as has been considered in the traditional gravity models. The findings also indicate that the effects of immigrants living in OECD and non-OECD countries are positive and significant at the aggregate level on FDI inflows, however, at the disaggregate level in the services and manufacturing sectors, the contributions of migrants living in the former are greater.

The empirical models in the fourth chapter are inspired by the seminal work on human investment theory by Borjas (1987, 1989) and the dynamic network theory of migration developed by Carrington et al. (1996) based on endogenous migration costs. According to the former, migration is undertaken to earn a high expected income and the latter considers the cost of migration and finds that established network of migrants facilitate potential migrants by reducing cost of migration for them by providing them information about for example job opportunities in the host countries and other logistic support and thus leading to chain migration. We use a modified gravity model in which the emigration rate in Pakistan (supply side) is explained by several socio- economic, demographic and geographical characteristics of the host country (demand side) like GDP per capita, population density, tertiary enrolment rate, dependency ratio. Our model also controls for other traditional gravity variables like bilateral distances, proximity, common language and common historical past. We also include previous migrant stock to test the prediction of network theory. In most of the previous studies which are largely done for the US or OECD countries as host regions, more emphasis is given on the characteristics of the origin country (supply side) while the characteristics of the host country (demand side) are not given due considerations. The demand side is considered by taking some subjective measure of the immigration policy of these

countries. Our study takes into consideration several features of the host countries, as mentioned above, which are taken into consideration implicitly in the formulation of immigration policies. Thus this study attempts to incorporate both the supply and the demand side of the model. Another contribution of this study is the use of new enlarged data set on migration prepared by the World Bank (unpublished)[5] which consists of both OECD and non-OECD countries. Therefore, we are also able to distinguish the effects of migrant networks in OECD/non-OECD/Middle East countries on the future migration in these regions which is important as the pattern and the characteristics of migrants differ in these regions.[6]

Finally in chapter five, we summarize our findings and draw some conclusions from our study. We also indicate limitations of this study and potential for future research.

[5] We are grateful to Chris Parsons for providing this data for our study. Recently, this data has been published.

[6] According to Hanson (2010, pp 4363-4414) "... the highest payoff to research is likely to be in the many under-studied parts of the world. Since 1990, Central and Eastern Europe have become major sending regions; the Gulf States, Russia, and Spain have become an important receiving regions; and emigration from China, India, Indonesia, Pakistan, and the Philippines have accelerated, to name but a few of the recent developments in global labor flows."

Chapter 2: Estimating the Knowledge Capital Model for a Developing Country – Pakistan

2.1: Introduction

This chapter is motivated by the ongoing lively debate on the new trade theory presented by the Vertical (VER), Horizontal (HOR) and Knowledge Capital models (KK) explaining the determinants of FDI. These models are largely studied in the context of developed countries. However, the importance of FDI in the development of a country and the recent upsurge in FDI inflows towards the developing countries should not be ignored. Like many other developing countries, Pakistan has also introduced several investment and trade and liberalization measures in the 1990s to attract FDI inflows and boost its trade. However, at the early phases of liberalization there were many uncertainties and the reforms were adopted in a piece meal fashion as there was the notion based on the classical view that trade in goods and factors are substitutes. As Markusen (1997, pp 1) observes that while liberalizing trade and FDI developing countries faced the issue of "what to liberalize and in what order to do so." However, recently developed new trade theory models of the multinational enterprise show that trade and FDI could both be substitute and complements depending on the type of FDI. Therefore, it would be relevant and useful to estimate these models for a developing country under going reform programme. This study aims to study and estimate the KK model in the context of a small developing country, Pakistan.[7]

[7] It should be noted that in this thesis Pakistan is referred as a small country relative to its market size (GDP) and relative to endowments (GDP per capita) of the source countries of FDI in our sample as emphasized in the KK model and not in terms of geography and demography unless specified so. We chose to describe Pakistan as a small developing country as we have large developing country such as China in our sample and many high income developing countries of the Middle East.

The new trade theory models are based on industrial economics approach and general equilibrium analysis and utilize the gravity model. These models explain the endogenous determination of multinational firms (MNEs)[8] based on bilateral country characteristics like differences in their relative sizes and factor endowments, trade and investment costs.

According to the vertical (VER) model introduced by Helpman (1984), the multinational firms (MNE) conduct FDI between countries which are dissimilar in size and have different factor endowments. Production is fragmented according to factor intensities to take factor costs advantages based on the principle of comparative advantage and lead to intra firm trade. On the other hand, the horizontal (HOR) model pioneered by Markusen (1984) states that with some positive level of trade costs FDI is done between similar large size countries to seek firm and plant level scale economies and avoid trade costs. The Knowledge capital model introduced by Markusen (1997, 2002) integrates both the characteristics of vertical and horizontal MNEs. It takes into account market size and trade costs as in the HOR model and factor intensities similar to the VER model.

Because of the heterogeneity in FDI flows due to the complex strategies adopted by the multinationals world over, it is very difficult to identify vertical and horizontal FDI in the empirical analysis.[9] Therefore, the KK model incorporating both the features of vertical and horizontal FDI seems more realistic when considering estimating determinants of FDI. However, the empirical works on the KK model indicate mixed or even conflicting results as we review the literature.

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[8] The MNEs are firms that conduct Foreign Direct Investment by acquiring substantial control over a foreign firm or setting up their own affiliates in foreign countries.

[9] Hanson et al (2001) studies three types of multinational activities: global outsourcing, the use of export platforms, and wholesale trading and explores how country and industry characteristics and country policies affect these activities. Moreover, new patterns of FDI are emerging. Ekholem et al (2003) studies the export platform FDI in which MNE produces in a country of the region to export to neighbouring countries. Another important type of FDI is more complex vertical integration where subsidiaries of MNEs in various host countries are shipping intermediate goods among them for further processing before shipping finished product back to source country (Bultagi et al; 2004)

The pioneering empirical work by Carr et al. (2001) (CMM hereafter) finds strong evidence of supporting the KK model in which both vertical and horizontal FDI occur simultaneously. However, subsequent studies by Markusen and Maskus (2002) and Blonigen et al. (BDH, 2003) with alternative specifications of the model failed to reject the HOR model in favour of the KK model. The majority of these studies are on the US and samples of OECD countries, particularly large countries with similar skills. Therefore, these studies find the HOR model to be more representative of their data when testing for the KK model. Thus, one focus of all these studies is to find the evidence of vertical FDI in their data. They term the absence of vertical FDI "a puzzle"[10] and try to resolve it by 'Hunting High and Low for Vertical FDI'.[11] The absence of vertical FDI is also intriguing as the role of intra firm trade has increased tremendously in world trade and there has been a significant increase in these flows towards developing countries in the last couple of decades.

However, very little work has been done on these models for the developing countries.[12] There are two reasons for this. First is that the data is mostly not available for the developing countries. Second, FDI flows are largely among the developed countries. Nevertheless, a significant increase of FDI towards the developing countries during the last two decades should not be ignored. According to the World Bank estimates, FDI flows towards the developing countries have dramatically increased from $131 billion per year in the 1990's to $ 500 billion in 2007 (World Bank, 2008). The MNEs are largely attracted towards the developing countries for cheap relatively less skilled labour – the comparative advantage motive for the vertical FDI.

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[10] " Recent Evidence on MNE Models: A Puzzle" Page 3, BDH (2003) AER, Vol.93 pp 280-294

[11] "Hunting High and Low for Vertical FDI," Davies (2008). Review of International Economics, 16(2), pp 250-267.

[12] Other studies which have studied the determinants of FDI for the developing countries have not used this model and therefore are unable to distinguish between VER and HOR FDI which have different determinants. See for example Nishat and Aqeel, (1998) and Aqeel and Nishat (2004) for Pakistan.

To distinguish the vertical side of the KK model, researchers have used different empirical specifications and various proxies for the skill variable which are reviewed in our study.[13] A few studies have found that vertical aspect of the model is more evident when FDI flows towards the developing countries are taken into account. In this regard a study by Blonigen and Wang (2004) which estimates the KK model with dummies for the developing countries concludes that there are significant differences in the types and determinants of FDI in the developed and developing countries. Similarly, Davies (2008) considers data sets on affiliates' sales for the US firms and on stocks of FDI for OECD countries and finds the prevalence of vertical FDI when the dependent variable is the stocks of FDI which have data on considerable number of developing countries.

Moreover, as more and more disaggregated data becomes available these models are being studied at the sector and industry and firm levels. The studies on disaggregated levels indicate that the types of FDI are different according to the production technology and the skill intensities of the sectors and industries, (Hanson et al; 2001, Waldkirch; 2003, Geishecker and Gorg; 2005, Yokota; 2007).

In addition, Hanson et al. (2001) using data on the US MNEs have also analyzed that besides the country and industrial characteristics, the policy variables like tariffs and non tariff barriers are also important to study the behaviour of MNEs regarding their exports and local sale decisions. [14]

[13] An alternative explanation for the lack of vertical FDI evidence is that the proxies for relative skill endowments are poor. Braconier, Norback, and Urban (2005c) use wage differences instead of the job categories of CMM or the education of BDH. They find that this measure tends to be more significant than the others and is indicative of greater vertical FDI. They do not, however, use the higher order specification and therefore according to Davies (2008) are unable to adequately test the KK model.

[14] Hanson tests for the reform measures like tariffs and Non tariff barriers and found significant effects of these measures. Their study shows the important role being played by policy variables. In (unreported) results, to explain the ratio of exports to local sales for the manufacturing sub sample they have stated that they first included as regressors sector dummies, distance, and country variables. They then added to this specification the policy variables tax rates, tariffs, and nontariff barriers. Across these two specifications the adjusted R-squared rose from 0.37 to 0.52. According to the authors, this indicates that although the country and industry characteristics help explain some amount of the overall variation in the decision about exports versus local sales, this aspect of multinational behaviour also depends importantly on country policy variables as well.

While estimating the KK model, most of the earlier studies pool developing countries with the developed countries as a result they reject the KK model in favour of the HOR model, which is more appropriate for large similar economies. Hence, by pooling developed and developing countries, most of the studies explaining the determinants of FDI have ignored the underlying factors explaining FDI flows in developing countries (Blonigen and Wang, 2004). [15] Furthermore and more importantly, all these studies estimating the new trade theory models have ignored the effects of structural changes and changes in policy regimes on FDI in developing countries which have different outcomes in each of these country. Therefore, it is important to study individual case studies.

Therefore, there is a need for case studies on these models for the developing countries that have undergone significant structural changes due to trade and tariff reforms. It would be interesting and useful to analyze the changes in the types of FDI as a result of the reform measures taken in the developing countries as this could have significant implications on their trade and welfare.

Pakistan being a small developing country has been a more open economy compared to its large neighbours like China and India. Initially FDI was attracted for import substitution in the manufacturing sector. Pakistan like many other developing countries had introduced many reform measures to liberalize its trade and finance since 1989-90. As a result, non tariff barriers (NTBs) were abolished and tariff rates have gradually declined. The average applied tariff rate has gone down from 66 percent in 1991 to 14.5 percent in 2007 (World Bank). Pakistan receives FDI from wide spectrum of countries in both the OECD and the Middle East.

In addition, many new sectors have been opened up for privatization and foreign investment, as a result there was a large inflow of FDI in the services sector particularly in the transport storage and communication and financial services sectors. As a result of these reform measures, the share of FDI in

[15] In addition, according to the observation of Hanson et al. (2001), earlier studies on the FDI models have used data before 1990, Therefore, these studies missed the decade of the 90s when many developing countries introduced trade and financial sector reforms.

the GDP of Pakistan has risen from an average of 3.5 percent in 1990-2000 to 17.4 percent in 2007 and the share of FDI in gross fixed capital formation has increased from 3.3 percent in 1990 to 14 percent in 2007 (World Investment Report, 2007). However, the reform period in Pakistan is also marred by the period of instability due to the nuclear test conducted in May 1998 and it being the frontline state after 2001 war in Afghanistan. Keeping the above scenario in mind we formulate our objectives in the next section.

The organization of this chapter is as follows: Section 2.2 provides an outline of the objectives. Trends and descriptive analysis of the FDI inflows in Pakistan are presented in section 2.3. A review of the theoretical literature on new trade theory models is provided in the section 2.4 and empirical evidences of the KK model are in section 2.5. In section 2.6 we relate our hypotheses based on CMM (2001) predictions and discuss our data and the methodology. The results of estimations are given in section 2.7. The modified KK model is presented in section 2.8. The final section derives the conclusions.

2.2 The Objectives of the Study

The main objective of this chapter is to identify the types and determinants of the FDI inflows in Pakistan and to see how well the KK model fits our data. More specifically we aim to:

Firstly, estimate the KK model for a small developing country (Pakistan) and test its prediction for both aggregate and disaggregate data on FDI inflows for the period 1986-2007 and 2002-07. Since most of the studies acknowledge that CMM (2001) study is the first one whose empirical estimation of the determinants of MNE's investment and exports choices is based on a formal theory of new international trade,[16] our focus is to estimate the CMM (2001) specification of the model and contribute to the ongoing debate about the robustness of this particular specification. We expect that the vertical aspect of the model would be more evident in our data because large countries' MNEs are attracted towards Pakistan for its

[16] Studies by Brainard (1993, 1997) also look into the proximity-concentration and comparative advantage motives of the MNEs but not in an integrated way.

abundance of cheap labour force which is relatively less skilled. Moreover, the large source countries of FDI are also the major trade partners of Pakistan which indicates that FDI from these countries may not be substituting trade but instead complementing it which is the characteristic of the vertical FDI.

Secondly, Pakistan, like many other developing countries, receives inflows of FDI from a few large source countries. The main source countries of FDI in Pakistan are the USA, UK and the UAE. It would be of interest to investigate how robust the KK model is for our data and developing countries in general. We will be using dummies for large investor countries to see the effects of inflows from these large source countries on our estimated model. Another relevant issue is that Pakistan has also strong historical and cultural links with these large source countries and since according to the new trade models trade, transport and information costs are important determinants of MNEs decisions of the types of investment to be made, we hypothesize that historical and cultural links lessens the information costs and positively influence FDI inflows in Pakistan.

Thirdly, our objective is also to look at the effects of trade and financial sector reforms initiated in 1989-90. We expect that as a result of the reform measures, lowering of tariff rates have led to an increase in the vertical FDI. Moreover, the opening of services sector for foreign direct investment has also attracted horizontal FDI. Therefore, we hypothesize that the KK model would better explain the determinants of FDI in the post reform period.

Fourthly, as stated before, the types of FDI are also affected by the risks in the economy (Aizenman and Marion, 2004). We look into the effects of instabilities in Pakistan during 1999-2002. These instabilities were caused due to the nuclear explosion conducted by Pakistan in 1998 resulting in international embargos and the aftermath of the 2001 turmoil.[17]

[17] Dunning, John H. (2003) reports three separate field surveys undertaken in the latter part of 2001 by the Economist Intelligence Unit 2002; UNCTAD 2002which found that around two thirds of the MNEs questioned did not expect to change their investment plans in the light of the terrorist attacks. On the other hand, about half of the Japanese companies participating

Fifthly, the KK model is also being estimated for the disaggregated broad sectors of the economy and the sub-sectors in the manufacturing sector for the period 2002-2007. The horizontal FDI will come in the relatively skilled labour intensive sectors while the vertical FDI will be in the unskilled labour intensive sectors. Moreover, trade policy measures are not uniform across the sectors. There are different tariff rates across sectors. For example, despite significant reduction in the tariff rates in Pakistan over the years, motor vehicle industry has still high tariff rates. There is likely to be horizontal FDI in the more protective sectors and vertical FDI in less protective sectors. We hypothesize that our estimated KK model would capture both types of FDI.

Finally, as we find by our extensive regression exercises that though the vertical aspect of the model is more evident in the estimates of our models, there is weak evidence of horizontal aspect. Therefore, in the last section we attempt to modify the KK model. However as stated before, at this stage we acknowledge like Davies (2008, pp 265) does, when he states in his conclusion "Please note that I am not suggesting that this is the "correct" specification of the KK model; instead, I interpret my results as indicating the need for continued refinement....."

2.3 FDI in Pakistan

Initially, Pakistan adopted an import substitution policy and encouraged FDI in selected sectors in the economy mainly in the manufacturing sector under high tariff regime. It was in the decade of 1990's that the government initiated wide ranging trade and investment reforms by eliminating the quota system and lowering of tariffs on imports and opening up the services and agriculture sectors for foreign investors.[18]

in a Japan Trade Center survey indicated that they intended to postpone their FDI plans until a clearer picture of global economic developments had emerged.

[18] See Khan and Kim (1999) and Zaidi S. Akbar (2005) for detail.

Table 2.1 and Chart 2.1 indicate FDI inflows over the period 1986-2007. Pakistan received a total of $ 16815 million of FDI inflows during these 22 years with an annual average of $ 764 million. The data shows there is also large volatility in these flows with a standard deviation of 897.

Wide ranging trade and financial sector reforms initiated in 1989-90 have led to marked increase in the FDI inflows in Pakistan despite instabilities in 1998 (Pakistan faced an embargo due to its nuclear explosion) and in the aftermath of the terror attack on the World Trade Centre in 2001.

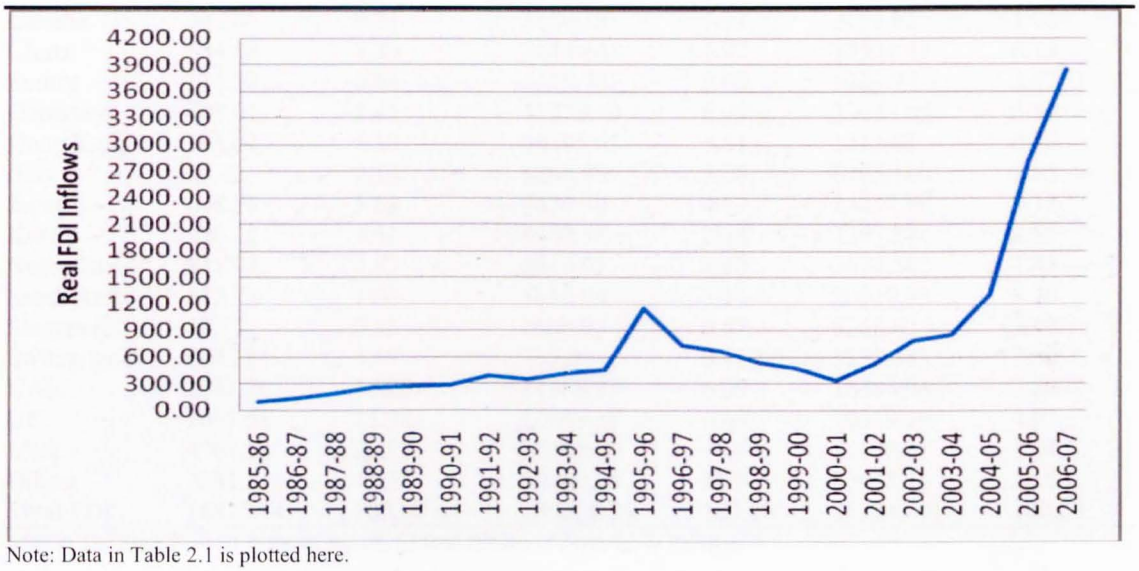
Table 2.1: FDI Inflows in Pakistan in 1986-2007 (Million of $ at 2000 prices)

Years	FDI Inflows
1985-86	88.16
1986-87	137.90
1987-88	193.22
1988-89	250.27
1989-90	271.53
1990-91	285.73
1991-92	391.77
1992-93	344.38
1993-94	409.56
1994-95	459.66
1995-96	1149.27
1996-97	728.98
1997-98	661.58
1998-99	531.98
1999-00	469.90
2000-01	336.26
2001-02	521.86
2002-03	782.45
2003-04	849.06
2004-05	1313.23
2005-06	2799.86
2006-07	3838.85
Total	16815.45
Average	764.34
Standard Deviation	896.91

Source: The State Bank of Pakistan

The trends in FDI inflows from 1986 to 2007 in Chart 2.1 show that FDI inflows rose gradually before an upsurge in 1995-96 due to significant inflows of FDI in the power plants and then declined due to instabilities in the country until 2000-01. However, there was a steady rise in the inflows after 2002-2003 onwards. This sharp rise in FDI was also to some extent due to the large-scale privatization in services and telecommunication sectors.

Chart 2.1: FDI Inflows in Pakistan, 1986-2007 (Millions of $ at 2000 prices)



Note: Data in Table 2.1 is plotted here.

The share of FDI due to privatization was 20 percent of the total FDI received during 2002-07. According to the World Investment Report 2008, economic growth and privatizations attracted increased inflows in the banking, telecommunications, and oil and gas industries. In addition, a 17% rise in reinvested earnings also contributed towards this increase.

Table 2.2 shows shares of FDI inflows and exports and imports in their respective totals in Pakistan. A diverse group of 16 OECD and non OECD countries were the major source of foreign direct investment providing over 85 percent of FDI inflows in Pakistan during 1986-07 and are also its main trading partners with 69 and 66 percent shares in total exports and imports.

The three major countries were the United States, United Kingdom and the United Arab Emirates. Most of the FDI came from the United States with a share of 28 percent while United Kingdom and United Arab Emirates both contributed around 15 percent of the total inflows.

Table 2.2: FDI Inflows, Exports and Imports in Pakistan, 1986-2007 (Million of $ at 2000 prices)

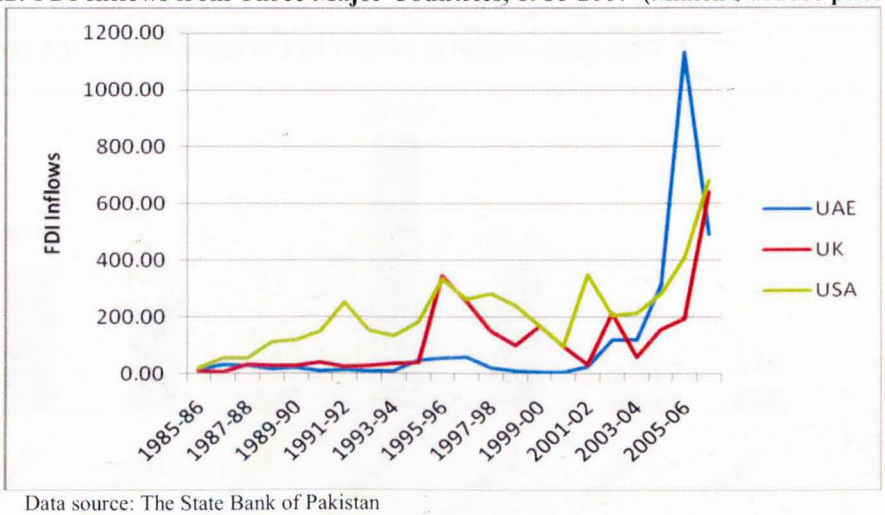
Countries	FDI Inflows	Shares (%)	Exports	(%)	Imports	Shares (%)
Australia	90.59	0.54	2161.49	1.17	5325.40	2.10
Canada	34.66	0.21	3160.32	1.71	2652.62	1.05
China	554.58	3.30	3644.44	1.97	15524.41	6.13
France	111.32	0.66	5559.70	3.00	5229.97	2.07
Germany	408.01	2.43	11274.10	6.09	13923.85	5.50
Hong Kong	185.04	1.10	10395.05	5.61	1413.68	0.56
Italy	23.42	0.14	6268.88	3.38	6465.10	2.55
Japan	608.54	3.62	8474.70	4.57	23237.46	9.18
Korea	220.12	1.31	4402.96	2.38	7297.37	2.88
Netherlands	811.97	4.83	4816.01	2.60	3677.50	1.45
Saudi Arab	512.75	3.05	5816.94	3.14	20910.83	8.26
Singapore	58.13	0.35	1608.97	0.87	5368.62	2.12
Switzerland	604.18	3.59	753.93	0.41	5833.38	2.30
UAE	2561.76	15.23	11288.23	6.09	18385.96	7.26
UK	2687.58	15.98	12369.38	6.68	10319.29	4.07
USA	4761.58	28.32	36009.40	19.44	22638.81	8.94
Others	2581.21	15.35	57260.26	30.91	85038.76	33.58
Total FDI	16815.44	100.00	185264.76	100.00	253243.01	100.00

Source: The State Bank of Pakistan and the Federal Bureau of Statistics in Pakistan.

It is also note worthy that though the bulk of FDI came from the developed countries; UAE, which consists of seven developing countries, was also a big contributor. The shares of countries' in FDI and trade shown indicate that three major investor countries the U.S., UK and UAE are also big trading partners of Pakistan. The U.S is the biggest market of Pakistani exports 19 percent of the total exports are directed towards it while 8 percent of total imports in Pakistan came from the U.S. during the period 1986-07. The other two big investing countries the U.K. and UAE have 10 percent and 9 percent of export shares and 6 percent and 11 percent shares in the imports.

Chart 2.2 presents the trends in the FDI inflows from these three major countries. It is evident that Pakistan received regular inflows from the US, UK and UAE over the period 1986-07.

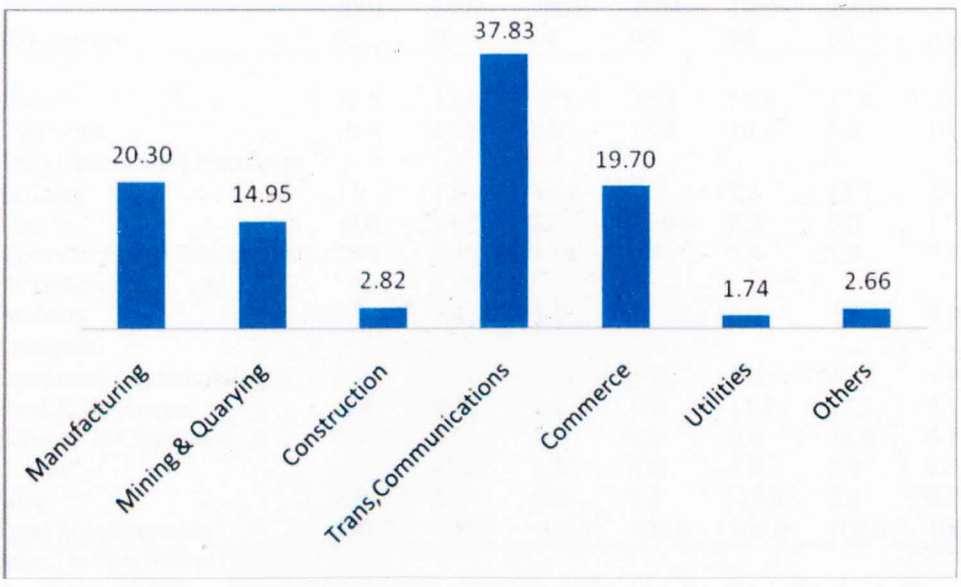
Chart 2.2: FDI Inflows from Three Major Countries, 1986-2007 (Million $ at 2000 prices)



Data source: The State Bank of Pakistan

The disaggregated data on FDI inflows relate to the inflows in 36 sub-sectors. These sectors are aggregated according to the industrial classification of the State Bank of Pakistan into six broad sectors and their percentage shares in the total of FDI inflows are presented in chart 2.3. During 2002-2007, most of the FDI has been directed towards the Transport and Communications (mainly telecom sector) (38 percent), commerce and manufacturing (20 percent each). While the FDI in the communications and commerce sectors are to serve the local market which is termed as HOR FDI, FDI in manufacturing is expected of largely VER in nature as it is a tradable sector and multinationals invest to take advantage of cheap labour in small developing countries by vertically breaking their production chain and engage in intra firm trade.

Chart 2.3: Percentage of FDI Inflows in Sectors, 2002-2007



Data source: The State Bank of Pakistan

Within the Manufacturing sector during 2002-07, Table 2.3 shows that the bulk of FDI on an average of 23 percent went into the Power sector. Other important sub sectors like Chemicals, Petro-Chemicals, Textiles and Electrical Equipments received substantial amount of a yearly average of 16 percent, 14 percent, 13 percent and 9 percent. These sectors have distinct characteristics for example chemicals is considered the most research oriented and therefore skill intensive sector while the sector of electrical equipments is less skill intensive.

However it is a challenging exercise to distinguish between horizontal and vertical FDI empirically as FDI is a complex activity. Our literature review section 2.5 indicates that empirical studies conducted on the KK model for large and similar countries found evidence of HOR FDI while studies which also have data on developing countries indicates of VER FDI in these countries.

Table 2.3: Share of FDI Inflows in Manufacturing Sub-sectors (2002-07)

(Percentages)

Sub- sectors	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	Average
Power	35.5	17.9	-9.1	22.2	55.8	17.4	23.3
Chemicals	10.4	47.0	9.8	15.4	10.9	3.9	16.2
Petro Chemicals &Petroleum Refining	4.9	1.6	46.4	7.5	7.1	13.7	13.5
Textiles	18.0	14.2	22.7	11.9	8.2	5.0	13.3
Electrical Equips/Electronics	25.7	9.4	10.4	4.1	3.4	1.9	9.2
Pharmaceuticals & OTC Products	7.0	3.4	8.5	11.5	6.0	3.3	6.6
Transport Equipment (Automobiles)	1.1	0.3	2.1	10.0	5.8	4.3	3.9
Food & Beverages	-5.8	4.3	2.9	6.2	11.2	12.1	5.1
Tobacco & Cigarettes	0.9	0.0	0.3	2.0	0.4	33.0	6.1
Cement	0.4	-0.2	1.2	4.0	6.8	2.9	2.5
Misc	2.0	2.1	4.8	5.1	-15.6	2.6	0.1
Total Manufacturing	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: The State Bank of Pakistan

The distinction between HOR and VER FDI also depends on how disaggregated the data is on FDI activities/sectors and the characteristics of the production process in these sectors. For example, within manufacturing sector while chemical is skill intensive sector therefore more likely to have the former and electrical equipments is less skill intensive and would attract the latter. More importantly, transport costs and tariffs in each of these sectors would determine the type of FDI in these sectors for example high tariffs on electrical equipments (vertical integrated production process) in the host country could lead to HOR FDI in this sector.

Likewise, services sector is largely non tradable and FDI is mostly of horizontal type as mentioned before, however, recently there is vertical integration by MNEs in certain financial services like banks and insurance companies locating some of their office activities and call centres in developing countries.[19] Moreover, complex FDI like having separate production plants in more than one country each supplying

[19] Recently vertical investment has emerged in certain financial services, for example, few US and UK banks and insurance companies are locating some of their bank office activities and call centres in developing countries. See footnote 3 in Geishecker, Ingo. and Holger Görg (2005). In this type of vertical investment MNEs offshore services of "second-level white-collar workers" which leads to exports of services from the affiliates back to high-income-country parent firms(Markusen;2005).

components to its parent firm or exporting components among each other before supplying it to the parent firm – complex VER FDI and cannot be captured by bilateral KK model.

In addition, recent surge in asset seeking FDI has led economist to re-examine the motives of MNEs which could give rise to both HOR and VER FDI. In the context of our study relating to FDI in Pakistan, asset seeking FDI is in physical infrastructure, mostly in the power[20] and telecommunications which are mainly done to serve the local market and could be termed as HOR FDI. The other type which is motivated by strategic considerations mainly in oligopolistic industries which are concentrated in industrial countries and the larger developing countries sought assets like technical knowledge, managerial and organizational competence, brand names and distribution networks etc. For example, China investing in the US for large market and to save on trade costs on Chinese imports. Big Chinese multinationals like Haier, TCL and Lenovo met their strategic needs by obtaining strategic assets via FDI in the US. As quoted by Amighini et al. (2011) for outward FDI in China for strategic resources and its rationale: "The case of outward FDI from Chinese companies Ping Deng Business Horizons (2007) 50, 71—81 : Upon purchasing IBM PC, we began to acquire advantages related to transnationality,T that is,confidence in and knowledge of operating in a foreign market. The acquisition certainly gives us access to technology and other strategic assets, such as brand names, as well as access to U.S. markets (Lenovo, personal communication, May, 2005)." Thus it implies that Chinese firm investing in strategic assets in the US could be termed as HOR FDI.[21] Haier's presence in the U.S. market also supports its investments and operations in other countries through 'spin-off technology' and reputation. For instance, Haier plants in Pakistan and Bangladesh are VER in nature as these are both small developing countries relative to China.

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[20] Foreign investment in power sector was done to serve the local needs as well as to provide power to other countries in the region i.e. market seeking FDI termed as HOR FDI (This plan was staled due to disputes on tariffs between the Government of Pakistan and foreign investors.(See Fraser (2005) for detail).

[21] Definitely not for VER FDI as labour is cheap in China than in the US.

In the light of the above analysis of FDI inflows, we expect that Pakistan received both types of HOR and VER FDI. After trade liberalization which resulted in the elimination of quotas (NTBs) and lowering of tariff rates, more of VER FDI is expected. Moreover, due to opening up of services sector which serves the domestic market, it is expected that increased inflows HOR FDI has come in. Thus we hypothesize that our data would fit the Knowledge Capital Model well as this model considers both types of FDI.

2.4 A Review of the New Trade Theory Models

2.4.1 The Evolution of New Theories of Trade and FDI

For decades, until 1960's foreign direct investment was not considered as a separate discipline. It was explained under the umbrella of orthodox neo classical theory of trade and capital movement in the Heckscher and Ohlin model (H-O).

These old theories have very restrictive assumptions of perfect competition and constant returns to scale. The consumer preferences are assumed to be the same and producers use the same type of technology, knowledge and information. There is no distinction between a firm and an industry. In addition, it is assumed that there are no trade costs and production factors are immobile.

According to the H-O theory, production and trade are the outcomes of differences in the relative cost of production between two countries. In addition, these differences in costs arise because countries are endowed with relatively different supplies of factors of production. This implies that a country, which has relatively abundant labour, will export labour intensive goods. Similarly, the other country, which has relatively abundant capital, will export capital-intensive goods. Therefore, trade will be mutually beneficial for both the countries. In a similar vein according to this approach, capital will flow from capital rich country/area to where it is deficient, to gain high rate of returns. This analysis was largely based on the capital movements that were for lending and borrowing purposes known as portfolio

investment but did not consider productive activities that are conducted as foreign direct investment (Gillies, 2005, pp 52).

It was the seminal work of Mundell (1957), "International Trade and Factor Mobility" which introduced physical capital mobility and analyzed the relationship between FDI and trade in a standard two-good, two-factor, two-country Heckscher-Ohlin-Samuelson trade model (H-O-S) by relaxing the assumption of factor mobility and identical production functions between countries. In his work, Mundell studies a setting in which a high tariff on imports restricts trade in a capital scarce country. This raises the return on capital leading to capital inflow in that country, resulting into an increase in the production of capital-intensive good and lowering the production of labour intensive good in accordance with the Rybenzki effect. Ultimately, capital inflows will equalize the relative factor endowments and hence the relative prices of the two goods in the two countries. This eliminates the basis of trade and there will be no trade even if tariff were now removed. Thus, factor flows lead to goods price equalization like goods trade causes factor price equalization in the standard H-O-S model. In general, it implies that increasing the volume of factor flows will decrease the volume of trade in goods. Therefore, factor trade is a substitute for trade in goods in this model (Goldberg, 1999).

It was the pioneering work of Hymer (1960, 1976), that distinguished the theory of international production from the orthodox theory of international trade and capital movements. He based his arguments on the industrial organization theory and emphasized market imperfections. According to him since local firms possess advantage of home market, foreign firms should possess some specific advantages that would offset the advantage of local firms. These advantages may be firm size and economies of scale, better technology, lower costs, market power, brand name and advertising or access to cheap finance etc. According to Hymer it is the market imperfections that cause internationalization of production, and the control of overseas productive asset leads to comparative advantage (Dicken, 1998, pp 182).

Hymer's work was a breakthrough. Later, Dunning (1977, 1981), further developed the concepts of internalization and specific advantage in his famous OLI paradigm. This became the basis of new theories of international trade and direct investment (Markusen, 1995).

International trade economists mainly focus on two questions in this context. First, when does a firm engage in exports versus foreign investment? Second, why does a firm prefer direct investment abroad to other alternatives such as joint ventures and licensing arrangements? (Markusen, 1995). The answers to these questions are being given in the context of OLI paradigm.

According to OLI a firm will prefer to engage in foreign direct investment than other alternatives like export and licensing if the following three conditions exist:

i. **O**wnership advantage: The firm should have some exclusive advantage over local firms due to its extensive research and development activities as it possess 'knowledge-based assets' which includes a new complex product, some innovative production process, blue prints, trademark and reputation. These knowledge based assets[22] give rise to FDI because they are easily transferred back and forth and possess the characteristics of a public good which can be supplied to additional production facilities at a relatively low costs for example supply of blueprints and chemical formulae etc. Whatever its form, the ownership advantage gives sufficient market power or cost advantage to outweigh the disadvantages of doing business abroad. More recently, large FDI inflows in the strategic assets has led Dunning (2004) to suggest a reassessment and reconfiguration of the O specific advantage and extend it by postulating that it not only considers exploiting the existing knowledge based assets but

[22] Because these knowledge-based assets are easily transferable and could be used jointly by many production facilities, they are more likely to give rise to direct foreign investment than physical capital assets (Markusen, 2005).

protecting and augmenting it by the acquisition of new assets, or by a partnering arrangement with a foreign firm in foreign countries as well. [23]

ii. Location advantage: For FDI to be conducted host countries must have a location advantage for production. This advantage could be a big and growing foreign market and other incentives as cheap factor prices, liberal trade and investment regime with lower tariffs and taxes in the host country.

iii. Internalization advantage: This relates to when the firm would like to keep its knowledge and technology (its ownership) to itself and is not willing to share it with foreign firm in the fear of losing its market power. Therefore, such firm instead of licensing its product to the foreign firm would prefer to conduct foreign direct investment itself.

Since the beginning of the 1980's multinational corporations have been analyzed in a micro economic, general equilibrium theory of international trade. This new trade theory takes its root from industrial organization theory and is based on OLI paradigm as discussed above. The new theory of trade builds three models based on increasing returns to scale and imperfect competition. These models explain how MNCs arise endogenously and are determined by country characteristics like their differences in relative size and factor endowments, trade and investment costs. According to these models trade in goods and services and FDI could be substitutes or complements, depending on the type of FDI. It is therefore important to study these models as they predict the relationship between trade and FDI that have significant implications on factor prices and welfare. The following sub sections will briefly look into the characteristics of each of these models.

[23] It is an acquisition of some strategic advantages rather than the possession of such advantages that motivates FDI. Dunning (2004) describes this asset seeking FDI as investments in technological, managerial, relational, and other created assets, be they those embodied in individuals, firms, or clusters of firms, physical infrastructure (ports, roads, power, telecommunications), macro-innovatory, entrepreneurial, educational capacity/environment (figure 1, page 283) in host countries. FDI in strategic assets are also done to gain brand names and distributional network.

2.4.2 The Horizontal Model (HOR)

Also referred to as Proximity – Concentration Approach, this model was first developed by Markusen (1984). Other important studies developing this model are by Horstmann and Markusen (1987, 1992 and 1995) and Markusen and Venables (1998, 2000).

According to this model, MNCs are firms with multiple production plants producing either a homogenous good or a single variety of a differentiated product. These firms replicate most of their production process in several places. Each production unit supplies the domestic market. In this way, transport and trade costs are being saved. Such FDI is sometimes referred to as the market seeking or tariff-jumping kind.

Moreover, according to this theory, only industries that have a comparative advantage in knowledge-based firm specific assets like R&D and human capital and those that can incur marketing expenditures with new, complex and differentiated products, can invest abroad. These knowledge based assets lead to FDI due to their ease of mobility at low costs and their 'public good character' as they can be shared amongst all the related production facilities. The basic assumption is of firm level scale economies. When the fixed costs of two plant firms are less than double of a single plant firm then the firm is motivated to invest abroad.

Gillies (2005, pp 148) lists the following assumptions of this model: First, FDI is of horizontal type only in which MNE's produce identical products in countries at similar stages of development. Second, the countries have large similar markets, which lead to plant economies of scale. Third, countries have similar factor endowments and therefore production costs are the same in countries. Fourth, the existence of large trade and transport costs. Finally, there are large firm level fixed costs of production of joint inputs, which also include intangible assets such as advertising and research and development.

The above assumptions are necessary for horizontal multinationals to exist because if two countries were of different sizes, it would be profitable to have a plant in the large country where the head-quarter of the

firm is also located rather than to build costly capacity in the small market. This small market could be catered by small amounts of exports that would entail relatively low trade costs. In addition, if country sizes are similar but factor endowments are different then also it would be costly to build a similar plant in the high cost country. For instance if source country is skill labour abundant relative to the foreign country, it would be costly to build a skill intensive plant in the foreign country. Thus the above assumptions implies that given moderate to low trade costs and firm and plant level economies of scale, Horizontal multinational activity would exist. These multinationals face a trade off between economies of scale and trade costs. If there were no trade costs single plant firms would be serving other markets and exploiting economies of scale. Therefore, in this model trade and FDI are substitutes.

This type of investment explains significant portion of FDI between high-income countries and could be the case with developing countries following import substitution development strategies (Navaretti and Venables, 2004, pp 49).

2.4.3 The Vertical Model (VER)

According to this model, firms fragment their production process into stages according to factor intensity to save on production costs. It is a refined form of factor proportion approach introduced by Helpman (1984) followed by (Helpman, 1985) and Helpman and Krugman (1985).

Helpman (1984) modelled a sector X as having two activities one is the head quarter producing blueprint etc and the other one is production activity. These two activities have different factor intensities. With headquarter being the skill intensive one. In addition, it is assumed that there are no trade costs. Therefore, production process could be split geographically based on comparative advantage, without incurring any cost.

This model also assumes that countries are at different levels of development having different factor endowments, and production of both intermediate and final products. There are internal economies of

scale due to joint inputs at both the plant and firm levels. In addition, output produced by joint inputs is company specific. Hence, this is the reason for the firm to internalise instead of licensing or other form of investment. Thus, there is vertical integration of production across countries and intra firm and intra industry trade in goods and services.

The above model implies that FDI will only occur between countries with different factor endowments so that MNEs could reap profits due to differences in factor prices. Moreover, intra-firm trade will grow as the affiliate ship the finished goods back to the source country. Thus, trade and FDI are complements in this model and trade costs would be impediments to such vertical type of FDI.

Although this model does not reflect the major trend of overall FDI among the developed countries, it explains the growing trend of intra industry trade, which according to some estimates was about 35 percent of world trade in the period 1990-2001 (Grossman et, al; 2006).

2.4.4 The Knowledge Capital Model (KK)

The KK model by Markusen (1997, 2002) integrates the characteristics of both vertical and horizontal models. It is based on the concept of knowledge capital. In this model, FDI is motivated by both market size and factor cost considerations. The knowledge capital refers to human capital and activities like research and development that are relatively skilled labour intensive. There are certain properties of this knowledge-based asset, which are crucial for this model. These properties with other characteristics of the model are described below.

The Knowledge Capital model is a general equilibrium model with two goods x and y, two countries h and f and two factors that are skilled and unskilled labour. While good y is labour intensive and produced under constant returns to scale under perfect competition, good x is skill intensive and produced by Cournot competitors under increasing returns to scale. Moreover, there is free entry and exit among the firms. Furthermore, national markets are segmented, factors of production are immobile between

countries and there are transport costs between countries (Markusen and Maskus, 1997, 2002 and Carr et al. 2001).

There are six x "firm types'' given as:

i) Single-plant national firms (Ni, Nj) with headquarter and plant in the respective countries. Firm Ni may or may not export to country j and likewise for the firm Nj.

ii) Two-plant horizontal firms (Hi, Hj) with headquarters in the respective countries and plants in both countries.

iii) Single-plant vertical firms (Vi, Vj) with headquarters and plant in different countries. Firm Vi may or may not export to country j and likewise for the firm Vj.

Additionally, the model assumes that knowledge-based asset has three properties. First, its services conducted in the head quarter have easy access to geographically separate production units implying that knowledge capital could exist in separate location from a production unit, second, it is skilled labour intensive; the head quarter services are more skilled-labour intensive than production which is more skilled-labour intensive than the composite rest of the economy. Thus the ranking of of activities according to their skill intensity is expressed as [head quarters only] > [integrated x] > [plant only] > [y]. And third it has a public good characteristic and its services like blue prints, manuals and procedures, etc could be used in various production facilities at low marginal cost. The first two assumptions lead to vertical production. In vertical production, the skill intensive services are done where the firm's headquarter is located; the relatively less skill intensive production activity could be performed in another location where it is cheap to produce. In this way, firms could reap plant economies of scale. The third assumption generates firm level scale economies and is conducive for horizontal investment (type-H firms) where analogous production plants could benefit from joint inputs provided by the firm's headquarter. There will also be multi-plant economies of scale as this joint input could be provided simultaneously and

with low marginal costs in additional plants. Thus, the total fixed costs of headquarters and two plants is less than the double of a single plant firm due to multi-plant economies of scale in the production of x.

The model further assumes that national markets for goods are segmented and transport costs use unskilled labour.

Based on the assumptions stated above, Carr et al. (2001) suggest that different country characteristics favour various firm types producing or maintaining headquarters in country h and in country *f*. We review below the authors' discussion on the types of firm favoured in the countries according to their size, skill levels and trade costs.

First considering the factors that favour national firms being headquartered in country h and also producing there, type N firms will be the dominant type active in h if: (1) h is both large and skilled-labour abundant; (2) h and *f* are similar in size and relative endowments and transport costs are low (type Nf will sell in h); or (3) foreign investment barriers in *f* are high (type Nf may sell in h).

If country h is large and also skill labour abundant, production as well headquarters location is favoured there. Thus, an integrated type-Nh, firm has a cost advantage over a type-Vh or Vf firm. A type-Nh, firm also has an advantage over a type-Hh, firm, which must locate costly capacity in the small *f* market unless trade costs are high. Type-N firms will also be dominant in similar countries with small trade costs as there is no motive for type-V firms while small trade costs favour type-N firms over two-plant type-H firms.

In countries which are similar in size and relative endowments and have high transport costs, Type-H, firms will be the dominant (type Hf will also produce in h). In other words, to avoid high trade costs, horizontal multinationals firms are located in similar countries in both size and in relative factor endowments each serving local markets. This is because if countries are dissimilar in size or relative endowments, it will not be cost effective to establish horizontal firms. For example, national firms located

in the large country will be dominant if the countries are similar in relative endowments but of different sizes to avoid costly capacity in the smaller market.

On the other hand, if the countries are different in relative endowments but of similar size, then there is an incentive to concentrate headquarters in the skilled-labour-abundant country and production in the skilled-labour-scarce country. Thus, unless trade costs are high, vertical firms headquartered in the skilled - labour- abundant countries are favoured. This leads to a prediction about vertical multinationals. Type-Vh, firms will be dominant in h if country h is small, skilled-labour-abundant, and trade costs from the host country back to the parent country are not excessive.

From the above analysis, it is evident that the KK model integrates both the size and relative factor endowments in determining FDI, for example one of the predictions of the KK model is that FDI would be highest when the country is skill-labour abundant and is relatively small.

The models of new international trade theory have important implications regarding trade and income distribution. Therefore, it will be worthwhile to see how different types of FDI affect these aspects of an economy in the next sub section.

2.4.5 Implications of the New Trade Theory Models

According to the predictions of the new trade theory models, HOR FDI would substitute trade and vertical FDI would increase it. However, trade in services could also rise due to horizontal FDI in the form of remittances, royalties etc. Additionally, vertical FDI may lower the differences in wages between skilled and unskilled labour and also can change the income distribution within a country. Horizontal FDI may increase income in each country but have negligible effect on its distribution, (Aizenman and Marion, 2004). Thus, investment liberalization could have significant effects on real and relative factor prices and distribution of income. In addition, since investment liberalization leads to changes in active production technology, these effects would be different from those brought about by trade liberalization. Let us

consider two scenarios presented in Markusen (2004). In the first scenario, investment liberalization is accompanied by high trade costs and in the second with low trade costs. If there are high trade costs, investment liberalization will lead to horizontal firms producing good x in the host country. The increase in the production of x in the host country leads to an increase in demand for skilled labour there. This increased demand will lead to a net transfer of resources from sector y to sector x and a rise in the real price of skilled labour in that country. In addition, a larger domestic supply of x will lower the its price causing price index to fall that may also make unskilled labour better off. On the other hand, since all the head quarter activity is now being carried out in country i, there will be a transfer of resources from production of x to headquarter services in that country. This will increase the real price of skilled labour in country i. However, the price of x may now rise and lead to a fall in the real price of unskilled labour in country i. In the second scenario where there are low trade costs, investment liberalization will lead to vertical multinationals. Similar to the first scenario, there will be a net shift of resources from less skilled to more skilled labour sector. Nevertheless, due to competitive effects the price of x falls in both the countries, making skilled as well as unskilled labour better off in both countries.

Overall, Markusen (2004, pp 176), studies the effect of investment liberalization on factor prices in an integrated model, and conclude "the knowledge-capital model has something of a ''skilled-labour bias'' to it, in the sense that investment liberalization may lead to an increase in the real and relative wage of skilled labor in both countries, and there are no pairs of economies (points in the world Edgeworth box) where investment liberalization leads to a fall in the real or relative price of skilled labor in both countries. This is due to a shift toward a more skilled-labor-intensive activity in both countries and/or increased efficiency (procompetitive effect) that lowers the price of X''.

Thus, different types of FDI have diverse and wide ranging implications in the economy. Therefore, it would be useful to study the determinants of each of these types of FDI. However, it is not an easy task to empirically distinguish these types of FDI because of the complex nature of FDI and limitations of the

data. The majority of the related studies utilize US or other OECD countries FDI data. More recently, the focus of research is shifting towards the developing countries. Our review of these empirical studies in the next section finds conflicting results based on the data sets and model specifications utilized.

2.5 Empirical Works on the KK Model

By incorporating the multinational firms, the new trade theory models have initiated a lively debate in the literature of globalization and led many researchers to test these models to verify the types of FDI conducted by these multinationals. These studies are important as they identify various determinants related to the vertical and horizontal FDI based on the knowledge capital that lead to different policy implications related to trade and investment. Most of the empirical studies use the gravity model to test the predictions of the KK model. The gravity model explains bilateral FDI by bilateral country characteristics like their incomes, skills, investment costs, trade costs and distances.

As mentioned before, various model specifications have been tested with mixed results. The majority of the studies relate to the determinants US FDI using data on affiliates sales of US multinationals. Markusen and Maskus, (2001) and Blonigen, (2005) have done extensive reviews of these works. These reviews indicate that very little work has been done on these models for the developing countries. In our context, it will be of particular interest to review studies from the perspective of the developing countries. A list of studies is given in the appendices in Table A2.1.

The pioneering work to test the KK model is by CMM (2001). The objective of their paper is to test the knowledge capital model drawn from Markusen et al. (1996) and Markusen (1997). Using a panel data of cross country observations of 37 countries over the period 1986-94, both inward and outward US FDI in non-bank manufacturing sectors have been studied. The study employs three methods for estimation. Firstly, the method of ordinary least squares (OLS) is used, secondly, the weighted least squares (WLS) is used due to heteroskedastic errors in the OLS specification and thirdly, the Tobit model is employed as

there were a large number of small skilled labour scarce countries relative to the US with no affiliate sales in the US. The study has also analysed the time series effects by employing country fixed effect.

The basic equation along with the predicted signs of the coefficients (in brackets under the coefficients) is given below:

$$\text{Real Sales} = \beta_0 + \underset{(+)}{\beta_1} * (\text{GDP Sum}) + \underset{(-)}{\beta_2} * (\text{GDP Difference Squared}) + \underset{(+)}{\beta_3} * (\text{Skill Difference}) +$$
$$\underset{(-)}{\beta_4} * [(\text{GDP Difference}) * (\text{Skill Difference})] + \underset{(-)}{\beta_5} * (\text{Investment Cost Host}) + \underset{(+)}{\beta_6} * (\text{Trade Cost Host}) +$$
$$\underset{(-)}{\beta_7} * [(\text{Trade Cost Host}) * (\text{Skill Difference Squared})] + \underset{(-)}{\beta_8} * (\text{Trade Cost Source}) + \underset{(?)}{\beta_9} * \text{Distance} \quad (2.1)$$

The dependent variable relates to both inflow and outflow of FDI for the US and measures annual data on real sales volume of non bank manufacturing foreign affiliates of the US source firms and of U.S. affiliates of foreign source firms. In this bilateral data the US is either the source or the host country in every observation.

The first two explanatory variables are the sum of the two countries real GDPs and squared difference between the two countries' real GDP respectively. These variables control for country size and are relevant for HOR FDI. Since horizontal MNEs are mostly active in similar and large economies, there is an expected positive sign for the coefficient on GDP Sum ($\beta 1$) and a negative sign for GDP Difference Squared ($\beta 2$). These hypotheses suggest that with some positive level of trade costs, it would be profitable due to the firm and plant economies of scale, to establish production plants rather than exporting in countries of larger and similar size markets.

The next two variables (Skill Difference) and [(GDP Difference) * (Skill Difference)] explain the relative factor endowment effects and are related to the vertical aspects of the KK model. The first relates to the

relative skill abundance of the source country and the second is the product of difference in economic size and skill endowments between source and host countries. Skill difference is measured as the ratio of skilled labour employed to total labour employment in the parent country and that in the host country, with skilled labour measured as managerial and professional, technical, and kindred workers. The coefficient on Skill Difference is expected to be positive because vertically integrated firms tend to perform the head quarter activity in the skill- labour abundant country and production is done in countries with cheap unskilled labour. Additionally, these firms' sales are also highest when the source countries are relatively small, therefore, the predicted sign of the coefficient of [(GDP Difference) * (Skill Difference)] is expected to have a negative coefficient.

The cost of investing and trade in the affiliate country is a simple average of several indices of perceived impediments to investment and trade, reported in the World Competitiveness Report of the World Economic Forum. The investment barriers include restrictions on the ability to acquire control in a domestic company, limitations on the ability to employ foreign skilled labour, restraints on negotiating joint ventures, difficulties in acquiring local bank credit, restrictions on access to local and foreign capital markets, and inadequate protection of intellectual property. The resulting indices are computed on a scale from zero to 100, with a higher number indicating higher investment costs. A higher investment cost in the host country would have a negative effect on the sales of multinationals. Therefore, it is predicted that the investment cost variable would have a negative sign.

The three variables (Trade Cost Host, [(Trade Cost Host) * (Skill Difference Squared)] and Trade Cost Source) indicate the effects of trade frictions. Trade cost is a measure of national protectionism, or efforts to prevent importation of competitive products. It also runs from zero to 100, with 100 being the highest trade costs. Since higher trade costs in the host country will discourage exports to this country and encourage HOR FDI, therefore the coefficient of (Trade Cost Host) is expected to be positive. The second term [(Trade Cost Host) * (Skill Difference Squared)] is the product of trade cost in the host country and

the squared skill difference between source and host countries. As trade cost in host country would encourage horizontal FDI and not vertical FDI when countries are similar in relative factor endowment, the negative sign predicts that the direct effect of host country's trade costs would be weaker. The third term (Trade Cost Source) would have a negative relationship with sales since higher trade costs in the source country would restrict good produced in the host country to be shipped back to source countries. This will discourage vertical FDI.

The Distance variable measures the distances between capital cities. It is used as a proxy for transaction costs. Its net effect is ambiguous as higher distances make both exports and MNE activity costly.

The authors find that investment flows between countries increase with an increase in the sum of their economic sizes, their similarity in size and the relative skilled-labour abundance of the source nation. It is noteworthy that in the Tobit specification, which incorporates many more developing countries with zero reported affiliate sales, the magnitudes and significance levels of relative endowment differences and trade costs in both host and source countries are higher than in the OLS case. This result provides some support for the notion that horizontal FDI and vertical FDI respond differently to host-country and source-country characteristics and that vertical FDI is more relevant in the context of the developing countries.

The CMM (2001) study has thus initiated an interesting and important debate in the literature on the complexity of estimating the KK model. Some of the related studies by Markusen and Markus (MM) (1999, 2001 and 2002) using the same data as CMM (2001) revealed that the KK model could be rejected in favour of the horizontal model. MM (1999) include additional interaction terms that indicate when this relative skill difference terms between source and host is positive and when it is negative. They argue that it is important to distinguish when the source country is skill abundant and when it is skill deficient. MM (2001) finds a negative relation between sales and skilled labour abundance in the source country when investigating outward FDI only.

Researchers doing subsequent work on the KK model have cited some shortcomings in the CMM (2001) specification of the model. First, the study pools inflows and outflows of FDI together although these flows are likely to have different determinants and implications. Second, the specification of the model is not accurate; specifically the specification of the skill variable which do not take non monotinicities of the model into account, (Blonigen et al. 2003, (BDH henceforth), Braconier et al. 2005a and Davies, 2008). Third, the study has lumped developed and developing countries together. The motives of FDI in the developed and developing countries are different therefore pooled estimates could be misleading, (Blonigen and Wang, 2004).

In the light of the above discussion, BDH (2003) show, that it is critical to distinguish between skill abundance in the source and host country. That is when the sign of the skill difference term is positive and when it is negative. A rise in difference in skills means that this difference is increasing when the source is skill abundant and decreasing when the host is skill abundant i.e. countries are converging. Therefore, they modified their framework and specified skill difference and GDP difference in absolute values and termed it the 'Absolute Value Model'. The estimated results show that the coefficient on the skill difference term is negative indicating that as difference in skills increases affiliates' sales decreases. Moreover, the coefficient on the interaction term of skill difference with GDP difference is positive. These results contradict CMM's estimated results, therefore BDH conclude that the HOR model could not be rejected in favour of the KK model. Similar specification issues and other limitations of the Carr et al model have been addressed more recently by some other researchers which we discuss in detail below.

Recent developments in the empirical specification of the model and the availability of more data have led to strong evidence that the KK model fits the data well. According to Braconier et al. (2005a), previous studies fail to find evidence of vertical FDI because they have used limited data sets, which do not consider observations where vertical FDI could be found i.e. when the source country is small and skill abundant. Therefore, these authors have used a richer data set of OECD countries and national data

on FDI from US, Germany, Italy combined with outward data of FDI from Sweden and Japan for years 1986, 1990, 1994 and 1998.

They have also re-specified their size and skill variables by geometrically deriving these measures from the Edgeworth box. While CMM specify size by the sum of source and host country GDP, and skill difference by source and host country difference in the share of skilled labour in the total population of the respective countries, Braconier et al., has taken source country's share in world endowments of high skilled and unskilled labour (Si and Ui). Moreover, the authors argue that CMM's GDP difference squared term impose a u shape or an inverse u shape on the data. From the mapping of the Edgeworth box similar to Figure 2.1, [24] they have calculated the relative size of a country by the length of a ray from the origin to its endowment point so that:

$$\text{SIZE}_i = \sqrt{u_i^2 + s_i^2}$$

$$s_i = S_i / (S_i + S\,j) \qquad u_i = U_i / (U_i + U\,j)$$

S_i ($S\,j$) : endowment of country i (j) of skilled labour

U_i ($U\,j$) : endowment of country i (j) of unskilled labour

The slope of this ray measures skill abundance:

$\text{SKILLi} = s_i / u_i$

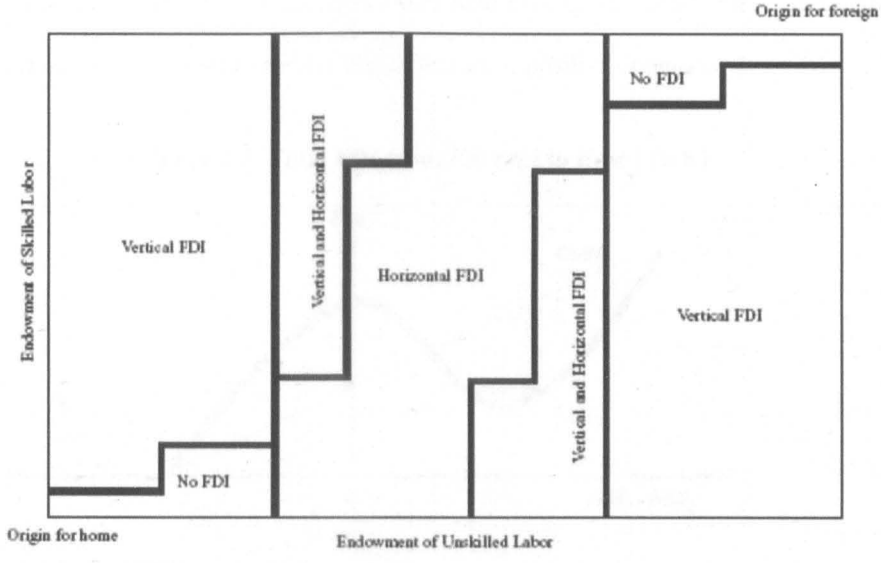
To account for non-linear effects of size on affiliate's sales they have also used a squared term of size. They expect size to increase sales while the squared size should decrease sales mainly reflecting horizontal FDI. (When moving, from SW to NE in figure 2.1). In addition, they expect SKILLi to be positive. Their results are consistent with the KK model. Moreover, as a robustness check they have also

[24] The coordinates of the Edgeworth box in their study are the ratios: $s_i = S_i/(S_i + S\,j)$, $u_i = U_i/(U_i + U\,j)$. See figure 1 page 772 in Braconier et al. (2005a).

used other explanatory variables such as a common border dummy and the share of source country GDP in the sum of the host and source country GDP as an alternate size variable and obtained similar results. In addition, they also disaggregated their sample into positive skill difference and negative skill difference as suggested by BDH, but did not find any qualitative changes in their results.

In the same context, a recent study by Davies (2008) has shown that it is not enough to see the different effects of skill differences on either side of zero to distinguish when the source is skill abundant and when the host is skill abundant as suggested by BDH. Instead, he augments the KK model specification that allows for non-monotonicities on both sides of zero differences for the skill variable and emphasizes the non monotonic feature particularly when the skill differences are positive. He illustrates his point using Figure 2.1.

Figure 2.1: Types of FDI Activities



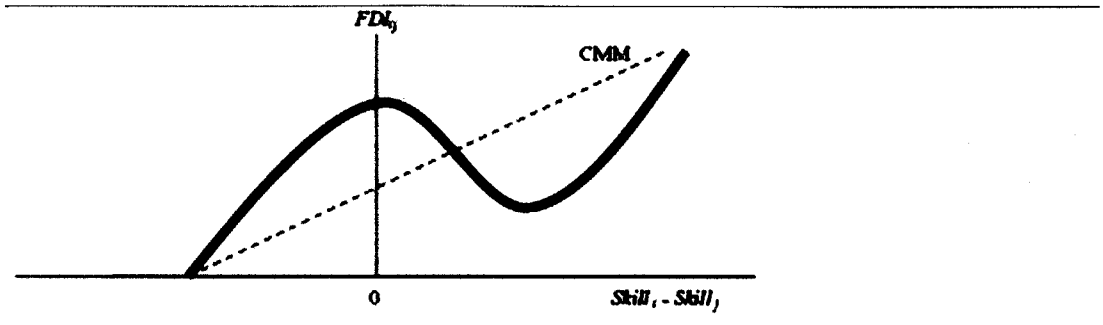
Source: Davies (2008)

Figure 2.1 depicts various regions in which different types of MNEs exist as a function of relative sizes and endowments of the two countries. The source country (Origin for home) is in the southeast corner and

the host country (Origin for foreign) is depicted in the northwest corner of the Edgeworth box. The vertical and horizontal axes indicate the skilled and unskilled endowments of the respective countries.

Assuming high trade costs, it can be observed that when the countries are large and similar in relative endowments, no vertical MNE exists because there is insufficient factor price differences to make it profitable than the horizontal MNE or a national firm. On the other hand, holding relative size constant and increasing skill difference will lead to the regions of northwest and southeast where all firms are vertical. However, there are regions in between where both types of FDI occur. Near zero skill difference there is dominance of horizontal MNEs and hence there is a negative relationship between the absolute value of skill difference and total FDI. A movement towards the positive skill difference leads to the emergence of vertical FDI, which eventually dominates leading to a positive relationship between skill difference and total FDI. Thus, a movement from the negative skill differences towards positive skill differences leads FDI first to increase then decrease and increase again as shown by the bold curve in Figure 2.2 below. (The dashed line shows the CMM specification where the relationship between FDI and skill difference is increasing whether this difference is positive or negative).

Figure 2.2: Total FDI from Parent i to Host j (KK)



Source: Davies (2008)

The study by Davies has used the data sets of CMM and BDH for the inflows and outflows and added a square term for the skill term as an explanatory variable in the model to control for the switching between

horizontal and vertical FDI. The results are according to the expectations. For the negative skill differences case there is a positive coefficient for skill difference term and a negative (or small positive) coefficient for the squared skill difference term *(*for CMM data set they have positive but insignificant coefficient*)*, implying that FDI falls as skill difference moves towards negative infinity. For the positive case, they found a negative coefficient for skill difference but a positive coefficient on square of skill difference, indicating that FDI first falls and then rise as this difference rises. Thus he found that when the source country is skill abundant but only slightly so, FDI is decreasing in skill differences, which is consistent with the horizontal FDI. On the other hand as the skill difference rises and source is very skill abundant, FDI increases in the skill difference. This is consistent with the vertical FDI. These results are strongest in the case of OECD data of stock of FDI. The author suggests that this is because OECD stock data covers more developing countries.

The above review indicates that as the empirical specification is important to distinguish between the types of FDI, the sample of countries in the data set is also very crucial. Many of the studies have found evidence of vertical FDI when they consider the developing countries in their data for example in the Tobit models in CMM's study and as BDH (2003), Blonigen and Wang (2004) and Davies (2008) has shown using the US and OECD FDI stocks data.

While all the above studies estimating the KK model, which find evidence of vertical FDI have indicated some implicit role of the less developed countries (LDCs), the study by Blonigen and Wang (2004), has explicitly shown the motives behind FDI towards the developing countries using dummies for these countries in their analysis. According to the authors, the CMM (2001) specification is inappropriate to distinguish between vertical and horizontal FDI because it uses pooled data for inflows and outflows of FDI as well as pooled developing countries and developed countries together. The pooled estimates do not reflect the structural differences between developed and developing countries and could be misleading. Therefore, they investigate CMM (2001) specification on inbound and outbound of the US FDI stocks for

the years 1970-99. In addition, they estimate their model with interactive country dummies for the developing countries.

The coefficients on these interactive terms indicate the incremental difference in the variable's effect on FDI due to the developing countries. Their hypothesis is that the vertical motive will be more evident in the US FDI towards the developing countries as the US seeks for labour abundant and low wage countries for out sourcing. They authors report that F-test strongly supports the inclusion of the interactive dummies for the developing countries in their regressions. Many of the developing countries interaction terms are statistically significant and in almost every case are exactly opposite in signs to their counterpart non-interacted terms. This result strongly suggests that a different process is governing MNE activity in the developing countries that is not captured by the model estimated in CMM (2001).

Table 2.4 shows the estimated coefficients for non interactive and interactive terms obtained by Blonigen and Wang (BW) (2004) in the regressions of the outbound US FDI stock in both level (columns 2 and 3) and log forms (columns 5 and 6).[25] For our own ease to explain the results below, we have also added the values of non interactive and interactive terms in columns 4 and 7.

Most of the signs of the coefficients for non-interactive terms (indicating the effect of variable's effect on FDI related to developed countries) in columns 2 and 5 are opposite of the interactive terms (which measure the incremental difference in the variable's effect on FDI when the observation is connected with an LDC) in columns 3 and 6. This indicates that motives behind FDI in the developed and developing countries vary systematically.

While the coefficients relating to market size, the GDP sum and GDP difference squared, for the developed countries have positive (7.85) and negative signs (-0.001) according to the expectations, these signs turned out to be negative (-12.39) and positive (0.001) for interactive terms indicating net effects of

[25] The coefficients of the two regression equations (in level and log forms) are divided into two columns for each regression to save space. The predicted signs of the coefficients for the CMM specification of the KK model are given in column 1 for comparison.

the developing countries. So the coefficient of the variables GDP sum falls from 7.85 to -4.54 (7.85-12.39) and for the GDP difference squared increases from -0.001 to 0.00 (-0.001 + 0.001)). According to the authors these estimates imply that market size in the LDC is not important for the amount of US FDI that they receive, which is more in accordance with a vertical FDI, rather than a horizontal FDI.

Table 2.4: The Estimated Signs of the Outbound FDI Stock Regression in Blonigen and Wang (2004) Study

1	2	3	4	5	6	7
Independent variables and the predicted signs of the KK model (CMM's model specification)	BW equation **Non interactive terms** LEVELS	BW Equation **Interactive terms** LEVELS	**2+3**	BW equation **Non interactive terms** LOGS	BW equation **Interactive terms** LOGS	**5+6**
GDP sum (+)	7.85 (1.70)	-12.39 (1.49)	-4.54	5.43 (0.81)	-3.29 (0.54)	2.14
GDP difference Squared (-)	-0.001 (0.0003)	0.001 (0.0002)	0.00	-1.75 (0.32)	2.08 (0.36)	0.33
Skill difference (+)	-12904 (4865)	12330 (4877)	-574	-0.51 (0.13)	0.95 (0.32)	0.44
Skill difference*GDP difference (-)	0.72 (0.54)	-0.60 (0.55)	0.12	-0.18 (0.02)	0.23 (0.06)	0.05
Trade cost host (+)	-191.4 (83.6)	163.9 (84.1)	-27.5	0.41 (3.94)	-0.21 (1.05)	0.2
Trade cost host*skill difference squared (-)	7.31 (4.05)	-6.90 (4.06)	0.41			
Trade cost source (-)	-3251 (974.3)	31.01 (154.2)	-3219.99			
Investment cost host (-)	327.3 (132.3)	-383.8 (136.0)	-56.5	-1.22 (0.24)	-2.14 (0.52)	-3.36
Distance (?)	-5.00 (0.85)	4.36 (0.86)	-0.64	-0.86 (0.11)	-0.07 (0.19)	-0.93

Notes: Source: Blonigen and Wang (2004). (Standard Errors are in the brackets). Columns 4 and 7 are author's calculations. Interactive terms : Independent variables of the KK model * dummies for the LDCs.

On the other hand, the coefficient for skill difference has the negative coefficient for the developed countries (-12904) but the net effect indicated by the coefficient on the interactive term (12330) has a positive coefficient in the case for developing countries indicating that vertical aspect is more important for the developing countries.

Moreover, while the host trade cost is negative for the developed countries, the net effect is positive in the case of developing countries, which is according to the expectation of the KK model according to, which higher trade costs in the host countries encourage HOR FDI.

The other significant difference is that investment costs in the host countries (as measured by an index of business environment risk in the host country) are much more important for the developing countries than for the developed countries as hosts. While the sign of the coefficient of investment costs for the developed host countries turned out to be positive and significant (327.3 (column 2)), it has a significant negative sign (-56.5 (column 4)) for the developing host countries as predicted by the KK model.

Thus the estimated signs for the interactive dummies for the developing countries are more in accordance with the KK model than those obtained for non-interactive terms in the case for the developed countries. However, the market size variables related to horizontal aspect are not according to the predictions of the KK model. There seems to be that as vertical FDI is difficult to be identified in the case of developed countries, the horizontal FDI has less convincing evidence in the regression analysis on developing countries, as market size variables do not perform well because the developing countries largely receive FDI from the large developed countries.

Apart from the issue of not finding horizontal FDI in the analysis of developing countries, there are also conflicting results regarding vertical FDI in the developing countries and this may arise due to lumping of developing countries with different characteristics together. For instance, a paper written from the perspective of the developing countries CMM (2002) (the paper does not particularly aim at estimating

the KK model specification but does derive related predictions from it) has found that lower wages do not attract US FDI towards the developing countries. On the other hand, US investors seek large market size and skilled labour in developing countries. This is quite the opposite view of what is believed to be, that vertical FDI is attracted towards developing countries to take advantage of low factor costs. The authors write, "---- increases in the differences in skill endowments between United States and its investment partners tend to reduce local affiliate activity significantly, as found earlier in Markusen and Maskus (2002) and Blonigen, Davies and Head (2002)''. Further, they clarify "However, we emphasize that the data exercise in this paper considers only FDI in aggregate manufactures, rather than FDI in labour intensive goods" (CMM, 2002, pp 3).

CMM (2002) use data on outward investment from the United States to a large sample of both developed and lower-to-middle income developing countries from 1986-1997. There are 39 host countries for which they have at least nine years of complete data over the 12-year interval, 18 of these countries are classified as developing countries.

The basic estimating equation is:

$$RSALESij = \alpha + \beta 0\ GDPi + \beta 1\ GDPj + \beta 2\ SKDIFFij + \beta 3\ SKDIFFij*GDPj + \beta 4\ INVCj + \beta 5\ TCj + \beta 6\ INFRAj + \beta 7\ DISTANCEij \quad (2.2)$$

Where i= US j=host countries

RSALESij: real affiliate sales of U.S. affiliates in country j;

RSALESLij : real affiliate sales of U.S. affiliates in country j to the local market in j;

RSALESEij : real affiliate sales of U.S. affiliates in country j to all export markets;

GDPi : real GDP in the United States

GDPj : real GDP in country j;

SKDIFFij the share of skilled labour in the US minus that in country j .

INVCj : an index of costs and barriers to investing in country j;

TCj : an index of costs and barriers to exporting into country j;

INFRAj : an index of overall infrastructure quality for country j;

DISTANCEij : the distance between the US and country j.

They have estimated the above equation for total real affiliate sales and also for its two components i.e. local affiliate sales (RSALESLij) and export sales (RSALESEij) for both full country samples as well as for the developing countries.

The definition and source of market size, skill and cost variables are the same as in CMM (2001), but as it can be observed the specification of some of the variables like market size is different from their earlier study and the equation contains an additional explanatory variable of infrastructure (INFRAj). The variables describing market size are not the GDPsum and GDP difference square. The variables now depict the respective source (US) and host countries market sizes. The coefficients of market size variables; $\beta 1$ on GDPj is expected to be positive, as is the coefficient $\beta 0$ on GDPi.

They have used the methods of weighted least squares (WLS) and generalized least squares (GLS) to control for heteroskedasticity and serial correlation within each country. However, they could not control for country effects, as variations in many variables like size, skill difference investment and trade costs and infrastructure quality are cross sectional rather than longitudinal.

Results for their GLS regressions for the developing countries indicate that market size of the developing countries is positive and significant. Their data shows that 64% of output is sold locally by the US affiliates in the developing countries. However, the coefficients are negative and insignificant in the WLS cases. The coefficients on skill difference variable vary across estimations techniques and across types of affiliate's sales. For example in total sales regression in WLS cases, it has negative signs. While in GLS regressions, it is positive but not significant. The study concludes that affiliate activity in developing

countries seem to be more responsive to an increase in local skill endowments than in the full sample at least in WLS regressions. This may be, as the authors acknowledge, that their analysis is of FDI in aggregate manufactures than FDI in labour-intensive goods. The authors have sighted several problems in their estimations like high correlation among independent variables, lack of variation in the data and lack of observations for the developing countries, which makes their estimates imprecise.

Moreover, this study lumps together all the developing countries with different characteristics, for example Singapore and Pakistan. Furthermore, disaggregated data in the manufacturing sector could be more revealing to determine the determinants of the types of FDI. As more and more data becomes available, the new trade models explaining the determinants of FDI flows are being estimated at a more disaggregated level. These works indicate that the types of FDI depend on the skill intensity of the sectors concerned. Geishecker and Gorg (2005), show that there is more evidence of horizontal FDI in the services sector and vertical FDI in the manufacturing sector. Looking at the country-industry determinants of the US FDI outflows, Yeaple (2003), by interacting industry specific skill intensity variable with the country skilled labour abundance variable (using a different variant of the KK model than used by the CMM, 2001), finds that the U.S. MNEs favour skilled-labour abundant countries over skilled-labour-scarce countries, however, in industries with low skilled-labour intensities U.S. MNEs favour skill-scarce countries over skill-abundant countries. Similarly, a study by Walrich (2003), using industry level data finds concentration of MNEs activities in the unskilled labour intensive sectors and finds evidence for the vertical FDI inflows in Mexico.

Has the KK model overwhelming support in the empirical analysis and does it explain the pattern of FDI in the developing countries? While there is more evidence in support of horizontal aspect of the model for developed countries, there is some evidence that the vertical aspect is more important for the developing countries. However, the recent pace of globalization and an increase in intra-firm trade and trade in differentiated products due to the increased role of the MNEs in the world trade give reason to believe

that FDI flows are of both types. Therefore, researchers are trying to come up with new specifications and data sets to estimate the simultaneous determination of vertical and horizontal FDI. The next section is an attempt in this direction.

2.6 The Model, the Data and the Methodology

Since the specification of the KK model by CMM (2001) is considered as a benchmark in the literature and has been tested by several studies, we will follow this specification to see how the model works with our data and some additional controls. The following equation with the predicted signs (below the coefficients) for each variable describes the basic model:[26]

$$FDIijt = \beta_0 + \beta_1 (GDPSUMijt) + \beta_2 (GDPDIF2ijt) + \beta_3 (ENDDIFijt) + \beta_4 (ENDDIFijt*GDPDIFijt)$$
$$(+) \qquad (-) \qquad (+) \qquad (-)$$
$$\beta_5 (INVCjt) + \beta_6 (TRDjit) + \beta_7 (ENDIF2ijt*TRDCji)t + \beta_8 (TRDCijt) + \beta_9 (DISTij) + uijt$$
$$(-) \qquad (+) \qquad (-) \qquad (-) \qquad (?) \qquad (2.3)$$

i= source country j=host country t=time

The dependent variable FDIijt is the net inflows of FDI in host country j (Pakistan) from source country i in period t. Net FDI inflows are investment inflows less outflows in cash (disinvestment) undertaken by an affiliate of a multinational in Pakistan. It also includes capital equipment brought in and reinvested earnings. These net inflows can be negative if outflows (disinvestment) to any country exceed the inflows from that country and/or when a multinational shows loss in their accounts and retained earnings for the year of that MNE decrease. The panel data on FDI used in this study are both on an aggregate and disaggregate levels obtained from the State Bank of Pakistan. The data on Aggregate FDI relates to the net inflows from 16 source countries for the period 1986-2007. We also use data on FDI net inflows in 6 broad sectors which are the Manufacturing, Mining, Construction, Transport-Communication, Commerce,

[26] Equation 2.3 is similar to Carr et al. specification as expressed in equation 2.1 above; we have used notations to save space.

and the Utility for 2002-2007. Additionally, data on the 23 sub sectors of the Manufacturing for 2002-2007 is also being used to estimate the KK model.[27] All FDI values were converted into constant prices of $ US at 2000 prices, deflating by a GDP deflator constructed from the World Development Indicators. The FDI inflows are in million of US dollars from 16 countries. The FDI figures were converted into real values by deflating with GDP deflator at constant prices of 2000 from the World Development Indicator (WDI). FDI consists of cash brought in, capital equipment brought in and reinvested earnings and consists of both manufacturing and non-manufacturing sectors. This data is unique, as it has never been used before. In addition, the definition and the measurement of FDI are consistent across the countries.

The summary statistics presented in appendices in Table A2.2 indicate that Pakistan received net FDI inflows of about $ 49.91 million on an average per year during 1986-2007. The dispersion of FDI inflows is large from a minimum value of 0.08 million to a maximum of 1133.06 million $ US. (Descriptive statistics are shown for FDI>0)

The first two explanatory variables, GDPSUMijt, and GDPDIFijt are the bilateral sum of GDPs and the difference in bilateral GDPs of source and the host countries. As market sizes of countries grow there will be more horizontal type of FDI, therefore, first term GDPSUMijt is expected to be positive and according to CMM's prediction FDI decreases with differences in market sizes, therefore we expect the coefficient on GDPDIF2ijt to be negative. The data on the GDP of the sample countries are obtained from World Development Indicators at constant prices of 2000 US $.

The third variable ENDDIFijt relates to the endowment difference between the source and the host countries and the fourth variable ENDDIFijt*GDPDIFijt is the product of endowment difference and GDP difference between the source and the host country. The sign of the former is predicted to be positive and the latter negative as vertical FDI is conducted between countries dissimilar in sizes and factor endowments. ENDDIFijt is measured by differences in per capita GDP of the respective countries.

[27] Names of source countries and sectors are provided under summary statistics Table A2.4.

We use per capita GDP as a proxy for endowment of a country following Braconier et al (b, 2005), Kristjánsdóttir (2005) and Geishecker and Gorg (2005). The data is extracted from the World Development Indicators at $ 2000 prices.

Investment costs in the host country are measured by the fifth variable INVCjt. As high investment costs in the host country discourage foreign investment in the host country we hypothesize the sign of its coefficient to be negative. This is being measured by the price level of capital equipment in Pakistan. It has been observed that investment costs in the source countries have been ignored in the previous estimations of the model. However, in the general equilibrium models investment costs in the source countries should also be considered. While FDI is financed in both the countries,[28] an investor considers the relative cost of investment in his country and the foreign country in which he is potentially going to invest. Therefore, in our exercise to check for the robustness of our estimated model we include an additional variable measuring investment costs, in the source countries, INVCit. We expect the coefficient of INVCit to have a positive sign implying that as investment costs in the source countries rise there will be more inflows of FDI from these countries in Pakistan. The price level of investment is taken from Penn World Tables 6.2 expressed in PPP values at current exchange rate from 1986 to 2004 and extrapolated until 2007. The price level is converted in constant prices by deflating it with the GDP deflator at 2000 prices in US $. Braconier et al (2005 b) has also used this measure. The advantage of our measure of investment costs is that it is more objective and varies over time.[29]

The next three variables capture the trade costs. These costs are vital to determine the types of FDI. If the trade costs in the host countries are high then MNEs would prefer to engage in HOR FDI rather than to export into these countries. Therefore we expect host country trade costs TRDCjit, to have positive

[28] Partly through cash and capital equipment brought in from the source country and reinvested earnings from the affiliates in the host country.

[29] Most of the previous studies measure investment cost with the index based on the investors' survey which is subjective and does not vary overtime.

and significant coefficient in accordance with the prediction of the KK model. The product of the trade cost of the host country and endowment difference squared, ENDIF2ijt*TRDCjit, is expected to have a negative coefficient because the trade cost in the host country will encourage horizontal FDI which is conducted when relative endowments are similar. TRDCijt is the trade cost in the source country and is relevant for the vertical FDI. According to the prediction of the KK model we expect the coefficient of this variable to be negative because if trade costs in the source country are high then firms would find exporting back to the source country costlier and vertical FDI would be discouraged. TRDCjit is being measured by the cost of importing in Pakistan and TRDCijt measures the cost of exporting from Pakistan into the source countries. The values of imports and exports are extracted from the Direction of Trade Statistics (DOTS) on line data. Trade costs expressed in real terms varies by countries and over time and are measured as:

Trade cost in Pakistan (j):

TRDCjit: IMPCIFjit / EXPFOBijt

Trade cost in country (i):

TRDCijt : IMPCIFijt / EXPFOBjit

Where:

IMPCIFjit: Imports in Pakistan (j) from country (i) in cif values.[30]

EXPFOBijt: Exports to country (i) from Pakistan (j) in fob values

IMPCIFijt: Imports in country i from Pakistan (j) in cif values.

EXPFOBjit: Exports to Pakistan (j) from country (i) in fob values.

Finally, DISTij is the distance between countries' capital cities. This indicates cost of transportation, which is a component in both trade costs and investment costs; therefore, it has ambiguous implications

[30] Import taxes are part of CIF (cost, insurance and freight charges) and FOB (free on board). See http://en.wikipedia.org/wiki/Cost,_Insurance_and_Freight#Cost.2C_Insurance_and_Freight for details.

for the FDI versus exporting decision. The DISTij variable is measured in kilometres and has been taken from www.indo.com.

The KK model has also been estimated by using dummies for large source countries. These regressions serve dual purposes. First is to check the robustness of the estimated model, since like other developing countries, Pakistan also receives its major share of FDI from a few large countries, therefore to check whether large source countries might be affecting the results of the overall estimated models and are explaining all the variations in the data. And second to investigate the influence of gravity factors on the inflows of FDI, for example the dummy for the UAE would indicate the cultural proximity explaining the FDI inflows. Our priori hypothesis for the former is that the three large source countries the USA, UK and the UAE do affect our estimates and for the latter we expect that historical and cultural links positively influence FDI inflows.

Next we consider effects of the reform process on the FDI inflows. Pakistan introduced wide ranging trade and financial sector reforms in 1988-89. As a result of the reforms there was a gradual reduction in Non Tariff Barriers (NTB's) and effective tariff rates. In addition, many sectors like agriculture and commerce and communication and utilities were opened for foreign investors. It would be interesting and worthwhile to see the effects of reforms as the liberalization measures affect the types of FDI and hence the trade patterns. We expect an increase in both types of FDI in Pakistan as a result of the reform measures. While the reduction in tariff rates would increase vertical FDI and intra-firm trade, opening up of services sectors would attract horizontal FDI. However, the period under reform is also considered the most unstable period in Pakistan due to the nuclear test conducted in 1998 and instability in the region after 2001. We suspect that these instabilities might have negated the positive effects of reforms on FDI inflows in Pakistan.

The choice of the variables in our study is dictated by the availability of the data. Since the data relate to a few countries, therefore we selected proxies for our explanatory variables that have the maximum

number of observations for the sample countries for the period of study. We are aware that FDI inflows are a rough proxy for sales of affiliates used in several earlier studies using BEA data for the US and the stock data in the case of OECD data. Affiliates sales and flows are expressed in current values of investment and could be viewed as the short term investment decisions while stocks are the accumulated changes in investment up to the current period and hence reflects long-term strategies and motives of MNEs (Davies; 2008).[31] On the one hand, the stock of FDI has been criticized as they are measured at the book value and reflect historical cost positions expressed in prices of various years rather than constant or current dollar values (Baltagi et al; 2003). On the other hand, FDI sales and flows are affected by short run variations in exchange rate and inflation rate and therefore are more volatile. To control for this volatility to some extent, FDI inflows are measured in real $ values.

In addition, it has been observed that data for the OECD countries are not consistent in definition and measurement.[32] Our data set is consistent since it has been obtained from the same source for all the countries. One shortcoming of our data is that since the aggregate FDI inflows are expressed in million of US $ therefore the data on small amounts of inflows (less than 0.1 million) are missing. There are 59 cases in which FDI inflows are either zero or missing and 7 cases where the inflows are in the negatives. However, the disaggregated data on FDI inflows in sectors are obtained in $ units therefore there is no missing observation though there are large number of truly zero observations. However, we have little option to choose on FDI measures as Dunning states "In practice, the matter is often settled by the data available and the economist has to cut his coat according to the cloth given him, or obtained by himself! And the research so far done on the growth of the multinational enterprise strongly reflects this constraint" Dunning (1973, page 292).[33] Moreover, the unavailability of sector specific data on

[31] Davies (2008) has discussed in some detail the implications of using FDI sales and stocks data.

[32] The study by Blonigen, Bruce A., Ronald B. Davies, and Keith Head, "Estimating the Knowledge-Capital Model of the Multinational Enterprise: Comment," American Economic Review, 2003, 93 980–994 suffers from inconsistency in their definition and measurement of FDI because the source of data is different in the case of OECD countries.

[33] Unfortunately this is still the case for many countries.

explanatory variables such as on trade costs and skills/occupation levels has limited our study to look only at the country level determinants of the types of FDI inflows in Pakistan.

Various measures have been used for the endowment or skill variable in the literature related to the new trade theory models. Mostly, studies compute the ratio of skilled workers to the total labour force by using occupations from ILO data set (CMM, 2001, Markusen and Maskus, 2001, 2002). Another measure is the educational attainment from the Barro-Lee data set (Blonigen, 2003). A few studies have taken wages (Braconier 2005b). We found very few observations for these variables for UAE and Saudi Arabia in case of occupation and wages data and the data on education is sparsely available for Pakistan. Therefore we use per capita GDP as a proxy for endowment of a country following Braconier et al (2005b), Kristjánsdóttir (2005) and Geishecker and Gorg (2005). However, there could be concerns that per capita GDP is not a perfect proxy for skills as has been considered in estimating KK model but could reflect other endowments (non-skill factors such as physical capital, institutions, infrastructure etc). However, Pakistan is relatively scarce in the above listed endowments than the source countries of FDI. Therefore it would not be plausible to assume that FDI is attracted for relatively poor infrastructure and institutions in Pakistan. Hence, the more appropriate and logical reason is that GDP per capita in our case is reflecting the cost of labour, raw materials and natural resources. The data on per capita GDP is from the WDI. Moreover, Human Development Index (HDI) has also been used as a proxy for skill for robustness check. The data on HDI is from Table 2, Human Development Report 2007/2008.

Likewise, we had to search for proxies for trade and investment costs, because the variables such as trade cost index from the World Competitive Report and World Economic Freedom Index and tax and tariff rates from IFS and DOTS which other studies use, were not available for our long study period. It is not difficult to get data for developed countries but as we have developing countries in the sample, we are severely constrained by the data availability.

It is difficult to identify which measures of the reform process would be ideal (e.g. privatization receipts, tariffs, non-tariff barriers, black market premium, simplification of import procedures, establishment of export processing zones, tax reforms etc) and to assess the time of liberalization because economic reforms (Structural adjustment programmes under IMF and the World Bank) in Pakistan like many other developing countries were wide ranging covering nearly all the macro economic sectors of the economy. Many researchers have tried to isolate the effects of different policy measures but have acknowledged the limitations of each of these measures in their overall effects of the reform process (See Levine and Renelt; 1992, Sach and Warner; 1995, Easterly et al; 1997, Paulino; 2002, Greenaway et al.; 2002). As Levine and Renelt (1992, pp: 960) state "National policies appear to be a complex package, and future researchers may wish to focus on macroeconomic policy regimes and interactions among policies as opposed to the independent influence of any particular policy." To capture the wide spectrum of reforms we have used a time dummy variables explained in the next section (Tables 2.7 – 2.9) in our study.

We estimate model (1) in the levels as most of the previous studies have done.[34] The methodology for estimation adopted is based on Ordinary Least Squares (OLS), and due to heterogeneity in the data as indicated by the Breusch-Pagan tests (Table A2.5), report robust t values. In addition we also report Weighted Least Square estimates.[35] Moreover, we have many zero observations in our data as reported earlier; therefore, Tobit procedure is also being used where the threshold is a lower limit of zero and is defined as:

$$\text{FDI ijt (Tobit)} = \text{FDIijt} \quad \text{if FDIijt} > 0, \quad \text{FDI ijt (Tobit)} = 0 \quad \text{if FDIijt} \leq 0. \qquad (2.4)$$

[34] Most of the studies have estimated the KK model in the levels and captured the non linearities in the model by the interactive terms. Blonigen et al. (2004) have also estimated the model in both levels and log form. However, Blonigen finds that by logging the data increase the collinerity in the variables and therefore he has to drop some variables.

[35] We posit that error variances depend on the sum of bilateral GDP. WLS are bilateral GDPSUM weighted OLS.

In most of the regressions Tobit model performed better than the OLS model. The reason may be that in the case of data for developing countries there are few large source countries and FDI is mostly concentrated in few sectors. Therefore there are large numbers of zero values in the data as in our case. For the robustness check of these models we have also estimated Random Effect Models as Hausman Test (reported in Table A2.6) rejected the Fixed Effect Models. The endogeneity between trade and other explanatory variables and FDI is taken control of by the Carr's KK model specification which includes many difference and interaction terms. According to Carr et al. (2001) both vertical and horizontal firms can arise endogenously due to the simultaneous existence of trade costs and different factor intensities across activities. The "theoretical model fully endogenizes trade flows in its calculations, allowing direct predictions on affiliate sales without requiring us to worry about questions of trade versus investment. Trade, like factor prices and commodity prices, is endogenous in generating the predictions of the model" (page 707).

2.7 Estimation Results for the KK Model

2.7.1 The KK Model for Aggregate FDI Inflows

The results of estimation of the basic model by OLS, WLS and Tobit methods are presented in Table 2.5. Most of the variables signs are as expected and are significant in all three regressions. We discuss our results in the light of the predictions of the KK model below.

Our results in Table 2.5 suggest that inflows of FDI increase as the bilateral GDPs of Pakistan (host) and source countries increase as the estimated coefficient of GDPSUMijt is positive and significant at 5% significance level in the WLS and Tobit models,[36] but contrary to our prediction (HOR FDI would decrease as bilateral GDP difference increases) we obtain a positive and highly significant coefficient for

[36] An analogous case where the data mainly reflect variations in the host country's GDP can be found in a paper by Markusen and Maskus (1999). In that case the source of data is outward FDI from the United States and recently in Kristjánsdóttir (2010) in the case of inward FDI in Iceland.

GDPDIF2ijt in all the three estimated models indicating that as the size of the host and source country differs, there will be more inflows of FDI. However, our sign for GDPDIF2ijt is consistent with the Blonigen and Wang (2004) estimate showing marginal effect of developing countries in the outbound stock of FDI regression in Knowledge Capital Model.[37]

In both OLS and Tobit regressions, the sign of the coefficient of endowment difference variable ENDIFijt is positive and highly significant at 5% and 1% significance levels. In addition, ENDDIFijt*GDPDIFijt is negative and significant. Contrary to various empirical studies reviewed in the literature review section,

Table 2.5: Estimates of the Basic Knowledge Capital Model for Aggregate FDI Inflows, 1986-2007

Dependent Variable: Aggregate Inflows of FDI in Pakistan

Independent variables	OLS		WLS		Tobit	
GDPSUMijt	37.668	Y	31.441**	Y	58.067**	Y
	1.3		*2.06*		*2.36*	
GDPDIF2ijt	5.915***	N	7.311***	N	5.215***	N
	4.23		*5.88*		*4.37*	
ENDIFijt	7.783**	Y	5.770*	Y	10.172***	Y
	2.18		*1.92*		*2.93*	
ENDGDPDIFijt	-1.950**	Y	-2.271***	Y	-2.228***	Y
	-2.34		*-3.13*		*-3.06*	
INVCjt	-3.026***	Y	-2.007**	Y	-4.083***	Y
	-3.09		*-2.16*		*-3.89*	
TRDCjit	122.266**	Y	89.999	Y	163.660***	Y
	2.14		*1.38*		*2.84*	
ENDIF2ijt* TRDCjit	-0.117*	Y	-0.042	Y	-0.173***	Y
	-1.89		*-0.63*		*-2.73*	
TRDCijt	45.923	N	12.891	N	25.759	N
	1.1		*0.31*		*0.81*	
DISTij	-12.645**		-13.948***		-14.977***	
	-2.44		*-2.96*		*-2.97*	
Constant	-51.311		4.873		-65.714	
	-0.56		*0.04*		*-0.87*	
Observation	286		286		352	
Adj.R-squared	0.299		0.611			
Log pseudo liklihood					-1751.51	

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the coefficients
Y: according to the prediction of the KK model, N: not according to the prediction of the KK model.

[37] However, we are sceptical about this result at this stage and further investigate this issue in our modified model in a latter sectionl.

our results lend support to the specification of the endowment difference term in CMM (2001) study to capture the vertical aspect of the model. These results suggest that Pakistan receives FDI mostly by large developed countries for comparative advantage reason which is its relatively cheap resources and endowments.[38]

The coefficient on investment cost in the host country, INVCjt is negative and significant as expected in all regression models in Table 2.5. This reflects that high investment cost in Pakistan discourages FDI.

Trade costs in the host country, TRDCjit, has a positive and significant coefficient in accordance with the prediction, implying that horizontal FDI will substitute for exports to save on trade costs. Moreover, the

product of the trade cost of the host country and endowment difference squared, ENDIF2ijt*TRDCjit has a negative and significant coefficient as expected. The signs and the significance levels are consistent in both the regressions. However, contrary to our expectations the coefficient on trade costs in the source country, TRDCijt, turned up to be positive but is insignificant.

Finally, the coefficient of DISTij turns out to be negative and significant in both the regressions. This indicates that the cost of transportation deters the inflow of FDI in Pakistan. As numerous studies on gravity models on trade also find a negative coefficient for the distance variable, these results together indicate a complementary relationship between trade and FDI.

Overall, the results of Table 2.5 indicate the presence of both types of FDI validating the predictions of the KK model. The results also suggest that vertical aspect of the model seems to be more robust – both the variables ENDIFijt and ENDDIFijt*GDPDIFijt have the expected and significant signs and are robust across various specifications. However, the market size variable GDPDIF2ijt representing the horizontal

[38] Impact of Difference in Skill Endowments is given as :

∂ FDI/∂ Skill Difference = $\beta 3 + \beta 4$ (GDP Difference) + $\beta 7$ [(Trade Cost Host) * (Skill Difference)]

aspect of the model is positive and significant against the prediction of the model. Nevertheless, the trade cost in the host country is positive and significant suggesting that FDI inflows in Pakistan were attracted to avoid high trade costs indicating the presence of the horizontal FDI.

Table 2.6 presents results of OLS and Tobit models with large source country dummies. Models 1 and 2 include dummies for three large source countries the US, UK and UAE and Models 3 and 4 include dummies for the UK, the Middle East and China to test for the effects of historical and cultural links and common border.

Contrary to our expectations that large source countries would affect our estimated results, our estimated models are robust as there are no qualitative changes on the overall results. Moreover, historical and cultural ties have positive and significant effects on FDI inflows as expected. As before (in our basic regressions in Table 2.1), the Tobit models performed better in significance levels.

It is noteworthy that dummy for UK is highly significant at 1% significance level in all the four regressions confirming that historical links are significant in explaining the FDI inflows in Pakistan. The dummy for the US is negative but insignificant indicating that the US is not an outlier. Similarly, the border dummy for China is negative but insignificant indicating that common border is not facilitating the inflows of FDI. This could be explained by the difficult mountainous border region between Pakistan and China, implying high transport costs. The dummies for the UAE and Middle East are positive and significant in the tobit models reflecting the cultural proximity in explaining the inflows of FDI.

Table 2.6: Estimates of the Knowledge Capital Model for Aggregate FDI Inflows with Dummies for Large Source Countries, 1986-2007

Dependent Variable: Aggregate Inflows of FDI in Pakistan

Independent variables	OLS	Tobit	OLS	Tobit	
GDPSUMijt	27.568	58.477	38.208	64.895**	Y
	0.44	*1.4*	*1.49*	*2.59*	
GDPDIF2ijt	5.430*	5.792**	5.791***	5.238***	N
	1.65	*2.38*	*4.79*	*5.07*	
ENDIFijt	3.861*	6.533***	6.753**	6.935**	Y
	1.86	*2.99*	*2.08*	*2.57*	
ENDGDPDIFijt	-1.486	-2.246	-2.025**	-2.557***	Y
	-0.7	*-1.56*	*-2.55*	*-3.28*	
INVCjt	-3.299***	-4.099***	-3.026***	-4.070***	Y
	-3.11	*-3.72*	*-3.34*	*-4.08*	
TRDCjit	71.007	106.141**	75.626*	79.942**	Y
	1.6	*2.52*	*1.77*	*2.12*	
ENDIF2ijt* TRDCjit	-0.058	-0.107**	-0.073	-0.083**	Y
	-1.19	*-2.33*	*-1.54*	*-2.03*	
TRDCijt	40.955	12.828	85.606	78.039	N
	0.66	*0.33*	*1.04*	*1.25*	
DISTij	-6.697**	-8.294***	-6.053**	-7.324***	
	-2.23	*-2.87*	*-2.37*	*-2.85*	
USA	-14.259	-67.424			
	-0.08	*-0.55*			
UK	105.743***	110.551***	107.409***	114.750***	
	3.41	*3.91*	*3.63*	*4.17*	
UAE	81.814	86.960*			
	1.51	*1.74*			
CHINA			-9.958	-79.542	
			-0.08	*-0.98*	
MIDDLE EAST			87.871	100.447**	
			1.55	*2.04*	
Constant	19.55	-5.436	-103.99	-77.279	
	0.3	*-0.1*	*-0.87*	*-0.86*	
Observations	286	352	286	352	
Adj.R-squared	0.36		0.368		
Log pseudo likelihood		-1734.21		-1730.76	

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the coefficients
Y: according to the prediction of the KK model (read across columns), N: not according to the prediction of the KK model (read across columns).

Tables 2.7 and 2.8 presents the results based on OLS and Tobit models with a dummy to reflect the period where the average tariff rates started falling in Pakistan as a result of trade and financial sector liberalization. In OLS regression in model 1 in Table 2.7, the dummy variable (REFORM 1), takes the

value of one for the year 1991 and thereafter. The estimated coefficient on the dummy reflecting the reform measure turns out to be negative but insignificant and (F test also could not reject it). This suggests that the reforms had no effect on FDI inflows.

Table 2.7: Estimates of the Knowledge Capital Model for Aggregate FDI Inflows with Dummies for the Periods of Reform and Instabilities, 1986-2007: OLS Models

Dependent Variable: Aggregate Inflows of FDI in Pakistan, 1986-2007

Independent variables	Model1	Model2	Model3	Model4
GDPSUMijt	37.683	35.135	35.114	36.134
	1.3	*1.25*	*1.26*	*1.26*
GDPDIF2ijt	5.893***	5.806***	5.813***	5.921***
	4.26	*4.33*	*4.3*	*4.29*
ENDIFijt	7.821**	7.296**	7.279**	7.376**
	2.17	*2.11*	*2.12*	*2.1*
ENDGDPDIFijt	-1.941**	-1.852**	-1.855**	-1.921**
	-2.34	*-2.32*	*-2.32*	*-2.35*
INVCjt	-3.306***	-3.810***	-3.712***	-2.593***
	-2.6	*-2.79*	*-3.29*	*-2.78*
TRDCjit	124.893**	123.731**	122.773**	114.751**
	2.11	*2.11*	*2.15*	*2.03*
ENDIF2ijt* TRDCjit	-0.119*	-0.110*	-0.110*	-0.109*
	-1.88	*-1.81*	*-1.83*	*-1.79*
TRDCijt	46.107	43.585	43.503	43.965
	1.11	*1.07*	*1.07*	*1.06*
DISTij	-12.715**	-12.231**	-12.203**	-12.178**
	-2.43	*-2.4*	*-2.42*	*-2.38*
REFORM 1	-9.525			
	-0.78			
REFORM 2		-3.485		28.314***
		-0.32		*3.84*
INSTABILITY		-51.782**	-48.585***	
		-2.39	*-3.41*	
Constant	-35.085	-1.095	-6.768	-73.584
	-0.4	*-0.01*	*-0.08*	*-0.8*
Observations	286	286	286	286
Adj.R-squared	0.297	0.32	0.322	0.309

Notes: * p<0.10, ** p<0.05, *** p<0.01. Robust t ratios are below the coefficients.

REFORM 1, takes the value of one for the year 1991-2007 and zero otherwise, REFORM 2 takes the value of 1 for the years 1991 to 1998 and 2003 to 2007 and zero otherwise and INSTABILITY takes the value of 1 for the period 1999-2002, zero otherwise.

F tests for the dummies indicate: REFORM 1=0: F(1,275) = 0.60, Prob>F= 0.4392. REFORM 2=0: F(1,275) = 14.80, Prob>F= 0.0001. INSTABILITY=0: F(1,275) = 11.63, Prob>F= 0.0007. The joint significance F test: REFORM 2=0 and INSTABILITY=0: F(2,274) =7.62, Prob>F= 0.0006.

However, since the period under reform is also considered the most unstable period in Pakistan as mentioned above, therefore, we add a dummy for instability period, which takes the value of 1 for the period 1999-2002 in model 2 (INSTABILITY). The dummy for reform period (REFORM 2) in model 2 contains years excluding the years of instability from the reform period and takes the value of 1 for the years 1991 to 1998 and 2003 to 2007. In OLS model, the coefficient on the dummy reflecting the instability period in model 2 is negative and significant as expected, but the dummy for the reform period is still insignificant. In models 3 and 4 we tried to capture the individual effect of these respective dummies. In model 3 the dummy for instability (INSTABILITY) is still negative and highly significant. Furthermore, in model 4 the dummy for the reform period (REFORM 2) (without the period 1999-2002) is positive and highly significant. These results suggest that the effect of the reform measures had been marred by the instability in the country. The Tobit models in Table 2.8 validate our results obtained in OLS models in Table 2.7.

Table 2.8: Estimates of the Knowledge Capital Model for Aggregate FDI Inflows for the Periods of Reform and Instabilities, 1986-2007: Tobit Models

Dependent Variable: Aggregate Inflows of FDI in Pakistan, 1986-2007

Independent variables	Model5	Model6	Model7	Model8
GDPSUMijt	58.120**	56.614**	56.552**	57.377**
	2.36	*2.38*	*2.38*	*2.36*
GDPDIF2ijt	5.195***	5.122***	5.134***	5.203***
	4.39	*4.46*	*4.45*	*4.41*
ENDIFijt	10.232***	9.857***	9.808***	9.937***
	2.93	*2.9*	*2.91*	*2.88*
ENDGDPDIFijt	-2.220***	-2.160***	-2.165***	-2.212***
	-3.06	*-3.08*	*-3.08*	*-3.07*
INVCjt	-4.502***	-4.965***	-4.681***	-3.818***
	-3.4	*-3.52*	*-3.95*	*-3.73*
TRDCjit	167.566***	166.639***	163.895***	158.895***
	2.82	*2.84*	*2.87*	*2.78*
ENDIF2ijt* TRDCjit	-0.174***	-0.169***	-0.167***	-0.168***
	-2.73	*-2.7*	*-2.7*	*-2.67*
TRDCijt	26.614	25.143	24.513	24.118
	0.83	*0.8*	*0.79*	*0.76*
DISTij	-15.115***	-14.831***	-14.729***	-14.696***
	-2.97	*-2.98*	*-2.99*	*-2.94*
REFORM 1	-14.323			
	-1.12			
REFORM 2		-10.129		18.677***
		-0.85		*2.66*
INSTABILITY		-49.675**	-40.324***	
		-2.41	*-3.12*	
Constant	-41.786	-12.259	-28.459	-79.907
	-0.57	*-0.17*	*-0.39*	*-1.05*
Observations	352	352	352	352
Log pseudo liklihood	-1751.15	-1747.51	-1747.69	-1750.22

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the coefficients.
REFORM 1, takes the value of one for the year 1991-2007 and zero otherwise, REFORM 2 takes the value of 1 for the years 1991 to 1998 and 2003 to 2007 and zero otherwise and INSTABILITY takes the value of 1 for the period 1999-2002, zero otherwise.
F tests for the dummies indicate: REFORM 1=0: F(1,342) = 1.25, Prob>F= 0.2642. REFORM 2=0: F(1,342) = 7.12, Prob>F= 0.0080. INSTABILITY=0: F(1,342) = 9.77, Prob>F= 0.0019. The joint significance F test: REFORM 2=0 and INSTABILITY=0: F(2,341) =5.14, Prob>F= 0.0063.

We are also interested to investigate the characteristics of FDI inflows in the reform period. Therefore, in Table 2.9 interactive dummies are used for the reform period and the explanatory variables of the KK model. As we expect that both horizontal and vertical types of FDI inflows have increased due to the reform measures, we can find this evidence from the estimated results of interactive terms.

Table 2.9: Estimates of the Knowledge Capital Model for Aggregate FDI Inflows with Interactive Dummies for the Period of Reform, 1986-2007

Dependent Variable: Aggregate Inflows of FDI in Pakistan, 1986-2007

Independent variables	OLS	Tobit
GDPSUMijt	3.079	38.689**
	0.2	*2.27*
GDPDIF2ijt	3.147**	2.781**
	2.4	*2.55*
ENDIFijt	2.471	5.711***
	1.33	*2.88*
ENDGDPDIFijt	-0.339	-1.212**
	-0.82	*-2.44*
INVCjt	-0.021	-1.348**
	-0.04	*-2.4*
TRDCjit	58.176	106.513**
	1.38	*2.44*
ENDIF2ijt* TRDCjit	-0.053	-0.105**
	-1.33	*-2.57*
TRDCijt	15.408	-4.123
	0.55	*-0.17*
DISTij	-3.113*	-7.175***
	-1.87	*-2.77*
GDPSUMijt * REFORM 2	51.544	32.472
	1.19	*0.93*
GDPDIF2ijt * REFORM 2	3.517*	3.197*
	1.67	*1.77*
ENDIFijt * REFORM 2	7.947**	7.580**
	2.27	*2.46*
ENDGDPDIFijt * REFORM 2	-2.211*	-1.488
	-1.84	*-1.52*
INVCjt * REFORM 2	-426.903**	-399.348**
	-2.35	*-2.49*
TRDCjit * REFORM 2	115.254**	103.387**
	2.02	*1.98*
ENDIF2ijt* TRDCjit * REFORM 2	-0.1	-0.120**
	-1.45	*-2.02*
TRDCijt * REFORM 2	40.948	45.905
	1.17	*1.51*
DISTij * REFORM 2	-14.531**	-12.369**
	-2.14	*-2.09*
Constant	-70.116	-89.836
	-0.75	*-1.14*
Observations	286	*352*
Adj.R-squared	0.334	
Log pseudo likelihood		-1741.2697

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the coefficients.

REFORM2 takes the value of 1 for the years 1991 to 1998 and 2003 to 2007 and zero otherwise.

Overall, the signs of the coefficients of the interactive terms (net effects of the variables in the reform period) are similar to their counterpart non-interactive terms (effects of variables in the pre-reform period) but the significance level is higher for the interactive terms. In OLS model, though the non-interactive terms are not significant (except for the coefficient on GDPDIF2ijt), the significance level is high for interactive dummy variables. The endowment difference (ENDIFijt) is insignificant in OLS model on non-interactive term but this coefficient is positive and significant on the interactive term. However, in the Tobit model, most of the non-interactive and interactive variables are significant with expected signs. The results suggest that the predictions of the KK model are not only valid before the reforms but are also explaining the types of FDI after the reform period even better.

It is also note worthy that the coefficient on the interactive term of host trade costs in Pakistan and the reform dummy (INVCjt * REF) is still positive and significant suggesting that the trade costs are still high to encourage horizontal FDI.

To summarize, the results indicate that the vertical aspect is more evident in our models. The coefficient on endowment difference is positive and significant in almost all the regressions indicating that large countries invest in Pakistan to gain advantage of cheap resources. Moreover, higher trade costs encourage horizontal FDI. (For example, motor vehicle sector is still a protected sector with high tariff rates). However, the market size hypothesis did not work well in our models. This seems puzzling despite an increase in the FDI in the services sector in recent years which is attracted by the market size. Furthermore, our estimated models are robust as there are no qualitative changes when regional, structural and time dummies are used. Our results indicate that besides the determinants of FDI given in the KK model other gravity factors like cultural links influence the inflow of FDI in Pakistan. In addition, our estimations indicate that the KK model performed better in the post reform period.

2.7.2 Robustness Checks

We estimated the basic regression models taking different proxies for investment and trade costs, culture and skills to check for the robustness of our model. In Table 2.10 we present our results for OLS and Tobit models. There are no qualitative changes in our results.

In previous research work, investment costs in the source countries have been ignored. As stated before, our understanding is that as investment cost in the host is important, a general equilibrium model should also consider the investment costs in the source country as well. We hypothesize that high investment cost in the source countries would result in more inflow of FDI in Pakistan. The coefficient on the investment cost in the parent countries is positive and significant in both OLS and Tobit models in Table 2.10 in models 1 and 2. The result validates our hypothesis of increase in the inflows of FDI in Pakistan when investment cost increases in the source countries. In models 3 and 4 tariffs in the host and source are considered as trade costs in the respective countries.[39] The coefficient for trade cost in host country (TRDCjit) is positive and significant supporting our previous finding in the basic regression.

While trade cost in the source countries (TRDCijt) are still insignificant but it has the expected sign in the Tobit model in model 4 (for the first time in our estimations).

The model with dummy for English language (LANGDUM) is presented in models 5 and 6. The dummy for English language takes the value of 1 for countries whose official language is English and also for countries where 20 percent of the population can speak English as reported in CEPII database. The coefficient for English language dummy is positive but insignificant in our estimated models. This indicates that besides language there are other factors, which are influencing FDI inflows from the UK and the US. (The dummy for the UK is positive and highly significant but the dummy for the US is negative but insignificant in our previous regressions.)

[39] The source of data on tariffs: www.worldbank.org/research/trade. The data on tariffs are not available for all the years for some countries. The missing values were filled in by the values available for the nearest year available.

Table 2.10: Estimates of the Knowledge Capital Model for Aggregate FDI Inflows, 1986-2007: Robustness Check

Dependent Variable: Aggregate Inflows of FDI in Pakistan, 1986-2007

Independent Variables	Investment cost Parent		Tariffs		Language		HDI	
	OLS Model1	Tobit Model2	OLS Model3	Tobit Model4	OLS Model5	Tobit Model6	OLS Model7	Tobit Model8
GDPSUMijt	44.402	64.677**	50.542*	74.000***	39.195	61.050**	23.316	35.723
	1.47	*2.50*	*1.96*	*3.00*	*1.33*	*2.44*	*0.22*	*0.40*
GDPDIF2ijt	7.083***	6.481***	6.358***	4.909***	5.323***	4.557***	3.383*	2.435
	3.85	*4.19*	*3.97*	*4.08*	*3.20*	*3.30*	*1.90*	*1.64*
ENDIFijt	7.284**	8.906***	7.257**	6.912**	7.195*	9.666***	1041.980**	1272.224***
	2.21	*2.96*	*2.06*	*2.56*	*1.94*	*2.76*	*2.53*	*3.24*
ENDGDPDIFijt	-2.532**	-2.848***	-2.654***	-2.774***	-1.800**	-2.104***	-71.095	-70.99
	-2.57	*-3.26*	*-2.66*	*-3.24*	*-2.18*	*-2.91*	*-0.31*	*-0.37*
INVCjt	-4.622***	-5.797***	-7.919**	-7.289**	-3.035***	-4.074***	-2.091	-3.615**
	-2.89	*-3.60*	*-2.48*	*-2.50*	*-3.10*	*-3.91*	*-1.36*	*-2.23*
TRDCjit	119.710**	145.296***	2.163**	2.401**	127.956**	170.752***	309.014**	319.830***
	2.15	*2.84*	*2.22*	*2.43*	*2.24*	*2.96*	*2.36*	*2.76*
ENDIF2ijt* TRDCjit	-0.117*	-0.156***	-0.001	-0.002**	-0.114*	-0.169***	-1574.430**	-1667.475***
	-1.90	*-2.71*	*-1.46*	*-2.56*	*-1.81*	*-2.68*	*-2.29*	*-2.72*
TRDCijt	73.004	49.429	6.026	-0.505	47.129	27.417	45.057	13.513
	1.36	*1.25*	*1.41*	*-0.36*	*1.13*	*0.86*	*0.99*	*0.41*
DISTij	-9.149**	-10.981***	-10.454**	-11.149***	-15.410***	-18.358***	-4.104	-7.358*
	-2.52	*-3.01*	*-2.46*	*-2.91*	*-2.87*	*-3.41*	*-0.94*	*-1.78*
INVCit	0.852*	0.930**						
	1.74	*2.21*						
LANGDUM					23.583	28.430*		
					1.2	*1.66*		
Constant	-99.054	-90.445	158.490*	152.636*	-43.52	-61.149	-374.452*	-376.750**
	-0.89	*-1.07*	*1.80*	*1.91*	*-0.47*	*-0.81*	*-1.78*	*-2.14*
Observations	286	352	286	352	286	352	286	352
Adj.R-squared	0.309		0.307		0.301		0.269	
Log pseudo likelihood		-1747.6522		-1756.9239		-1749.9252		-1763.4401

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the coefficients.

The Human Development Index (HDI) is used as a proxy for endowment difference in models 7 and 8. As the HDI index is constructed using Adult literacy rates and Education Index it could be a good proxy for skills. The data on HDI has been taken from Table 2 in Human Development Report 2007/2008 and are at 5 years interval from 1975 to 2005. (The notes in the Report indicate that HDI values in Table 2 are

calculated using consistent methodology and data series to make them comparable). The coefficient on ENDIFijt which now measures difference in HDI index between host and source countries is positive and significant in both the OLS and Tobit models, validating our previous results.

The positive sign on the coefficient of endowments/skill difference (proxied by GDP per capita and Human Development Index) in our estimations of the KK model indicates that Pakistan receives VER FDI from countries which are highly endowed/skilled since the prediction of the model is that as the endowments/skill levels of source countries increase relative to host country there will be more VER FDI. Basically, VER FDI is done due to different factor intensities, high skilled countries locate lower skill production activity in relatively low skill countries where labour is cheap to save on production costs. However, it is to be noted that according to the KK model assumptions, this labour is unskilled relative to labour in source countries but they are considered skilled than labour in all other sectors in the host country. In other words, in a host country Pakistan, sectors in which FDI is attracted have more skilled labour than the composite rest of the economy.

2.7.3 The KK Model for the Broad Sectors

The data is of the FDI inflows in six sectors of the economy in Pakistan for the period 2002-2007. These sectors are the Manufacturing, Mining, Construction, Commerce, Transport and Communications and Utilities. The summary statistics in Table A2.3 indicate that on average, Pakistan received 17.74 million of FDI during 2002-07.[40]

Table 2.11 presents results on the OLS, WLS and the Tobit models for the inflows of FDI in six sectors. Although the Breusch-Pagan test for heteroskedasticity (Table A2.5) was not significant,[41] to be on the conservative side, OLS and Tobit robust models are presented. Comparing the estimates for sectors from

[40] Total number of observations is 576, of which 94 observations are zero and 16 are in negative values.

Table 2.11: Estimates of the Basic Knowledge Capital Model for FDI Inflows in Broad Sectors, 2002-2007

Dependent Variable: FDI inflows in the Broad Sectors in Pakistan

Independent variables	OLS	WLS	Tobit	
GDPSUMijt	10.689	11.758	8.737	(Y)
	0.5	*1.11*	*0.5*	
GDPDIF2ijt	1.335***	1.497***	1.323***	(N)
	3.51	*3.13*	*3.51*	
ENDIFijt	2.496*	1.999	2.456*	(Y)
	1.77	*1.57*	*1.78*	
ENDGDPDIFijt	-0.524	-0.635*	-0.463	(Y)
	-0.91	*-1.68*	*-0.96*	
INVCjt	-3.790***	-3.964***	-3.519***	(Y)
	-3.25	*-3.14*	*-3.15*	
TRDCjit	46.021*	35.966	40.350*	(Y)
	1.83	*1.08*	*1.66*	
ENDIF2ijt*TRDCjit	-0.04	-0.04	-0.02	(Y)
	-1.25	*-0.65*	*-1.11*	
TRDCijt	15.210	15.21	16.907	(N)
	0.67	*0.83*	*0.08*	
DISTij	-4.653**	-4.771*	-3.459*	
	-1.97	*-1.91*	*-1.71*	
Constant	62.223	73.517	50.045	
	1.37	*1.1*	*1.15*	
Observations	466	466	576	
R-squared	0.087	0.201		
Adj.R-squared	0.069	0.185		
Log pseudo likelihood			-2696.37	

Notes: Robust t ratios are below the coefficients, * p<0.10, ** p<0.05, *** p<0.01
Y: according to the prediction of the KK model, N: not according to the prediction of the KK model.

the estimates obtained for the aggregate FDI inflows, the sign of the coefficients are similar but coefficients have low significance level. The key variable measuring endowment difference (ENDIFijt) is now significant at 10% in the OLS and Tobit models. The market size variables, (GDPSUMijt) is positive but insignificant in all the models but (GDPDIF2ijt) has still an unexpected positive sign at 1% significance level similar to the regressions for the aggregate FDI inflows. The coefficients of host trade

[41] However, heteroskedasticity between groups was detected by Levene (1960) and Brown and Forsythe tests discussed later in the text.

costs have the expected positive signs but are significant at 10%. Moreover, the Adjusted R-squared statistics are very low at 0.069 in the OLS model.

The estimated models (OLS, WLS, Tobit) in Table 2.12 consists of a dummy for the manufacturing sector. There are no qualitative changes in the estimates of the models. The coefficient on the dummy variable is significant at 5% in only the Tobit model.

Table 2.12: Estimates of the Basic Knowledge Capital Model for FDI Inflows in Broad Sectors with Dummy for the Manufacturing Sector, 2002-2007

Dependent Variable: FDI inflows in the Broad Sectors in Pakistan

Independent variables	OLS	WLS	Tobit	
GDPSUMijt	10.671	11.874	8.744	(Y)
	0.5	*1.11*	*0.5*	
GDPDIF2ijt	1.333***	1.495***	1.322***	(N)
	3.51	*3.13*	*3.52*	
ENDIFijt	2.535*	2.061	2.483*	(Y)
	1.81	*1.61*	*1.81*	
ENDGDPDIFijt	-0.522	-0.637*	-0.463	(Y)
	-0.9	*-1.69*	*-0.96*	
INVCjt	-3.820***	-3.994***	-3.542***	(Y)
	-3.28	*-3.17*	*-3.18*	
TRDCjit	46.706*	37.169	40.816*	(Y)
	1.86	*1.12*	*1.68*	
ENDIF2ijt*TRDCjit	-0.041	-0.021	-0.033	(Y)
	-1.27	*-0.69*	*-1.13*	
TRDCijt	15.145	16.73	1.422	(N)
	0.66	*0.83*	*0.08*	
DISTij	-4.667**	4.183*	-3.4705*	
	-1.97	*-1.92*	*-1.71*	
MANF	6.119	10.044	13.243**	
	1.00	*1.47*	*2.35*	
Constant	61.093	70.797	47.81	
	1.35	*1.06*	*1.11*	
Observations	466	466	576	
R-squared	0.089	0.205		
Adj.R-squared	0.069	0.188		
Log pseudo likelihood			-2694.87	

Notes: Robust t ratios are below the coefficients,* p<0.10, ** p<0.05, *** p<0.01.
MANF: Dummy for the Manufacturing Sector.
Y: according to the prediction of the KK model, N: not according to the prediction of the KK model.

To investigate whether inflows from three large countries affect the estimates of the models, three dummy variables each for the USA, UK and the UAE are included in estimated models in Table 2.13.

Table 2.13: Estimates of the Knowledge Capital Model for FDI Inflows in Broad Sectors with Dummies for Large Source Countries, 2002-2007

Dependent Variable: FDI inflows in the Broad Sectors in Pakistan

Independent variables	OLS	Tobit
GDPSUMijt	1.861	7.741
	0.42	*0.39*
GDPDIF2ijt	1.9	1.893
	0.78	*0.89*
ENDIFijt	0.656	0.118
	0.74	*0.13*
ENDGDPDIFijt	-0.585	-0.448
	-0.63	*-0.66*
INVCjt	-3.899***	-3.740***
	-3.49	*-3.34*
TRDCjit	16.711	5.126
	1.26	*0.35*
ENDIF2ijt*TRDCjit	-0.005	0.012
	-0.25	*0.64*
TRDCijt	4.955	-10.615
	0.25	*-0.67*
DISTij	-1.216	0.899
	-1.54	*1.19*
USA	-58.484	-64.436
	-0.35	*-0.44*
UK	30.472***	43.625***
	3.04	*4.39*
UAE	50.325	68.127**
	1.61	*1.99*
Constant	99.210***	98.636**
	3.08	*2.58*
Observations	466	576
Adj.R-squared	0.097	
Log pseudo likelihood		-2679.18

Robust t ratios are below the coefficients, * p<0.10, ** p<0.05, *** p<0.01.

It is evident that except for the coefficients of investment costs in the host country, all other coefficients are insignificant. Moreover, signs of some of the coefficients in the Tobit model change, for example, distance is positive, trade cost in the parent country (TRDCijt) turns out to be negative as predicted by the KK model but the sign of the product of squared endowment difference and host trade cost (ENDIF2ijt* TRDCjit) is now positive contrary to the expectations. The results also indicate that the dummy variables for the UK and the UAE are positive and significant and the dummy variable for the US is negative and insignificant as in earlier regressions for the aggregate FDI inflows. It seems that the estimates of the KK model for the sectors for the period 2002-2007 are driven by the inflows of FDI from the large source countries like the UK and the UAE. The results also suggest that for a small developing country where inflows of FDI are from few countries it would be appropriate to estimate the KK model for a longer time period. The significance of long time series data in our estimation of the model for aggregate FDI inflows is clearly the case.

As the test for heteroskedasticity between groups of observations that of Levene (1960) and Brown and Forsythe (1974) rejected the equality of variances between groups (Table A2.5), robust estimates in six alternate OLS and Tobit models are presented in Table 2.14. While Model 1 and Model 2 provides robust estimates taking in 96 clusters of country and years, the estimates in Model 3 and Model4 are robust in 95 and 96 clusters of country and sectors and Model5 and Model6 controls for heteroskedasticity between the 6 sectors. The models do not seem to work well in terms of the significance levels of the estimated coefficients.

Table 2.14: Estimates of the Knowledge Capital Model for FDI Inflows in Broad Sectors, 2002-2007 : Robustness in Groups

Dependent Variable: FDI inflows in the Broad Sectors in Pakistan

Independent variables	Model1	Model2	Model3	Model4	Model5	Model6
	OLS	Tobit	OLS	Tobit	OLS	Tobit
GDPSUMijt	10.689	8.737	10.689	8.737	10.689	8.737
	0.66	*0.67*	*0.53*	*0.46*	*0.99*	*0.97*
GDPDIF2ijt	1.335***	1.323***	1.335**	1.323**	1.335*	1.323**
	3.76	*3.56*	*2.33*	*2.23*	*2.42*	*2.3*
ENDIFijt	2.496*	2.456*	2.496	2.456	2.496	2.456
	1.94	*1.85*	*1.31*	*1.29*	*1.59*	*1.39*
ENDGDPDIFijt	-0.524	-0.463	-0.524	-0.463	-0.524	-0.463
	-1.21	*-1.34*	*-0.96*	*-0.87*	*-1.27*	*-1.35*
INVCjt	-3.790***	-3.519***	-3.790***	-3.519***	-3.790*	-3.519**
	-3.31	*-2.97*	*-3.26*	*-3.07*	*-2.16*	*-2.06*
TRDCjit	46.021*	40.35	46.021	40.35	46.021	40.35
	1.85	*1.53*	*1.31*	*1.22*	*1.33*	*1.35*
ENDIF2ijt*TRDCjit	-0.04	-0.032	-0.04	-0.032	-0.04	-0.032
	-1.39	*-1.13*	*-0.9*	*-0.78*	*-1.15*	*-0.91*
TRDCijt	15.21	1.471	15.21	1.471	15.21	1.471
	0.80	*0.1*	*0.54*	*0.06*	*1.15*	*0.19*
DISTij	-4.653**	-3.459*	-4.653	-3.459	-4.653	-3.459
	-2.22	*-1.83*	*-1.42*	*-1.18*	*-1.39*	*-1.11*
Constant	62.223	50.045	62.223	50.045	62.223	50.045
	1.62	*1.23*	*1.37*	*1.11*	*1.73*	*1.25*
Observations	466	576	466	576	466	576
No. of Clusters	96	96	95	96	6	6
Adj.R-squared	0.069		0.069		0.069	
Log pseudo likelihood		-2696.37		-2696.37		-2696.4

Notes: Robust t ratios are below the coefficients. * p<0.10, ** p<0.05, *** p<0.01.
Models 1 and 2: robust in clusters of country and years: 96 clusters, Models 3 and 4: robust in clusters of country and sectors 95 and 96 clusters in OLS and Tobit model, Models 5 and 6: robust in clusters of 6 sectors.

Since the Hausman test (Table A2.6) suggested that random effect model fits the data better than the fixed effect model, The KK model has also been estimated by random effect and Tobit random effect models.. The results presented in Table 2.15 indicate that the signs of all the variables are as obtained in most of the models (6 Y's and 2 N's), there are few significant coefficients and the main variable endowment difference is only significant in the Tobit random effect model at 10% level of significance. The insignificance of many explanatory variables in the regressions for the broad sectors might also be due to

the lack of data on any sector specific explanatory variables as these sectors may have significant differences in the technology and skill intensities.

Table 2.15: Estimates of the Knowledge Capital Model for FDI Inflows in Broad Sectors, 2002-2007 (Random Effect Models)

Dependent Variable: FDI inflows in the Broad Sectors in Pakistan

Independent variables	Random Effect	Tobit (Random Effect)	
GDPSUMijt	10.316	11.308	(Y)
	0.48	*0.91*	
GDPDIF2ijt	1.378***	1.510**	(N)
	2.99	*2.39*	
ENDIFijt	2.491	2.554*	(Y)
	1.64	*1.86*	
ENDGDPDIFijt	-0.525	-0.596	(Y)
	-0.87	*-1.44*	
INVCjt	-3.790***	-3.573***	(Y)
	-3.67	*-3.36*	
TRDCjit	42.034*	30.744	(Y)
	1.8	*1.24*	
ENDIF2ijt* TRDCjit	-0.04	-0.027	(Y)
	-1.26	*-0.92*	
TRDCijt	17.633	4.932	(N)
	0.84	*0.36*	
DISTij	-4.650*	-3.554*	
	-1.72	*-1.75*	
Constant	63.245	51.904	
	1.45	*0.88*	
Observations	466	576	
R-squared	0.087		
Log likelihood		-2670.61	

Notes: * p<0.10, ** p<0.05, *** p<0.01.
Y: according to the prediction of the KK model, N: not according to the prediction of the KK model.
Random Effect Model: Robust z values in country and sectors.

2.7.4 The KK Model for the Sub Sectors of Manufacturing

Data on FDI inflows in this sectoral analysis relates to 23 sub sectors of the manufacturing sector for the period 2002-2007. The total number of observations is 2208. Out of the total 1472 are zero observations and 25 observations are in negative values. The data descriptive in Table A2.4 indicates that Pakistan received a meagre amount of 2.75 million $ of FDI on an average per year in the manufacturing sector. The variation in these inflows is indicated by a standard deviation of 14.75. (There was an outflow of FDI of 82.89 million $ in the fertilizer sector by the UAE in 2006 and the maximum amount of FDI received was 283 million $ in Tobacco and cigarettes sector by the Netherlands in 2007).

Because of a large number of zero observations, Tobit model is more appropriate for our regression analysis. Although the Breauch-Pagan test of heteroscdasticity did not indicate significant heteroscdasticity in the data, the test for heteroskedasticity between groups of observations of Levene (1960) and Brown and Forsythe (1992) rejected the equality of variances between groups. The former is robust to non-normality of the error distribution and the latter uses median instead of mean which is a more robust estimator. (See Table A2.5, STATA computes this test).

Table 2.16 presents the results of four Tobit models where Tobit 1 shows robust t values, Tobit 2 considers robustness in country and year as clusters (96 clusters), Tobit 3 is robust in country, year and sub-sectors cluster (368 clusters) and as Hausman test rejected the fixed effect model, we estimated Tobit 4, the random effect model. Here the dependent variable is FDI inflows in the sub sectors of manufacturing. The pattern of the results, the signs and the significance levels in the sub sector regressions are more or less as good as obtained in the basic regression for aggregate FDI. It indicates that many of the variables of the KK model explain the data well in the manufacturing sub-sectors as in the aggregate inflows case.

Table 2.16: Estimates of the Knowledge Capital Model for FDI Inflows in Manufacturing Sector, 2002-2007

Dependent Variable: FDI inflows in the Sub sectors of Manufacturing in Pakistan.

Independent variables	Tobit 1	Tobit 2	Tobit 3	Tobit 4 Random Effect
GDPSUMijt	0.368	0.368	0.368	-0.643
	0.29	*0.19*	*0.21*	*-0.31*
GDPDIF2ijt	0.220***	0.220**	0.220**	0.253**
	2.79	*2.53*	*1.98*	*2.40*
ENDIFijt	0.754***	0.754**	0.754**	0.693***
	2.88	*2.55*	*2.42*	*3.02*
ENDGDPDIFijt	-0.024	-0.024	-0.024	0.001
	-0.58	*-0.42*	*-0.39*	*-0.01*
INVCjt	-0.403**	-0.403	-0.403**	-0.436**
	-2.01	*-1.53*	*-2.06*	*-2.53*
TRDCjit	11.740***	11.740**	11.740**	12.121***
	2.64	*2.09*	*2.29*	*2.82*
ENDIF2ijt* TRDCjit	-0.012**	-0.012**	-0.012**	-0.011**
	-2.53	*-2.10*	*-2.02*	*-2.17*
TRDCijt	-0.277	-0.277	-0.277	2.927
	-0.15	*-0.10*	*-0.12*	*1.25*
DISTij	-0.142***	-0.142***	-0.142***	-1.473***
	-3.51	*-3.42*	*-3.00*	*-4.05*
Constant	-13.633*	-13.633	-13.633	-17.537*
	-1.70	*-1.46*	*-1.56*	*-1.81*
Observations	2208	2208	2208	2208
No. of clusters		96	368	
Log pseudo likelihood	-3524.819	-3524.819	-3524.819	-3424.643

Notes: * p<0.10, ** p<0.05, *** p<0.01

Tobit 1: robust t values, Tobit 2: robust in clusters of country and years: 96 clusters, Tobit 3: robust in clusters of country and sub sectors 368 clusters, Tobit 4: z values in Random Effect Tobit Model.

The above models are also estimated with dummy variables for the electronics and chemical sub sectors. These sectors were chosen keeping in view the factor intensities of US multinationals in the developing countries obtained from Nunnenkamp and Spatz (2003). Table 2.17 below presents the characteristics of the US industries in the manufacturing sector. As can be seen, electrical equipment has the highest labour intensity with a ratio of 61 and a minimum of human capital intensity of 8.1. Moreover, data in the column for vertical integration shows that firms in this sector are largely vertically integrated. On the

Table 2.17: Characteristics of the US Manufacturing Industries: Selected Indicators[a]

	Labor intensity[b]	Human capital intensity[c]	R&D intensity[d]	Technology transfers[e]	Export orientation[f]	Vertical integration[g] (1)	(2)
Food	27.9	12.5	1.51	2.39	20.8	3.6	5.4
Chemicals	19.9	19.7	6.51	5.77	18.8	11.3	12.1
Metals	25.1	16.5	0.96	1.54	30.8	10.6	9.2
Machinery	28.2	12.8	5.56	12.43	75.7	43.3	59.1
Electr. equip.	61.0	8.1	2.70	2.91	53.0	64.9	120.2
Transp. equip.	22.2	15.1	6.35	1.13	40.6	65.1	76.4
Other manuf.	25.8	14.2	1.29	3.18	24.8	17.1	22.3
Total manuf.	30.1	12.8	3.70	4.64	40.5	35.0	43.9

[a]Data refer to majority-owned non-bank US affiliates, except technology transfers (all affiliates). Data are for 1995, if not mentioned otherwise, since many observations are missing for earlier years. Industry characteristics are calculated for all developing host countries, by adding up Africa, Asia (excluding Australia and Japan), Middle East and Latin America, if not mentioned otherwise. – [b]Number of employees of US affiliates per million US$ of value added. – [c]Compensation of employees (1000 US$) per person employed by US affiliates. – [d]R&D expenditures of US affiliates in percent of value added. – [e]Royalties and license fees paid by US affiliates to their parent companies in percent of value added. Data refer to 1999 because of missing data for earlier years. – [f]Total exports of US affiliates in percent of total sales. Data refer to 1996. All developing host countries proxied by substracting Canada, Europe and Japan from all host countries (because of missing observations for developing country regions). – [g]Sum of exports of US affiliates to, and imports of US affiliates from their parent companies in percent of total sales of affiliates. Data refer to 1996. Column (1): all developing host countries proxied by substracting Australia, Canada and Europe from all host countries (Japan not excluded because of missing observations); column (2): only Latin American host countries (missing observations for other developing country regions).

Source: Table 5, pp 25, Nunnenkamp and Spatz (2003)

other hand chemicals is the least labour intensive sub sector with a ratio of 20 but is highly research oriented and is not strongly vertically integrated.

The regression results are presented in Table 2.18. The first two models Tobit 1 and 2 consider the dummy for electronics and the last two Tobit 3 and 4 consider the dummy for chemicals. The coefficients of both the dummies are positive and are significant across all the models.

These results indicate that there is an existence of both types of FDI inflows in the manufacturing sector. In the electronics FDI inflows are labour intensive and are vertical in nature, while FDI in the chemicals

sector is not specifically labour intensive (it is more research oriented) neither it shows strong vertical integration.

Table 2.18: Estimates of the Knowledge Capital Model for FDI Inflows in Manufacturing Sector with Dummies for Electronics and Chemicals Sub Sectors, 2002-2007

Dependent Variable: FDI inflows in the Sub Sectors of Manufacturing in Pakistan

Independent variables	Tobit 1	Tobit 2	Tobit 3	Tobit 4
GDPSUMijt	0.424	0. 424	0.464	0.464
	0.24	*0.21*	*0.26*	*0.23*
GDPDIF2ijt	0.223**	0. .223**	0.222**	0.222**
	2.01	*2.53*	*2.01*	*2.5*
ENDIFijt	0.759**	0. 759**	0.768**	0.768**
	2.44	*2.56*	*2.45*	*2.56*
ENDGDPDIFijt	-0.026	-0. 026	-0.026	-0.026
	-0.44	*-0.44*	*-0.43*	*-0.45*
INVCjt	-0.412**	-0.412	-0.428**	-0.428
	-2.08	*-1.55*	*-2.12*	*-1.58*
TRDCjit	11.773**	11.773**	12.049**	12.049**
	2.30	*2.08*	*2.33*	*2.11*
ENDIF2ijt*TRDCjit	-0.012**	-0. .012**	-0.012**	-0.012**
	-2.03	*-2.09*	*-2.08*	*-2.12*
TRDCijt	-0.413	-0. 413	-0.216	-0.216
	-0.18	*-0.15*	*-0.09*	*-0.07*
DISTij	-1.399***	-1.399***	-1.434***	-1.434***
	-2.97	*-3.40*	*-3.01*	*-3.42*
ELECTRONICS	5.843**	5.843***		
	2.43	*3.03*		
CHEMICAL			11.478***	11.478***
			3.50	*3.83*
Constant	-13.807	-13.807	-14.012*	-14.012
	-1.58	*-1.46*	*-1.61*	*-1.47*
Observations	2208	2208	2208	2208
No. of clusters	368	96	368	96
Log pseudo likelihood	-3519.969	-3519.969	-3503.417	-3503.417

Notes:* p<0.10, ** p<0.05, *** p<0.01.
Tobit 1 and 3: robust in clusters of country and sub sectors 368 clusters, Tobit 2 and 4: robust in clusters of country and years: 96 clusters.

Table 2.19 presents results including large source countries dummies. Contrary to the results in our aggregate FDI regressions, the dummies for all the three large source countries the USA, UK and UAE are positive and significant and are likely driving the results of our models because almost 50 percent of FDI in the manufacturing sector comes from these countries. The coefficients on endowment difference are now negative and insignificant and the coefficients of sum of GDP are negative but not always significant contrary to the predictions of the KK model.

Overall, results of our estimations suggest that Pakistan receives VER FDI as the estimate of skill difference variable is positive and significant in most of the regressions but there is less evidence of HOR FDI. While the sign on host country trade cost is positive and significant that indicates HOR FDI which is market seeking and is done to avoid trade costs, the sign on the squared of difference of bilateral GDP is unexpectedly positive and significant which is against the prediction of the model implying that as differences in bilateral GDP increase there will be less HOR FDI. To further explore the horizontal aspect of the model, we modify the specification of the KK model in the next section.

Table 2.19: Estimates of the Knowledge Capital Model for FDI Inflows in Manufacturing Sector with Dummies for Large Source Countries, 2002-2007

Dependent Variable: FDI inflows in the Sub Sectors of Manufacturing in Pakistan

Independent variables	Tobit 1	Tobit 2	Tobit 3	Tobit 4 Random Effect
GDPSUMijt	-3.753*	-3.753	3.753*	-5.291**
	-1.76	*-1.73*	*-1.48*	*-2.17*
GDPDIF2ijt	-0.202	-0.202	-0.202	-0.285
	-1.02	*-1.2*	*-0.96*	*-1.28*
ENDIFijt	-0.02	-0.02	-0.02	-0.083
	-0.10	*-0.10*	*-0.07*	*-0.32*
ENDGDPDIFijt	0.134*	0.134*	0.134	0.187**
	1.68	*1.69*	*1.42*	*2.09*
INVCjt	-0.562**	-0.562**	-0.562**	-0.662***
	-2.22	*-2.1*	*-2.24*	*-3.55*
TRDCjit	2.654	2.654	2.654	4.516
	0.76	*0.66*	*0.62*	*1.01*
ENDIF2ijt*TRDCjit	0.001	0.001	0.001	0.001
	0.33	*0.3*	*0.23*	*0.13*
TRDCijt	-1.229	-1.229	-1.229	1.854
	-0.67	*-0.51*	*-0.6*	*0.79*
DISTij	-0.838**	-0.838**	-0.838*	-0.843**
	-2.34	*-2.3*	*-1.86*	*-2.07*
USA	30.281*	30.281**	30.281*	39.569***
	1.86	*1.99*	*1.82*	*2.68*
UK	13.050***	13.050***	13.050***	15.820***
	4.27	*4.36*	*3.76*	*5.69*
UAE	7.388***	7.388***	7.388***	9.911***
	3.95	*3.85*	*2.70*	*3.04*
Constant	7.77	7.77	7.77	5.237
	0.79	*0.79*	*0.73*	*0.47*
Observations	2208	2208	2208	2208
No. of clusters		96	368	368
Log pseudo likelihood	-211.642	-211.642	-211.642	-127.898

Notes: * p<0.10, ** p<0.05, *** p<0.01
Tobit 1: robust t values. Tobit 2: robust in clusters of country and years: 96 clusters. Tobit 3: robust in clusters of country and sub sectors 368 clusters. Tobit 4: Random Effect Tobit Model, z values below the coefficients.

2.8 The Modified KK Model

The results of our estimations of the KK model in the preceding sections indicate mixed evidence of the horizontal aspect of the model. On the one hand, one of the variables, 'trade cost in the host country', which reflects the horizontal side of the model is according to the expectation that is as trade costs in Pakistan increase there will be more horizontal type of FDI which refers to the tariff jumping motive. Therefore, the coefficient of the variable of trade cost in Pakistan is positive and significant. But on the other hand, it has been observed that the sign of one of the coefficients of market size variables, 'GDP difference square', which also reflects the horizontal aspect of the KK model, is not consistent with the prediction of the KK model in our estimations. According to the predictions of the KK model the coefficient of the GDP difference square should be negative implying that as the bilateral differences in the GDPs of countries increase, horizontal FDI would decrease. On the contrary, we got a positive and highly significant coefficient for the GDP difference square. This result is not unique because Blonigen and Wang (2004) have also observed while estimating the KK model that market size in the developing countries is not determining US FDI in these countries.[42] Other example is a case study by Kristjánsdóttir (2010) which finds positive and significant coefficient on GDP difference square term for inward FDI in Iceland.[43] Nevertheless, this result is not what we expected because a recent upsurge in FDI inflows mostly in the services sector in Pakistan is also attracted to its growing market size.

During our literature review we have observed that many researchers estimating the KK model using the CMM (2001) found little evidence of the vertical aspect of the model. The two reasons of not finding vertical aspect cited are, first, most of the studies have data mainly on large similar countries and therefore the horizontal aspect of the KK model was more evident in their regressions and therefore, the vertical aspect did not seem to have chance to appear. Second, several researchers argue that the CMM

[42] On the contrary CMM (2002) find market size of the developing countries is important for the US FDI as being seen in the literature review section.

[43] She also obtained a negative and significant coefficient on GDP sum. It is also noteworthy that Iceland is a small developed country.

(2001) specification does not capture all the non-linear and non-monotonic relationships between the relevant variables of the model, (Blonigen et al; 2003, Braconier et al; 2005a, and Davies; 2008).

The above two observations indicate that the estimates of the KK model are sensitive to the sample of countries in the data used and the mathematical specification of the variables to capture the complex relationships between the relevant variables.

We follow Braconier et al, (2005a) and Davies, (2008) in modifying our estimated model to control for the non-linearity and non-monotonic relationship between the variables.

The KK model is represented in the Edgeworth box in Figure 2.3.[44] The coordinates in the Edgeworth box give the position of bilateral pairs of countries. Hence, the law of Pythagoras implies that the size of a country can be calculated by the length of a ray from the origin to its endowment point in the Edgeworth box.[45] CMM capture movements along the SW–NE diagonal in Figure 2.3 only through the squared-difference of GDP between the home and the host country. This imposes a U-shape or an inverse U-shape on the data.

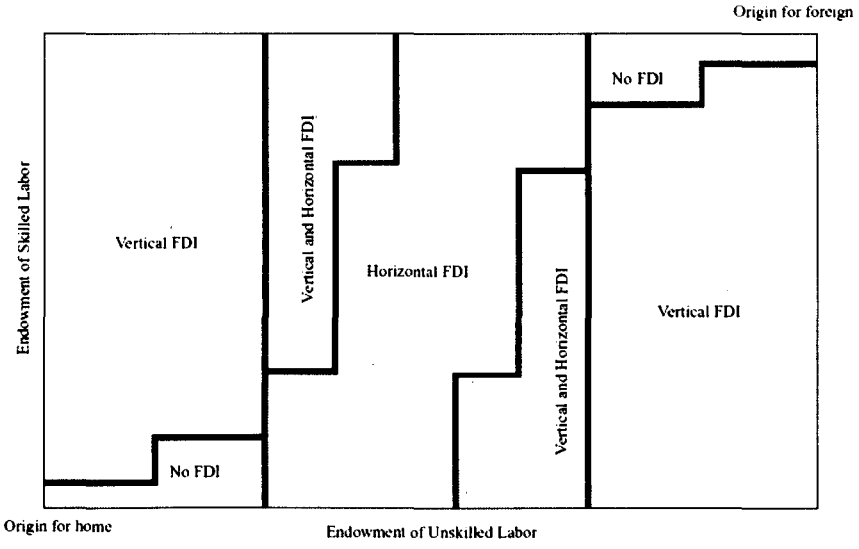
However, the relationship between the variables seems more complex due to the presence of regions in the figure where there are simultaneous occurrence of both the vertical and the horizontal FDI and it is difficult to capture the switch over from one type of FDI to the other.

Therefore, Braconier et al. (2005a) include two terms 'size; and 'size squared' while Davies, (2008) uses skill and skill squared terms to capture the non-monotonic nature of the model as discussed in detail in our review of literature section .

Further, Davies (2008) argues that it is more likely that in the positive range of skill difference both horizontal and vertical FDI could be prevalent because of the U shape of horizontal FDI which in the

[44] We have reproduced this figure here again for easy reference.
[45] See Braconier et al, (2005a, pp 773) for reference.

Figure 2.3: Representation of the KK Model

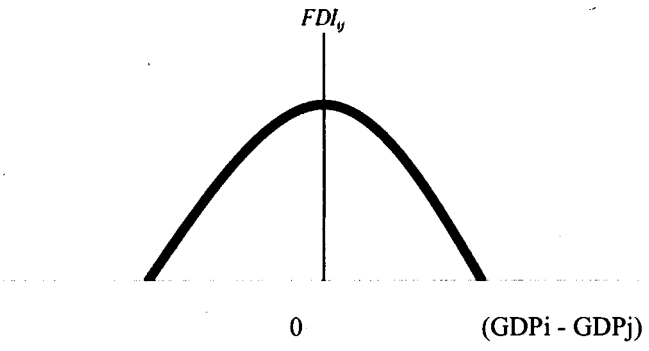


Source: Davies (2008)

positive region indicates that outflow of FDI drops because foreign country becomes less attractive and the fact that vertical FDI is conducted by only skill abundant source countries. Since Davies (2008) was exploring the vertical aspect of the model, so he emphasized the skill variable, we apply his arguments in terms of size variable measured by the GDPs of the countries. The three figures below have been adapted from Davies to forward our case regarding the size variable.

Figure 2.4 represents the horizontal FDI. In the region where (GDPi – GDPj) < 0, as the difference in the sizes of countries increase the countries are becoming similar and horizontal FDI rises till it reaches the maximum. In the region where (GDPi – GDPj) > 0, as the difference increases, countries become more dissimilar and horizontal FDI decreases.

Figure 2.4: Horizontal FDIij

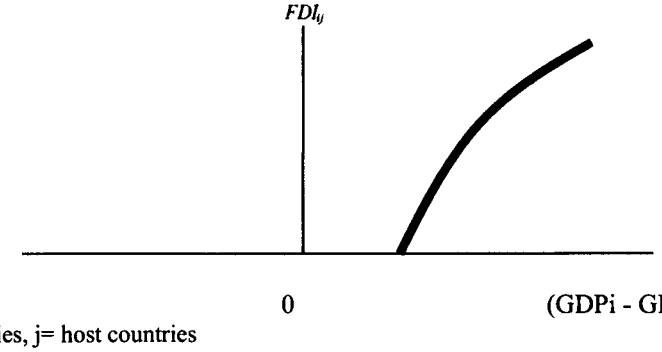


i=source countries, j= host countries

Adapted from Davies (2008)

The vertical FDI shown in Figure 2.5 is only conducted by large source countries. As horizontal FDI exists along with the vertical FDI in the positive range, there is more possibility of CMM specification being not able to capture the switch over between these two types of FDI.

Figure 2.5: Vertical FDIij



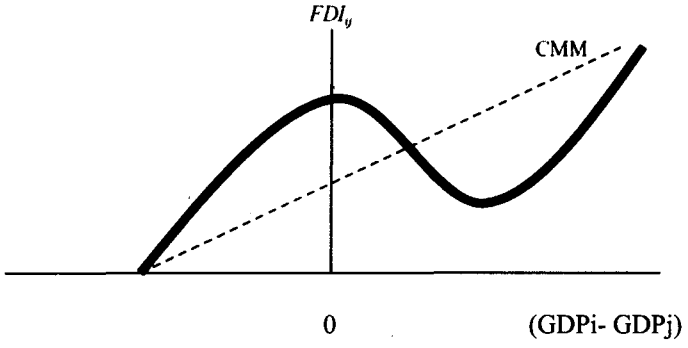
i=source countries, j= host countries

Adapted from Davies (2008)

Fig 2.6 adds the trends of horizontal and vertical FDI illustrated in Figure 2.4 and Figure 2.5. In the positive range in Figure 2.6, aggregate FDI first decreases as the GDP difference increases and then increase as the differences increase.

Similar to Davies (for skill variable), we also argue that when the source country is large in size, but only

Figure 2.6: Aggregate FDI



i=source countries, j= host countries

Adapted from Davies (2008)

slightly so, FDI is decreasing in the sizes representing horizontal FDI dominating in this region.

As the size difference rises, this relationship reverses itself and FDI increases in the size difference reflecting that vertical FDI dominates when the source countries are very large in sizes. So the types of FDI depend on how much and to what degree the countries differ in sizes.

Following our arguments above, we add GDP difference (GDPDIFijt) with GDP difference square (GDPDIFijt2) in our basic equation. We hypothesize that GDPDIFijt would have a negative sign indicating that the difference in sizes discourages horizontal FDI but as this differences increase there would be a switch over from horizontal to vertical FDI and in this case we expect GDPDIFijt2 would be positive.

The results of estimation are presented in two tables. While Table 2.20 does not differentiate between the positive and negative ranges of GDP difference the results presented in Table 2.21 only include results obtained for the positive range of GDP difference. The results seem promising the signs of the coefficient of GDP difference and GDP difference square are negative and positive as expected and are significant at 1 percent level of significance.

Moreover, in both the above tables, investment costs refer to the difference in these costs between the source and host countries and the sign of this variable is positive indicating that as investment costs in the source countries increase relatively to these costs in Pakistan, there will be more inflows of FDI in Pakistan.

Table 2.20: Estimates of the Modified Knowledge Capital Model for Aggregate FDI Inflows, 1986-2007

Dependent Variable: Aggregate Inflows of FDI in Pakistan, 1986-2007

Independent variables	OLS	TOBIT
GDPSUMijt	1172.009***	1371.618***
	3.44	*4.07*
GDPDIFijt	-1125.392***	-1306.563***
	-3.43	*-4.02*
GDPDIF2ijt	7.351***	6.801***
	4.04	*4.45*
ENDIFijt	6.550**	7.816***
	2.12	*2.79*
ENDGDPDIFijt	-2.702***	-2.989***
	-2.8	*-3.49*
INVCDIFijt	1.219**	1.269***
	2.23	*2.67*
TRDCjit	109.482**	126.003***
	2.08	*2.67*
ENDIF2ijt*TRDCjit	-0.114*	-0.143***
	-1.93	*-2.62*
TRDCijt	76.92	51.634
	1.46	*1.34*
DISTij	-6.839**	-8.591***
	-2.14	*-2.69*
Constant	-420.265**	-465.235***
	-2.44	*-3.09*
Observations	286	352
Adj.R-squared	0.348	
Log pseudo likelihood		-1738.88

* p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the coefficients.

Table 2.21: Estimates of the Modified Knowledge Capital Model for Aggregate FDI Inflows, 1986-2007: for GDPDIFijt > 0

Dependent Variable: Aggregate Inflows of FDI in Pakistan, 1986-2007

Independent variables	OLS	TOBIT
GDPSUMijt	1143.397***	1340.085***
	3.44	*4.03*
GDPDIFijt	-1094.548***	-1275.420***
	-3.44	*-4*
GDPDIF2ijt	8.240***	7.341***
	3.79	*4.14*
ENDIFijt	7.833**	8.418***
	2.16	*2.67*
ENDGDPDIFijt	-3.010***	-3.120***
	-2.88	*-3.41*
INVCDIFijt	1.397**	1.340**
	2.25	*2.54*
TRDCjit	126.809**	132.344**
	2.14	*2.52*
ENDIF2ijt*TRDCjit	-0.132**	-0.151**
	-2.01	*-2.52*
TRDCijt	82.778	51.205
	1.52	*1.27*
DISTij	-9.041**	-10.278***
	-2.24	*-2.64*
Constant	-447.407**	-464.127***
	-2.47	-2.95
Observations	271	329
Adj.R-squared	0.359	
Log pseudo likelihood		-1653.33

* p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the coefficients.

2.9 Conclusions

This study attempts to estimate the KK model for a small developing country, Pakistan, at both aggregate and disaggregate levels. The aim is to see how well the KK model fits on a small developing country data and how the model works when the structural changes due to trade and investment reforms and political and economic instabilities in the economy are taken into account.

Our regression exercises indicate that the KK model fits the data reasonably well. Nearly all the explanatory variables, the sum of bilateral GDPs, the endowment differences and investment and trade costs in the host country have the expected signs and are highly significant in all the specifications and with alternative proxy measures, except for the coefficients on GDP difference square and trade cost in the source country. While the former is significant, the latter is insignificant in almost all regressions. It has also been observed that all the previous studies have ignored the investment costs in the source countries as a determinant of FDI, therefore, we include an investment cost variable for the source countries in one of the models and find a positive and significant coefficient for this variable according to our expectations that as investment costs in the source countries rise there will be more inflows of FDI in Pakistan.

This study differs from most of the studies done to estimate the KK model. First, all the previous studies take either the US or OECD data which mostly includes FDI between large developed countries and a few developing countries. These studies lump developed country and developed countries together in their analysis, hence ignoring the structural differences in their economies which affect the determinants of FDI. Our study estimates the model from the perspective of a small developing host country and provides some answer for the clue regarding vertical aspect of the KK model. Our results validate the Blonigen and Wang (2004) results that there are structural differences in the economies of the developed and the

developing countries. Second we find that the specification of skill variable used in the CMM (2001) study works quite well on our data. The coefficient on skill difference variable has the expected positive sign and is significant in almost all the regressions in our models for aggregate FDI inflows and also in the FDI inflows in the manufacturing sub sectors. Thus, confirming that developing countries receive more vertical FDI.

The results also indicate that while high investment costs in Pakistan discourage FDI inflows, high trade costs in Pakistan encourage horizontal FDI as predicted by the KK model.

It is also evident that historical links and cultural proximity have positive effects on the FDI inflows as dummies for the UK and Middle East countries are both significant.

Moreover, the coefficient on the dummy for the reform period is positive and significant indicating that open policy regime in Pakistan also attracted FDI inflows. Most of the signs of interactive terms of the dummy on reform period and the explanatory variables are according to the predictions of the KK model and provides evidence of both types of FDI during the reform period. However, the flows of FDI in Pakistan were discouraged in the period of instability as reflected by the negative and significant coefficient of the dummy used for the years of instabilities. Thus these instabilities undermined the positive effects of the reform measures.

The results of the regressions on the FDI inflows in the broad sectors reveal that signs of all the coefficients are consistent with the results obtained for the aggregate inflows but the significance level of the estimates are low. However, the results of Tobit models in the manufacturing sub-sectors are consistent and highly significant as obtained for the aggregate inflows of FDI. We find that FDI inflows are of both vertical and horizontal types. The coefficients on dummies for the electronics and chemical sub-sectors are positive and significant, while the former is considered the most labour intensive and integrated sector the latter is the least labour intensive and is not much integrated. However, our results

indicate that the inflows of FDI in the broad sectors and sub sectors are affected by the inflows from the three large source countries.

Overall, our estimations of the model provide strong evidence that Pakistan receives VER FDI as the estimate of skill difference variable is positive and significant in almost all the regressions but there is less evidence of HOR FDI. While the sign on host country trade cost is positive and significant which indicates HOR FDI which is market seeking and is done to avoid trade costs, the sign on the squared of difference of bilateral GDP is unexpectedly positive and significant which is against the prediction of the model that as differences in bilateral GDP increase there will be less HOR FDI. Therefore, we modify the specification of the KK model and try to capture the non linearities and the 'switch over' regime of the model by an additional explanatory variable of GDP difference. The coefficient on GDP difference is negative and significant indicating that difference in bilateral GDP discourages HOR FDI. However, more research is needed on this aspect of the model in the case of developing countries as has been done in the case of developed countries in search of VER FDI.

The policy implication of the KK model for Pakistan is that liberalization of its trade and investment regimes will attract more VER FDI in the manufacturing sector while opening up of services sector will attract HOR FDI (to some extent VER FDI). Thus increase in these two types of FDI will also boost trade in goods and services. The VER FDI also lowers the differences in wages between skilled and unskilled and can change the income distribution in the country.

Our attempt to estimate the KK model from the perspective of a small developing country reflects the challenges of estimating the model for these countries with all the data limitations. But there has to be a beginning from somewhere.

Appendices 2.10

Table A2.1: Empirical Studies on the New Trade Theory Models of the Multinational Enterprise

1.Country Studies	Countries & Years covered	Methodology	Dependent variables	Results
Blonigen et, al; (2003) (BDH)	US and OECD. 1983-92. 51Countries	OLS, TOBIT	Real FDI Sales for the US MNEs and FDI Stock for OECD MNEs	HOR
Blonigen & Wang (2004)	1970-99	OLS in levels and log linear models	i) inbound US FDI stock . ii) outbound US FDI stock.	VER (LDC's)
Braconier et al (2005 a)	1986,1990,1994,1998. 56 source and 85 host countries. Stock data from OECD data base for 58 source and 57 host	OLS, WLS and Fixed Effect models	i) Real sales of i affiliate to country j. ii) stock of FDI.	KK
Braconier et al (2005 b)	1986,1990,1994,1998. US and Swedish MNE's	OLS	i) Total sales of affiliates. ii) affiliates exports to source country. iii) export to the third country. iv) local sales	VER
Carr, David L.; Markusen, James R. and Maskus, Keith E; (2001)	1986-94 50 countries	OLS, WLS, TOBIT	Pooled real inbound and outbound FDI of US non-bank manufacturing sectors.	KK
Davies (2008)	As of Carr et al (2001) and BDH (2003)	OLS	i) FDI sales US MNEs ii) FDI stock OECD	KK
Kristjánsdóttir (2005)	1989-99 23 countries	OLS, TOBIT	Stock of FDI in Iceland	MIXED but mostly VER
Markusen & Maskus (2002)	1986-94 37 countries	OLS, WLS,TOBIT	Pooled real inbound and outbound FDI of US non-bank manufacturing sectors.	HOR
Tanaka (2006)	1989-2002 50 countries (Pakistan inclusive)	OLS	Real volume of sales by US & Japanese affiliates in the host countries	KK (Overall) HOR (US) VER (JAPAN)

2.Sector/Industry Studies				
Yokoto & Tomohara (2007)	44 countries 1983-99 Industry level data of the following: Food, Chemicals, Metal, Machinery, Electric machinery, Transportation equipment	OLS	i)Real sales of non-bank US affiliates in country j at the time t. ia)Local Sales iib)Exports to US iiib)Exports to other countries	HOR (Over all) HOR (Machinery and Transportation industries). VER (Food and Chemical industries. And in Electric Equipment in LDCs).
Alfaro (2007)	2005 More than 43 million firm level observations in more than 213 countries and territories	TOBIT		VER
Yeaple (2003)	34 countries, 50 manufacturing industries 1994	OLS, TOBIT	i)Total US affiliate sales . ii) Exports of US affiliate back to parent. iii) ratio of all exports from US to a host country to the sum of these exports plus UK affiliates sale in that country	HOR (Over all) KK (In least skilled-labor-intensive industries).
Hanson et al. (2001)	58 countries 1982,1989, 1994 and 1998 data on 12 two digit manufacturing and non manufacturing sectors	OLS	i) ln(EXPijt) – ln(SALEijt) ii) ln(IMPijt) – ln(SALEijt) iii) Ratio of sales of wholesale trade affiliates to total sales of manufacturing and wholesale trade affiliates	VER (dominant in industries like machinery, electronics and transportation and wholesale-trade and distribution).
Geishecker and Gorg (2005)	1994-2001, 354 country partner pairs, Manufacturing and Service sectors	OLS	Total outward stock of FDI from country i in country j at time t.	VER in Manufacturing and HOR in Services.
Waldkirch (2003)	1994-2000 4 digit industry level	TOBIT	Inflows of FDI in Mexico	VER

Notes: VER: vertical, HOR: horizontal, KK: Knowledge Capital. EXP: exports, IMP: imports. i=source country, j= host country, t =time

Table A2.2: Summary Statistics: Aggregate FDI inflows, 1986-2007

Variables	Observations	Mean	Std. Dev.	Min	Max
FDIijt	286	49.91	119.26	0.08	1133.06
GDPSUMijt	286	1.67	2.38	0.07	11.71
GDPDIF2ijt	286	8.00	22.04	0.00	132.09
ENDIFijt	286	21.52	8.07	0.31	40.00
ENDGDPDIFijt	286	42.84	81.58	-0.24	433.03
INVCjt	286	40.11	7.96	27.36	52.12
TRDCjit	286	1.02	0.31	0.40	3.83
ENDIF2ijt*TRDCjit	286	564.60	490.37	0.08	4106.16
TRDCijt	286	1.00	0.27	0.32	2.56
DISTij	286	5.99	2.71	2.07	11.41

Summary Statistics is for only positive values of FDI inflows.
i= source country j=host country (Pakistan) t=time

Description of the variables and data sources:

FDIijt:	Inflows of FDI from country i to j (Pakistan) (million US$ at constant 2000 prices).
GDPSUMijt:	Sum of bilateral GDP (trillion US$ in constant 2000 prices).
GDPDIF2ijt:	Difference of bilateral GDP (trillion US$ in constant 2000 prices).
ENDIFijt:	Endowment Difference measured by differences in per capita GDP of country (thousand US$ in constant 2000 prices).
ENDGDPDIFijt:	Product of endowment difference and GDP difference.
INVCjt :	Investment cost in country j (PPP values deflated by GDP deflator in 2000 prices)
TRDCjit :	Trade cost in country j : IMPCIFjit / EXPFOBijt where, IMP=imports EXP=exports
ENDIF2ijt* TRDCjit :	Product of squared differences in endowment and trade cost in country j
TRDCijt:	Trade cost in country I : IMPCIFijt / EXFOBjit where, IMP=imports EXP=exports
DISTij :	Distances between country i and j (thousand km).

Table A2.3: Summary Statistics: FDI inflows in the Broad Sectors in Pakistan, 2002-2007

Variables	Observations	Mean	Std. Dev.	Min	Max
FDIijt	466	17.74	68.71	0.00	1082.18
GDPSUMijt	466	1.93	2.88	0.16	11.71
GDPDIF2ijt	466	11.33	30.87	0.00	132.09
ENDIFijt	466	24.15	9.09	0.57	40.00
ENDGDPDIFijt	466	54.40	107.01	0.01	433.03
INVCjt	466	30.99	2.58	27.36	34.86
TRDCjit	466	1.00	0.22	0.30	1.77
ENDIF2ijt*TRDCjit	466	692.46	480.28	0.18	2009.53
TRDCijt	466	1.03	0.29	0.32	2.37
DISTij	466	6.16	2.84	1.96	11.41

Summary Statistics is for only positive values of FDI inflows in six Broad sectors.
i= source country j=host country (Pakistan) t=time

The units and sources of the data of all the variables are the same as given in Table A2.2.

Table A2.4: Summary Statistics: FDI inflows in the Manufacturing Sub Sectors in Pakistan, 2002-07

Variables	Observations	Mean	Std.Dev	Min	Max
FDIijt	711	2.75	14.75	0.00	283.30
GDPSUMijt	711	2.76	3.83	0.16	11.71
GDPDIF2ijt	711	21.32	42.83	0.00	132.09
ENDIFijt	711	26.03	8.71	0.57	40.00
ENDGDPDIFijt	711	86.63	141.84	0.01	433.03
INVCjt	711	30.92	2.69	27.40	35.00
TRDCjit	711	1.03	0.21	0.30	1.77
ENDIF2ijt*TRDCjit	711	793.29	486.66	0.18	2009.53
TRDCijt	711	1.00	0.27	0.32	2.37
DISTij	711	6.13	3.13	1.96	11.41

i= source country j=host country (Pakistan) t=time
Summary Statistics is for only positive values of FDI inflows in twenty three sub sectors of Manufacturing. The minimum FDI inflows were too small to be recorded in two decimal places. The units and sources of the data of all the variables are the same as given in Table A 2.2.

The data for the inflows of FDI in Pakistan has been obtained by the State Bank of Pakistan. The values of the GDP's and per capita GDP's are from the World Development Indicators. The cost of investment data has been extracted from the PENN World Tables 6.2. The cif values of imports and fob values of

exports for the partner countries are from [Direction of Trade Statistics, IMF] [Annual values] [February 2009] [Units: US Dollars], the data on distances between capital cities is from www.indo.com.

16 source countries of FDI

Australia Canada China France Germany Hong Kong Italy Japan Korea Netherlands Saudi Arabia Singapore Switzerland United Arab Emirates United Kingdom United States of America

6 Broad sectors

Manufacturing Mining Construction Transport and Communications Commerce Utility

23 Manufacturing sectors/industries

Food
Beverages
Tobacco & Cigarettes
Sugar
Textiles
Paper & Pulp
Leather and Leather Products
Rubber and Rubber Products
Chemicals
Petro Chemicals
Petroleum Refining
Pharmaceuticals & OTC Products
Cosmetics
Fertilizers
Cement
Ceramics
Basic Metals
Metal Products
Machinery Other than Electrical
Electrical Machinery
Electronics
Transport Equipment(Automobiles)
Power

Table A2.5: Heteroskedasticity Tests

Heteroskedasticity in Aggregate Inflows

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of the dependent variable

chi2(1) = 7.85
Prob > chi2 = 0.0051

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: GDPSUMijt GDPDIF2ijt ENDIFijt ENDGDPDIFijt INVCjt TRDCjit endifthsqTRDCjit TRDCijt DISTij

chi2(9) = 21.23
Prob > chi2 = 0.0117

Heteroskedasticity in Broad Sectors

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of the dependent variable

chi2(1) = 5.68
Prob > chi2 = 0.0172

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: GDPSUMijt GDPDIF2ijt ENDIFijt ENDGDPDIFijt INVCjt TRDCjit endifthsqTRDCjit TRDCijt DISTij

chi2(1) = 9.45
Prob > chi2 = 0.397

By Groups:

robvar eps, by (countryyear)

W0 = 6.256986 df(95, 480) Pr > F = 0

W50 = 1.499265 df(95, 480) Pr > F = 0.003494

W10 = 6.256986 df(95, 480) Pr > F = 0

robvar eps, by (sector, country, year)

W0 = 4.516412 df(95, 480) Pr > F = 0

W50 = 2.205036 df(95,480) Pr > F = 3E-08

W10 = 4.516412 df(95, 480) Pr > F = 0

robvar eps, by (sectors)

W0 = 6.969778 df(5, 570) Pr > F = 2.48E-06

W50 = 2.921809 df(5, 570) Pr > F = 0.012922

W10 = 2.917337 df(5, 570) Pr > F = 0.013038

Heteroskedasticity in Sub-sectors of the Manufacturing Sector

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of the dependent variable

chi2(1) = 3.46
Prob > chi2 = 0.0628

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: GDPSUMijt GDPDIF2ijt ENDIFijt ENDGDPDIFijt INVCjt TRDCjit endifthsqTRDCjit TRDCijt DISTij

chi2(1) = 5.57
Prob > chi2 = 0.7823

Heteroskedasticity between groups in sub sectors of manufacturing
(pppcode)

W0 = 6.2693 df(367, 1840) Pr > F = 0.0000

W50 = 1.3250 df(367, 1840) Pr > F = 0.0002

W10 = 6.2693 df(367, 1840) Pr > F = 0.0000

Notes: Wo : test conducted by Leven (1960), which is robust to nonnormality of the error distribution.
W50 and W10 : Test proposed by Brown and Forsythe (1992), uses more robust estimators of central tendency (e.g., median rather than mean),.
The hypothesis of equality of variances is soundly rejected by all three robvar test statistics, implying of heteroskedasticity.

Table A2.6: Hausman Tests

Aggregate Inflows: chi2(7) = 15.49 Prob>chi2 = 0.0303
Inflows in Broad Sectors: chi2(7) = 8.08 Prob>chi2 = 0.3256
Inflows in Sub-sectors of Manufacturing: chi2(7) = 3.03 Prob>chi2 = 0.8824

Chapter 3: The Relationship between Migration and FDI in Pakistan

3.1 Introduction

As a result of rapid globalization, trade, FDI and migration have increased significantly over the last two decades. According to WTO (2004) estimates in the decade of 1990-2000, the world Export/GDP ratio has grown by a factor of 1.5 and the FDI/GDP ratio by 3. During the same period, the total number of legal immigrants in the OECD member countries has also increased by 40 percent, with a larger increase for highly skilled migrants (64 percent) than for low skilled migrants (14 percent) (Docquier and Marfouk, 2006). However, despite the abolition of taxes and tariffs (formal barriers) and advancement in the modes of transport and communications which led to the rapid globalization, research studies find a large role of natural and informal barriers or frictions on trade and FDI which incur huge transaction costs. One of the main natural barriers is geographical distance between countries which has still a strong negative effect on these flows.[46] The informal barriers of trade and investment arise due to weak legal institutions and lack of information and knowledge of languages, customs and cultures and business and working environment in foreign countries (Rauch; 2002, Javorcik et al; 2010). In search to overcome these barriers, the role of migrants has widely been recognized in the pioneering empirical study by Gould (1994) and theoretical works by Granovetter's (1973, 1983), Greif (1993) and Rauch and Casella (1998).

To date, the role of migrants in the reduction of transaction costs has been studied more for trade relative to FDI, although the latter involves huge sunk and transactions costs. [47] Moreover, by studying the

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[46] 'The death of distance is exaggerated.' Trade Costs, James Anderson Boston College NBER Eric van Wincoop University of Virginia NBER September 10, 2003.

[47] An extensive study by Gaston and Nelson (2010) surveys and analyzes the works on the role of migrants in reducing the transaction costs for trade but surprisingly has left out studies on the role of migrants in the reduction of these costs for FDI.

migration-FDI linkage it is also possible to indirectly link migration with trade as a very high proportion of multinationals are involved with intra firm trade. This study aims to explore migration-FDI linkage for a developing country (Pakistan), on which little research has been undertaken.

In the context of a developing country, the role of migrants has largely been limited on the recognition of the remittances sent by these migrants. An extensive literature exists on the effects of remittances on poverty reduction through their effect on consumption, investment and imports and overall development of the economy, but the impacts of migration on trade and FDI have been explored little. As these countries are trying to increase their trade and FDI for their growth and development, the role of their migrants in foreign countries gives them an important channel to increase these flows as the role of networks of migrants is more important for developing countries because of their weak institutions and instabilities. In this regard our study is an early attempt to explore the role of immigrants in attracting FDI inflows in a small developing country - Pakistan.

The chapter is organized as follows: In Section 3.2 the motivation and objectives have been defined for this study, section 3.3 provides the theoretical underpinnings, a review of empirical studies is done in section 3.4. In section 3.5 we propose our empirical model of migration-FDI linkage and describe the data. The estimation techniques used have been discussed in section 3.6 and results of estimation in section 3.7 and finally we conclude.

3.2 Motivation and Objectives

Like many developing countries, Pakistan has experienced large outflows of migrants over decades and is one of the top ten emigration countries, with an emigration stock of 3,415952, which was 2.2 percent of the population in 2005.[48] The emigration rate of tertiary educated labour is fairly high at 9.2 percent in

[48] These migration flows were both due to pull and push factors and were due to both economic and non-economic reasons. The top ten emigration countries are: Mexico, Russia, India, China, Ukrain, Bangladesh Turkey, Kazakistan, Phillipines and Pakistan).

2000 (For both India and China these rates are 4.2percent). (The World Bank, 2005). Despite a higher rate of migration of labour force from the developing countries, little knowledge exists about the effects of migration on trade and FDI in these countries as noted earlier. Most of the studies done for OECD countries investigate the effect of migrants on trade and FDI by lumping migrants of different ethnic backgrounds. A few studies concentrate only on large country networks like that of the Chinese. For other developing countries the relationship between migration and FDI is limited to a small number of sectoral case-studies, for example on the software industry in Silicon Valley in India by Saxenian (2002) and the role of business networks in the surgical instruments sector from Pakistan by Schmitz and Nadvi (1999) and Nadvi and Halder (2005).

Apart from the above evidence, there are only some mixed observations on the role of Pakistani immigrants on trade and investment which we quote below. First observation is by Williamson (1998, pp 190-191):

'Much of East Asia's export success was based on inward direct investment, particularly in Singapore, Malaysia, China and Thailand. The Chinese experience is particularly interesting because much of the inward investment there came from the Chinese expatriate community, Pakistan is also a country with a relatively large and affluent expatriate community, and so it is worth asking why there has (so far as I am aware) been virtually no inward investment by expatriate Pakistani.'

The second observation is by Zavadjil. Assistant Director in the IMF's Middle East and Central Asia: [49]

'Many foreign investors are concerned about security in Pakistan, and these perceptions often drive their decisions. Pakistan's foreign direct investment has increased, but this is not coming from the blue-chip multinationals. In large part, investment is coming from the Middle East and from Pakistani expatriates.'

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[49] Sheila Meehan (2004) 'Growth recovers in Pakistan in difficult circumstances' IMF Survey, VOLUME 33, NUMBER 22 pp 351. Available at http://www.imf.org/external/pubs/ft/survey/2004/121304.pdf

Given the lack of empirical support on migration-FDI relationship for developing countries, Pakistan is an interesting case as it is one of the major labour exporters in the world. The extent and diversification of labour migration from Pakistan to Gulf region, Europe and the US also provides us with the opportunity to study the effects of migration on the inflows of FDI from these diverse regions. Moreover, countries hosting large number of Pakistani immigrants are also the major partners in trade and FDI of Pakistan.

To explore the relationship between migration and FDI, we attempt to address the four questions. First, do Pakistani immigrants have a significant role in attracting FDI inflows in Pakistan? Second, what is the mechanism through which Pakistani immigrants facilitate FDI inflows – by providing information and reducing transaction costs? Third, what is the impact of immigrants on sectoral FDI and which type of FDI inflows (Vertical or Horizontal) are facilitated by Pakistani immigrants? And finally, do the effects of immigrants living in Commonwealth and non-Commonwealth countries and OECD and non-OECD countries vary?

3.3 Theoretical Underpinnings

Factor mobility has always been a central issue in theoretical analysis in international economics. The most fundamental question raised in the literature is: Are trade, FDI and migration substitutes or complements?

Trade and factor flows are substitutes according to neo-classical open economy Heckscher-Ohlin model with two factors of production (capital and labour) and based on the principle of comparative advantage due to differences in factor endowments.[50] If trade were allowed, exchange of goods would serve as a means to acquire the services of scarce factor of production embodied in imports. On the other hand, if

[50] Comparative advantage in Ricardian models, where the reason for trade is given by cross-countries differences in technology leads to a complementary relationship between capital and labour flows. The technological superiority of one country becomes the basis for wage differentials across regions and act as an incentive for workers to migrate as well as for capital to flow where it can be employed more efficiently. The survey study by Navaretti et. al (2007) provides 'a cursory review' on migration - FDI literature.

factors are internationally mobile then there is no need or scope for trade. The labour and capital will flow where they can earn the highest returns. Labour will migrate to the capital-intensive country to get higher wages and capital is expected to flow to where it is relative scarce and highly rewarded. Therefore, according to the neo classical models based on the assumptions of frictionless world of perfect competition, a labour abundant country would be a net exporter of labour and a net importer of capital.

However, research studies have found that there is still a significant impact of 'frictions' on international trade, FDI and migration despite rapid globalization. Two puzzles have intrigued researchers about these flows. The first puzzle is that distance appears to matter too much, for both trade and foreign investment. The second puzzle commonly called the 'border puzzle', is that trade between countries is a small fraction of trade within countries (McCallum, 1995). Similarly, foreign investment is a small fraction of domestic investment (Dolman, 2008).

These puzzles of missing trade and foreign investment have led researchers to search for other explanations like informal barriers of trade and investment, which arise due to lack of information and knowledge of languages, customs and cultures in foreign countries. A recent study by Bergstrand and Egger (2011),[51] distinguishes barriers as 'natural' and 'unnatural' frictions of trade, FDI and migration. One common measure of natural costs used in the studies is the distance between countries. The unnatural costs include policy-based measures like taxes and tariff rates and immigration policies.

It has been observed that the distance variable in trade equations has a negative coefficient, indicating that high distances reflect high transport costs and therefore the farther the countries are from each other there will be less trade between them and more FDI flows. [52] On the contrary, studies have also found a

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[51] Bergrstrand, Jerey H. and Peter Egger.(2011). \Gravity Equations and Economic Frictions in the World Economy", in Daniel Bernhofen, Rodney Falvey, David Greenaway and Udo Krieckemeier, eds., Palgrave Handbook of International Trade, Palgrave-Macmillan Press, in press.

[52] Disdier and Head (2008) examine 1467 distance effects estimated in 103 papers and find a persistent negative effects of distances on trade even after controlling for many important differences in samples and methods and using more recent data as well. On average, they find a 10percent increase in distance lowers bilateral trade by about 9percent. The study observes that

negative impact of distance in FDI equations.[53] This is interpreted as that distance does not only capture transport costs but also takes into account information costs. Therefore, a reason that international trade and foreign investment are lower than domestic trade and domestic investment is due to information barriers faced by traders and foreign investors (Portes et al. 2001; Portes and Rey, 2005).

Moreover, international transactions are very risky and involve huge transaction costs.[54] Foreign investment is riskier than trade because it carries huge sunk costs. To compete with a domestic producer, a foreign investor should not only have an information advantage of his firm specific assets but should have information on the working of local formal and informal institutions of the country.[55] In addition, knowledge about other informal barriers like language, customs, attitudes and social values are very important for choice of location of multinationals in host economies. However, a foreign investor has to incur huge transaction costs to get information about foreign markets. The relatively high fixed costs of securing the information necessary to undertake a foreign investment causes small firms to settle for licensing or exporting, (Caves, 1971). On the other hand, Teece (1985) demonstrates that licensing involves huge governance costs that include many types of contracting costs, including opportunism, asset specificity, asymmetries in information and other contingencies. These costs lead a MNE to conduct

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Grossman (1998) performs a simple calculation showing that estimated distance effects are about an order of magnitude too large to be explained by shipping costs and speculates that the reason why distance matters so much is lack of familiarity or cultural differences.In this regard, the study also reports the results of Blum and Goldfarb's (2006) who find the effect of distance of 1.1 for "digital goods" consumed over the internet. Another study by Leamer (2007, pp110) remarks that the distance effect on international commerce is "possibly the only important finding that has fully withstood the scrutiny of time and the onslaught of economic technique."

[53] Egger and Michael Pfaffermayr (2004) give a detailed list of studies on FDI which have found negative coefficients on distance, we quote the authors here:"Carr et al. (2001) estimate an even more important effect of distance (-1.48) on the volume of real affiliate sales of US MNEs and foreign headquartered plants in the US. Ekholm (1998) provides industry-level evidence and likewise finds that distance exerts a stronger negative impact on foreign affiliate production than on exports. Blonigen et al. (2002, pp. 17) report a significant negative OLS-based distance coefficient of -2.17 for their outbound sample using US affiliate sales as the dependent variable. Markusen and Maskus (1999, Table 1) report a random effects model parameter estimate of distance of -1.53 for affiliate sales. Hanson et al. (2001, Table 5) use a fixed industry and time effects panel framework without country pair effects and find that distance exhibits a negative parameter of -0.59 with respect to US affiliate sales in the average industry. However, the mentioned evidence for the impact of distance relies on OLS, pooled OLS, random effects models and fixed effects models, where the latter by and large do not account for country pair effects."

[54] Obstfeld and Rogoff (2001) show even small differences in transactions costs account for large border effects.

[55] As Caves (1971, pp5) describes that foreign investor needs knowledge of local economic, social, legal and cultural conditions to offset his 'alien status'.

FDI rather than licensing, (exports being ruled out for locational cost factors). Nevertheless, these seemingly contradictory arguments indicate that transaction costs and internalization decisions are linked and are important determinants of FDI. [56]

Given the importance of transaction costs in FDI decision, our focus here is to see how new trade-theory models of multinational firms (MNE) incorporate these costs. The new trade theory literature on MNEs incorporates transaction cost in the fixed cost of production. There is a trade-off between the fixed costs of setting up production facilities abroad and the benefits of avoiding trade costs in the case of horizontal FDI (Markusen,1984) and the benefits of cheaper factors of production in case of vertical FDI (Helpman,1984). The Knowledge Capital (KK) model (Markusen and Maskus, 2002) integrates both vertical and horizontal FDI. It involves a trade off between the fixed costs and both avoidance of trade costs and benefits of cheaper factors of production. The fixed cost of building production facilities in foreign countries includes both the cost of constructing a plant and the cost of gathering information on local business environment, rules and regulations, functions of labour markets and availability of suppliers (Javorcik et a; 2006).

However, the new models do not fully incorporate the information asymmetries in their analysis. These models focus on the FDI versus exporting decision and do not explore why FDI is preferable to joint ventures, licensing or franchising as they simply assume that these alternative forms of transaction are costly. Consequently, these models fail to endogenize the internalization process, which is critical in explaining the emergence of the MNE (Ethier 1985; Rugman, 1986). In the words of Rugman (1986):

'Like most international trade models it is possible to derive elegant location-based conditions for the switchover from exporting to FDI, but the switchover from FDI to licensing is more difficult to handle since it involves the treatment of often intangible market imperfections. Examples of these are

[56] Rugman (1986) discusses the arguments put forward by transaction cost theorists and internalization theorists and emphasizes their similarities rather than differences.

information asymmetries (giving buyer uncertainty), contracting and re-contracting costs under conditions of bounded rationality, opportunism, and so on. The challenge now facing trade theorists is how to model such costs as separate from the predominantly location decision (of exporting or FDI) yet also sequentially related to it.' (Rugman,, 1986, pp 113). He further adds 'Indeed, the choice between FDI and licensing has not yet been adequately modelled by trade theorists since many of the intangible transaction costs relevant to this choice cannot be put into the frictionless world of general equilibrium models.' (Rugman,, 1986, pp 114).

From the above discussion, it is obvious that a foreign investor needs information about local conditions and working of formal and informal institutions mainly for two reasons. Firstly, to lower his fixed cost of production to conduct FDI rather than export as emphasized in the new trade –FDI models and secondly, and more importantly, to decide on modes of entry in foreign markets.

Given the above two observations, the issue we are interested in here is to explore the possibility to extend the models of MNEs by incorporating sources of information as explanatory variables, which affect foreign investors' decisions and are theoretically plausible. Therefore, we follow the recent theoretical literature on migration-trade-FDI that shows that ethnic, social and business networks of migrants facilitate foreign investment by reducing fixed costs of investment through reduction in information costs and by provision of other opportunities of investment like joint ventures. Since it is very difficult and costly for traders and investors to search and find the best distributors, suppliers and partners for joint ventures in foreign countries, ties developed through migrant networks increase the probability that producers would find suitable trade and investment partners in the matching process, (Rauch and Casella, 2003). The model developed by Rauch and Casella (2003) has two theoretical underpinnings regarding how diasporas promote international trade and investment. The first is that diasporas build up trust and deter opportunistic behaviour through contract enforcement and community sanctions in a weak legal environment. The second is that they provide information and supply matching and referral services,

especially when there are large differences in factor endowment ratios between countries and prices fail to provide complete information. Moreover, the authors show that the impact of migrant networks on trade in differentiated products is more pronounced than homogenous products. The intuition is that price signals and ties are both sources of information, and in the case of homogenous goods, price signals are effective therefore there is less need of ties. From this, it could be inferred that since the basis of MNEs existence is on differentiated products,[57] the incorporation of the role of migration in the new trade FDI models would further highlight the importance of transactions costs in these models.[58]

Furthermore, new theoretical developments in the networks' literature have led to our understanding of the effects of unskilled and skilled labour migration on FDI. The models developed by Kugler and Rapoport (2005, 2007) and Flisi and Murat (2007) based on a Cobb Douglas production function ($Y_t = A(H_t)K_t^{1-\alpha}L_t^{\alpha}$), emphasize that migration of skilled workers have more positive effects on FDI inflows for two reasons. Firstly, skilled migration increases the returns to education and secondly through strong business networks. The arguments by Kugler and Rapoport (2005, 2007) indicate both substitutability and complementarity between migration and FDI, incorporating both the neo classical and the network theories' views. According to their model, initially, migration will reduce the number of workers (L_t) in the country and all else equal, will result in a fall in domestic return to capital and lead to an outflow of capital. Thus migration and FDI 'substitute one another from a static (or contemporaneous) standpoint' as more migration results in less FDI and vice versa. This effect is higher for the skilled migrants as it not only reduces L_t but also A (Ht), the total factor productivity which is the function of human capital. However, as migrants settle down, both skilled and unskilled migrants may serve as a

[57] Caves Richard E. (1971), notes 'Here is the link to the basis for direct investment: the successful firm (multinational) producing a differentiated product controls knowledge about serving the market that can be transferred to other national markets for this product at little or no cost. This is clearly so for the patented good or the product embodying a particularly apt bundle of traits. The proposition probably holds even for differentiation created through advertising; not only does the advertising to some extent spill across national boundaries, but also successful differentiation. Through advertising is normally accompanied by some accumulation of unique knowledge about marketing the product and adapting it to users' tastes.'

[58] In addition, the new trade theory of multinationals explains the emergence of a multinational firm due to within-industry heterogeneity as a result of product differentiation and monopolistic competition.

source of information to potential foreign investors and 'complement one another from a dynamic perspective', former by forming networks and latter by joining the labour force may reveal the productivity of the labour force in their countries of origin. Thus, migrants help in reducing the uncertainty which investors face in foreign investment decisions and reduce the risk factor for their country of origin.

While Kugler and Rapoport (2005, 2007) base their arguments more on future expectations on network effects, Flisi and Murat (2007) provide an explanation in a slightly different context of selective immigration policies in developed countries and brain drain in the developing countries. These authors argue that immigration of unskilled labour in the developed countries reduce wages and leads to a lower capital labour ratio due to increase in L_t and a reduction in A(Ht) resulting in more labour intensive production in the developed countries. On the other hand, immigration of skilled labour in the developed countries from the developing countries widens the gap in the level of human capital, equilibrium capital to labour ratio and wages between these countries. Hence, other things constant, long run stock of capital increases in the developed countries as L_t and A (Ht) increase due to skilled migration while it decreases in the developing countries because of brain drain from these countries. These arguments explain the selective immigration policies of the developed countries and the concerns in the developing countries. However, positive network effects on FDI inflows, particularly of skilled migration, could mitigate concerns in developing countries.

To sum up, the theoretical literature has established that migrants help in overcoming informal barriers of trade and investment through contract enforcement and providing information to foreign investors about the business climate in their country of origin. Thus by reducing transaction costs they facilitate trade and investment between countries. In the next section we review the empirical work which tests these theoretical findings that migration is an important determinant of trade and FDI.

3.4 Review of Empirical Studies

The empirical work on the FDI-migration relationship is small relative to the work on trade-migration linkage but is growing. A study by Dolman (2008) finds an estimated elasticity of investment with respect to migrants much larger than the elasticity of trade with respect to migrants, indicating the greater amount of information required by prospective investors compared to traders. This section focuses on an analysis of empirical studies on migration-FDI linkage. However, since the migration-trade-FDI literature is interrelated, we will be supplementing our analysis with some references from the migration -trade literature but will not explore them in detail in the present chapter as they have been reviewed in migration-trade studies.[59]

The existing studies basically address one or more of the following issues in investigating the links between migration and FDI. First, and the basic issue that all studies explore, relates to the significance and extent of migrant networks on FDI between countries. Secondly, they study the mechanisms through which migrants affect FDI and finally, the differential effects of unskilled and skilled migrants on FDI.

To investigate the migration-FDI relationship, studies have constructed both bilateral and aggregate models and have used various specifications to arrive at their results. However, we will only concentrate on the bilateral models as they are more relevant for our work. In this context we will first review the gravity model framework used in migration-FDI linkage studies in sub-section 3.4.1. We then elaborate on their scope, specifications and results obtained in sub-section 3.4.2, followed by the methodological approaches adopted in these studies in sub-section 3.4.3.

[59] See Rauch (2003), Parsons (2005) and Gaston and Nelson (2010). Of these studies only Rauch (2003, pp 10) has only briefly mentioned about study by Tong(2005) and states 'Although immigrants and diasporas could be expected to have the same effects on FDI as on trade, at least qualitatively, I know of only one paper that attempts to estimate such effects. This is by Sarah Y. Tong (2003) and also examines the impact of the overseas Chinese.'

3.4.1 Migration – FDI Linkage in a Gravity Framework – A Review

To explore the effects of migration on FDI most of the studies employ a gravity framework. It has long been a tradition to study migration, trade and FDI in the general gravity framework.[60] The gravity model for the determinants of FDI has been used as an analogy to trade (Bergstrand and Egger, 2011). The standard gravity model, shows bilateral FDI to be positively related with the source and host country GDP and inversely related with distance between them as a measure of trade and investment costs.[61] This model has recently been augmented by Tong (2005), Kugler and Rapoport (2007), and Javorcik et al. (2010) by including variables related with migration to investigate the effect of migration on FDI.

However, the traditional gravity model does not take into account the types of FDI which have different determinants and implicitly takes into account the relation between distance and pure trade costs only and ignore its relevance for FDI. The theoretical model of trade and multinationals developed by Egger and Pfaffermayr (2001) shows that the impact of distance depends on its relative importance for plant set-up costs versus trade costs and therefore its effect is ambiguous on FDI. Recent new trade theory models of multinationals (The Vertical, Horizontal and Knowledge Capital Models) based on general equilibrium analysis provide a theoretical justification for using a gravity model of the determinants of FDI.[62] An influential empirical study by Carr et al. (2001), report that the Knowledge Capital Model (KK) performs better than the standard gravity model in explaining the determinants of FDI. The KK model distinguishes the types of FDI which are important for differentiating the effects of trade and other transaction costs on FDI. For example, in the empirical specification of this model three of the explanatory variables, the sum of bilateral countries and the squared difference in the GDP of the source and host country, and the

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[60] See Bergstrand and Egger (2011) for trade and FDI and Gaston and Nelson (2010) for migration.

[61] Theoretical works (e.g.Anderson, 1979; Bergstrand, 1985, 1989; Deardorff, 1995) show that gravity specification is consistent with various trade models. Later studies have employed gravity models to predict the amount of FDI (Brainard, 1997; Ekholm, 1998; Eaton and Tamura, 1994; Frankel and Wei, 1998).

[62] Theoritical works include Helpman (1984), Markusen (1984) and Markusen and Maskus (2002).

difference in the relative endowments in both the countries (measured by differences in per capita GDP or skill endowments)[63] are crucial for identifying horizontal and vertical FDI. Theoretically, it is established that given moderate trade costs, as market sizes increase and become similar horizontal FDI will take place to take advantage of economies of scale and save on trade costs, therefore, it is expected that the coefficient of combined GDP is positive and the sign of squared difference in GDP is negative. By contrast, vertical FDI is undertaken to save on high endowment/labour costs and that the coefficient on difference of per capita GDP to be positive. Thus, the KK model endogenizes both horizontal and vertical FDI. In addition the variable distance is also used as in a standard gravity model but its sign is assumed to be ambiguous because distance accounts for both export costs and investment and monitoring costs (Carr et al., 2001; Markusen and Maskus, 2002; Blonigen, 2004).

The KK model was augmented for the first time by Gao (2003) by adding variables related to migration to explore the effects of the Chinese network on FDI inflows in China. The author finds that the augmented KK model has a better fit than a model that does not consider migration in its specification and also that this model is better than the augmented standard gravity model.[64] Other studies which follow Gao (2003) to use this model is Flisi and Murat (2009) for five European countries and Murat and Pistoresi (2009) for Italy. While Gao (2003) finds evidence of both horizontal and vertical FDI in China indicating that FDI in China is attracted by its large market size and cheap production costs, Murat and Pistoresi (2009) show that the FDI is mostly of horizontal nature indicating that a large proportion of the Italian inward and outward FDI is conducted within a group of developed and similar countries and the vertical FDI is only found in inward FDI.

[63] Higher per capita GNP is highly correlated with human capital; the two variables reflect similar country characteristics (Eaton and Tamura, 1994).

[64] Bandyopadhyay et.al (2005) study related to the US exports at state level, found that inclusion of migration variable has statistically significant effect on the rest of the model. Especially the coefficients on distance and contiguity change suggesting their correlation with migration. The authors suggest that gravity models that do not include migrant networks are providing biased estimates. Similarly Gao shows that by including migrant variable in a gravity models increases the explanatory power of the equation.

Migration can have different effects on the types of FDI. We can expect that there will be more inflows of horizontal FDI if there is more skilled migration due to their business network connections and vertical FDI will be attracted by unskilled labour migrants by providing information about the quality of workforce in their country of origin to foreign investors. Another argument put forward by Dolman (2008) is that vertical FDI will be more affected by migration (as multinationals could shift their production in low cost countries) than horizontal FDI which is done because of the large market size to serve locally.

3.4.2 Scope of Research Studies, Specifications Used and Their Main Findings

To broadly analyze the scope and the main findings in the migration – FDI link literature we first present a list of the related studies in Table 3.1 and details on specifications.

It is to be noted from Table 3.1 that despite that all the studies cover different countries, time periods and use different specifications and methodologies; they have a consensus that migration has a significant positive effect on FDI, though the estimates across the studies largely differ due to the differences noted above. These studies use variables in logarithm form therefore these estimates can be interpreted as elasticities.

The single most important network which has been widely researched is that of the Chinese, which is not surprising due to the large and strong network of Chinese migrants and huge inflows of trade and FDI in China.[65] The rest of the studies investigate the average effects across all immigrants in OECD countries.

[65] A study by Felbermayr et al. (2009) explores the significance of other networks' effect along with Chinese networks on trade. The authors argue that empirical work by Rauch and Trindade (2002) overestimates the effects of Chinese network due to omitted variable bias. Using World Bank data for 200 countries for the year 2000 in a gravity framework the authors found positive and significant effects of other networks on bilateral trade flows. According to the authors, "While confirming the existence of a Chinese network, its trade creating potential is dwarfed by other ethnic networks." They conclude, "Focusing on average effects, we document the existence of a large number of networks. Judging by the obtained size of coefficients and the size of the involved emigrant population, the most relevant are the Moroccan, the Polish, the Turkish, the Pakistan, the Mexican, the British, the Chinese and the Indian networks. However, in all of these cases, the amount of trade creation due to these networks is very small."

These studies estimate pooled ethnic-network elasticity for FDI and thus does not take into account the heterogeneity of network effects; by assuming that migrants from all countries have the same characteristics, although they differ in many ways like in their duration of stay, their occupation and skills

Table 3.1: Studies on Migration –FDI Linkage

Authors	Sample and period	Focus of the study	Inward FDI (Estimated Coefficient)	Estimation Techniques
Gao (2003)	Inward cumulative FDI in China from 68 source countries, 1984-1997	Both the share of ethnic Chinese in the population of source countries and their absolute numbers	3.7 or higher	OLS Cross sectional
Tong (2005)	FDI stock from country i to country j, 70 countries, 1990	Product of the numbers of ethnic Chinese in country i and j	0.38	OLS and Tobit Cross sectional
Kugler and Rapoport (2007)	Outward US FDI, & 55 migrants' origin countries, 1990-2000	Both stocks and flows of migrants at different educational level	0.2 (un-skill.) 0.4 (skill.) (stocks)	OLS Difference in Difference and dynamic model
Javorcik et al. (2010)	Outward US FDI, & 56 migrants' origin countries, 1990-2000	Stock of migrants by educational attainment	0.5 (total.) 0.6 (tertiary)	OLS, Instrumental Variable Technique
Flisi and Murat (2009)	Outward and Inward FDI stock for each of the 5 OECD countries in their respective partner countries (Sample period varies)	Skilled and unskilled migrants, and the specific effects of skilled migrants from developed and developing countries	Skilled migrants from OECD: 1.703 (UK) 1.282(Spain) Skilled migrants from non-OECD: 1.648 (UK) 0.452(Germany)	Pooled OLS
Murat and Pistoresi (2009)	Outward and Inward stock of FDI of Italy and 51 partner countries 1990 to 2005	Emigrants of and immigrants in Italy.	0.25 (Italian emigrants on inward FDI) 0.13 (immigrants in Italy on outward FDI)	Pooled OLS

Notes: Adapted, modified and updated from Elisabetta, L. (2009).' Diaspora Externalities as a Cornerstone of the New Brain Drain Literature' page 31, available online: *http://wwwfr.uni.lu/recherche/fdef*

and the difference between their home and host countries characteristics (including the types of firm in them) which effect this relationship.[66] By removing the restriction that the network effect is the same for all ethnicities, a study by Bandyopadhyay et al. (2008) on the effects of ethnic networks on U.S. state level exports finds that ethnic-network effects are much larger than has been estimated previously and are important only for a subset of countries.[67]

Looking in some detail at the measures and specifications used in the above studies will give us further insights into the extent and robustness of the effects of migration on FDI. The researchers have used different measures of FDI, the dependent variable, and of their main variable of interest migration as an explanatory variable. In this respect, Gao (2003) considers both the population share of ethnic Chinese and the absolute population of ethnic Chinese in the source country in alternative specifications on cumulative FDI inflows[68] in China in 1984-1997. The latter indicates the strength of Chinese immigrants and former is used because of the fact that there is a certain threshold level of immigrants when Chinese businesses network associations form. For both of their measures they find positive and significant effects. Moreover, to check for robustness of the results, the author also drops the regions where the majority of immigrants reside (like Hong Kong and Taiwan) and finds Chinese migrants contribute more where they are less in numbers. Another study on Chinese networks by Tong (2005) studies the role of ethnic Chinese in promoting bilateral investments in 70 countries by using the product of the numbers of ethnic Chinese in pairs of countries in 1990. She further disaggregated the network variable by dividing country pairs into three groups. In the first group, both the source and the host country are in Southeast Asia. In

[66] A broad exception are Kugler and Rapoport (2007) who have used regional dummies but for only Europe and Latin America as controls and add interaction terms between regional dummies and migration variables to make allowance for regional determinants of migration and FDI patterns but have not reported the coefficients on these terms in their study. Flisi, S. and Murat, M. (2009) has also distinguished the effects of immigrants in OECD and non-OECD countries, which we have discussed later in this section.

[67] In one of the specifications they removed the restriction on the coefficient on the migrant to be the same for all countries. They have also estimated separate gravity models for each country in their sample.

[68] According to the author since there was very little FDI in China before 1984, therefore cumulative inflows are equivalent to FDI stock. He also uses FDI inflows in one of his specification with similar results. Since the production and sales data of foreign firms in China are not available therefore data on both inflows and stock of FDI is being used.

the second group, either the source or the host country is in Southeast Asia. In the third group, neither is in Southeast Asia. Separate estimates on Chinese immigrants are obtained for the three groups and the results on each of coefficients are positive and indicate significant impacts of Chinese networks in all three groups. The highest coefficient (0.26) is for immigrants in country pairs outside Southeast Asia, and the lowest is where only one of the pairs is in Southeast Asia (0.16). Thus both these studies suggest that there is a decreasing marginal effect of ethnic Chinese networking on FDI. [69]

More recently, the availability of more disaggregated data on the characteristics of migrants in OECD countries have enabled researchers to explore the effects of unskilled and skilled migrants on FDI. In addition, they have also disaggregated FDI into sectors. In this context, Kugler and Rapoport (2007) regress growth in US FDI inflows in 55 countries in the 1990-2000 at the aggregate and sectoral levels on the stock of immigrants from these countries present in the US in year 1990 and the change in this stock between 1990 and 2000. This specification allows the authors to test for both 'contemporaneous substitutability' as dictated by standard static trade models and 'dynamic complementarity' as propagated by the network theory between migration and FDI.[70] The study uses three dependent variables in growth form: total FDI, FDI in manufacturing and FDI in services and distinguishes between migrants with primary, secondary and tertiary education. At the aggregate level, the results indicate that a 1 percent increase in the number of skilled and unskilled migrants in the U.S. in 1990 raises the annual growth rate of US FDI to their country of origin by 0.4 percent and 0.2 percent points in the following decade of 1990 -2000. According to the authors, these estimates suggest that the presence of unskilled immigrant workers facilitate foreign investors in getting to know about the labour force quality in their country of origin and skilled immigration facilitates FDI through their business networks. In the manufacturing sector, US FDI is negatively correlated with current immigration by workers with secondary education, while it is positively associated with past immigration in the U.S. of individuals with tertiary immigrants. Similar

[69] Rauch (2002) has found similar effects of Chinese networks for trade.

[70] We have discussed the analytical framework of this study in our earlier section on theoretical underpinnings)

results have been found in the services sector, except that there is no significant effect of unskilled immigrants in this sector. The role of skilled immigrants on total assets of US affiliates abroad and sales of US affiliates abroad at both country level and by country and industry level for 1990 and 2000 is also confirmed by Javorcik et al. (2010). Unlike Kugler and Rapoport (2007), this study also distinguishes immigrant by their industry of employment and has constructed migrant stock for each industry, year and country of origin using Census information.

Furthermore, to investigate the distinct effects of skilled immigrants from both developing and developed countries Flisi and Murat (2009) estimate separate models on five European countries' inward and outward FDI to study the effects of both immigrants in and emigrants from these countries.[71] The sample period differs according to the availability of data for each of the country. Their results indicate that each country has its own experience of migration and therefore the effects vary. Their findings suggest that, while the FDI of the UK, France and Germany are affected by the immigrant links, those of Spain and especially Italy depends on the ties with their respective diasporas. According to the authors these diverse effects of migration may depend on the production structure in these countries, and the characteristics of their immigrant population - skill levels , the average size of firms and multinationals, (large in the UK and small in Italy). Furthermore, by splitting immigrant populations into skilled and unskilled immigrants, the study finds that generally the former have positive effects and the latter have non-significant and in some cases even negative effects (for the UK). A further disaggregation of skilled immigrants into OECD and non-OECD networks shows that both have positive effects, with a relative importance that depends on the country under analysis as indicated in Table 3.1. These results imply that skilled networks from developing economies do positively affect bilateral FDI with their countries of origin compensating for the brain drain.

[71] Analysis on skill is only related to the immigrants in these countries due to data unavailability on skill of emigrants as reported by the authors.

Moreover, to isolate the effects of migrants these studies control for many cultural, institutional and regional factors that could affect FDI by taking dummy variables for common languages, colonial ties, geographical proximity and other regional and trading blocs. The signs on these variables are expected to be positive as closeness in culture and institutions facilitate trade and investment. However, studies find mixed results on them. For example the dummy for language is positive but insignificant in studies by Gao (2003) and Javorcik et al. (2010), however, Tong (2005) finds mixed results; a positive significant coefficient in her overall regressions but not significant for regressions on FDI inflows when she does separate analysis on FDI inflows from the developing countries and developed countries, the effect of language is positive and significant for the latter only. Similarly she finds common language facilitating in countries with high bureaucratic institutions.[72] The study by Flisi and Murat (2009) finds that colonial ties positively affect Spanish FDI, while Britain invests less in Commonwealth countries. Tong (2005) finds a positive, but insignificant dummy for adjacent countries and only finds positive and significant effects of European Community (EEC) but not for European Free Trade Association (EFTA).

In addition to looking at the effects of migrants on FDI, few studies attempt to identify the mechanism through which these migrants affect FDI. The new theoretical literature on migration and FDI links reviewed earlier indicates that migrant networks help in reducing informal barriers of trade and FDI by mainly two mechanisms. Firstly, these networks check opportunism through creating trust and community enforcement of contract[73] and secondly, they provide information to foreign investors about the local customs, working of institutions and the environment for doing business. Both the mechanisms of information sharing and reinforcing of contracts could be at work simultaneously, and it is useful to distinguish the two empirically as they have different policy implications (Rauch and Trinidad, 2002).[74]

[72] Similar mixed effects of common language has been reported by Parsons (2005) in trade equations with Rauch and Trindade (2002) obtaining positive significant effects but Wagner et al. (2002) find contrary evidence.

[73] Anderson and Marcouiller (2002, p. 342) cite a World Bank survey that lists corruption as a significant obstacle to business worldwide.

According to Rauch (2003), the "information" channel seems to be very important, since its impact is less likely to decrease over time; therefore migrants are more likely to promote the types of international trade and FDI that stimulate economic growth.

To distinguish these two mechanisms and to explore whether migrants are effective in sharing information researchers have used various specifications.[75] For example, Javorcik et al. (2010) and others, control for governance data between countries, Tong (2005) divides the FDI data into two groups and estimates the gravity model separately. The first group includes FDI inflows in countries with weak institutions and the second includes FDI in countries with strong institutions. The results of the study validate the hypothesis that if networks are more significant in FDI to countries with strong institutions then it is reasonable to conclude that the information sharing function of networks is relatively important. Similarly, Murat and Pistoresi (2009) explore whether migrants facilitate in dissemination of information in countries far apart from each other by interacting the migrant variable with bilateral distances and find some mixed evidence. The authors find a positive coefficient on the interactive term on immigrants (but not on emigrants), and conclude from their results that immigrants from distant countries have a larger role in inward FDI (not in outward FDI) in Italy.

3.4.3 Methodological Issues

Empirical methods that the above studies use in exploring migration-FDI relationship depend on the data availability and the related econometric issues. These studies use either cross section or panel data (dictated by availability) and address issues related to zero observations of the dependent variable,

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[74] It is a kind of similar approach when researchers try to distinguish between preference, contract and information effects on trade in studies on migration-trade linkage.

[75] In migration-trade literature similar approach has been taken to find distinguish the information and contract enforcing channels for example for the former Dunlevy (2006) and Girma and Yu (2002) finds that migrants have a larger role where trading partners do not share common language and institutions and for the latter, Dunlevy also reports that migrants are more effective when their home country has more corruption. Rauch and Trinidad (2002), finds that migrants have a larger effect on trade in 'differentiated goods' for which information is more valuable as quality of these goods vary significantly while their positive effect on homogenous goods indicate the contract enforcement mechanism.

heteroskedasticity and the endogeniety in the variables. In addition, one of the main empirical challenges facing these studies is to control for unobserved heterogeneity in the data.

Mainly researchers estimate their models by the Ordinary Least Squares (OLS). However, since FDI data frequently encounter zero observations (this could be due to either no investment between countries, or due to missing data, small values not recorded or measurement errors) many studies use Tobit regressions as well. [76]

The choice of techniques of estimation depends on how the dependent variable is constructed. In this regard, Gao (2003) uses cumulative FDI as the dependent variable (thereby removing zero observations) and adopts the Ordinary Least Square (OLS) technique for the cross section data. However, to deal with zero observations, Tong (2005) adopts both scaled OLS and Tobit models for the bilateral data on FDI stocks. In OLS regression she measures FDI as ln (FDI + 1). In the Tobit model the dependent variable, *FDI*, is bounded below by zero and thus non-negative. The study follows Eaton and Tamura (1994) and estimates a modified gravity model. It assumes that the actual FDI will be strictly positive only when the right-hand side of the equation achieves a minimum threshold value *A*, where A is estimated.

To tackle the potential endogeniety between migration and FDI, a couple of studies have used Instrumental Variables in their estimations. Endogeniety between FDI and migration arises as they can influence each other. A rise in FDI inflows in a country would increase incomes and reduce migration or it may increase migration initially if potential migrants were not able to migrate due to the high cost of migration (López and Schiff, 1998). In this regard, Javorcik et al. (2010) uses instrumental variables in a log-linear model by the OLS. The instruments include the stock of migrants in the European Union (EU), the costs of acquiring a national passport in the migrants' country of origin and the population density in the migrants 'country of origin. The three instrument variables are correlated with migration but less

[76] Head and Ries (1998) observes that when dependent variable is transformed from ln m to ln(1+m), it makes the results sensitive to the units in which m are measured. The Eaton and Tamura method avoids this problem.

likely to be correlated with the error term in the regression with FDI as the dependent variable. Likewise, Murat and Pistoresi (2009) have run both OLS and IV regressions, testing for endogeniety through the Hausman test and the test for no correlation between the error terms in first and second stage regressions. The IV variable used is the stock of immigrants living in the EU-15 in 1990 (prior to the period of their study).[77] In the cases where there is no evidence of an endogeniety, OLS estimates are presented because these are more efficient by definition.

A different methodology than others has been adopted by Kugler and Rapoport (2007) to deal with zero observations and endogeniety. The authors use an OLS first difference regression of US FDI in 55 countries in the 1990s on the stock of immigrants from these countries present in the US in year 1990 and the change in stock between 1990 and 2000. This kind of specification is being used to mitigate the problems of endogeniety and simultaneity and the first difference accounts for unobserved heterogeneity by eliminating the fixed effect.[78] The dependent variable, growth in FDI stock is not restricted to be negative, but the authors report that out of more than 100 countries for which immigration data was available they were able to calculate the change in FDI between 1990 -2000 for only 55 countries because of missing data for FDI. Thus there is a sample selection bias as they exclude countries for which historical sectoral FDI stocks are missing. If the lack of FDI inflows is due to weak fundamentals which may also increase migration then there would be bias towards substitutability.

An important issue which studies address is to control for the unobserved heterogeneity, both time variant and time invariant in the data. Most of the studies both in migration-trade and migration-FDI literature take into account the time variation by using time dummies and avoid using country fixed

[77] In the first stage they estimated the following regression:

$$network_{it} = \alpha_0 + \alpha_1 \times immig90\_EU15_i + \delta \times controls + \varepsilon_t$$

Where, network is the (in logarithm) network variable instrumented, immig90_EU15 is the corresponding instrumental variable relating to the previous migration to the EU-15, and controls is the set of exogenous variables of the main regression.

[78] See page245, 'Mostly Harmless Econometrics' by Joshua D. Angrist and Jorn-Steffen Pischke)

effects as it takes away much of the cross country variation in the data which is the focus of the study.[79] To deal with unobserved heterogeneity, Kugler and Rapoport (2007) use a lagged dependent variable regional dummies for Europe and Latin America and interaction terms between regional dummies and migration variables as an explanatory variables, to make allowance for region specific factors like factor endowments which effect the patterns of migration and FDI across regions.[80] Similarly, Gao (2003) and Tong (2005) use regional dummies for countries in south-east Asia to control for the preferential treatment to countries in this region to isolate the effect of migrants. Javorcik et al. (2006) uses country and industry fixed effects in her sectoral regressions and not at the aggregate level.

The methodology adopted greatly influences the estimates of a model. For example, cross section studies may over estimate by not controlling for unobserved factors affecting migration and FDI. Therefore, Egger (2002) argues against relying on a cross-section framework and recommends a panel framework as the estimated coefficients are a composite of within and between effects, and using fixed effects may mitigate the problem of unobserved heterogeneity and provide consistent estimates. However, fixed effects has its own limitations as it discards the significant information contained in cross section units and many important gravity variables like distances and other time invariant variables and thus bias the estimates downwards. As observed by Griliches (1986) fixed effect estimation increases the 'noise to information' ratio in the data and exacerbates measurement error, biasing estimates downward. Given the pros and cons of all the alternate empirical approaches, all these methodological issues and a few more relevant to our data structure and the research questions will be evaluated further to adopt what is suitable for our study in a subsequent section.

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[79] For migration-trade links see Head and Ries (1998), Girma and Yu(2002).

[80] Similar to Head and Ries (1998) and Gould (1994)

3.5 The Proposed Empirical Models of Migration-FDI Linkage and Data Description

3.5.1 The Proposed Empirical Models

Guided by our review of literature on modelling which finds that the new trade models of MNEs performed better in explaining FDI than the standard gravity model and that the augmented specification of the KK model also performed better than the augmented standard gravity model in migration-FDI studies, we follow Gao (2003), Flisi and Murat (2009) and Murat and Pistoresi (2009), and augment this model with our main variable of interest – the stock of Pakistani immigrants in the source countries of FDI to estimate the effect of migration on FDI inflows in Pakistan. It is expected that these immigrants would facilitate FDI inflows through their own networks by investing themselves and by reducing informal barriers of investment through providing information about culture and institutions of their country of birth to other foreign investors in their country of residence according to the prediction of the network theory. The model has been employed at both aggregate and sectoral levels. We specify our augmented gravity models as follows:

For aggregate level:

$$FDI_{ijt} = \beta_0 + \beta_1(GDPSUM_{ijt}) + \beta_2(\text{GDP DIFFERENCE SQUARED}_{ijt}) + \beta_3(\text{GDP PER CAPITA DIFFERENCE}_{ijt})$$

$$+ \beta_4(DISTANCE_{ij}) + \beta_5(\text{TRADE COST}_{it}) + \beta_6(\text{TRADE COST}_{jt}) + \beta_7(\text{CONTIGUITY})$$

$$+ \beta_8(\text{COMMON WEALTH}) + \beta_9(IMMIGRANT_{ij}) + \alpha_t + \varepsilon_{ijt} \qquad (3.1)$$

For sectoral level:

$$FDI^{k}_{ijt} = \beta_0 + \beta_1(GDPSUM_{ijt}) + \beta_2(\text{GDP DIFFERENCE SQUARED}_{Fijt}) + \beta_3(\text{GDP PER CAPITA DIFFERENCE}_{ijt})$$
$$+ \beta_4(DISTANCE_{ij}) + \beta_5(\text{TRADE COST}_{it}) + \beta_6(\text{TRADE COST}_{jt}) + \beta_7(\text{CONTIGUITY})$$
$$+ \beta_8(\text{COMMON WEALTH}) + \beta_9(IMMIGRANT_{it}) + \alpha_t + \delta_k + \varepsilon^{k}_{ijt} \qquad (3.2)$$

i= source country j= Pakistan t= time k=sectors/industries

As almost all the explanatory variables are the same in the aggregate and sectoral equations, we explain these variables in these equations in a single setting below.

The dependent variable, FDI_{ijt} in equation (3.1) stands for the net FDI inflows in Pakistan at the aggregate level from 32 source countries for the period 2002-2007. FDI^{k}_{ijt} in equation (3.2) are the net FDI inflows in sectors from 16 countries for the same period in 5 services sectors and 23 manufacturing industries.

The two variables ($GDPSUM_{ijt}$) and (GDP DIFFERENCE SQUARED$_{ijt}$) are used to distinguish horizontal FDI. The former is the bilateral sum of GDP of Pakistan and the source country i and the latter is the squared difference of their GDPs. Since horizontal FDI is attracted to large similar markets to take advantage of the economies of scale, we expect the coefficients β_1 to be positive and β_2 to be negative. The variable on the difference in per capita GDP of the source country and Pakistan (GDP PER CAPITA DIFFERENCE$_{ijt}$) serves as a proxy for the endowment/skill differences between Pakistan and country i and distinguishes the vertical FDI. According to the prediction of the model, the coefficient β_3 is positive, indicating that vertical FDI increases with endowment difference between countries to save on production costs.

The variable on bilateral distances between Pakistan and country i ($DISTANCE_{ij}$) indicates transaction costs, which include trade costs, plant set-up costs, coordination and monitoring costs and information costs. The sign of this variable is ambiguous in theory as bilateral distances measure both trade and investment costs. Large distances increase trade costs and encourage horizontal FDI to save on trade costs. However, monitoring costs increase in distant countries. In addition, large distances discourage vertical FDI which is related to intra firm trade (shipment of components back home). Therefore, we cannot predict a priori the sign on the coefficient β_4 .

We also include two bilateral trade costs variables. In the light of the new trade theory of multinationals we hypothesize that high trade costs in the source countries (TRADE COST_{it}) discourage vertical FDI as shipments of components back home become costlier but high trade costs in the host country Pakistan (TRADE COST_{jt}) encourage horizontal FDI inflows to save on trade costs. Therefore, β_5 and β_6 will be negative and positive. Most of the studies have ignored trade costs in their estimations. Gao (2003) takes distances as a proxy for trade costs but distances also reflects investment costs so it is important to control for trade costs. Studies by Tong (2005), Dolman (2008) and Flisi and Murat (2009) have only included tariffs in the host country in their regression models of bilateral FDI with mixed results and mostly with insignificant estimates. The other trade related measure which few of these studies consider as a regressor is called 'openness', which is the ratio of trade and GDP in the host country. However, according to the new trade theory models of the multinationals, the trade costs in both the source countries and the host countries are important determinants of FDI.

Two dummy variables are also included in the regression. One is a dummy for adjacent countries (CONTIGUITY) that takes the value of 1 if the source country has a common land border with Pakistan (China and Iran) in our sample in the aggregate equation (3.1) and only China in equation (3.2). The other dummy variable (COMMON WEALTH) is for British Commonwealth countries. It is hypothesized, as in other studies on colonial links, that the socio-cultural and institutional similarities and other preferential

status as a member of the Commonwealth facilitate trade and investment among these countries. We hypothesize that both the coefficients β_7 and β_8 are positive.

Finally, we include our main variable of interest, the stock of Pakistani immigrants ($IMMIGRANT_{it}$) in the source countries in the year 2000. According to the prediction of the network theory we expect the sign of β_9 to be positive. By considering migrant stock for the prior year than the data on FDI inflows also mitigate the problem of endogeniety. Also, the immigrant stock itself is the sum of both earlier and contemporaneous immigration flows and therefore is essentially a predetermined variable as Dunlevy (2008) notes.

We include time effects (α_t), in both equations to capture various macroeconomic and policy factors and other omitted variables that vary through time in Pakistan and other source countries which could affect FDI and migration. In the sectoral analysis we also control for sector effects (δ_k) to capture heterogeneity across commodities caused by systematic differences in shipping costs and tariffs which are not country or time dependent.

The terms ε_{ijt} and $\varepsilon^k{}_{ijt}$ are white noise error terms associated with the dependent variables in aggregate and sectoral equations.

All the variables are in logarithm form (except the dummy variables) to control for heterogeneity and to obtain elasticity estimates to compare with results obtained in other studies.

In addition to the above specifications of the augmented models, we also attempt to employ three alternative specifications to test related hypotheses which have been tested in previous empirical literature to explore whether our data also validates them. We discuss these alternate hypotheses and specifications below.

First, our augmented models in equation (3.1) and (3.2) provide us with estimates on immigrants which indicate the effect on FDI but do not reflect the mechanism of how they affect FDI. We hypothesize that immigrants reduce transaction costs. If migrants reduce information costs, these costs vary with distance. The above models assume that given the distances immigrants have similar effect on FDI, implying that immigrants in nearby and distant countries have the same effect.

But distances differ across countries and so do information costs, therefore, when we control for distance the coefficient on migrants suggests that the effect of immigrants are the same across countries. This implies that whatever the transaction costs reflected by the distance, migrants have the same effect, this seems rather restrictive. To reaffirm the role of immigrants in reducing these costs, we follow Murat and Pistoresi (2009) and hypothesize that the effect of immigrants is greater when their host country[81] is far from Pakistan.[82] Therefore, the model is modified and besides the intercept shift effect reflected by the migrant variable, we also look at the effect of slope change by interacting migrant and distance variables ($IMMIGRANT_{ij} * DISTANCE_{ij}$).

Secondly, in an alternate specification we explore the effect of immigrants living in Commonwealth versus non-Commonwealth countries by adding the interactive dummy of Commonwealth and migrant countries (COMMONWEALTH * IMMIGRANTS) in one of the equations. Similar effects have been studied by Girma and Yu (2002) for migration and trade for the UK and following them we expect that immigrants living in non-Commonwealth countries provide additional information than their counterparts in Commonwealth countries about their country of origin to foreign investors.

[81] It is important to note that here host country is related to migrants and refer to foreign countries while in equations of FDI the reference of host country is with reference to FDI inflows like 'trade cost host' country means trade cost in Pakistan.

[82] They Dhar and Panagariya (1999) argue that pooling data for different countries then fitting the same equation for all countries in the sample imposes identical coefficients across countries and this induces mis-specification, the authors proposed solution is to estimate the equation separately for individual countries using time series data see Greenaway and C. Milner (2002). Murat and Pistoresi (2009) estimate a single estimate for immigrants of different ethnicities and interacted this variable with distance variable. The authors found larger effects of Chinese immigrants from those of French immigrants on outward and inward FDI for Italy through reduction in transaction costs, as China is far from Italy than France. However, as Bandyopadhyay et al.(2008) has shown that the effect of migrants differ across ethnicities, therefore, they have estimated country specific gravity models for different countries to see the specific effects of different migrants. We are considering only the effects of Pakistani immigrants on transaction costs from different source countries and in this way our estimate is more specific and indicates the effect of Pakistani migrants in reducing transaction costs.

Finally, we follow Tong (2005) to distinguish the effects of immigrants living in OECD and non OECD countries as they are structurally different countries with different technological and human endowments. Based on the predictions of network theory, we expect that immigrants in OECD countries provide more information for two reasons. First is that prices often fail to provide information when there are large differences in the ratio of factor endowments between countries and second is that relatively skilled migrants in OECD countries are more effective through their business networks. Therefore, we interact OECD countries dummies with immigration to investigate the effects of migration specific to this group of countries.

3.5.2 Data Description

The panel data used is on net FDI inflows at both aggregate and disaggregate levels from the State Bank of Pakistan. At the aggregate level, data on FDI inflows in Pakistan is from the website of the State Bank of Pakistan[83] and is for 32 countries for the period of 2002-2007. The data on FDI in sectors (is unpublished but obtained through personal visits to the Bank),[84] relates to these inflows from 16 source countries in 5 service sectors and 23 industries in the manufacturing sector for the same period.[85] The list of countries and sectors are provided in Table A3.1. The FDI inflows are in million of US dollars, which were converted into real values by deflating with GDP deflator at constant prices of 2000 from the World Development Indicator (WDI). FDI consists of cash brought in, capital equipment brought in and

[83] The State Bank of Pakistan has recently broadened its aggregate FDI data to 35 countries. The data for the period 2002-07 which is available in the form of 'New Format' was extracted from the official website on 17.10.2008: http://www.sbp.org.pk/ecodata/NIFP_Arch/index.asp. We have used this enlarged data set in this chapter. However, the stocks of immigrants in India and Bangladesh cause lot of noise in migration data therefore are dropped from the analysis. Also, Caymen island was dropped due to unavailability of macro data for the country. As a result, we are left with FDI data on 32 countries.

[84] The data on sectors is the same which is used in sectoral analysis in the first chapter.

[85] FDI inflows are on the net basis. The dependent variable is ln (FDI+1), one is added to take into account zero observations. There are 19, 101, and 1497 zero or negative observations. in the aggregate, service and manufacturing sectors. The negative values are replaced by zero for computational ease.

reinvested earnings. This data is unique, as it has never been used before. In addition, the definition and the measurement of FDI are consistent across the countries.

According to the basic statistics in Table A3.2, at the aggregate level, Pakistan received on average 48 million dollars of FDI during the period 2002-2007, with a wide variation indicated by the standard deviation of 136. While the average for the services sectors is 13 million dollars, the average for manufacturing sectors is quite lower at 0.8 million dollars.

The stock of migrant data used is for the years 1990 and 2000 from the World Bank (Parsons) data. [86] The migrant data has the advantage from the previous data sets in (for example data in Docquier and Marfouk, 2006) as it covers the migration in both the OECD and the non-OECD countries.[87] The data on non-OECD countries are important as these countries host a large proportion of Pakistani immigrants especially in the Middle East.

The statistics in Table 3.2 show the shares of FDI inflows in Pakistan during 2002-07 and Pakistani immigrants for 1990 and 2000 in our sample of 32 OECD and non-OECD countries out of total FDI inflows received and total Pakistani immigrants in these regions. We also indicate the shares in Commonwealth and Middle East countries. The Commonwealth countries are in both OECD and non-OECD classifications and therefore are structurally different though may have common political and legal institutions. The Middle East countries are classified in non-OECD region but are different from other non- OECD countries as they are the high income countries.

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[86] We thank Chris Parsons for providing us this data. The data is on 225 host countries for the years 1960, 1970, 1980, 1990, and 2000 from the World Bank (Parsons') data. This data does not control for the age and skills of the migrants.

[87] Another data set which looks at the migration trends in 212 OECD and non-OECD countries is by Ratha, Dilip K. and William Shaw (2005), University of Sussex and World Bank: (www.worldbank.org/prospects/migrationandremittances). But we found lot of gaps (both in terms of missing data and wrong recording) in the data for Pakistan. For example the numbers of Pakistan immigrants in the UAE are recorded as zero while there are blanks for several of other countries.

The shares of FDI inflows and immigrants in our sample are more than 90 percent in their respective totals. It is evident that Pakistan received a larger share (60 percent) of the inflows from OECD countries during 2002-07. However, the shares of immigrants are greater in non-OECD countries (which largely consist of immigrants in the Middle East as indicated in the numbers in the parenthesis) but declining overtime; 72 and 62 percent in 1990 and 2000 respectively. On the other hand, the proportion of immigrants has increased by 10 percentage points in the OECD countries during the same period. Contrary to the expectation, the Commonwealth countries contribute only 18 percent of FDI inflows and host less than 20 percent of Pakistani immigrants.

Table 3.2: Regional Shares of Aggregate FDI Inflows in Pakistan (2002-2007) and Pakistani Immigrants (1990 and 2000)*

Regions	FDI (2002-2007) Shares(%)	Migrants 1990 Shares(%)	Migrants 2000 Shares(%)
Non-OECD (16 countries)	40 (76)*	72 (100)*	62 (98)*
OECD (16 countries)	60	28	38
Commonwealth (8 countries)	18	18	19
Middle East (9 countries)	30	72	61
Share of 32 source countries of FDI in the Total	91	93	93
Total**	100	100	100

Notes: *The numbers in the parenthesis indicate the share of Middle East countries in the Non-OECD region.
**Excluding India and Bangladesh, total host countries of migrants are 223 countries.
Source: The State Bank of Pakistan for FDI and Parson's data on migration, World Bank.

Some basic descriptive statistics on FDI inflows and Pakistani immigrants in Table 3.3 reflect the characteristics of these two variables of interest in our aggregate sample.

The average annual stock of immigrants in the sample is around 25,690 for the OECD countries and 66,780 for the non-OECD countries in 1990. Though the average stock of migrants in OECD countries is

lower than in non-OECD, the increase in stock is higher in the former between 1990 and 2000. The stock of migrants has more than doubled in OECD countries between 1990 and 2000.

Table 3.3: Descriptive Statistics

		OECD		Non-OECD	
Variables		Mean	Std. Dev.	Mean	Std. Dev.
FDI	overall	57.83	130.96	38.32	140.69
	between		100.05		91.35
	within		87.57		109.03
Immigrant stock 1990	overall	25690	59397	66780	157379
	between		61024		161692
	within		0.00		0.00
Immigrant stock 2000	overall	55201	96174	89865	196918
	between		98810		202314
	within		0.00		0.00

Note: Total number of countries is 32. There are 16 countries in each group of countries.
Source: The State Bank of Pakistan for FDI and Parson's data on migration, World Bank.

The average net FDI inflows in Pakistan from OECD and non-OECD countries are around $58 million and $38 million during the period 2002-2007. These inflows range in the OECD countries between $682.16 million for the US and $ -7.41 million for France. Among the non-OECD countries, the range of inflows is between $ 1133.04 million for UAE and -$ 50.21 for Bahrain.

It is evident from Table 3.3 that between-country variation in FDI inflows and immigrant stocks is greater than within-country, except for the FDI inflows from non-OECD countries. The within standard deviation of the immigrant variable for 1990 and 2000 is zero, indicating this variable is time invariant in our sample.

However, the data on regions show broad trends. To gauge the heterogeneity of country-wise FDI and migration in these regions we present the stock of Pakistani immigrants in the top ten source countries of FDI in Pakistan in Table 3.4.

Table 3.4: Immigration Stocks (1990, 2000) in the Top Ten Source Countries of FDI Inflows (2002-2007) in Pakistan

Countries	FDI (Average 2002-2007)	Immigrant stock 1990	Immigrant stock 2000	Average annual change in immigrant stock 1990-2000 (percent)
UAE*	367.35	331493	569556	7
USA	357.66	87805	228473	16
UK	216.45	240327	349042	5
Netherlands	119.06	7424	11008	5
Switzerland	96.57	590	2301	29
China*	91.6	294	2557	77
Norway	63.04	10476	13289	3
Saudi Arabia*	60.95	590318	638605	1
Mauritius*	30.6	71	367	42
Japan	27.78	3862	4700	2
Sub Total	1431.06	1272660	1819898	4
Shares in the total of 32 countries (percent)	93	86	78	-1

Source: The State Bank of Pakistan for FDI and Parson's data on migration, World Bank.

Out of these ten countries, four are non-OECD countries (UAE, China, Saudi Arabia and Mauritius) and two are from the Commonwealth (UK and Mauritius). On average over the period 2002-07, 93 percent of the total FDI from thirty two countries in Pakistan came from these ten countries which also hosted significant proportions of Pakistani immigrants (86 percent and 78 percent of the total Pakistani immigrants in 1990 and 2000). Although the overall proportion of immigrants has fallen in these countries in 2000, the annual percentage increase of stocks in the individual countries has risen over the period as shown in the last column. Moreover, the top three source countries of FDI, the UAE, USA and UK also have large number of immigrants. However, there are exceptions, like the Saudi Arabia and Mauritius. The former has the highest number of immigrants but only provide $61 million of FDI while the latter has the lowest number of immigrants but provide $31 million that is equal to half of FDI inflows from Saudi Arabia.

The data on other gravity variables in our model, GDP and per capita GDP in 2000 constant dollars are from World Development Indicators (World Bank) and the distances between capital cities are from CEPII. The information on Commonwealth countries is from http://www.commonwealth-of-nations.org/Commonwealth-Home and of Middle East : http://data.worldbank.org/region/ARB and OECD countries: "Ratification of the Convention on the OECD". The trade costs variables are computed from the bilateral exports and imports data available in Direction of Trade Statistics (IMF). [88]The basic statistics on all these variables are shown in Appendix Table A3.2.

3.6 Estimation Techniques

Given the structure of our data sets we employ both OLS and Tobit techniques for our regressions. The

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[88] trade cost in the source country (i) = Mi(cif)/Xj(fob)

trade cost in the host country (j) (Pakistan) = Mj(cif)/Xi(fob)

Where X and M are for exports and imports.

former is used because of its easy interpretation of the coefficients and the latter because of large number of zeros in FDI data. It is also been found that OLS based on ln (FDI+1) provides estimators which suffer from downward bias and therefore produces less precise results even in large samples.[89] As reported by Westerlund and Wilhelmsson (2006) and Rauch (2002) the t statistics in the OLS models may give deceptive inference and there is more likelihood of getting insignificant estimators than with the Tobit procedure. However, researchers have used both types of models according to the structure of their data and for robustness check.[90]

Following Rauch (2002) and Tong (2005) both Ordinary Least Square (OLS) and Tobit technique based on Maximum Likelihood are used. The former is used for all the models at aggregate and sectoral levels, while the latter technique is used only for sectoral analysis because of large number of zero observations in the dependent variable in the disaggregated data. The estimates in OLS and Tobit are not directly comparable. Eichengreen and Irwin (1995) have used scaled OLS estimates that approximate the maximum likelihood estimates by multiplying OLS estimates by the reciprocal of the proportion of non-limit observations in the sample (as suggested by Greene (1993) and quoted in the study). We will also be comparing the coefficients obtained on our main variable of interest (immigrants) with both these techniques.

All the variables are in logarithms, except the dummy variables. Expressing coefficients in logarithm takes care of strong heteroskedasticity and provides measures of elasticity which makes it comparable with other estimates available in the literature. Since taking the logarithm would lead to negative values for observations for which the total inflows of FDI acquires a value lower than unity and the lack of observations when total inflows are equal to zero, we add one before taking the log as elimination of zero

[89] Here the downward bias in the OLS estimates is referred in comparison with the Tobit estimates and not with the fixed effects technique. OLS estimates have upward bias in comparison with the fixed effects estimates because they do not take into account unobserved effects.

[90] For example Girma and Yu reports that there are no zero observation in their data on UK trade therefore they have used OLS while Head and Ries (1998) and Dunlevy (2006, 2008) use Tobit procedure as they have many zero values in their dependent variable. For robustness sake, Raunch (2002) and Tong (2005) use both OLS and Tobit specifications.

values of FDI would lead to selection bias and a few negative values are set to zero for computational ease. To avoid this bias, we follow Tong (2005) and adopt both OLS and Tobit models for data on FDI inflows. The dependent variable FDI is measured as ln (FDI + 1). In the Tobit model the dependent variable is bounded below by zero and thus non-negative. A few studies have also used Tobit model using Eaton and Tamura method and assuming that the error term is normal and homoskedastic.

We do not adopt Fixed Effect Model (FE), as we are interested in cross sectional information. There are many criticisms on not using the fixed effects. It has been shown by several empirical papers that the estimates of a gravity model are inefficient and biased in the presence of heteroscedasticity and unobserved fixed effects when they are correlated with other explanatory variables and these studies strongly recommend for using FE model.[91] However, FE model has not been used in majority of migrant-trade-FDI studies using gravity model because of its disadvantage of not providing estimates for time invariant variables as it accounts for only within variance and does not consider the between variance (Head and Ries, 1998; Girma and Yu, 2002; Gao, 2003; Tong, 2005; Kugler and Rapoport, 2007 and Javorcik et al., 2010).[92] Since we are interested in the estimates of time invariant variables specially distance and migrant variables, both of which are time invariant in our study we also opted for pooled regression. Another characteristic of our data that is not suitable for fixed effects is the short time span of six consecutive years in which macro aggregates change very slowly i.e. there are more between variations in the data than within variations.[93] The 'drawback' of the FE model which according to Plumper and Troeger (2007) is less recognized is that it gives inefficient estimates when variables have very little within variance. Therefore, these inefficient estimates are very unreliable and may provide

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[91] In our data set Hausman test indicates that FE is more appropriate than RE model except for the services sector. For the aggregate case the test statistics is : chi2(5)=35.94 Prob=0.0000, for the services sectors: chi2(5)= -2.42 which means that data fails to meet the asymptotic assumptions of the Hausman test, for the manufacturing sub sectors: chi2(5)=44.81 Prob=0.0000

[92] Javorcik et al (2010) has used FE in sectoral regressions but not at the aggregate level.

[93] Cheng and Wall (2005) strongly recommend to use fixed effects but also notes that fixed-effects estimation is criticized when applied to data pooled over consecutive years on the grounds that dependent and independent variables cannot fully adjust in a single year's time. To avoid this, they have used observations five years apart for the years: 1982, 1987, 1992, and 1997. .

wrong inferences similar to a biased estimator. Moreover, we are also interested to explore the effects of few time invariant variables like distance, regional and language effects which would otherwise be dropped. However, we use year,[94] regional and sector specific dummies in our alternative specifications to control for time variant, regional and sector specific unobserved factors to avoid omitted variables bias (Egger and Pfaffermayr, 2003).

It is also observed that the lagged dependent variable in trade and FDI equation is an important explanatory variable as it reflects a kind of adjustment used in the empirical analysis to take account of decision, production and delivery lags (Gould; 1994, Girma and Yu; 2002, Kugler and Rapoport; 2007). Additionally, Head and Ries (1998) use lagged dependent variable in trade equation to partially control for unmeasured slow moving country specific variables like "country's degree of integration in the world economy".

However, we have not used lagged dependent variable in our models for two reasons. First, our dependent variable is net FDI inflows that reflect the short term decisions of foreign investors compared to the FDI stock which depicts long term strategies. Therefore, annual inflows are more volatile than stocks and would not be able to capture the agglomeration effects precisely. Secondly, to avoid small sample bias known to exist in dynamic or autoregressive models (Nerlove; 1967, 1971, Nickell; 1981, Harris and Matyas; 1998) as we have a very short time series panel of six years.

3.7 Results of Estimations

In this section we present results for both aggregate FDI inflows and these inflows in service and manufacturing sectors. Although these results are not strictly comparable because of different sample sizes, it is useful to check for the robustness of the estimates of our main variable of interest (migration)

[94] Many studies also use dynamic model in which they use lagged dependent variable as an explanatory variable. However, due to small number of observations we do not estimate a dynamic model. The time and regional dummies could capture these effects. Head and Ries (1998) have dropped regional and time dummies in their estimation of dynamic model.

across these regressions and more generally to see how the gravity model works at aggregate and sectoral levels.

The subsections are structured as follows: Subsection 3.7.1 presents result of the effects of immigrants on transaction costs, sub sections 3.7.2 and 3.7.3 reports result on the effects of immigrants in Commonwealth (CW) versus non CW countries and OECD versus non-OECD countries.

3.7.1 The Effects of Immigrants on FDI inflows: Do Immigrants Reduce Transaction Costs

A. Aggregate level

The results of pooled OLS models in logarithm form are presented for the aggregate level in Table 3.5. In all our regressions we have used time dummies to control for any omitted variable that varies over time. Hence the estimates reflect between country variations. Also there was some evidence of heteroscedasticity in our data as reported by LM tests in Appendix Table A3.3. Therefore we report t statistics based on robust standard errors. The results of our basic model (without migration variable), are presented in column 1. The dependent variable is ln (FDI +1).

The coefficients on the first two variables, the bilateral GDP of Pakistan and the source country (GDPSUM) and the square of the difference of their GDP (GDP DIFFERENCE SQUARED) are according to the predictions of the theory and are significant, the former is positive and the latter negative suggesting the presence of horizontal FDI. The third variable the difference in GDP per capita (GDP PER CAPITA DIFFERENCE) reflecting the possibility of vertical FDI, is also positive and significant as the theory predicts. Thus it would appear that Pakistan received both types of FDI.

The coefficient on distance is negative and significant at 1percent level, indicating that large distances involve more set-up, monitoring and information costs. The elasticity with respect to distance suggests that a 10 percent increase in distance will decrease FDI by 11 percent. [95]

The signs on the estimates of the two bilateral trade costs variables (TRADE COST SOURCE and TRADE COST HOST) are as expected but not significant in any of the specifications.

Table 3.5: The Effects of Pakistani Immigrants on Aggregate FDI Inflows in Pakistan, 2002-2007.

OLS Regressions Dependent Variable: ln (FDI+1) from 32 source countries for the period

Independent Variables	col1	col2	col3	col4
GDPSUM	1.209***	0.924***	0.871***	1.062***
	4.44	*3.73*	*3.32*	*4.18*
GDP DIFFERENCE SQUARED	-0.216**	-0.210**	-0.222**	-0.215**
	-2.17	*-2.27*	*-2.58*	*-2.52*
GDP PER CAPITA DIFFERENCE	0.622***	0.484***	0.449***	0.430***
	5.05	*3.67*	*3.47*	*3.16*
DISTANCE	-1.085***	-0.317		1.329*
	-3.07	*-0.71*		*1.89*
TRADE COST SOURCE	-0.215	-0.132	-0.11	-0.099
	-0.59	*-0.38*	*-0.32*	*-0.3*
TRADE COST HOST	0.35	0.37	0.38	0.393
	1.31	*1.32*	*1.36*	*1.37*
CONTIGUITY	0.336	0.515	0.605	0.413
	0.46	*0.71*	*0.83*	*0.58*
COMMON WEALTH	0.770**	0.394	0.21	0.35
	2.08	*1.02*	*0.81*	*0.9*
IMMIGRANTS		0.166***	0.197***	1.660***
		2.71	*4.14*	*2.93*
IMMIGRANT*DISTANCES				-0.175***
				-2.65
CONSTANT	-0.476	-5.426	-7.698***	-21.440***
	-0.11	*-1.15*	*-3.01*	*-2.74*
TIME FIXED EFFECT	YES	YES	YES	YES
Observations	192	192	192	192
Adj.R-squared	0.316	0.332	0.334	0.342

Notes: * p<0.10, ** p<0.05, *** p<0.01, t ratios are below the estimates and are based on robust standard errors.
COMMON WEALTH: Australia, Bahamas, Canada, Malaysia, Mauritius, Singapore, South Africa, UK.
Contiguous countries: China, Iran

[95] Disdier and Head (2008) using a meta-analysis of distance elasticities for trade flows found that the average elasticity is -0.9.

Similar to Tong (2005), the coefficient on the dummy variable for adjacent countries, China and Iran (contiguity) is positive as expected but not significant statistically in any of the specifications.[96] The other dummy variable (COMMON WEALTH) for British Commonwealth countries is positive and significant at 5 percent significance level, which supports our hypothesis that Commonwealth countries invest more in Pakistan than what our model otherwise predicts.

In column 2, we augment our basic model by adding the migrant stock in 2000 (IMMIGRANTS) from Pakistan in each of the thirty two source countries of FDI. As a result, the explanatory power of the equation slightly increases as reflected by an increase of the adjusted R squared from 0.316 to 0.332. The estimate on (IMMIGRANTS) is positive and statistically significant at the 1percent level, which indicates that immigrants facilitate FDI inflows from the country they reside in. A 10 percent increase in the stock of migrants from Pakistan leads to 1.7 percent of FDI inflows in Pakistan, which is consistent with the estimates by other studies listed in Table 3.1.[97]

It is observed that coefficients on the sum of bilateral GDP and on difference of per capita GDP fall in magnitude when migrant variable is added.[98] However, since we are not controlling for the country fixed effects this instability may be due to heterogeneity of countries and migrants (migrant variable has between variance and no within variance) in our sample. It is also noteworthy that the inclusion of the migrant variable makes the distance variable insignificant. In column 3, we drop the distance variable,

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[96]We tried another option of just looking at the effect of dummy for China (results not reported). The coefficients on the dummy variable were larger in magnitude (1.62) in the basic model and (1.88) in the augmented model but were not significant. The coefficient on migrant was slightly larger in magnitude (0.179) and significant at 1percent level than from the model where we were including Iran with China in the contiguity variable. Also, the coefficient on migrant was slightly larger in magnitude (0.179) and significant at 1percent level than from the model where we were including Iran with China in the contiguity variable.

[97] The models were also estimated by taking migrant stock in 1990 instead of 2000; however the results were qualitatively the same. The correlation between migrant stocks of these two years is 0.9616.

[98] Dunlevy (2008) found the estimated coefficients on per capita income and population negative in the gravity model on migration- trade linkage and states in footnote (34, pp 21) "we offer no conjecture as to the reasons for this, although we note that Haveman and Hummels (2004, p. 210) show that it is possible in a Heckscher-Ohlin world of incomplete specialization where small countries have resource-endowment ratios far from the world average that the gravity equation may yield negative income coefficients." Bandyopadya et al. (2008) also report idiosyncratic gravity model for Columbia.

which results in an increase in the magnitude of the coefficient on migrants to 0.20. These results suggest that immigrants and distance which are proxying for transaction costs between countries are related. [99]

But distances differ across countries, therefore, when we control for distances in our regressions the coefficient on migrants suggests the effect of immigrants is the same across countries. This implies that whatever the transaction costs reflected by the distances, migrants have the same effect. This seems rather restrictive and does not take into consideration that transaction costs vary across countries and therefore migrants have different effects across the countries depending on these costs. To reaffirm the role of immigrants in reducing transaction costs, we follow Murat and Pistoresi (2009) and hypothesize that the effect of immigrants is greater when their host country[100] is far from Pakistan.[101] Therefore, the model is modified and besides the intercept shift effect reflected by the migrant variable, we look at the effect of slope change by interacting migrant and distance variables (MIGRANT*DISTANCES) in column 4 and expect the sign of the interactive term to be positive.

Contrary to the expectation, the coefficient on interactive term is negative and significant at 1 percent significance level.[102] However, the effect of migration on transaction costs (1.660-0.175 DISTANCES) is

[99] Loungani et al. (2002) analyze the ability of the gravity model to explain financial flows as well as trade flows and show that properly accounting for the ability of people in one country to communicate with those in another country reduces the absolute size of the distance coefficient and actually turns it positive. The authors further elaborate "While the 'distance puzzle' is not resolved, it is considerably reduced by going beyond consideration of physical distance to concepts of transactional distance and scale economies."

[100] It is important to note that here host country is related to migrants and refer to foreign countries while in equations of FDI the reference of host country is with reference to FDI inflows like 'trade cost host' country means trade cost in Pakistan.

[101] Murat and Pistoresi (2009) estimate a single estimate for immigrants of different ethnicities and interacted this variable with distance variable as noted earlier in our empirical review of literature. The authors found larger effects of Chinese immigrants from those of French immigrants on outward and inward FDI for Italy through reduction in transaction costs, as China is far from Italy than France. However, as Bandyopadhyay et al.(2008) has shown that the effect of migrants differ across ethnicities, therefore, they have estimated country specific gravity models for different countries to see the specific effects of different migrants. We are considering only the effects of Pakistani migrants on transaction costs from different source countries and in this way our estimate is more specific and indicates the effect of Pakistani migrants in reducing transaction costs.

[102] Correlation coefficient between MIGRANTS and MIGRANT*DISTANCES = 0.9705. The F statistics of joint significance of distances, migrants and the interactive term was F(3, 176) = 7.41 with Prob > F = 0.0001 rejecting the hypothesis that the coefficients on the above three variables are zero.

positive at a mean distance of 5372 kilometres (8.589 in logarithm).[103] This effect is negative if distances are greater than 13170 kilometres which is not the case in our sample of countries whose distances from Pakistan is less than this threshold.

Although we have few observations which have zero values (19 out of 192) and we did not intend to estimate Tobit at the aggregate level before, but since our result in the OLS models came up against our expectations on the interactive term, we also estimated these models by Tobit just to recheck and report these results in Table 3.6.

The results in first three columns are almost similar in quality. It is also observed that the trade cost host is now marginally significant in column 3. In column 4, the interactive term (IMMIGRANT*DISTANCES) is still negative as in OLS model but is now marginally significant at 10 percent level. Thus we observe that the sign on the interactive term in the Tobit estimates is also not in accordance with our expectations.

[103] The effect of migration on transaction costs $\Delta FDI/\Delta MIGRANT=\alpha + \beta$ DISTANCE Where α is a parameter on (MIGRANTS) and β on the interaction term (MIGRANT*DISTANCE). Substituting the values of coefficients from our regression equation and the mean distance we obtain (1.660-0.175 (8.465)) =0.179

Table 3.6: The Effects of Pakistani Immigrants on Aggregate FDI Inflows in Pakistan, 2002-2007.

Tobit Regressions: Dependent Variable: ln (FDI+1) from 32 source countries

Independent Variables	col1	col2	col3	col4
GDPSUM	1.329***	1.053***	0.955***	1.135***
	5.07	*4.29*	*3.70*	*4.50*
GDP DIFFERENCE SQUARED	-0.225**	-0.219**	-0.241***	-0.221***
	-2.39	*-2.49*	*-2.95*	*-2.63*
GDP PER CAPITA DIFFERENCE	0.653***	0.515***	0.452***	0.481***
	5.51	*4.10*	*3.63*	*3.71*
DISTANCE	-1.321***	-0.573		0.576
	-3.62	*-1.28*		*0.75*
TRADE COST SOURCE	-0.331	-0.246	-0.202	-0.223
	-0.98	*-0.76*	*-0.64*	*-0.71*
TRADE COST HOST	0.451	0.465	0.478*	0.474
	1.63	*1.63*	*1.67*	*1.65*
CONTIGUITY	0.42	0.58	0.737	0.531
	0.63	*0.87*	*1.1*	*0.81*
COMMON WEALTH	0.909**	0.536	0.205	0.512
	2.51	*1.38*	*0.8*	*1.32*
IMMIGRANTS		0.164***	0.219***	1.188**
		2.83	*4.63*	*1.98*
IMMIGRANT*DISTANCES				-0.120*
				-1.71
CONSTANT	-0.007	-4.873	-8.952***	-15.856*
	-0	*-1.05*	*-3.52*	*-1.96*
TIME FIXED EFFECT	YES	YES	YES	YES
Observations	192	192	192	192
Uncensored Observation	173	173	173	173
Log pseudolikelihood	-344.842	-342.377	-343.024	-341.663

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the estimates. COMMON WEALTH: Australia, Bahamas, Canada, Malaysia, Mauritius, Singapore, South Africa, UK. Contiguous countries: China, Iran

We further explore these issues by analysing both OLS and Tobit models at the disaggregated sectoral level by comparing these alternative techniques in the next section.

B. Sectoral level

A similar analysis as above has been done for the services and manufacturing sectors/industries to in-

vestigate the issue at the disaggregate level in this section. The OLS and Tobit results for the services sector are recorded in Table 3.7 and Table 3.8.

The coefficient on our main variable of interest (IMMIGRANTS) in the augmented model in column 2 inTable 3.7 is highly significant and indicates that a 10 percent increase in migrants leads to around 2.3 percent of FDI inflows. [104] Moreover, the adjusted R squared rises from 0.291 in the basic model in column 1 to 0.362 in the augmented model. It is also observed that, while the coefficient on contiguity is not significant in the former model, it is highly significant with large magnitude of 3.028 in the latter, implying that FDI inflows from China are more than what the model explains otherwise. [105]

The three gravity variables related to bilateral GDP, distinguishing the types of FDI have the expected signs and are significant but are instable across all the models as in the aggregate level regressions. We found a high correlation of -0.915 between difference in per capita GDP and the contiguity variables; however, the F test of joint significance suggested retaining both of these variables.[106]

Furthermore, though the distance variable is not significant indicating the non tradable character of the sector, trade cost in Pakistan (TRADE COST HOST) is positive and significant indicating that as trade costs increase there will be more horizontal FDI to serve the local market.[107]

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[104] The exact percentage variation in predicted FDI is $\exp(e^{\hat{\beta}}) - 1$, which comes to 2.6percent for 10percent change in migrant stock.

[105] We got an insignificant effect of contiguity at the aggregate level with China and Iran as contiguous countries in our sample as reported in the preceding section. Also to further check on this issue we reduced the sample size at the aggregate level to 16 countries to make the results more comparable with those obtained in the sectoral level, the results of this reduced sample size at the aggregate level are reported in the Appendix in Table A3.4.The estimates gravity variables related to GDPs look more instable like in the sectoral regressions implying that reduced cross section of observations could be the cause of this instability. In addition, similar to the results obtained in sectoral regressions, the coefficients on contiguity (China) and trade cost in host country (Pakistan) also become significant. The coefficients on immigrant variable in both OLS and Tobit regressions are still highly significant but with a much larger magnitudes indicating that a 10 percent increase in immigrants' abroad lead to a 3.7percent increase in FDI inflows in Pakistan.

[106] F=9.33, Prob>F=0.0001

[107] The service sectors were not open for foreign competition in Pakistan until very recently.

Table 3.7: The Effects of Pakistani Immigrants on FDI Inflows in Pakistan in 5 Services Sectors, 2002-2007.

OLS Regressions: Dependent Variable: ln (FDI+1) from 16 source countries

Independent variables	col 1	col 2	col3	col4
GDPSUM	1.167***	0.693***	0.679***	0.710***
	6.36	*4.13*	*4.20*	*4.36*
GDP DIFFERENCE SQUARED	-0.272***	-0.192***	-0.178***	-0.229***
	-4.33	*-3.31*	*-3.72*	*-4.11*
GDP PER CAPITA DIFFERENCE	0.408**	0.854***	0.893***	0.693***
	2.04	*4.44*	*5.11*	*3.64*
DISTANCE	-0.104	0.146		-3.792***
	-0.31	*0.50*		*-3.53*
TRADE COST SOURCE	-0.173	0.095	0.107	0.076
	-0.76	*0.41*	*0.46*	*0.32*
TRADE COST HOST	0.413**	0.396**	0.409**	0.581***
	2.33	*2.04*	*2.13*	*2.87*
CONTIGUITY	0.916	3.028***	3.087***	2.291***
	1.21	*4.07*	*4.24*	*3.08*
COMMON WEALTH	0.186	0	0.067	-0.033
	0.82	*0*	*0.55*	*-0.17*
IMMIGRANTS		0.232***	0.229***	-2.764***
		8.07	*7.86*	*-3.49*
IMMIGRANT*DISTANCES				0.354***
				3.78
CONSTANT	-9.836**	-7.144*	-5.711***	25.913***
	-2.45	*-1.95*	*-2.77*	*2.76*
TIME FIXED EFFECT	YES	YES	YES	YES
SECTOR FIXED EFFECT	YES	YES	YES	YES
Observations	480	480	480	480
Adj.R-squared	0.291	0.362	0.363	0.378

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the estimates. Commonwealth countries: Australia, Canada, Singapore, UK . Contiguous country: China

In contrast to our result at the aggregate level in the previous section, the estimate on the interactive term in column 4 is now positive (0.354), and significant at a 1 percent significance level. This estimate, along with the estimated elasticity of migrant stock, indicates elasticity of migrants in the US of 0.54 while the elasticity of migrants in the UAE -.06 (or nil).[108] This result validates our hypothesis that immigrants reduce transaction costs more in distant countries. We further investigate the effect of interactive term in the Tobit analysis below.

Although the OLS models seem to provide reasonably consistent estimates for most of the variables in our models, we further check for the robustness of our estimates since the literature suggests that OLS technique based on the dependent variable defined as ln (FDI+1) provides estimators which suffer from downward bias and therefore produces less precise results even in large samples.[109] As reported by Westerlund and Wilhelmsson (2006) and Rauch (2002) the t statistics in the OLS models give deceptive inference and there is more likely of getting insignificant estimators than the Tobit procedure. However, researchers have used both types of models according to the characteristics of their data and for robustness check.[110]

Due to large number of zeros in the FDI data on sectors, Tobit estimates are also reported in Table 3.8. These estimates are "unconditional" which reflect the expected changes in the observed volume of FDI in response to a unit change in the explanatory variables; both the changes in the probability of FDI being above zero (above the threshold) and changes in the value of FDI when it is already above the

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[108] The effect of migrants is calculated as, $\Delta FDI/\Delta MIGRANT=\alpha + \beta$ DISTANCE Where α is a parameter on (MIGRANTS) and β on the interaction term (MIGRANT*DISTANCE). We obtained a value of -0.059 for the migrants in the UAE. We ignore the negative value as it seems implausible that overall effect of migrants from UAE is negative see page 26, Hutchinson and Dunlevy (2009) for a similar interpretation of the results on the effects Canadian and British immigrants on the US trade.

[109] Here the downward bias in the OLS estimates is referred in comparison with the Tobit estimates and not with the fixed effects technique. OLS estimates have upward bias in comparison with the fixed effects estimates because they do not take into account unobserved effects.

[110] For example Girma and Yu reports that there are no zero observation in their data on UK trade therefore they have used OLS while Head and Ries (1998) and Hutchinson and Dunlevy (2008) and Dunlevy (2006) use Tobit procedure as they have many zero values in their dependent variable . For robustness sake, Rauch (2002) and Tong (2005) use both OLS and Tobit specifications.

threshold.[111] It is observed that t ratios have indeed increased for all the estimates compared with the t statics obtained in OLS models.

The coefficient on trade cost in the source country and the dummy variable on Commonwealth countries now become significant at the 10 percent level.

Table 3.8: The Effects of Pakistani Immigrants on FDI Inflows in Pakistan in 5 Services Sectors, 2002-2007.

Tobit Regressions	Dependent Variable: ln (FDI+1) from 16 source countries			
Independent Variables	col1	col2	col3	col4
GDPSUM	1.319***	0.690***	0.683***	0.711***
	6.92	*3.87*	*3.93*	*4.09*
GDP DIFFERENCE SQUARED	-0.293***	-0.183***	-0.175***	-0.214***
	-4.68	*-3.18*	*-3.65*	*-3.84*
GDP PER CAPITA DIFFERENCE	0.606**	1.248***	1.268***	1.096***
	2.54	*5.11*	*5.52*	*4.5*
DISTANCE	-0.226	0.073	-	-3.134**
	-0.66	*0.25*		*-2.58*
TRADE COST SOURCE	-0.461*	-0.195	-0.189	-0.198
	-1.80	*-0.77*	*-0.75*	*-0.79*
TRADE COST HOST	0.720***	0.638**	0.646***	0.790***
	2.93	*2.58*	*2.64*	*3.08*
CONTIGUITY	1.315	4.287***	4.316***	3.595***
	1.46	*4.47*	*4.57*	*3.73*
COMMON WEALTH	0.420*	0.166	0.2	0.14
	1.78	*0.84*	*1.5*	*0.72*
IMMIGRANTS		0.287***	0.286***	-2.152**
		8.84	*8.68*	*-2.41*
IMMIGRANT*DISTANCES				0.287***
				2.73
CONSTANT	-10.495**	-6.293	-5.575**	20.533*
	1.319***	-1.64	-2.37	1.95
TIME FIXED EFFECT	YES	YES	YES	YES
SECTOR FIXED EFFECT	YES	YES	YES	YES
Observations	480	480	480	480
Uncensored Observations	379	379	379	379
Log pseudolikelihood	-707.078	-679.1	-679.134	-675.849

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the estimates. Commonwealth countries: Australia, Canada, Singapore, UK. Contiguous country: China

[111] See page 16, Hutchinson and Dunlevy (2008) and McDonald and Moffitt (1980) for further details.

The migrant stock variable in the augmented model in column 2 is highly significant (as in the OLS case) with a magnitude of 0.287, which indicates that a 10 percent increase in immigrants of Pakistani origin in a particular country would lead to an increase of around 3 percent in overall FDI inflows in services sectors from that country. To compare this estimate with the estimate obtained by OLS we compute the scaled OLS estimate and arrive at a value of 0.294 which is a similar to our Tobit estimate.[112] Thus our estimate on immigrant variable is robust using both the techniques.

The estimate on the interactive term is also positive and significant at the 1 percent level in column 4, as in the OLS model in Table 3.7. The effect of migration on transaction costs (-2.152+0.287 DISTANCES) is positive at a mean distance of 5410 kilometres (8.596 in logarithm).[113] This effect is negative if distances are less than 1804 kilometres which is not within our sample of sixteen countries that are all farther from Pakistan is more than this threshold. To verify the marginal effect of immigrants obtained in the OLS for the immigrants in the US and the UAE, we again compute these effects using Tobit estimates and obtain an estimate of 0.529 and 0.041 which indicates the similarity of results and robustness of our estimates.[114]

The positive effect of immigrants in the services sector implies that they facilitate horizontal FDI, which is most prevalent in the service sectors (for example in Transport and Communications, and Commerce and Banking for serving local markets). Moreover, it would not be unreasonable to deduce from our results that skilled immigrants may have a larger role in these sectors due to the importance of strong business and financial connections in the provision of services.

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[112] 0.232*(480/379). See tables 3.7 and 3.8.

[113] The effect of migration on transaction costs $\Delta FDI/\Delta MIGRANT=\alpha + \beta$ DISTANCE Where α is a parameter on (MIGRANTS) and β on the interaction term (MIGRANT*DISTANCE). Substituting the values of coefficients from our regression equation in column four in Table 3.8, and the mean distance we obtain (-2.152+0.287(8.596))=1.37

[114] The value of Tobit estimate for the UAE is positive and seems more plausible than obtained by OLS.

The results of OLS and Tobit models on manufacturing sectors are presented in tables 3.9 and 3.10 in the same format as for the services sectors. We compare the results of the models using these two procedures here. All the GDP related variables have the expected signs and are highly significant in both the tables.[115] We prefer the estimates in the Tobit models which have higher t statistics as expected. Some of the variables which were not or marginally significant in the OLS models become highly significant in the Tobit models, for example coefficients on distance, trade cost in the source country (in basic model), and dummy for Commonwealth countries.

The coefficients on migrants are positive and highly significant in both the OLS and Tobit estimations with magnitudes of 0.054 and 0.199 in columns 2 in Table 3.9 and Table 3.10.[116] The magnitude of coefficient in OLS seems very small. We compute a scaled OLS estimate to compare with the Tobit estimate. The value of the scaled OLS estimate is 0.168, which suggests that Tobit estimate is still higher than the scaled OLS estimate. As we have noted earlier that the Tobit technique is likely to provide more reliable estimates. We conclude therefore that a 10 percent increase in immigrants of Pakistani origin in a particular country leads to an increase of around 2 percent in overall FDI inflows from that country in the manufacturing sector.

In addition the results on interactive terms in column 4 for both OLS and Tobit are positive and significant, as expected. The effect of immigrants at mean distance is positive confirming our earlier results for aggregate and services sector. The threshold distance below which the effects of immigrants is

[115] However these estimates are much smaller in magnitude than in the models at aggregate and services sectors given the smaller size of the manufacturing sector in the overall size of the economies of the countries. I won't conjecture more because there are some issues regarding gravity model for sub sectors and other related issues discussed by Parson (2005).

[116] The estimates in OLS and Tobit are not directly comparable. Eichengreen and Irwin (1995) has used scaled OLS estimates that approximates the maximum likelihood estimates by multiplying OLS estimates by the reciprocal of the proportion of nonlimit observations in the sample as suggested by Greene (1993) and quoted in the study. However, these are approximations, Eichengreen and Irwin observes that scaled OLS estimates are good approximations of the maximum likelihood estimates but found the coefficient on contiguity "more pronounced" in tobit model in their study (page 12). To check our estimates in the OLS models we also compute the scaled OLS for estimates on migrants.

negative is 1898 kilometres (slightly more than found for services sectors), but again this is not within our case as the closest country UAE is also 2084 kilometres from Pakistan.

Together with this positive effect of immigrants in the manufacturing sector and taking into account that FDI in the manufacturing sector is more likely to be of vertical nature in a small developing country, it can be conjectured that unskilled immigrants are facilitating FDI directly and trade indirectly as vertical FDI is complementary to trade.

Table 3.9: The Effects of Pakistani Immigrants on FDI Inflows in Pakistan in 23 Manufacturing Industries, 2002-2007.

OLS Regressions: Dependent Variable: ln (FDI+1) in from 16 source countries

Independent Variables	col1	col2	col3	col4
GDPSUM	0.291***	0.182***	0.188***	0.185***
	8.19	*5.38*	*5.96*	*5.51*
GDP DIFFERENCE SQUARED	-0.052***	-0.034***	-0.041***	-0.042***
	-4.25	*-2.83*	*-4.7*	*-3.46*
GDP PER CAPITA DIFFERENCE	0.101***	0.204***	0.186***	0.169***
	2.80	*5.73*	*6.27*	*4.55*
DISTANCE	-0.128*	-0.07		-0.926***
	-1.75	*-1*		*-4.59*
TRADE COST SOURCE	-0.014	0.047	0.042	0.043
	-0.42	*1.28*	*1.17*	*1.17*
TRADE COST HOST	0.145***	0.141***	0.134***	0.181***
	4.75	*4.55*	*4.3*	*5.44*
CONTIGUITY	0.101	0.589***	0.561***	0.429***
	0.89	*5.29*	*5.33*	*3.69*
COMMON WEALTH	0.083	0.04	0.008	0.033
	1.57	*0.8*	*0.31*	*0.66*
IMMIGRANTS		0.054***	0.055***	-0.597***
		8.59	*8.42*	*-3.75*
IMMIGRANT*DISTANCES				0.077***
				4.05
CONSTANT	-1.574*	-0.952	-1.639***	6.229***
	-1.85	*-1.14*	*-4.21*	*3.58*
TIME FIXED EFFECT	YES	YES	YES	YES
INDUSTRY FIXED EFFECT	YES	YES	YES	YES
Observations	2208	2208	2208	2208
Adj.R-squared	0.198	0.221	0.221	0.226

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the estimates.
Commonwealth countries: Australia, Canada, Singapore, UK. Contiguous country: China.

Table 3.10: The Effects of Pakistani Immigrants on FDI Inflows in Pakistan in 23 Manufacturing Industries, 2002-2007

Tobit Regressions: Dependent Variable: ln (FDI+1) in from 16 source countries

Independent Variables	col1	col2	col3	col4
GDPSUM	0.869***	0.354***	0.363***	0.383***
	11.94	*4.96*	*5.1*	*5.52*
GDP DIFFERENCE SQUARED	-0.153***	-0.055***	-0.086***	-0.078***
	-7.28	*-2.69*	*-4.65*	*-3.82*
GDP PER CAPITA DIFFERENCE	0.355***	0.935***	0.839***	0.814***
	3.38	*7.63*	*7.17*	*6.64*
DISTANCE	-0.591***	-0.369***		-2.724***
	-4.62	*-3.25*		*-5.17*
TRADE COST SOURCE	-0.239**	-0.166	-0.181*	-0.152
	-2.47	*-1.59*	*-1.75*	*-1.51*
TRADE COST HOST	0.503***	0.413***	0.364***	0.510***
	4.36	*3.98*	*3.61*	*4.81*
CONTIGUITY	0.292	2.880***	2.749***	2.287***
	0.82	*6.63*	*6.39*	*5.24*
COMMON WEALTH	0.391***	0.192**	0.047	0.182**
	4.14	*2.29*	*0.78*	*2.23*
IMMIGRANTS		0.199***	0.208***	-1.540***
		10.93	*11.02*	*-4.03*
IMMIGRANT*DISTANCES				0.204***
				4.53
CONSTANT	-3.665**	0.426	-2.941***	19.977***
	-2.52	*0.3*	*-2.9*	*4.5*
TIME FIXED EFFECT	YES	YES	YES	YES
INDUSTRY FIXED EFFECT	YES	YES	YES	YES
Observations	2208	2208	2208	2208
Uncensored Observations	711	711	711	711
Log pseudo likelihood	-1412.39	-1341.88	-1347.18	-1334.33

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the estimates.
Commonwealth countries: Australia, Canada, Singapore, UK. Contiguous country: China

Overall, the results of our estimates on the migrant variable are robust across the regressions at aggregate and sectoral levels and across alternate econometric specifications. These results suggest a strong and positive elasticity of FDI inflows with respect to Pakistani immigrants and are comparable with the estimates obtained in earlier studies as noted before. It would also be useful to reiterate that migrants reduce informal costs of transaction of doing trade and business. But as trade is endogenously determined in the new theory of trade and multinationals, therefore, it could reasonably be assumed that migrants

affect trade through their effects on FDI and not vice versa. After controlling for trade costs and distance, the effect of migrant network is positive in FDI regressions which reflect that as migrant stock increases in the host country, there will be more FDI inflows in Pakistan from that country. Thus if they facilitate in vertical FDI (which is mostly done in the Manufacturing Sector) we can deduce that they also facilitate in trade. However, in the case of horizontal FDI (mostly prevalent in the Services Sector), migrants could help in trade in services.

Most of the estimates on gravity variables are according to the predictions of the new trade theory of the multinationals and statistically significant at both at aggregate and sectoral levels.

In addition, as the sign of distance in the theory of multinationals is ambiguous, the negative sign obtained most often in FDI studies have baffled many researchers and have led them to believe that distance not only proxies for trade costs but information costs also. Therefore we interacted the distance and the migrant variables to test the hypothesis that migrants reduce information costs after controlling for trade costs. The results obtained on this interactive term support the hypothesis at the disaggregated level.

Furthermore, positive and significant coefficients on the migrant variable for both services and manufacturing sectors indicate that migrants facilitate both vertical and horizontal FDI. Additionally, a large coefficient on the migrant variable in the service sectors than in the manufacturing sector where mostly vertical FDI (related to less skilled workers) is done leads us to derive though implicitly, that the skilled migrants through their better business and network connections have a larger role than unskilled migrants. This is predicted by the network theory. [117]

[117] As reviewed in the empirical literature review, Kugler and Rapoport (2007) have reported no impact of unskilled immigrants and a larger role of skilled immigrants in the service sector compared to in the manufacturing sector in the study on the effects of immigrants according to their skill levels in the US on US outward FDI. However, we are implicitly deriving our results here as we do not have information on the skill levels of the immigrants.

3.7.2 The Effects of Immigrants in the Commonwealth vs. non-Commonwealth Countries on FDI Inflows

Similar to Girma and Yu (2002), we expect that the impact of immigrants living in non-Commonwealth countries would be larger in reducing transaction costs as they provide additional knowledge to foreign investors living in countries with different political, social and legal institutions. As a corollary, the impact of Pakistani immigrants in Commonwealth countries will be smaller in reducing transaction costs as Pakistan is also a member of the Commonwealth with similar institutions.

A. Aggregate Level

The estimations in this sub-section allow us to assess the differential effects of immigrants living in Commonwealth and non-Commonwealth countries. At the aggregate level, we have eight Commonwealth countries out of thirty two countries sample countries (25 percent of the sample). In Table 3.11, we report results at the aggregate level obtained by both OLS and Tobit procedure, which seem to be qualitatively similar.

For simplicity and not to be repetitive, we interpret estimates obtained by the former. In column 1, the coefficient on (IMMIGRANTS) is 0.195 and is significant at 1 percent level, which indicates that a 10 percent increase in immigrants in non-Commonwealth countries raises FDI inflows by 2 percent and for immigrants in Commonwealth countries by (0.195-0.102= 0.093) 1 percent. The difference is not however significant since the coefficient on the interactive term is not significant. There is no evidence therefore that the effects of immigrants in both these group of countries have significantly different effects.

Table 3.11: The Effects of Pakistani Immigrants in Commonwealth vs. non- Commonwealth Countries on Aggregate FDI Inflows in Pakistan, 2002-2007

OLS and Tobit Regressions: Dependent Variable: ln (FDI+1) from 32 source countries

	OLS Models			Tobit Models		
Independent Variables	col1	col2	col3	col4	col5	col6
GDPSUM	0.943***	0.894***	1.065***	1.059***	1.017***	1.197***
	3.88	*3.62*	*3.88*	*4.38*	*4.19*	*4.52*
GDP DIFFERENCESQUARED	-0.205**	-0.261***	-0.336***	-0.216**	-0.269***	-0.346***
	-2.24	*-2.74*	*-3.84*	*-2.44*	*-2.95*	*-4.15*
GDP PER CAPITA DIFFERENCE	0.480***	0.412***	0.462***	0.515***	0.443***	0.548***
	3.57	*3.23*	*2.97*	*4.08*	*3.72*	*3.89*
DISTANCE	-0.349	0.131	0.409	-0.586	-0.12	0.097
	-0.79	*0.3*	*0.65*	*-1.32*	*-0.27*	*0.15*
TRADE COST SOURCE	-0.146	-0.055	-0.254	-0.254	-0.164	-0.392
	-0.42	*-0.16*	*-0.77*	*-0.79*	*-0.51*	*-1.32*
TRADE COST HOST	0.349	0.431	-0.089	0.45	0.524*	-0.089
	1.20	*1.57*	*-0.21*	*1.55*	*1.88*	*-0.25*
CONTIGUITY	0.509	0.524	0.823	0.586	0.584	0.98
	0.70	*0.70*	*1.09*	*0.88*	*0.86*	*1.46*
COMMONWEALTH	1.289	-0.239	-	1.004	-0.089	-
	1.54	*-0.61*		*1.11*	*-0.22*	
IMMIGRANTS	0.195***	0.161***	0.240***	0.178**	0.158***	0.209**
	2.70	*2.68*	*2.61*	*2.58*	*2.81*	*2.39*
COMMONWEALTH * IMMIGRANTS	-0.102	-	-	-0.053	-	-
	-1.04			*-0.53*		
IMMIGRANTS * UK		0.180***	0.133***		0.172***	0.143***
		4.64	*3.23*		*4.77*	*3.76*
IMMIGRANTS *AUSTRALIA			-0.062			-0.025
			-0.75			*-0.32*
IMMIGRANTS * BAHAMAS			0.19			0.053
			0.84			*0.21*
IMMIGRANTS * CANADA			-0.152**			-0.122*
			-2.31			*-1.88*
IMMIGRANTS * MALAYSIA			-0.06			-0.048
			-0.75			*-0.61*
IMMIGRANTS * MAURITIUS			0.447***			0.518***
			2.75			*3.79*
IMMIGRANTS * SINGAPORE			-0.06			-0.055
			-1.05			*-1.04*
IMMIGRANTS * S.AFRICA			-0.147*			-0.098
			-1.86			*-1.26*
CONSTANT	-5.737	-8.504*	-12.733**	-5.009	-7.920*	-11.221**
	-1.21	*-1.78*	*-2.41*	*-1.07*	*-1.67*	*-2.12*
TIME FIXED EFFECT	YES	YES	YES	YES	YES	YES
Observations	192	192	192	192	192	192
Adj.R-squared	0.332	0.362	0.425			
Log pseudo likelihood				-342.251	-338.503	-326.687

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the estimates. COMMON WEALTH: Australia, Bahamas, Canada, Malaysia, Mauritius, Singapore, South Africa, UK. Contiguous countries: China, Iran

However, since the Commonwealth countries consist of diverse countries from geographically different regions and include both OECD and non-OECD countries, there is the possibility of specification error as opposed to genuine regional integration effects. Therefore, we further investigate the effects of these individual countries in our sample.[118] In column 2, we control for immigrants in the UK by interacting the dummy for the UK and immigrants (IMMIGRANTS * UK). The coefficient on the interactive term is positive and significant at 1 percent level. The effect FDI inflows of Pakistani immigrants living in the UK are much higher at 3 percent as a result of 10 percent increase in immigrants (0.161+0.180=0.341). These results suggest that though immigrants living in the Commonwealth countries have no significant different effects from immigrants from non-Commonwealth, when these countries are taken as a group but individual countries may have different effects.

To investigate further in column 3 we control for the immigrants in individual Commonwealth countries by interacting these countries dummies and immigrants, as indicated by the coefficients on these interactive terms there is large variation in the pattern of the effects of immigrants in these countries. For example, while the net effect of immigrants in the UK and Mauritius is positive and significant at 1 percent, this effect is negative and significant for Canada at 5 percent. Moreover, the effect of immigrants living in non-Commonwealth countries increases from 0.195 (column 1) to 0.240 (column 3) when we control for these interactive terms from than when we were controlling them as a group.

B. Sectoral Level

Table 3.12 provides results at the sectoral level. At the disaggregate level we have an equal proportion of 25 percent of Commonwealth countries (4 out of 16 countries), as at the aggregate level, we repeat the same exercise as above to see the effect of immigrants from Commonwealth vs. non-Commonwealth countries for FDI inflows in the services and the manufacturing sectors. However, because of a large

[118] As discussed by Greenaway and Milner (2002) in the specification of regional dummies in a gravity model.

number of zeros at the sectoral level we prefer the Tobit estimates. [119]

The estimates on the variable IMMIGRANTS indicate that the effects of immigrant in non-Commonwealth countries are positive and highly significant in both the services and manufacturing sectors across all the specifications. The coefficient on COMMONWEALTH * IMMIGRANTS is positive in both the service sectors (column 1) and manufacturing industries (column 4) but only significant in the latter case. These results indicate that the immigrants from non-Commonwealth countries are facilitating FDI in both services and the manufacturing sectors and their effects are similar to immigrants in the CW countries in the services sector. However, there is evidence that in the manufacturing sector immigrants in the Commonwealth countries have a larger impact on FDI inflows in Pakistan.

Table 3.12: The Effects of Pakistani Immigrants in Commonwealth vs. non- Commonwealth Countries on FDI Inflows in Pakistan in 5 Services and 23 Manufacturing Industries, 2002-2007

Tobit Regressions: Dependent Variable: ln (FDI+1) from 16 source countries

	Service Sectors			Manufacturing Industries		
Independent variables	col1	col2	col3	col4	col5	col6
GDPSUM	0.706***	0.892***	0.691***	0.366***	0.481***	0.269***
	3.99	*4.99*	*3.65*	*5.00*	*6.68*	*3.46*
GDP DIFFERENCE SQUARED	-0.190***	-0.261***	-0.339***	-0.063***	-0.110***	-0.108***
	-3.48	*-4.93*	*-4.92*	*-3.11*	*-5.28*	*-3.93*
GDP PER CAPITA DIFFERENCE	1.230***	0.909***	0.434*	0.912***	0.689***	0.515***
	5.09	*3.84*	*1.78*	*7.56*	*5.92*	*4.02*
DISTANCE	0.102	0.365*	2.211***	-0.321***	-0.113	0.639***
	0.37	*1.87*	*5.47*	*-3.06*	*-1.42*	*3.31*
TRADE COST SOURCE	-0.208	-0.26	-0.038	-0.174*	-0.180*	0.016
	-0.82	*-1.04*	*-0.15*	*-1.67*	*-1.78*	*0.16*
TRADE COST HOST	0.626**	0.687***	0.880***	0.399***	0.440***	0.616***
	2.55	*2.89*	*3.55*	*3.86*	*4.16*	*5.88*
CONTIGUITY	4.227***	3.223***	2.565***	2.806***	2.100***	1.973***
	4.44	*3.46*	*2.78*	*6.52*	*5.12*	*4.64*
IMMIGRANTS	0.281***	0.214***	0.309***	0.193***	0.154***	0.226***
	8.38	*6.33*	*5.99*	*10.29*	*8.71*	*8.77*

[119] The dummy for Commonwealth countries was dropped in sectoral regression as F test performed better without including it. However, the results with the dummy variable for Commonwealth with both OLS and Tobit techniques are in Appendices in Table A3.5 for the services sectors and in Table A3.6 for the manufacturing sector. The results indicate (only in the tobit model) that immigrants from Commonwealth countries has lesser effect than those from the non-Commonwealth countries on FDI inflows in this sector.

COMMONWEALTH * IMMIGRANTS	0.015 *0.79*			0.015** *1.97*		
IMMIGRANTS * UK		0.092*** *4.7*	0.067*** *3.1*		0.044*** *5.28*	0.028*** *3.13*
IMMIGRANTS *AUSTRALIA			-0.190*** *-4.31*			-0.106*** *-4.86*
IMMIGRANTS * CANADA			-0.201*** *-7.04*			-0.098*** *-6.41*
IMMIGRANTS * SINGAPORE			-0.036 *-0.7*			0.041* *1.68*
CONSTANT	-6.676* *-1.82*	-11.177*** *-3.35*	-25.856*** *-5.81*	-0.079 *-0.06*	-3.312** *-2.5*	-8.184*** *-4.14*
Observations	480	480	480	2208	2208	2208
TIME FIXED EFFECT	YES	YES	YES	YES	YES	YES
SECTOR FIXED EFFECT	YES	YES	YES	-	-	-
INDUSTRY FIXED EFFECT	-	-	-	YES	YES	YES
Log pseudo likelihood	-679.126	-669.588	-649.813	-1342.707	-1329.43	-1297.15

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the estimates.

In services sector: Commonwealth dummy variable was dropped. Since F tests with and without the dummy variable is F(10, 460) = 16.34 Prob > F = 0.0000 and F (9, 461) = 18.24, Prob > F = 0.0000

In manufacturing sector: Commonwealth dummy variable was dropped. Since F tests with and without the dummy variable are F(10,2170) = 24.36, Prob > F = 0.0000 and F(9, 2171) = 27.00, Prob > F = 0.0000

It can also be observed that the results on the immigrants in the individual member countries have diverse effects. For example, immigrants in the UK have positive and significant effects on FDI in both the sectors, while immigrants in Canada and Australia have significantly negative effects as suggested by the estimates of the interactive term of immigrants and each of these countries. Immigrants in small member countries like Mauritius (at aggregate level) and Singapore (manufacturing sectors/industries) are also facilitating FDI inflows.

From the above results we cautiously conclude that, due to similar institutions, immigrants in Common wealth countries are not providing valuable information. Similarly, there is evidence that immigrants in non-Commonwealth countries as a group have strong significant positive effects on FDI inflows, but we cannot say that immigrants from each non-Common wealth countries have the similar effects. We could have done the analysis for immigrants living in individual non-Commonwealth countries but as the number of these countries is much larger in the sample we cannot consider them separately due to lack of degrees of freedom.

3.7.3 The Effects of Immigrants in Developing vs. Developed Countries on FDI Inflows

A. Aggregate Level

To investigate the role of immigrants in non-OECD and OECD countries, we present results obtained for immigrants in these two respective regions. The data at the aggregate level allows us to disaggregate our sample into two equal samples of 16 countries each in the OECD and non OECD groups. With some prior evidence that OECD countries host a large proportion of skilled immigrants (90 percent in OECD countries are skilled); we expect that immigrants in this region facilitate more FDI than immigrants in non-OECD countries. Table 3.13 provides the estimates at the aggregate level.

The estimate in column (1) in Table 3.13 indicates that a 10 percent increase in non-OECD immigrants leads to 2 percent increase in FDI inflows. However, the interactive term on (OECD * IMMIGRANTS) is negative but insignificant. This result indicates that there is no evidence against the hypothesis that the effects on immigrants from the two groups of countries are the same. Since the majority of FDI inflows come from the Middle East high income countries of non-OECD countries, we control for this region by adding a dummy variable (MIDEAST) regression in column 2. The overall results indicate no qualitative changes; the coefficient on (IMMIGRANTS) falls slightly but remains significant and the interactive term (OECD * IMMIGRANTS) remains insignificant.

Table 3.13: The Effects of Pakistani Immigrants in the OECD vs. non- OECD Countries on Aggregate FDI Inflows in Pakistan, 2002-2007.

OLS Regressions : Dependent Variable: ln (FDI+1) from 32 source countries

Independent Variables	col1	col2
GDPSUM	1.066***	1.119***
	4.31	*4.19*
GDP DIFFERENCE SQUARED	-0.178*	-0.181**
	-1.96	*-1.99*
GDP PER CAPITA DIFFERENCE	0.624***	0.634***
	4.6	*4.53*
DISTANCE	0.111	0.18
	0.22	*0.35*
TRADE COST SOURCE	-0.016	0.041
	-0.05	*0.12*
TRADE COST HOST	0.284	0.267
	1.01	*0.95*
CONTIGUITY	0.287	0.306
	0.42	*0.45*
OECD	-0.284	0.052
	-0.26	*0.04*
COMMONWEALTH	0.143	0.276
	0.35	*0.58*
MIDEAST	–	0.327
		0.74
IMMIGRANTS	0.191**	0.183**
	2.56	*2.5*
OECD * IMMIGRANTS	-0.099	-0.126
	-0.71	*-0.85*
CONSTANT	-10.100*	-11.374**
	-1.81	*-1.98*
Observations	192	192
TIME FIXED EFFECT	YES	YES
Adj.R-squared	0.357	0.355

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the estimates.

B. Sectoral Level

The data in sectors contains only five non-OECD countries out of the total of sixteen. The results are presented in Table 3.14. The first two columns are on services sectors and the other two are on the manufacturing sectors/ industries.

The estimates on the variable (IMMIGRANTS) are positive and significant at the 1 percent level in column 1 (0.236) and column 3 (0.152) for the service and manufacturing sectors. In addition, the estimates on the interactive term (OECD * IMMIGRANTS) are positive in both these sectors but only marginally significant in the case of the manufacturing sub sectors.

Table 3.14: The Effects of Pakistani Immigrants in the OECD vs. non- OECD Countries on FDI Inflows in 5 Services Sectors and 23 Manufacturing Industries in Pakistan, 2002-2007.

Tobit Regressions :	Dependent Variable: ln (FDI+1) from 16 source countries			
	Services Sectors		Manufacturing industries	
Independent Variables	col1	col2	col3	col4
GDPSUM	0.668***	0.991***	0.338***	0.554***
	3.8	*6.49*	*4.81*	*9.08*
GDP DIFFERENCE SQUARED	-0.179***	-0.257***	-0.052**	-0.102***
	-3.18	*-4.87*	*-2.52*	*-5.39*
GDP PER CAPITA DIFFERENCE	1.162***	0.259**	0.874***	0.293***
	4.48	*2.46*	*6.91*	*5.78*
DISTANCE	0.103	0.268	-0.384***	-0.343***
	0.33	*0.86*	*-3.3*	*-2.93*
TRADE COST SOURCE	-0.147	0.225	-0.129	0.135
	-0.56	*0.93*	*-1.21*	*1.39*
TRADE COST HOST	0.763***	1.080***	0.513***	0.694***
	2.63	*3.6*	*4.34*	*5.61*
CONTIGUITY	3.798***	_	2.480***	_
	3.51		*5.23*	
OECD	-1.066	-2.329***	-0.941**	-1.602***
	-1.15	*-2.65*	*-2.46*	*-4.34*
COMMONWEALTH	0.037	-0.102	0.096	0.053
	0.16	*-0.42*	*0.99*	*0.53*
IMMIGRANTS	0.236***	0.124**	0.152***	0.082***
	4.02	*2.2*	*5.62*	*3.4*
OECD * IMMIGRANTS	0.096	0.207**	0.085*	0.144***
	0.96	*2.07*	*1.95*	*3.32*
CONSTANT	-5.983	-12.947***	1.064	-3.006**
	-1.47	*-3.74*	*0.71*	*-2.46*
Observations	480	480	2208	2208
TIME FIXED EFFECT	YES	YES	YES	YES
SECTOR FIXED EFFECT	YES	YES	-	-
INDUSTRY FIXED EFFECT	-	-	YES	YES
Log pseudolikelihood	-678.362	-685.379	-1338.81	-1351.78

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are below the estimates.

As the proportion of non-OECD countries are less in the overall sample, we adopt a different strategy than adopted in the aggregate analysis. We do not control for China (the only contiguous country in the sample) and the Middle East countries. The results in columns (2) and (4) for the services and manufacturing sectors indicate that the magnitudes of coefficients on (IMMIGRANTS) fall by halve, while the coefficients on the interactive terms are positive and are now significant implying that immigrants in OECD countries are facilitating more than immigrants in non-OECD countries in these sectors.

Overall, these results suggest that effects of immigrants in both OECD and non-OECD countries on FDI are positive and significant in both the aggregate and sectoral analysis in all specifications. This finding supports Tong's findings. The immigrants from OECD countries are contributing more towards the FDI inflows when we consider FDI in sectors, but we were unable to find this in our aggregate analysis. However, the countries within these two groups have diverse characteristics of firms and immigrants as observed by Murat (2009). Thus aggregation may not reveal the different effects that immigrants may have from these countries in different sectors.

3.8 Conclusions

In an augmented gravity model based on the new trade theory of the multinational, this study explores the effects of Pakistani immigrants living abroad on FDI inflows in Pakistan from their country of residence at both the aggregate and sectoral level. Overall, the gravity model performed well with most of the coefficients on gravity variables having the expected and significant signs, suggesting that Pakistan received both horizontal and vertical FDI.

In addition and more importantly, the signs of coefficients on immigrants are positive and significant at 1 percent level at both aggregate and sectoral levels and across various specifications, in line with the predictions of network theory. A 10 percent increase in immigrants leads to an increase of 1.7 percent

increase in FDI inflows at the aggregate level, 2.9 percent in services sectors and 1.9 percent in the manufacturing industries. Further analysis suggests that immigrants living in more distant countries from Pakistan reduce transaction costs more than those living in nearby countries.

Moreover, immigrants living in both Commonwealth and non-Commonwealth countries facilitate FDI but there is large variation for individual countries especially within the former. Looking at the effects of immigrants in developing and developed countries we find no evidence against the hypothesis that immigrants in OECD and non-OECD countries contribute equally. However, disaggregated analysis suggests a larger effect of immigrants in OECD in both services and manufacturing sectors and more so in the former.

Although our data does not allow us to gauge the effect of immigrants according to their skills directly, sectoral analysis suggests that positive effects of immigrants in FDI inflows in services sectors (which consists of mainly horizontal FDI) and in the manufacturing sector (which is predominantly of vertical type) imply that both skilled and unskilled immigrants contribute in FDI.

These empirical findings on the migration-FDI relationship have highlighted the role of immigrants in a small developing country from rather a new perspective as largely the role of immigrants, till recently, has only been emphasized in the context of remittances they send back home. It would therefore be worthwhile to study the determinants of migration in these countries, given their wider role in the economies of their home and host countries and in the overall process of globalization.

3.9 Appendices

Table A3.1: List of Countries and Sectors

32 source countries of FDI at the aggregate level

Australia Bahama Bahrain Canada China Denmark Egypt France Germany Hong Kong Iran Italy Japan Korea Kuwait Libyan Arab Jamahiriya Luxembourg Malaysia Mauritius Netherlands Norway Oman Qatar Saudi Arabia Singapore South Africa Sweden Switzerland Turkey United Arab Emirates United Kingdom United States of America

16 source countries of FDI at the sectoral level

Australia Canada China France Germany Hong Kong Italy Japan Korea Netherlands Saudi Arabia Singapore Switzerland United Arab Emirates United Kingdom United States of America

5 Service sectors

Mining Construction Transport and Communications Commerce Utility

23 Manufacturing sectors/industries

Food	
Beverages	Cosmetics
Tobacco & Cigarettes	Fertilizers
Sugar	Cement
Textiles	Ceramics
Paper & Pulp	Basic Metals
Leather and Leather Products	Metal Products
Rubber and Rubber Products	Machinery Other than Electrical
Chemicals	Electrical Machinery
Petro Chemicals	Electronics
Petroleum Refining	Transport Equipment(Automobiles)
Pharmaceuticals & OTC Products	Power

Table A3.2: Summary Statistics

Aggregate (32 countries)

Variables	Observations	Mean	Std. Dev.	Min	Max
FDI	192	48.07	135.91	-50.21	1133.04
GDPSUM	192	985950.80	2022091.00	82650.12	11600000.00
GDP DIFFERENCE SQUARED	192	4711131.00	20200000.00	0.64	129000000.00
GDPPERCAPITA DIFFERENCE	192	0.02	0.01	0.00	0.06
TRADE COST SOURCE	192	1.03	0.29	0.20	2.37
TRADE COST HOST	192	1.19	1.64	0.30	23.06
DISTANCE	192	5371.92	2750.66	1801.39	12786.85
IMMIGRANTS	192	72533.20	155529.00	17.84	638605.10

Services and Maufacturing Sectors (16 countries

Variables	Observations	Mean	Std. Dev.	Min	Max
FDI (Service)	480	13.32	64.68	-9.06	1082.18
FDI (Manufacturing)	2208	0.81	8.69	-82.89	283.30
GDP DIFFERENCE SQUARED	480	9411646.00	27700000.00	0.64	129000000.00
GDP PER CAPITA DIFFERENCE	480	0.02	0.01	0.00	0.04
TRADE COST SOURCE	480	1.05	0.32	0.32	2.37
TRADE COST HOST	480	0.99	0.24	0.30	1.77
DISTANCE	480	5957.26	2674.16	2083.98	11392.76

FDI: net FDI inflows in Pakistan in millions of $ in constant 2000 prices from 32 countries at the aggregate and 16 countries at sectoral levels.

GDPSUM: sum of bilateral GDP of Pakistan and source country in millions of $ in constant 2000 prices

GDP DIFFERENCE SQUARED: squared difference in GDP of Pakistan and source country in millions of $ in constant 2000 prices

GDP PER CAPITA DIFFERENCE: difference in per capita GDP and the source country in millions of $ in constant 2000 prices

TRADE COST SOURCE: Mi(cif)/Xj(fob)

TRADE COST HOST: Mj(cif)/Xi(fob)

DISTANCE: distances between capital cities in kilometres

MIGRANTS: stock of migrants in 2000

Sources of data are provided in data description section.

Table A3.3: Heteroscedascity Tests

Aggregate

i. Basic model

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of dependent variable

chi2(1) = 7.80 Prob > chi2 = 0.0052

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: all explanatory variables
chi2(13) = 24.23 Prob > chi2 = 0.0291

ii. Augmented model

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of dependent variable

chi2(1) = 7.17 Prob > chi2 = 0.0074

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: all explanatory variables

chi2(14) = 31.34 Prob > chi2 = 0.0050

Service sectors

i. Basic model

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of dependent variable (fdiln)

chi2(1) = 61.76 Prob > chi2 = 0.0000

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: all explanatory variables

chi2(17) = 85.95 Prob > chi2 = 0.0000

ii. Augmented model

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of dependent variable (fdiln)

chi2(1) = 57.81 Prob > chi2 = 0.0000

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: all explanatory variables

chi2(18) = 86.47 Prob > chi2 = 0.0000

Manufacturing sectors

i. Basic model

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of dependent variable (fdiln)

chi2(1) = 130.54 Prob > chi2 = 0.0000

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: all explanatory variables

chi2(35) = 160.57 Prob > chi2 = 0.0000

ii. Augmented model

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of dependent variable (fdiln)

chi2(1) = 135.27 Prob > chi2 = 0.0000

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: all explanatory variables

chi2(36) = 165.63 Prob > chi2 = 0.0000

Table A3.4: The Effects of Pakistani Immigrants on Aggregate FDI Inflows in Pakistan, 2002-2007.

OLS and Tobit Regressions:	Dependent Variable: ln (FDI+1) from 16 source countries			
	OLS		Tobit	
Independent Variables	col1	col2	col3	col4
GDPSUM	1.455***	0.707	1.503***	0.779**
	3.24	*1.64*	*3.86*	*2.08*
GDP DIFFERENCE SQUARED	-0.294*	-0.167	-0.300**	-0.178*
	-1.97	*-1.28*	*-2.43*	*-1.67*
GDP PER CAPITA DIFFERENCE	1.755***	2.459***	1.687***	2.375***
	2.84	*4.28*	*3.14*	*4.75*
DISTANCE	-1.469	-1.073	-1.558**	-1.161*
	-1.63	*-1.52*	*-2.01*	*-1.89*
TRADE COST SOURCE	-0.819	-0.396	-0.726	-0.34
	-1.15	*-0.66*	*-1.23*	*-0.68*
TRADE COST HOST	1.719***	1.692**	2.175***	2.036***
	2.92	*2.55*	*3.17*	*2.86*
CONTIGUITY	5.395**	8.729***	5.276**	8.484***
	2.11	*3.55*	*2.47*	*4.15*
COMMON WEALTH	0.503	0.209	0.623	0.315
	0.76	*0.41*		*0.7*
IMMIGRANTS		0.366***		0.351***
		4.93		*5.22*
CONSTANT	4.737	8.983	4.534	8.617
	0.44	*0.98*	*0.49*	*1.11*
TIME FIXED EFFECT	YES	YES	YES	YES
Observations	96	96	96	96
Adj.R-squared	0.405	0.497		
Log pseudolikelihood			-170.189	-162.996

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are under the estimates.

Table A3.5: The Effects of Pakistani Immigrants in Commonwealth Countries on FDI Inflows in Pakistan in 5 Services Sectors, 2002-2007.

OLS and Tobit Regressions: Dependent Variable: ln (FDI+1) from 16 source countries

	OLS Models			Tobit Models		
Independent Variables	col1	col2	col3	col1	col2	col3
GDPSUM	0.722***	1.077***	0.709***	0.679***	1.074***	0.691***
	3.84	*5.86*	*3.80*	*3.47*	*5.72*	*3.65*
GDP DIFFERENCE SQUARED	-0.204***	-0.459***	-0.362***	-0.178***	-0.443***	-0.339***
	-2.93	*-6.25*	*-5.16*	*-2.60*	*-6.15*	*-4.92*
GDP PER CAPITA DIFFERENCE	0.828***	0.014	0.05	1.259***	0.347	0.434*
	4.38	*0.07*	*0.26*	*5.01*	*1.44*	*1.78*
DISTANCE	0.181	2.071***	2.412***	0.061	1.938***	2.211***
	0.6	*5.34*	*6.33*	*0.20*	*4.78*	*5.47*
TRADE COST SOURCE	0.07	-0.17	0.187	-0.187	-0.391	-0.038
	0.28	*-0.71*	*0.76*	*-0.69*	*-1.54*	*-0.15*
TRADE COST HOST	0.377*	0.308*	0.663***	0.644**	0.555**	0.880***
	1.81	*1.75*	*3.28*	*2.5*	*2.42*	*3.55*
CONTIGUITY	2.939***	0.901	1.394*	4.322***	1.899**	2.565***
	4.00	*1.26*	*1.96*	*4.38*	*2.10*	*2.78*
COMMONWEALTH	-0.279	-1.620***		0.26	-1.410***	
	-0.32	*-5.81*		*0.28*	*-4.76*	
IMMIGRANTS	0.220***	0.105***	0.257***	0.291***	0.154***	0.309***
	4.66	*3.26*	*5.64*	*5.30*	*4.17*	*5.99*
COMMONWEALTH * IMMIGRANTS	0.026			-0.009		
	0.32			*-0.10*		
IMMIGRANTS * UK		0.225***	0.062***		0.214***	0.067***
		7.30	*2.94*		*6.69*	*3.10*
IMMIGRANTS * AUSTRALIA			-0.223***			-0.190***
			-5.56			*-4.31*
IMMIGRANTS * CANADA			-0.222***			-0.201***
			-8.60			*-7.04*
IMMIGRANTS * SINGAPORE			-0.072			-0.036
			-1.46			*-0.70*
CONSTANT	-7.680**	-27.446***	-27.911***	-6.101	-26.289***	-25.856***
	-2.01	*-6.02*	*-6.72*	*-1.52*	*-5.55*	*-5.81*
TIME FIXED EFFECTS	YES	YES	YES	YES	YES	YES
SECTOR FIXED EFFECTS	YES	YES	YES	YES	YES	YES
Adj.R-squared	0.386	0.458	0.486			
Log pseudo likelihood				-679.096	-658.95	-649.813

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are under the estimates.

Table A3.6: The Effects of Pakistani Immigrants in Commonwealth Countries on FDI Inflows in Pakistan in 23 Manufacturing Industries, 2002-2007.

OLS and Tobit Regressions: Dependent Variable: ln (FDI+1) from 16 source countries

	OLS Models			Tobit Models		
Independent Variables	col1	col2	col3	col1	col2	col3
GDPSUM	0.208***	0.277***	0.202***	0.241***	0.540***	0.269***
	6.09	*8.05*	*5.92*	*2.84*	*7.59*	*3.46*
GDP DIFFERENCE SQUARED	-0.045***	-0.100***	-0.082***	-0.01	-0.177***	-0.108***
	-3.73	*-7.52*	*-6.49*	*-0.37*	*-6.60*	*-3.93*
GDP PER CAPITA DIFFERENCE	0.181***	-0.005	-0.008	1.084***	0.429***	0.515***
	5.99	*-0.15*	*-0.21*	*7.7*	*3.70*	*4.02*
DISTANCE	-0.039	0.410***	0.501***	-0.511***	0.475***	0.639***
	-0.61	*4.77*	*5.09*	*-3.94*	*2.72*	*3.31*
TRADE COST SOURCE	0.025	-0.019	0.056	-0.114	-0.195*	0.016
	0.63	*-0.49*	*1.42*	*-1.07*	*-1.94*	*0.16*
TRADE COST HOST	0.124***	0.119***	0.197***	0.464***	0.394***	0.616***
	3.69	*3.96*	*5.63*	*4.37*	*3.84*	*5.88*
CONTIGUITY	0.511***	0.059	0.135	3.411***	1.404***	1.973***
	5.26	*0.58*	*1.39*	*6.77*	*3.65*	*4.64*
COMMONWEALTH	-0.205	-0.364***		1.176**	-0.569***	
	-1.34	*-6.13*		*2.57*	*-4.04*	
IMMIGRANTS	0.043***	0.022***	0.053***	0.242***	0.124***	0.226***
	4.80	*3.72*	*5.61*	*8.6*	*6.69*	*8.77*
COMMONWEALTH * IMMIGRANTS	0.023			-0.090**		
	1.45			*-2.19*		
IMMIGRANTS * UK		0.056***	0.020***		0.095***	0.028***
		7.33	*3.27*		*6.3*	*3.13*
IMMIGRANTS * AUSTRALIA			-0.054***			-0.106***
			-6.00			*-4.86*
IMMIGRANTS * CANADA			-0.048***			-0.098***
			-7.00			*-6.41*
IMMIGRANTS * SINGAPORE			-0.019**			0.041*
			-2.20			*1.68*
CONSTANT	-1.423*	-6.013***	-6.309***	2.748	-8.953***	-8.184***
	-1.90	*-6.23*	*-6.31*	*1.63*	*-4.77*	*-4.14*
TIME FIXED EFFECTS	YES	YES	YES	YES	YES	YES
SECTOR FIXED EFFECTS	YES	YES	YES	YES	YES	YES
Adj.R-squared	0.222	.25	.258			
Log pseudolikelihood				-1339.78	-1321.02	-1297.15

Notes: * p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are under the estimates.

Chapter 4: Determinants of Migration in Pakistan

4.1 Introduction

With an average population growth rate of more than 2.5 percent for decades, Pakistan is a labour surplus country. Therefore, like many developing countries, export of labour is one of its development strategies. It is one of the top 10 major emigration countries in the World. [120] Export of labour reduces unemployment; increases wages and the remittances sent home improve the balance of payments and reduce poverty. [121] However, much has been studied about remittances in the developing countries, their determinants and consequences because of their fiscal expediency and availability of data; little is known about determinants of international migration itself because of lack of data. [122] [123]

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[120] According to the World Bank estimates, Pakistan is among the top 10 emigration countries with 4.7 million emigrants in 2010.[120] These emigrants remitted 9.4 billion US$ (officially) to Pakistan making her the 11th top receiving country in the world. For review of literature on the role of remittances in the economy of Pakistan see Iqbal and Sattar (2005). The Contribution of Workers'Remittances to Economic Growth in Pakistan. Research Report No 187, Pakistan Institute of Development Economics

[121] This reasoning has led countries such as the Philippines, Portugal, and Turkey (Paine,1974) to make worker exports an integral part of their economic development strategy. See Carrington et al (1996).

[122] a. An important source of data on remittances is the House Income and Expenditure Survey (HIES) in Pakistan reports "Absent household members such as migrant workers in the Middle East, are not considered to be part of the household and their income (as far as made available to the household) is included as remittances received." There is no emphasis to record migrant data. A casual question asked is about the relationship of the person with head of household from whom major part of remittances is received. Other sources contain data on migrants that has emphasis in Middle East countries and those who go by registering through Bureau of Emigration and Overseas Employment, Pakistan.

[123] Recent study by Borjas (2006) on labour migration in and from Puerto Rico has also international dimension. Previous studies on Latin American countries are limited in scope and study migration from Mexico to the US. On Pakistan, one study by Nisar et al. (2008) on the determinants of migration in Pakistan is based on aggregate time series data on migrants going through official channel. However, as noted by Iqbal and Sattar (2005) their data set is limited as significant number of migrants goes through unofficial channel. The analysis revealed that the migration from Pakistan (number of emigrant workers (flow) in logs) was found positively related with inflation and unemployment rate in the country and was negatively related with real wage rate. Thus inflation, unemployment and declining wage rate were the push factors for international migration from Pakistan. Moreover, the findings of the research paper showed that the international migration was also influenced by the inflow of the remittances positively. The size and amount of remittances was mainly dependent upon the economic conditions of the host country. Therefore, the inflow of remittances was safely considered as the pull factor of international migration from the country.

The development of international data on migration during the last decade has led to a number of studies relating to either one destination country like the US or for a few destination OECD countries. Moreover, these studies pool migrants from the developed and developing countries together. However, in Pakistan's context studying only the determinants of migration in the OECD countries would be only a part of the story because majority of 60 percent of Pakistanis go to the Middle East countries as our data analysis on migrants from Pakistan presented in a subsequent section of this chapter indicates. There is a huge difference in the structure and the quality of migrants in these two regions. While migrants to the Middle East/Gulf countries are mainly skilled or unskilled construction workers working on short contract periods in response to the demand in these areas due to huge infrastructural development, the migrants towards OECD countries are mainly educated people who go to these countries to get higher returns usually on permanent basis. They are also selected by the immigration policies in these countries which prefer educated workers who could contribute in their economies. Workers in the non-OECD countries are comparatively from lower income groups who go without their families, while the migrants to the OECD go with their families. Gulf countries are near and less costly to travel to and they have similar culture. The number of emigrants varies across destinations, reflecting differences in both their attractiveness and openness to international migrants.

Given the broad diversity of migration patterns in Pakistan both with regard to the characteristics of migrants and of the countries of their destination, it would be interesting to identify the determinants of migration and to extend the literature on developing countries.

4.2 Objectives of the Study

The literature on international migration from developing countries is very limited as noted earlier. These studies mostly look at the supply side determinant of migration and find that low income, population pressure on resources and increase in the cohort of young potential migrants -'demographic supply side pressure' are the main driving force of migration in less developed countries Hatton and Williamson

(2001, 2011). Other studies (for example Mayda, 2010) which are mostly from OECD host countries' perspectives consider the demand side determinants and use some exogenous measures of immigration policies of the host countries which are subjective in nature.[124] In addition these studies also overlook the demographic characteristics of host countries which are important in the making of these policies.

We attempt to balance both supply and demand factors in our analysis. Given the supply side determinants, this study focus on the demand side determinants like demographic features of the destination countries which have been largely overlooked in the previous migration studies and which are the basis of immigration policies. The demand for working age human capital in the developed world has increased over the years due to their demographic transition. According to the World Migration Report (2008) the demand for human capital in the developed world will increase further as the population aged 20-64 is expected to decline by 23% from 741 million to 571 million by 2050. The proportion of population above the age of 60 is expected to grow from 21% in 2007 to 32% in 2050 which may further increase the number of dependents on working age population and would exert pressure on available resources. In addition the population density of a country which is a proxy for amenities available may affect the migration. As migrants expect a better living standard in potential host country they will prefer countries which are not too densely populated.

The other main focus will be on the role of migrant network (or family and friends effect) on emigration from Pakistan. It is now well documented in the literature that family and friends reduce the cost of potential migrants in several ways, like by providing them cost of travel, food and shelter and information about jobs and opportunities in destination countries,. A few studies also relate to the influence of the previous stock of migrants on the immigration policies of the destination countries which encourage families and friends to migrate. Given the poverty levels in Pakistan, the role of previous stock of migrants is important in determining the propensity to migrate of future emigrants. Therefore, it is useful

[124] Mayda (2010), constructs a data set by considering the timing of immigration policies changes and 'qualitative assessment' of the direction of changes in law '(loosening vs. tightening)' See footnote 19.

to study the determinants of migration from Pakistan. We also explore whether these networks have different impacts in both OECD and non-OECD regions which have diverse demographic, socio-political and economic features which affect the demand for labour both in numbers and in their skill levels.

A modified gravity model is used to study the emigration rate from Pakistan to 175 countries for the period 1980-2000. The results indicate that high income in host countries is important in explaining migration from Pakistan. Moreover, other amenities also attract migrants as they are likely to go to places which are not densely populated. The impact of an increase in the tertiary rate of education in the host country reduces migration from Pakistan. The impact of past migration is positive and highly significant on future migration indicating a strong network of families and friends.

The structure of this chapter is as follows: an overview of emigration from Pakistan is presented in section 4.3. Section 4.4 discusses theoretical models of migration and section 4.5 review empirical studies based on the predictions of these models. In section 4.6 we present our empirical models and explain the data and empirical methodology in section 4.7. The empirical results are provided in section 4.8 and finally the conclusions.

4.3 An Overview of Trends and Pattern of Migration from Pakistan

This section presents the spatial and temporal patterns of migration from Pakistan to 223 host countries in broad regional and top host countries in 1980, 1990 and 2000.[125] The data we analyse is extracted from the world wide migration data prepared in collaboration of the United Nations, the World Bank and the University of Sussex for 226 countries' bilateral matrices for the period 1960-2000. The data set does not contain any characteristics of the migrants (except the gender), but is unique as it contains migration stocks in both OECD and non-OECD countries.[126] Therefore, to understand the dynamics of migration

[125] The data on migration to India and Bangladesh was excluded as it caused lot of noise in the overall data. Moreover, we do not consider stock data before 1980 due to partition of Pakistan in 1971.

across the countries in these two regions, an attempt is being made to supplement this information from other studies which though limited in their scope and based on mainly micro level surveys could provide some relevant information in this regard.

Several factors are likely to influence the size and destination of labour movements at each point in time and contribute to the variation observed in the data. Table 4.1 presents migration stock of Pakistani origin in the OECD and non-OECD countries during the last three decades.

Table 4.1: Numbers and the Percentage Shares of Emigrants from Pakistan to OECD and Non-OECD Countries (1980, 1990, 2000)

	Numbers			Shares (%)		
	OECD	Non-OECD	Total	OECD	Non-OECD	Total
1980	296145	573703	869848	34	66 (89*)	100
1990	420896	1169088	1589984	26	74 (96*)	100
2000	918576	1572771	2491347	37	63 (94*)	100

. *Shares of migrants in Middle East countries in Non-OECD countries.
Source: Parson's data on migration, World Bank.

The total recorded stock of migrants stood around 2.5 million in 2000 up from 1 million in 1980. Across the three decades, less than 40 percent immigrants reside in OECD countries (30 countries).[127] However, it is also noteworthy that the shares of migrants going to the OECD countries have risen more recently from 26 percent in 1990 to 37 percent in 2000.

An overwhelming majority of immigrants residing in non-OECD countries are located in rich Middle

[126] We are grateful to Chris Parsons in providing the unpublished data relating to migration from Pakistan for this study. The data provided is not gender disaggregated, so in this study we could not make use of this important information. The data set is 'less than ideal'. The two main definitions are applied in accounting for migrants i. Place of birth ii. Country of citizenship. The former being the preferred option.

[127] Contrast to the overall data on immigrants in OECD countries where it has been reported that two-thirds immigrants come from low-income countries (Gaston and Nelson 2010, table 3).

East countries (Gulf region),[128] which are geographically near and are of similar culture. Although the number of Pakistani migrants in both regions has increased over time, the data indicates some variations in the shares of migrants across these regions during this period. It could be observed that the share in the migrants going to non-OECD (Middle East) countries have risen dramatically to 74 percent (96 percent) in the 1990 reflecting the high demand in the Middle East countries for labour for construction activities during 1980s. In the 1990s due to gulf war of 1991 the share of migrants in these countries declined to 94 percent which led to a decline of the overall share of non-OECD countries to 63 percent in 2000.

According to Lucas (2005), during the period from 1977- 1985 less than 2 percent of the total migrants to the Middle East were professional or managers, 18 percent were masons, carpenters and electricians. As these economies grew, there was demand for workers with different skills – particularly for services such as transport, trade, social infrastructure, and even the provision of private and public security. The demand for uneducated and unskilled labour has fallen since 1991 Gulf War when regional economic activity declined. By 1990-96, the proportion of professional migrants have increased and averaged nearly 8 percent.[129]

To look at the more disaggregated geographical dispersion of Pakistani emigrants, Table 4.2 displays the distribution of emigrants in top 10 destination countries during the last three decades. The top 10 destinations listed in the Table account for around 90 per cent of the Pakistani emigrants.

The Pakistani emigrants are largely concentrated in three countries Saudi Arabia, the UAE and the UK. On the whole these three countries have been host to 68, 73 and 63 per cent of the total migrants. Although the number of emigrants has increased in these countries over time, the shares of immigrants in

[128] The Arab world as referred to by the World Bank uses the membership list of the League of Arab States. . We have added Israel in this region. http://data.worldbank.org/region/ARB

Non OECD countries are other than OECD member countries as of 2000. ^ "Ratification of the Convention on the OECD". OECD.org.

[129] The remittances from the Middle East helped in reducing poverty at home. Pakistan also enjoyed high growth rates across sectors until the late 1980s compared with other developing countries in the region (Gazdar, 2003).

the total have been fallen recently. This change in the composition of the migrant stock indicates that the migrant flows are being diversified over the period. While the share in the Saudi Arabia has fallen recently after reaching a peak (37 per cent) in 1990, the share in the UAE is more or less consistent over the period at a little more than 20 percent. Likewise, the share of migrant stock in the total has fallen in

Table 4.2: Shares (%) of Emigrants in Top Ten Countries

Countries	1980	Countries	1990	Countries	2000
Saudi Arabia	26.0	Saudi Arabia	37.1	Saudi Arabia	25.6
U.K.	21.6	U.A.E	20.8	U.A.E.	22.9
U.A.E.	20.5	U,K.	15.1	U.K.	14.0
US	3.8	US	5.5	US	9.2
Yemen	3.1	Oman	3.1	France	4.5
Germany	2.9	Kuwait	2.6	Canada	3.2
Kuwait	2.6	Yemen	2.1	Oman	2.9
Afghanistan	2.1	Bahrain	1.3	Kuwait	2.3
Oman	2.0	Canada	1.2	Yemen	1.6
Canada	1.9	Qatar	1.2	Germany	1.5
Others	13.2	Others	9.7	Others	12.2
Total	100.0	Total	100.0	Total	100.0

Source: Parson's data on migration, World Bank.

the UK over decades despite a well recognized role of social networks (biradri) of Pakistanis there.[130] Since Britain has special historical links with Pakistan, it had more friendly policy towards migrants as a part of her policy towards Commonwealth countries. However, the Immigration Act of 1988 in the UK limited the entry of families of workers (Ceri Peach, 2005).[131]

There is also some evidence that migration flows have risen in other destinations in Europe during the last decade for example in France where the share of stock of Pakistani immigrants rose to 4.5 per cent in 2000. There is also a significant increase in the shares in North America, specifically in the US and

[130] Anwar Muhammad (1995) 'Social Network of Pakistanis in the UK: A Re-evaluation in 'Ethnicity, Social Networks and Situational Analysis' edited by Alisdair Rogers, Steven Vertovec.

[131] Ceri peach: The UK:Transition from immigrants to ethnic communities, Johannes Pflegerl, Sylvia Trnka (eds.) in:Migration and the Family in the European Union Schriftenreihe des ÖIF Nr. 13, Wien, 2005

Canada over the period.

The demand conditions and policies of the host countries are significant in the selection and sorting of migrants from Pakistan over time. Unlike in non-OECD countries, in OECD countries there are severe quantitative and qualitative restrictions on immigration which makes migration costlier.[132] Due to these restrictions current migration is of people with relatively strong initial endowments of various forms of capital: financial, human and social (Gazdar, 2003; Lucas, 2005). Another study by Docquier and Rapoport (2009) provide data on researchers' (in Science and Technology) emigration numbers and rates to the US for 70 countries, including 39 developing states. According to this study, the average emigration rate of developing countries which includes Pakistan (45.6 percent) exceeds that of developed countries (21.4 percent). The estimates of brain drain are also higher in these countries, for Pakistan it is 53.2 percent.[133] [134]

Another major difference between migration to the Middle East and the developed countries is the relatively weak propensity or ability of workers to bring over their families and dependents. This is partly due to the migrant workers' own predisposition towards saving most of their incomes, and partly due to the policies of host governments which do not extend secure residential or citizenship rights to migrants.[135]

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[132] Migration policies also affect the cost of migration. "quotas play the important role of increasing migration costs of emigrants (if the numerical constraints are binding), since these individuals will presumably have to compete (and invest time and effort) to obtain the relatively scarce visas. Hence mobility costs ensure that only some persons in country 0 find it worthwhile to emigrate and thereby create the selection biases that are apparent in immigration data." Borjas(1987 page 535). If the policies are selective and biased towards skilled immigration then it would be more costly for unskilled workers to migrate given his already low propensity to do so due to poverty.

[133] The number of S&T researchers of Pakistani origin reported are 14682 and number of researchers in Pakistan are 12919 'Quantifying the Impact of Highly-Skilled Emigration on Developing Countries' Docquier, and Rapoport CEPR project, Fondazione Rodolfo Debenedetti draft: May 16, 2009

[134] There is also evidence that in the late 1980s and early 1990s the US 'permitted' the immigration of agricultural workers through the 'green cards system' in which visas are awarded by lottery. This led to a wave migration of blue collar workers. 'Pakistani Migration to the United States: An Economic Perspective'. IDE Discussion Paper No.196. Institute of Developing Economies, JETRO. Hisaya Oda

Despite these limitations, there is ample evidence that social networks of migrants are very active in the Middle East in facilitating migration of their relatives and friends. As cited in Lucas (2005), Azam studying migration to these countries from two districts in Pakistan finds that around 40 to 50 percent of migrants obtained their placement through friends and relatives. Another survey study by Shah (1998) among South Asian males in Kuwait validates these findings and reports that among the Pakistani skilled and unskilled workers, 48 percent and 63 percent were facilitated by friends and relatives.

Moreover, Pakistan is among the top ten remittance receiving countries in the world. The remittances sent by the migrants living abroad reduce poverty and encourage more migration.[136]

The analysis in this section shows that there is a rising trend of migration over the period 1980 to 2000. Though the share of migrants in non-OECD countries are larger than in OECD countries but this share is rising in the latter since 1990. The top three destination countries are Saudi Arabia, the UAE and the UK. However, more recent data indicates that other destinations in Europe like France and Germany and other countries like the US and Canada are attracting migrants from Pakistan.

A few survey studies on migration from Pakistan also provide some evidences of social networks helping future migrants in getting visas and jobs. The role of remittances sent by the migrants is also important in reducing poverty and hence increasing the propensity to migrate. However, no empirical work has been conducted to explore the impact of past migration on future migration from Pakistan which this study attempts to do.

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[135] This pattern changed somewhat as more people from professional and commercial backgrounds began to migrate to the Middle East. See Gazdar (2003)

[136] Nisar A. et al. (2008) find a significant positive effect of remittances on aggregate migration from Pakistan and identify it as a 'pull' factor.

4.4 A Review of Theoretical Literature

Economists have for long tried to study and model the motivation of people to migrate and persistence of migration flows across space and time. There are several explanations of migration embedded in neoclassical and new economic theories. These theories use different concepts and frames of reference and are based on different assumptions. They offer differing explanations with different implications for immigration policies. While the neoclassical theory is mainly based on income/utility maximization given the cost of migration (See Borjas 1987, 1989), new economic approaches have more emphasis on cost minimization and diversification of risks (Stark, 1991). Network theory encompasses both the aspect of maximization of utility and minimization of costs and explains the persistence of the migration process across space and time. Massey et al (1993, page 432) explain and try to synthesize these theories to explain the current trends and diverse patterns of migration. They suggest that 'a full understanding of contemporary migratory processes will not be achieved by relying on the tools of one discipline alone, or by focusing on a single level of analysis. Rather, their complex, multifaceted nature requires a sophisticated theory that incorporates a variety of perspectives, levels, and assumptions.'

As there is no single coherent theory of international migration, the recent empirical studies on the determinants of migration use a combination of variables which reflect various supply and demand side approaches. The broad aim of this section is to review briefly these theories.[137]

Neo classical macro economic theories emphasize the difference in wages between countries as the main cause of migration. The equilibrium wage is determined by the supply and demand of labour. The workers move from a low wage country which has a large endowment of labour (relative to capital) to a country where labour is scarce and could be employed more productively and therefore could earn higher wages. The process of labour mobility will continue until the wages are equalized at equilibrium and any

[137] Massey et al (1993) provides an elaborate analysis of all the theories of migration.

differences in wages are due only to costs of migration. Accordingly, Hicks states "differences in net economic advantages, chiefly differences in wages, are the main causes of migration." [138]

There are divergent views of economists on the significance of supply and demand factors in the process of migration. The supply and demand for labour are largely determined by demographic forces. While the OECD countries face the problem of declining and ageing populations, creating demand for labour, there is a surplus supply of labour due to high birth rates in the developing countries. According to a UN estimate Europe and Japan may lose 12 and 17 percent of their populations in the next five decades, UN 2000.[139] Therefore differences in wages and demographic factors are considered the primary factors for migration in origin and destination countries.[140]

A few scholars who emphasize demand side determinants, for example Piore (1979), argue that international migration is not caused by push factors like low wages and unemployment but it is due to the permanent demand for immigrant workers which is built-in the industrial structure of developed economies. They note that statistical models that regress secular trends in international migration on the market conditions in the origin and destination countries identifying a higher significance of indicators of the destination countries than for the origin countries.[141]

A relatively large number of scholars, especially neo classical theorists, give more importance to supply side. It is this approach which is more popular in recent empirical studies. Sjaastad (1962) and Borjas (1987, 1989, 1990, 2000) consider migration as a form of investment for a rational individual who aims at maximizing his income. To maximize his income, he compares the cost and benefit of moving to alternate

[138] As quoted in footnote 1 in Borjas (2006).

[139] As quoted in Pederson et al. (2008).

[140] But the demographic factors particularly related to the host countries have been ignored in the empirical literature as we will note in the next section on our review of empirical studies. Immigration policies are formulated keeping in view these demographic changes in the country which in turn affect migration.

[141] For example they note that in a regression predicting migration to Germany from Turkey, the indicators like real wages and employment rates in Germany have more predictive power. See Massey (1993). In the next section of our empirical review we find these observations consistent with the findings in many studies.

locations according to his skill and migrate where the present value of his life time earnings is higher. It costs M dollars to move from i to j. These migration costs include the actual expenditures incurred in transportation, as well as the "psychic cost" due to pain and suffering of leaving one's family and friends. The net gain of migration is given as:

$$\text{Net Gain} = \sum_{k=t}^{T} \frac{w_{jk} - w_{ik}}{(1+r)^{k-t}} - M, \qquad (4.1)$$

Where i and j stands for the home and host countries, r is the discount rate and T is the age of retirement and w denotes wages. The worker moves if the net gain is positive. Borjas (2000) proposes three testable propositions from the above framework. First, the likelihood of migration would increase if economic opportunities i.e.net gains improve in the host countries (j), secondly, an improvement in the economic opportunities at home (i), lowers the net gains to migration, and decreases the probability that the worker moves and thirdly, an increase in migration costs (M), lowers the net gains to migration, and reduces the likelihood of a move.

Moreover, expressing wages as proportional to the skills of an individual Borjas (1989) implies that an individual will migrate to a country where the value of his skill is higher.[142]

In another formulation Borjas (1990) expresses this net gain as the expected net return, the difference in the expected net earnings expressed as observed earnings and the probability of employment in the host and home countries over some time horizon. Thus international migration occurs from international differences in both earnings and employment rates. In addition the equation also indicates that migration is a forward looking decision. Since earnings are considered in present value terms, with younger individuals having higher present values, emigration rate should be positively related with younger adults in population.[143]

[142] Economic Theory and International MigrationAuthor(s): George J. Borjas Source: International Migration Review, Vol. 23, No. 3, Special Silver Anniversary Issue:International Migration an Assessment for the 90's (Autumn, 1989), pp. 457-485.

Research works by Borjas are highly influential in the study of migration. However, it has been observed that his model does not fit the data on developing countries where the rise in income has been associated with increased migration instead of reducing it. Moreover, the model is also criticized for its assumption of constant costs since M is defined as "time-equivalent" measure of the costs of emigration which is assumed constant across all individuals in the country of origin (Borjas, 1987). Borjas (1989, page 464) clarifies that this assumption does not mean that dollar mobility costs are constant, since it is the ratio of cost to wages in the origin country that is assumed constant. "Instead, it is basically assuming that individuals with higher earnings capacities find it more expensive to migrate. This correlation may be caused by the higher foregone earnings associated with unemployment spells in the host country while the individual is searching for job, higher costs of moving household goods, etc." This assumption has been criticized on two grounds by Chiswick (2000). Firstly, Borjas' model ignores the 'out-of-pocked' fixed costs of migration which are independent of ability, and are much higher for poor people. Secondly, it does not take into account that more able individuals will be more efficient in migration process. According to Chiswick's arguments, higher ability increases productivity in the labour market and enhances investment in human capital so that the same amount of investment may involve a fewer units of time and/or fewer units of out of pocket costs (efficient utilization of pocket expenditure). Thus "those with more human capital, for example, those with more schooling and greater proficiency in destination language skills, are more efficient in obtaining and interpreting information and in making decisions (greater allocative efficiency), they would be more efficient in the migration process (Schultz 1975)."[144]

It follows from above that, due to costs considerations, individuals with low skill and lower income in developing countries are less likely to migrate. This is consistent with the data on migration of brain drain

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[143] Studies focussing on supply side therefore use share of young population in the origin countries as one of their explanatory variables Hatton and Williamson (2011).

[144] As cited by Chiswick (2000).

in these countries,[145] but at odds with the prediction of Borjas model of negative selection from these countries.

The assumption of income maximization is also very strong as individuals also consider other factors like weather, culture and other amenities in other countries before migrating. However, Borjas (2000) maintains that income maximization is a necessary condition for utility maximization.[146] The differences in wages could be due to these differences in amenities offered by different regions to the same individual and wages may be lower in a pleasant country termed as "compensating wage differentials". So although wages may be different for an individual in different labour markets, individual's utility is constant across these markets. However, Borjas (2000, page 6) maintains "The wage differentials that are the focus of the human capital approach—and that determine the migration decision in equation (4.1)—are the ones that persist after the analysis has controlled for regional differences in the value of amenities and disamenities." However, Borjas ignores networks as an amenity.

Many other assumptions and conclusions of the neo classical theory have been challenged by the New Economics of Migration (NEM) initiated by Stark and Lehri (1982) and Stark and Bloom (1985). According to these NEM theorists, the focus of neo classical economists is on the income maximization of an individual under complete or well functioning markets. However, the migration decision is not taken by an individual but by a number of related households. The motivation of these household members is not only to maximize total household expected income but also to minimize risks in the absence or incomplete credit and insurance markets and overcome credit constraints on family production activities. To minimize risks they also diversify the allocation of family labour; some of the members working at home while others may go abroad to work. The remittances sent by the members abroad are a

[145] See Docquier and Rapoport (2007).

[146] "The fact that migration maximizes utility introduces a number of interesting twists into the study of migration decisions." Borjas 2000.

reliable source of income when local production fails to provide sufficient income.[147] Moreover, these remittances are also used to cover the cost of other potential migrants in the family and thus create a chain of migration.

The propositions of these NEM models are quite in contrast with those of neo classical theory. First, the decision making unit in the case of migration is not an individual but it is the household who decides. Second, difference in income between countries is not the necessary condition for international migration since households are more concerned to diversify risks and income is not assumed to be homogenous goods as in neo classical world but sources of income matters. It is further asserted that international migration would continue in the absence of wage differentials because uncertainty due to lack of good credit and other supportive institutions. Finally, the proponents of NEM question the assumption of neo classical economics that income has a constant effect on utility for individuals across socioeconomic classes and argue in contrast that people migrate not only to increase absolute income but to improve their relative income and reduce their relative deprivation relative to some 'reference group'. This implies that income inequality may exacerbate migration.

These two broad theoretical approaches provide two diverging determinants of migration, one giving more emphasis to income maximization of income by assuming that markets are complete or are well functioning while the other puts more emphasis on risk minimization where markets are absent or incomplete. But these two objectives are interconnected because there is high correlation between incomplete markets which NEM models consider and low incomes which is the main determinant of migration in the neo classical models (Massey et al. 1993).

In contrast to the above two approaches which take static views of migration, network theory takes a dynamic approach and considers both the objectives of income/utility maximization and cost

[147] Due to bad weather or other natural calamity or other market failures.

minimization as a result of positive externality of migration.[148] Although network theory combines theses two approaches by asserting that migrants prefer living with their friends and relatives who had previously migrated (amenity) to maximize their utility,[149] and also argues that moving is less costly as established networks of migrants assist them in migration process by providing information about job and housing, give them credit, help them in temporary lodging and adapting to new culture and language of the destination countries.

A recent influential work by Carrington et al. (1996) based on a dynamic model of migration establishes that in the presence of networks, labour emigration may accelerate over time despite declining wage differentials between the source and destination due to a growing stock of previous migrants lowering moving costs for future migrants. His work was motivated by the migration of blacks from the South to the North in the US. Their model assumes the 'one-time' moving cost to be heterogeneous for workers in the origin region, but decreasing function of the stock of previous migrants in the destination. An important implication of this model is that migration leads to interregional income convergence.

Network theory emphasizes the positive role of networks in reducing migration costs and thus focuses on potential poor migrants. From the evidence that networks reduce migration costs for poor potential migrants who are also unskilled, a few studies find that networks lead to negative selection (McKenzie and Rapoport, 2010). However, another aspect which these studies ignore is the possibility that networks can reduce costs of hiring immigrants for foreign employers by providing information about his fellow countrymen productivity and facilitate in emigration of highly skilled individuals. Katz and Stark (1984, 1987) develop a model of asymmetric information.[150] According to this model, a producer in the origin country knows the true productivity of local labour due to his long experience and pays labour according

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[148] Early works on networks include Nelson (1959), Rees (1966) and Greenwood (1970). See Massey et al (1993), Carrington et al (1996) and Gaston and Nelson (2010) for the survey of literature on migration.

[149] By building sub cultures of their own abroad where they feel much at ease.

[150] As cited in Chiswick (2000).

to their actual productivity. However, employers in the destination country cannot differentiate potential migrants by their abilities and thus end up offering wages according to average (expected) productivity of migrants. This leads to high ability workers having a smaller wage differential and higher foregone earnings than low ability workers which lowers their incentive to migrate. The increase in migration of lower ability workers drives down the expected wages of immigrants in the destination country further discouraging migration of more productive people. It is in this context that the role of previous migrants has largely been ignored in the migration literature. By providing information to employers in the destination about the quality of work force in their country of origin they play an important role in reducing the possibility of adverse selection due to asymmetric information.

Another strand of literature which is still in its early stages, studies the impacts of political-economy factors on migration policy (Benhabib 1996; Ortega 2005; Facchini and Willman 2005).[151] These studies suggest that preferences of voters (which are affected by the "human-capital gap" between natives and immigrants) and interest-group politics play an important role in influencing migration-policy decisions. Based on this political-economic setting, the empirical impact of network of migrants on future migration has yet to be developed as economists are working on quantifying the effects of immigration policies.

The review of theoretical literature points towards various dynamics of international migration. The process of migration is based on both supply and demand side determinants which consist of economic, socio-political and demographic factors. While the focus of neo classical economists is on income maximization, the new economics economists emphasize risk minimization as the cause of migration. The network theory takes a dynamic approach and considers both objectives of income/utility maximization and cost minimization into account. According to the network theory, to maximize their utility, potential migrants prefer living with their friends and relatives who had previously migrated, and these established networks of migrants help in reducing economic and uneconomic costs of potential migrants by providing

[151] See Mayda (2005) for the review of this literature.

information about job and housing, give them credit, help them in temporary lodging and adapting to new culture and language of the destination countries and influencing immigration policies' outcomes.

Since there are many facets of migration process as this review illustrates, the empirical studies try to capture all these aspects and therefore considers a multitude of factors in their models in a modified gravity framework to study the determinants of migration. The next section reviews these empirical studies.

4.5 A Review of Empirical Studies

The gravity model has been used to study the pattern of migration for over a century. [152] The main focus of this section is to review the estimates and impact of specific determinants of international migration in recent studies using a modified gravity model of migration based on Roy-Borjas model of human capital investment. Taking per capita GDP and distances as proxies for wages and costs of migration, the Roy-Borjas selection model is generally represented by the following form:

$$M_{ijt} = \beta G_{ijt} + \lambda_{ijt} + \varepsilon_{ijt} \qquad (4.2)$$

Where Mijt is the value of migration from origin country j to destination country i; Gijt is the matrix of standard gravity variables like GDP of origin and host countries also referred as push and pull factors in migration literature. It is hypothesized that lower GDP in the origin country would lead to emigration to host countries with higher GDP. Other standard gravity variables distances, common border and languages and culture affect cost of migration and it is expected that there will be less migration in distant and dissimilar countries which involve high economic, time, psychic and information costs; λ_{ijt} is a matrix of fixed effects and ε_{ijt} is an error term.

[152] See Gaston and Nelson (2010, page 69, footnote 122) for reference. The use of gravity model to study migration traces back to the work of Ravenstein (1885). Also, Bergstrand and Egger (2011) note that gravity model was used to study migration flows long before it was used to study trade and FDI flows.

In addition to the standard gravity variables researchers have extended the model by including many political, geographic, social and demographic variables related to both or any of the host and origin countries in their models as we will see in this review. While an earlier work by Borjas (1987) emphasizes the effect of country of origin characteristics (supply or push factors) on emigration rate on his study on migration to the US during 1951-80,[153] more recent works include a number of supply (push) and demand (pull) factors that affect migration to many other OECD countries.

According to the classical theories reviewed in the previous section, a potential migrant compares the income at home and the expected income he would receive abroad before making a decision to migrate. To account for the incomes at the aggregate level, macro empirical studies include GDP/GNP or GDP/GNP per capita as mentioned above to reflect the income opportunities in both the origin and destination countries. The hypothesis is that income increases in the destination country attract migrants from a country of origin and the income increases in the origin country detract potential emigrants. However, studies find that income increases have the expected positive sign for the destination countries but the sign on the incomes of origin countries are not always negative as expected. Karemera et al. (2000) use panel data on log migration inflows in the US and Canada for the decade 1976–86 from 70 countries and find the estimated coefficients on log GNP in the destination countries have the expected signs and are significant for the US model. The magnitude of income elasticities of migrant flows for destination countries are greater than 1.0, which indicates immigration flows are sensitive to the level of development and the absorption capacity of the receiving countries. However, the income elasticity for the origin countries is not according to expectations. It is found to be negative but not significant in the regression

[153] Borjas (1987) main focus is on the determinants of the (relative) earnings of immigrants, however, in a latter section of his paper he also estimates the determinants of emigration rate and states 'It is worth noting, however, that the Roy model also implies that the emigration rate will be a function of the same characteristics of the income distribution, political conditions, and migration costs that determine the relative earnings of immigrants.' (Page 551) The determining variables include some political factors - Politically competitive system, loss of freedom, number of assassinations and economic determinants – income inequality and log per capita GNP. Other gravity variables are distance and dummy for English language.

for the US, and is positive and significant at 5 per cent level in the regression for Canada.[154]

The ambiguous result for the income of origin countries are linked to poverty in these countries. Low incomes reduce the affordability to migrate and when incomes grow the poverty constraint is reduced, leading to an increase in emigration. A few of the empirical works find a non-linear effect of income in source countries.[155] Pederson et al. (2008) study emigration rates from 129 source countries into 22 OECD countries during the years 1990–2000. Dummy variables are used for source countries representing lowest income, lower middle income countries, higher middle income and higher income (highest level is excluded) in order to allow for nonlinear effects. They find the expected inverted U-curve (also referred in the literature as a bell shaped or a hump), migration flows are higher from source countries with middle-low income levels compared to the countries with the lowest or highest income levels.

Similarly, Hatton and Williamson (2011) explores the life cycle of emigration in three regions, Latin America including the Caribbean; the Middle East (MENA), North Africa, and Asia; and sub-Saharan Africa to the US. He investigates by regressing the log of emigration rates (to allow for differences in scaling) on time and time squared for all the countries in each regional sample over the seven 5-year periods 1970–74 to 2000–04, using country-fixed effects. He reports that the 26 countries of Latin America and the Caribbean yield a positive coefficient on the linear time trend and a negative coefficient on the squared term. This result implies a significant bell shape with a maximum in the early 1990s. An even stronger life cycle pattern is found for the 35 countries in MENA and Asia, where the peak also occurs in the early 1990s. By contrast, only the linear term is significant for sub-Saharan Africa, the

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[154] Surprisingly the authors report this result incorrectly as "The migration elasticity coefficient with respect to income of origin countries are negative and significant at 1% level. This result implies that sustained economic development of the source countries could lead to a decrease in migration flows to the USA. (page 1751, Table 3)

[155] See Hatton and Williamson (2011) for more references on studies on the emigration life cycle hypothesis for example Faini and Venturini (1994) show that increasing income at home accounted for much of the surge in Italian emigration after the 1870s, especially after the turn of the century. Such findings are consistent with micro-level evidence that in the early stages of the emigration life cycle migrants were not the poorest but those with skills and resources (Erickson, 1990; Wegge, 1998).

sending region containing the poorest countries. A similar pattern is observed when the analysis is repeated for Germany and Canada as destinations. The author suggests that the slowdown and fall in emigration rates from the early 1990s is not just the result of some US-specific policy changes and therefore demand side determinants are not important. Hatton and Williamson then regress emigration rates in the countries of these regions over many supply side factors and the results suggest that demographic trends, relative income and education, poverty in the origin countries, and migration stock of these countries in the US all affect emigration rate. However, the author suggests that among these factors "demographic transition and migrant stock dynamics were the key forces behind mounting emigration pressure from the 1970s to the 1990s" (page 20).

In contrast to the supply side approach adopted by Hatton and Williamson (2011), Mayda (2010) finds that the demand side factors of 14 OECD countries are more important in explaining emigration rates from 79 origin countries. Her results indicate that the emigration to a given destination is an increasing function of that country's per worker GDP as expected, but that the impact of the per worker GDP in the origin country is seldom negative as the theory suggests and when it is, the size of the effect is smaller than for the former and insignificant. To investigate this 'asymmetry' further, the study extends the empirical model to find the effect of poverty and immigration policy variables on the emigration rate. Both a linear and a quadratic term in per worker GDP of the origin country is used to indicate effects of poverty. The results indicate 'very weak evidence' of poverty. To gauge the effects of immigration policy, she interacts an indicator variable of changes in destination countries' migration policies with pull and push factors and finds evidence that when a host country's immigration laws become less restrictive, pull effects become more positive and push effects turn negative in those years. According to the author, " A possible explanation of the asymmetry between push and pull factors is the role played by the demand side of the model, that is, destination countries' migration policies" (page 1271). However this study assumes that migration policy measures i.e. quotas are exogenous. This is a very strong assumption and we will discuss its implications later in this section.

In accordance with the Roy-Borjas model, the gravity model has been modified to include the unemployment rate and some measure of skill/education. The hypothesis is that the unemployment in the destination country discourages migration and vice versa for the origin country. The researchers found a mixed effect of unemployment rate in the destination country while there is no strong evidence that an increase in the unemployment rate increases emigration. The Karemera et al. (2000) models for the US and Canada have mixed evidence. The study finds the unemployment rate in the US to have the expected negative sign in the US model and significant at 5 per cent, however, since the magnitude of the coefficient is less than 1.0, the authors conclude that migration is not sensitive to the US unemployment rate. The unemployment variable in the Canadian model has an unexpected positive sign and is not significant. This result suggests that migrant flows to Canada may be unaffected by the Canadian domestic unemployment rate, indicating that despite a slowdown in Canadian employment during the period of study, immigration to Canada continued unabated. The insignificance of the effect of the unemployment rate according to the authors may be due to the existence of 'chronic' unemployment rate in the countries of origin. Similarly, Pedersen et al. (2008, pp 1180) find 'some importance' of unemployment in destination countries, but no impact from source countries' unemployment which the authors remark may be 'a lack of reliable or valid unemployment measures in poor countries.'

With regard to the migrants' skill, the studies report positive selection. This is due the fact that these studies are mainly done for OECD countries which have selective immigration policies; however they have used different data sets and measures of skill. By using the average number of schooling years in the total population of destination and origin countries (over age 15) from Barro and Lee's (2000) dataset, Mayda's study tests the theoretical predictions that the average skill level in the population of the destination (origin) country has a negative (positive) impact on the emigration rate. Her results are according to the predictions; the sign on the coefficient on schooling level of origin country is positive and significant and negative but insignificant on coefficient for the schooling level of destination countries. Lewer and Berg (2008) use the gross secondary education enrolment ratio in the origin country

from the UNESCO Statistical Yearbook and find evidence of a 'brain drain.' Pedersen et al. (2008) consider data on adult illiteracy rate (% of people aged above 15) in the origin country from UNESCO[156] and find that countries with high illiteracy rates tend to have lower emigration flows. In one of their regressions they interacted dummy variables for destination countries that have the most skill biased immigration policies (Australia, Canada and New Zealand) and find that there are fewer immigrants from countries with a high illiteracy rate in these countries relative to other OECD host countries.

One of the most robust results found in the migration literature is the effect of previous migration on current emigration rate. The effect of network of family and friends is found to be positive and significant in all the studies which consider it in their regression analysis and has stood the test of the time. The pioneering studies in this regard include Nelson (1959), Rees (1966) and Greenwood (1969, 1970). For example, Greenwood (1969, page 189) states: [157]

"The most unique explanatory variable employed is the "migrant stock," i.e., the number of persons born in state i (the origin state) and living in state j (the destination state). It is shown that the failure to include the migrant stock variable in the estimated relationship causes the true direct effect of most other variables to be obscured."

However, researchers in the past have also discussed many statistical problems when lagged stock of migrants is added as a regressor as discussed by Laber (1972) and Dunlevy (1977). In this respect, Dunlevy (1977) studying the role of migrant stock in the settlement patterns of immigrants in the US States, suggests that the result on this variable may indicate the influence of family and friends or it may capture a partial adjustment mechanism. Further, it may introduce multicollinearity in the analysis. The migrant stock may be correlated with other explanatory variables in two ways. Firstly, since migrant stock

[156] Adult illiteracy rate is the percentage of people ages 15 and above who cannot, with understanding, read and write a short, simple statement on their everyday life

[157] Greenwood has studied interstate migration in the US. Greenwood (1975a) coined the term "modified gravity model" to indicate the infusion of relative economic opportunity (or more generally, utility) into the original and more mechanistic version of the gravity model of spatial interaction See greenwood 2003 studies on migration using gravity model.

is the sum of all past gross migration less deaths and secondary migration of the earlier migrants, therefore, it is itself a function of all those factors which influenced the earlier migration. Secondly, to the extent that current values of the other independent variables are correlated with their lagged values, migrant stock will also be correlated with these current explanatory variables. Therefore, the regression coefficients on migrant stock are likely biased upward since they will tend to reflect indirect as well as direct effects. On the other hand he reports that many explanatory variables decline in magnitude when migrant stock variable is added as an independent variable which he refers to as 'Nelson-Greenwood Hypothesis'. According to this hypothesis, in the absence of the migrant stock variable in the regression, other explanatory variables are likely to capture indirect effects of past values of the explanatory variables as well as the current direct effects.

Due to these econometric issues related with including stock of migrants as a regressor in model of migration "the original interest in the family-friends effect was soon obscured" (Dunlevy 1977, page 137). On the other hand, the author argues that omission of the migrant stock variable may result in specification bias as well as in the loss of information regarding the family-friends effect. Further, he asserts "The presence of multicollinearity, however, does not in itself invalidate the use of migrant stock as a measure of the family- friends' effect. ..... attempt be made to control for it explicitly by entering the appropriate lagged variables into the regression model" (Dunlevy 1977, page 138).

More recently, several empirical studies have confirmed a positive effect of previous migrants on the current flow of migrants by using lagged flows or stocks of migrants in the destination country as an explanatory variable in the regression on the emigration rate of origin country. However, the magnitude of these effects differs across destination and source countries.

Pedersen et al. (2008) explore the effects of networks in detail from both the origin and destination countries perspectives. Their research finds that networks are more important for the poorest origin countries with low skilled labour. The study uses the lagged stock of immigrants and an interaction term

between this stock and dummy variables for origin countries which are grouped into five income group levels (as described earlier) and obtains positive coefficients on this term. The coefficient on the interaction term is numerically largest for low income source countries.

These authors also try to distinguish the network effect according to destination countries having different kind of welfare regimes and immigration policies. Their results indicate weak selection effects of the welfare states. For a destination country having a selective immigration policy, they find a stronger network effect from high income origin countries. However, for the other group of destination countries, the network effects are relatively stronger for the poorest countries of origin.

Thus these results indicate that network effects are more significant for poorer origin countries in destination countries which have less selective immigration policies. Overall these results indicate that networks are important under both policy regimes and for both low income and high income source countries.

For the developing countries where poverty is a constraint and restricts the propensity to migrate, Hatton and Williamson (2011) finds that network effects ease poverty constraints through remittances and support in the destination countries. He uses the inverse of the GDP per capita of the origin countries as a proxy for poverty and finds a negative coefficient on it. Furthermore, he finds a positive sign on the interaction of this proxy with immigrant stock, which indicates that a large migrant stock mitigates poverty as a constraint for potential migrants. The effect of migrant stock indicates that an increase of 1 per cent stock of migrants in the US increases the emigration rate by about 0.36 percent. At the sample mean this effect implies a chain migration where for every 1000 added to the stock a further 120 would arrive in the following five year period. Thus the study suggests that network effects are large enough to cause an upward swing in the emigration life cycle. Historically it is observed that the migration process persists even after the original shocks that created it die out. One of the shocks is immigration policy which many researchers assume to be an exogenous factor. As the authors discuss, the effect of 1965

ACT which attracted migrants from Third World countries and had a cumulative effects leading to a sharp increase in the stock of migrants 'fed' further increases in flows till 1990 and beyond.

Though the immigration policy which is a demand side determinant has an important role in making these stock as Hatton and Williamson put it that stocks were 'fostered' by reforms, network effects are only viewed from the supply side. Assuming quotas to be exogenous, Mayda (2010) also finds a positive effect of networks but acknowledges that in practice quotas are not exogenous and in that case networks could also be reflecting the factors from the demand side as past migration flows can influence the emigration rate through family reunification immigration policies. Besides political economy factors, the voters' attitudes toward immigrants, naturalized immigrants affect immigration policy outcomes through their votes, interest-groups pressure, policy-makers preferences, and the institutional structure of government interact with each other.[158]

However all these studies ignore that the formulation of immigration policies involves much more than these non economic factors, which themselves are affected by economic factors like for example when the economy is growing and average incomes are rising. Economic conditions not only attract migrants but also influence the political process in the formation of migration policies. For example, as reported by Mayda (2010), it is much easier in economic booms for policy-makers to overcome political opposition to and accommodate increasing migration inflows. So many supply and demand factors are intertwined in determining migration flows through networks as Mayda explains her result on the effect of lagged migration flows as "it is not clear how to interpret this result. While it is consistent with supply factors (that is, network effects), it could also be driven by demand factors (for example, family reunification policies)" (page 1254).

In the context of our study since we are considering only one host country we assume that the stock could not affect policies rather due to policies there is a stock of migrants in a particular destination country.

[158] (Rodrik 1995; Facchini and Willmann 2005) as cited in Mayda, 2010.

However, we do not assume that policies are set exogenously as other studies do. Our contention is that behind these policies there are a whole lot of economy wide projections of the manpower and types of skill needed towards the development of the economy according to various demographic scenarios in the destination countries. It has been documented that there are low birth rate and ageing populations in the developed economies. Therefore, there is demand for labour in these economies. Demographic features could be strong pull factors for migration. However, in empirical studies these facts are often overlooked and more emphasis is given to the population 'pressure' or 'explosion' in the developing countries as a cause of large migration from these countries. More often the quota setting is assumed to be exogenous and demographic factors like birth and fertility rates and population cohorts in different age groups are only considered for the origin countries, while these features in the destination countries are not taken into account.[159] It is obvious that developing countries have low income levels and lower living standards and a rational individual will invest in migration if he expects a better return from it which has been emphasized by the human capital theory. But as stated earlier only considering one theory and ignoring other approaches would not fully explain the dynamic process of migration. To consider the dynamics involved we have to study the structural features of both the origin and destination countries. To reinforce our point we review divergent views when considering the demographic factors in estimation of these studies below.

According to Mayda (2010, page 1253): " Demographics—in particular, the share of the origin country's population who is young—shape bilateral flows as predicted by the theory. Since the effect of geography and demographics works through the supply side of the model, their impact should be even stronger when migration quotas are relaxed" Therefore she only includes the share of the origin country's young

[159] Neither do the studies relate to any fiscal considerations in the destination countries which could be the determining factor in migration because economy needs working people to get the finances (through taxes) to sustain the welfare programmes, though much is written about fiscal constraints and absence of institutions in the developing country. Pedersen considers the social expenditure and tax revenue but his perspective is different he expects that migrants from poor countries will choose countries with high social expenditure; however his results are inconclusive. If the data consists of only legal immigrants, our perspective is that these immigrants equally contribute towards tax revenue and benefit from social welfare like any other citizen of the country.

population (between 15 and 29 years old) as a demographic determinant of migration flows and expects a positive effect of young population in the origin country. The result indicates that a ten percentage point increase in the origin country's young population raises the emigration rate by 20 emigrants per 100,000 individuals.

Similarly, Hatton and Williamson (2011) only consider the share of population aged 0–14, in the origin countries 15 years before the beginning of the observation period. By using data on the birth cohort, they avoid the possible endogeniety that might otherwise arise from the effect of emigration on the population age structure. He finds a positive relationship between emigration rate and the relevant birth cohort considered.

However, to consider the demographic features from the supply side perspective may provide a partial picture of the migration process. A study by Karemera et al. (2000) for the US and Canada indicates that both population in the population in the origin and destination country are important they expect that a migration flow from country *i* to country *j* is expected to have a negative (positive) function of income in home (host) country, a negative (positive) function of population size of the host (home) country, The estimated coefficient on origin population is positive as expected and highly significant in both the US and Canadian models, implying that population growth in the origin countries will lead to an increase in migrant flows in these countries. On the other hand, a negative elasticity on US and Canadian population implies that an increase in domestic population is associated with reduced migration flows. However, while the magnitude of the coefficients for origin country is smaller than 1.0, the author interprets this result as that it "indicates that the migration flows are not sensitive to demography of origin countries. This insensitivity can be attributed to the existence of large population size in these countries"(page 1750). The magnitude of the coefficient for the destination countries is greater than 1.0, which indicates that destination countries' population are sensitive to immigrant flows. This result is significant for the USA and not significant for Canada. The author asserts "This means, *ceteris paribus*, an increase in the US

population will significantly lead to reduced migration to the USA, while continued flow to Canada can be expected" (page 1754).

In addition, a population density variable is included to estimate the effects of changes in population concentration per square kilometre in the country of origin and finds a positive effect on emigration rate. However, the population density for the destination country has been overlooked.

The studies on migration consider other gravity variables, like distance, common language, common border and past colonial links. The hypothesis regarding these gravity variables is that since large distances increase both economic and non economic (logistics, opportunity and psychic) costs therefore it would be more costly to migrate to distant countries and it is less costly to travel to countries with similar culture or common historical links. While the results of all of the studies[160] indicate a negative and mostly significant effect of distance on migration as expected, the results on the dummy variables on common language, historical links and common border are mixed.[161] Karemera et al. (2000), Pedersen et al. (2008) find insignificant effects of common language on migration, in contrast Lewer and Berg (2008) finds a significant positive effect. While in Karemera et al. (2000) study the coefficient on dummy variable for adjacency is positive and significant at 1 percent, studies by Lewer and Berg (2008) and Mayda (2010) find this variable insignificant and the former suggests that 'people move more easily across multiple borders than do goods.' (page 166). There is also no strong evidence of the effect of colonial links for example Mayda (2010) states that she tried different options like looking at the effect of dummy on colony and language separately but still could not find a significant effect on either of the variables.

Our review of empirical studies indicates that indicators relating to income and employment of the origin countries fell short of the expectation. To explore these anomalies, researchers try to investigate the

[160] Except Pedersen gets a negative coefficient but not significant.

[161] Pioneering study by Borjas (1987, table 8) also found a negative and significant coefficient of distance on emigration rate but insignificant effect of 'English Proficiency' which measures a fraction of 1975-80 cohort of immigrants who speak English well or very well.

poverty measures in the countries of origin and various measures of welfare and policy indicators of destination countries with mixed evidence.[162] However, the positive role of networks seems to be robust across the studies. It is also observed that the effects of demand factors are mainly seen in some measures of policies which are assumed exogenous and the demographic features in the destination countries which are the basis of these policies are often been ignored.

Moreover, the results on traditional gravity model like dummy variables for common language, contiguity and historical links are mixed and often not according to the predictions of the gravity model. However, the negative impact of bilateral distances is consistent and robust in the empirical literature on migration. This confirms that moving to distant places involve huge logistic and other costs.

In the light of our theoretical and empirical literature review we present a modified gravity model to determine the determinants of emigration rate in Pakistan in the next section.

4.6 Empirical Model

We study determinants identified in neo classical and the network theories of migration in a modified gravity model. We estimate two models without and with migrant network (the basic model in equation 4.3 and the augmented model in equation 4.4). Our approach is different from Borjas (1987) and others who emphasize only the supply side determinants of emigration rate. Since we have one country of origin, it is more logical to look at various demand side determinants which vary for different host countries. The advantage of this approach is that we are incorporating both the supply side and the demand side of the model.

We attempt to explain emigration rate, a supply side variable, by various demand side factors which consists of the characteristics of the host countries. The basic model is of the form:

[162] Grogger and Hanson (2008) study shows that this may be due to specification problems.

The Basic Model:

$$\text{FLOW ijt / POPULATION jt} = \beta 0 + \beta 1\ (\text{PER CAPITA GDP})\ \text{it-1} + \beta 2(\text{POPULATION DENSITY})\ \text{it-1} + \beta 3\ (\text{TERTIARY ENROLMENT RATE})\ \text{it-1} + \beta 4\ (\text{COMMONWEALTH}) + \beta 5\ (\text{LANGUAGE})\ \text{ij} + \beta 6\ (\text{ADJACENT})\ \text{ij} + \beta 7\ (\text{DISTANCE})\ \text{ij} + \text{Uijt} \quad (4.3)$$

i: host country j= origin country (Pakistan) t-1= refer to lag of a decade

All the explanatory variables are in logs except the dummy variables.

The dependent variable is the gross emigration rate for the period from 1980 to 2000. It is calculated as the difference in the stock per decade over this period. For example net flows in 1990 = Stock (1990) – Stock (1980) and similarly for the year 2000. The change in the migration stock of Pakistani origin in the host countries during a decade (net flows) consists of both positive and negative numbers (which might reflect deaths, return migrants or even some measurement errors), we compute a measure of gross inflows by converting all the negative flows to zeros by submitting that gross flows could either be zero or some positive numbers.[163] These flows are divided by the population in Pakistan in 1980 and 1990.[164] It reflects the likelihood of people migrating from Pakistan during a decade.

The explanatory variable, the mean wage in the host country is approximated by the per capita GDP. Based on the human capital investment theoretical view, we expect that a higher average income in the destination country will lead to higher emigration rates because potential emigrants are attracted towards better income opportunities.

The second variable is the population density in the host country. Unlike Karemera et al. (2000), who use population density in the origin country to show that population pressure is a push factor, we include

[163] There are 82 negative values and 39 zero values in the total of 309 observations.

[164] Hatton and Willaimson (2011) use gross emigration bounded at zero. Their dependent variable log of emigration rate is the log of the 5-year emigration rate for fiscal years 1970–74 to 2000–04. The emigration rate for example for 1970-74 is calculated as the log of the 5-year emigration rate for fiscal years 1970/1 to 1974/5), where the denominator is the source country population in the initial year (e.g., 1970). Similarly, Mayda (2010) retains zero observation in her dependent variable emigration rate (in levels).

population density in host countries to show that there is also a corresponding pull factor i.e. population density in the host country. Lower population density may reflect less pressure on resources and therefore a better quality of life or could be a proxy for amenities. We hypothesize that migration will be high when population density is low as people are attracted to places where there is good quality of life. Therefore, a negative sign on the coefficient of this variable is expected.

The third variable is the rate of tertiary enrolment over gross enrolment in the population of the host country. We expect that as the rate of tertiary enrolment increases in the host countries, there will be lower demand for educated manpower and therefore less migration of educated people from Pakistan.

We also consider other important factors which affect migration costs, the physical distance DISTANCEij and ADJACENTij (dummy variable=1 for common border countries, zero otherwise) and to capture past historical links, COMMONWEALTHij (dummy variable=1 for British Commonwealth countries, zero otherwise) and LANGUAGEij (dummy variable=1 for countries having English as their official language, zero otherwise). We hypothesize in accordance with other studies on gravity model of migration, that further away a destination country is from Pakistan, the higher the monetary/nonmonetary, information and time costs involved and therefore there will be less migration to distant countries. In the same context, a common land border is likely to encourage migration flows from Pakistan. Linguistic and cultural similarity is also likely to reduce the magnitude of migration costs. Past colonial relationships should increase emigration rates as the commonwealth countries have similar institutions and stronger political and friendly ties between these countries reduce migration costs.

Uijt is normally distributed random error.

We also augment our basic model to investigate the network effect. To relate to our main hypothesis that previous migrants positively affect the decision to migrate of potential migrants to a particular destination, we augment our basic model and include a lagged variable (10 years back) on stock of Pakistani migrants

in country i (STOCK/POPULATION) jt-1 in equation 4. This variable indicates the network effects or the friends and relative effects which affect both the utility and the cost for migrants as discussed in our literature review. The more the stock of emigrants in the population of the origin country implies more links in the origin country which lead to more emigrations of relatives and friends in the future. As mentioned before, Mayda (2010) refers to it as supply side factor.

The Augmented Model:

$$\text{FLOW ijt / POPULATION jt} = \beta 0 + \beta\ 1\ (\text{PER CAPITA GDP})\ \text{it-1} + \beta 2\ (\text{POPULATION DENSITY})\ \text{it-1} + \beta 3\ (\text{TERTIARY ENROLMENT RATE})\ \text{it-1} + \beta 4\ (\text{COMMONWEALTH}) + \beta 5\ (\text{LANGUAGE})\ \text{ij} + \beta 6\ (\text{ADJACENT})\ \text{ij} + \beta 7\ (\text{DISTANCE})\ \text{ij} + \beta 8\ (\text{STOCK/POPULATION})\ \text{jt-1} + \text{Uijt} \qquad (4.4)$$

i: host country j= origin country (Pakistan) t-1= refer to a lag of a decade

All the explanatory variables are in logs except the dummy variables.

In addition, as Mayda (2010) also suggests that previous migrant stock may influence the immigration policy as a voter which is through the demand side, therefore, in one of the specifications we also use lagged stock of migrants relative to host country population (STOCK/POPULATION) it-1. As the stock of migrants increases relative to host country population the more the immigrants are in a position to affect the immigration policy.

Overall, we expect that previous stock of migrants will reduce all types of costs economic and non economic including policy related.

4.7 Data and Empirical Methodology

In this chapter, the data used is from an international migration panel (as discussed in section 4.2) related to migration stock of Pakistani origin for the period 1980, 1990 and 2000.[165] Other data relates to macroeconomic and demographic information on destination countries and other gravity variables as discussed in the preceding section. The data set on migration stock of Pakistani origin (in 223 countries) contains many zero observations. There are also many missing observations on explanatory variables selected from the data provided in World Development Indicators, World Bank (WDI), because this data set contains information on 213 countries only. Moreover, not every explanatory variable has equal number of observations. For example data on GDP per capita is available for 175 countries in 1990 and 134 in 1980.[166] Thus data set used is unbalanced.[167]

Tables A4.1 and A4.2 in the Appendix provides the summary statistics and correlation matrix of the variables used in the regression models. There is a wide variation in the incomes and demographic features of host countries. The levels of GDP per capita of these countries range from US $ 129 to US $ 74493 with a dispersion of 10266.[168]

Since the structure of our data consists of a short unbalanced panel, time and country fixed effects could not be employed. Therefore, the model is estimated by pooled OLS technique which is supported by the specification test. [169] Since there are large number of zero observation in the migration stock data, Tobit

[165] Most of the studies use annual data of short period as Hatton and Williamson (2011) notes but our data allows us to capture long term trend as it is based on decades. However, this is still a short unbalanced panel compared to Hatton and Williamson's data set.

[166] This may be due to data not recorded due to wars for example for Iraq and Afghanistan for these years or for small island states like Cayman Island and Marshall Island and also because countries were not in existence in 1980.

[167] Our analysis includes all the countries and years which have data on GDP. Therefore, countries which do not have data in a particular year were dropped for that year. For example, Azerbaijan was dropped for the year 1990 as no GDP was reported for it in 1980.

[168] Minimum is recorded for Ethopia and maximum is for Monaco in 2000.

technique is also being employed where dependent variable gross emigration rate is bounded below by zero.[170] Further, to explore the OECD and non-OECD and other regional effects (Middle East), we have used dummy variables for these regions.

The data sources on explanatory variables and information on Commonwealth, Middle East and OECD/non OECD countries is in the Table A4.3 in the Appendix.

Following Pedersen et al. (2008) and Mayda (2010), all time-varying explanatory variables are lagged by one period (in our case it is a decade) to avoid problem of endogeniety as migration could affect incomes in the countries. So for the gross emigration rate between 1980 and 1990 and between 1990 and 2000 we use data on explanatory variables for 1980 and 1990. It is assumed that migrant flows and other third factors in the error term can affect current and future values but not the past values of the explanatory variables.[171] To address heteroscedasticity, robust t values are reported and to further control the heterogeneity in terms of large dispersion in the GDP levels of countries (as reported earlier), Weighted Least Square (WLS) estimation is also done to check for the robustness of results .

4.8 Empirical Results

Table 4.3 presents the OLS estimation results for gross emigration rate from Pakistan during 1980-2000. Since we are interested in the network effect on future migration we present our results for the Basic Model and the Augmented Model (with and without the lagged migration stock) in column 1 and column 2 for comparison.

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[169] The panel is unbalanced and consists of data relating to 1990 and 2000. Since some host countries have data only for 2000, we are not able to use fixed effects. The F test indicates that pooled OLS is appropriate. The F test for basic model: F(129, 71) = 1.28 with Prob > F = 0.1275 and for the augmented model: F(129, 70) = 1.16 Prob > F = 0.2500

[170] As explained in the empirical model in section 4.6

[171] Hatton and Willaimson (2011) uses explanatory variables of the initial years of each of the five year periods. For example, for fiscal years 1970/1 to 1974/5, the explanatory variables are measured at the beginning of this 5-year period i.e. of initial year 1970.

Table 4.3: Regression Estimates of Gross Emigration Rate from Pakistan, 1980-2000: OLS Models

Independent Variables	Col (1)	Col (2)	Col(3)	Col(4)
Lagged migration stock (logs)		4.100** *2.56*		3.927*** *2.62*
GDP per capita of host countries (logs)	10.523*** *3.00*	4.811*** *2.69*	16.052*** *2.62*	10.051** *2.46*
Population density of host countries (logs)	-5.834* *-1.87*	-4.895* *-1.8*		
Percentage of old in working age Population			-2.516* *-1.9*	-2.255* *-1.88*
Tertiary enrolment rate in host countries population (logs)	-4.678*** *-2.83*	-1.087 *-0.95*	-4.336*** *-2.73*	-0.926 *-0.74*
Commonwealth	-10.381* *-1.68*	-6.804 *-1.11*	-13.952* *-1.77*	-10.251 *-1.40*
Contiguity (China)	-13.927** *-2.17*	-5.823 *-1.13*	-9.246 *-1.26*	-1.584 *-0.24*
English language	17.391** *2.49*	9.878 *1.46*	15.073* *1.73*	8.343 *0.99*
Distance (logs)	-14.740** *-1.98*	-7.609 *-1.59*	-11.729** *-2.04*	-5.357 *-1.41*
Constant	11.232 *0.24*	96.559 *1.36*	-46.382 *-1.27*	43.406 *0.85*
Observations	204	204	204	204
Adj. R- squared	0.167	0.215	0.208	0.252

* p<0.10, ** p<0.05 *** p<0.01. Robust t values are under the estimates.

It is noteworthy that the explanatory power of the regression increases significantly by the inclusion of the lagged migrant stock as indicated by a rise in the adjusted R- squared from 0.167 to 0.215. It is evident from column 2 that migrant stock variable is significant at 5 percent level. The estimate implies that a 10 percent increase in lagged migration stocks increases 4 emigrants per 100,000 individuals. Thus previous migrants seem to be facilitating potential migrants by giving logistics and other support and

helping in the reduction of the cost of migration.[172]

The above observation is also supported by the coefficient on distance variable which is negative and significant in equation without the migrant stock variable but loses significance when migrant stock is included as a determinant variable. This result in the light of the prediction of the network theory of migration suggests that migrants help in reducing economic and non economic costs of migration of distant places making it easier for their friends and relatives to follow them by providing economic and non economic costs and helping them in getting jobs and settling down in a new place.

Comparing the results on coefficients on other variables in columns (1) and (2), it is observed that emigration rate is positively related with the GDP per capita of host countries as expected. But, the magnitude of the coefficient falls when migrant stock variable is included as an explanatory variable in column 2. According to the estimate in model in column 1, a 10% increase in the level of per capita GDP in the host country increases emigration by 11 emigrants per 100,000 of population while in column (2) with lagged migration stock as an additional explanatory variable, this increase is less to 5 emigrants per 100,000 persons.[173] However, the correlation between lagged GDP per capita and lagged stock of migrants is not high[174] and the significance levels are high of both these variables in column 2 which suggests that multicollinearity is not a problem. In addition by using lagged values of GDP per capita we are controlling the effect of past values therefore it seems that our result validate the prediction of the network theory of migration according to which migration will continue due to the stock of previous migrants and income opportunities may not be the primary motive of migration.

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[172] There is concern by some researchers that since migrant stock is itself a function of all those factors which influenced the earlier migration, it may act as a proxy for lagged explanatory variables. However, we are controlling for lagged explanatory variables in the regressions and the correlations between stock of migrants and other explanatory variables are not high as indicated by the correlation matrix in the Appendix Table A4.2.

[173] In the light of Nelson-Greenwood hypothesis in the absence of migrant stock variable, the coefficient on GDP per capita may also reflect the effects of previous migrant stock as high income countries also have large migrant stocks. However, the lagged values used on both of these variables control for these effects.

[174] The correlation coefficient between GDP per capita and migration stock is 0.4095

The population density variable has the expected negative sign which suggests that densely populated host countries are not attractive to the emigrants as these countries may have fewer amenities to provide because their resources are already under pressure. This seems logical because studies estimating the effect of population density in the origin countries have found that high population density is a strong push factor,[175] therefore, an emigrant will naturally want to go to a country with low population density.

Next we explore the effect of tertiary education in the host country on the emigration rate from Pakistan. The sign of the coefficient on tertiary education is negative and significant at 1 percent level in column (1).[176] This suggests that as the rate of tertiary education in the population of a host country increases there will be less migration from Pakistan. However, in the second column the coefficient not only falls in magnitude but loses its significance too when migrant stock is included. This result implies that the migration stock is a catalyst for migration from Pakistan to countries where skill levels are high.[177]

The impacts of Commonwealth and neighbouring country (China) are not according to the prediction of the gravity model. The coefficients on both of these variables are negative and are significant in column 1 but lose significance in column 2. While the result obtained for China is not surprising because it has never attracted migrants from Pakistan (at least till the last decade). The results obtained for Commonwealth countries seem unrealistic as the UK is one of the most popular destinations for Pakistani emigrants. On the other hand the dummy variable for English language is positive and significant as expected in column 1 but not significant when migrant stock is controlled for. [178]

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[175] See Pedersen et al.(2008) for example.

[176] Mayda (2010) also obtained a negative coefficient on the schooling level of the host countries on emigration rates but the coefficient was insignificant as reported in our literature review.

[177] The data available on tertiary enrolment rate was not available for many countries. Therefore our sample size becomes smaller when tertiary education is included. However, the results on other variables are stable when this variable is excluded and sample size increases to 304 observations. The regressions without tertiary education are reported in Table A4.4 in the Appendix.

[178] The correlation between Commonwealth and English language variables is 0.67. The effect of commonwealth countries were checked without the language variable separately in both OLS and Tobit models. Results are reported in Appendix Table A4.5 in the Appendix. The signs obtained on Commonwealth countries are the same as obtained here but are insignificant.

The above results support the findings of Mayda (2010) and Pedersen et al. (2008) who also could not find that past historical links reduce the cost of migration. It has generally been observed that results on the coefficient on distance variable is robust in the literature on gravity model but the results obtained for other 'cultural distance' variables like language, proximity and colonial links are not always according to the predictions of the model as we have discussed in our literature review. The reason could be that these countries have diverse economies including both developed and developing countries, which are also politically, socially and demographically different and are geographically dispersed with different climate. Therefore, to lump them together and to see their effect as a group, as is a tradition in estimating gravity models does not work more often. Similarly looking at the effects of contiguous states as a group may have same implications because of, for instance, different border terrain.[179]

However, we feel cautious about interpreting our results on these gravity variables and some of these unexpected results warrant further analysis which is done later in this section.

In columns 3 and 4 we repeat our above exercise by dropping population density variable and instead use variable on the dependency ratio in the host countries. The dependency ratio is the population above 64 years over the working age population. Results on other coefficients are qualitatively the same and the coefficient on dependency ratio is negative and significant which indicates that countries which have larger share of dependents will have lower migrants. This implies that there are fiscal constraints in the host countries to accommodate potential migrants.

Thus results obtained for population density and dependency ratio may also reflect the tight policy stance of many developed countries whose populations are ageing very fast and their resources are over stretched. Contrary to the view held by international institutions, this result does not support that due to ageing population, these countries need more migrants to work there is replacement migration. However,

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[179] For example China and Pakistan have mountainous border which increases the cost of mobility. It also depends on the bilateral relations and immigration policies of neighbouring states.

this result is tentative because we do not have any information on gender, age and other categories like asylum seekers etc, of migrants that could throw more light on this issue.

The same analysis is performed in Tobit regressions. The results reported in Table 4.4 validate our findings of the OLS analysis above. The lagged stock of migrants and the GDP per capita of the host country remains highly significant and coefficients on other variables remain qualitatively the same.

Table 4.4: Regression Estimates of Gross Emigration Rate from Pakistan, 1980-2000: Tobit Models

Independent Variables	Col (1)	Col (2)	Col (3)	Col (4)
Lagged migration stock (logs)		5.205**		4.850***
		2.58		*2.64*
GDP per capita of host countries (logs)	17.026***	9.514***	23.679***	15.961***
	3.19	*2.92*	*2.99*	*2.88*
Population density of host countries (logs)	-5.719*	-4.363		
	-1.68	*-1.50*		
Percentage of old in working age Population			-2.936**	-2.587**
			-2.13	*-2.11*
Tertiary enrolment rate in host countries population (logs)	-5.088**	-0.803	-4.710**	-0.777
	-2.43	*-0.45*	*-2.34*	*-0.43*
Commonwealth	-14.371*	-8.759	-20.313**	-14.43
	-1.73	*-1.06*	*-1.98*	*-1.52*
Contiguity (China)	11.399	19.052	18.171	25.019*
	1.08	*1.62*	*1.48*	*1.88*
English language	17.837**	7.633	16.941	7.821
	2.09	*0.87*	*1.63*	*0.77*
Distance (logs)	-18.845**	-9.233	-15.155**	-6.83
	-2.00	*-1.38*	*-2.08*	*-1.23*
Constant	-25.374	76.113	-91.767	13.834
	-0.42	*0.96*	*-1.61*	*0.22*
Observations	204	204	204	204
Log pseudolikelihood	-702.491	-697.087	-697.027	-692.006

* p<0.10, ** p<0.05,*** p<0.01. Robust t values are under the estimates.

Coming back to the impact of the Commonwealth and neighbouring countries on the emigration rate, in Table 4.5 we employ a dummy for the UK and the results show that this variable is positive and marginally significant in the OLS (column 1) but highly significant in Tobit models (columns 3 and 4). The results on other variables are consistent with our previous results. We conclude that in our case study, migrants from Pakistan are facilitated due to its past historical links to the UK but this is not valid for the Commonwealth as a group.

Table 4.5: Regression Estimates of Gross Emigration Rate from Pakistan, 1980-2000: The UK Effect

Independent Variables	OLS Col1	OLS Col2	Tobit Col1	Tobit Col2
GDP per capita of host countries (logs)	10.108*** *2.78*	4.713** *2.57*	16.584*** *3.02*	9.434*** *2.86*
Population density of host countries (logs)	-5.953* *-1.92*	-5.026* *-1.87*	-5.885* *-1.74*	-4.526 *-1.59*
Tertiary enrolment rate in host Countries population (logs)	-4.386** *-2.53*	-1.003 *-0.87*	-4.870** *-2.23*	-0.764 *-0.42*
Contiguity (China)	-12.464* *-1.92*	-5.043 *-0.98*	12.368 *1.17*	19.581* *1.67*
UK	51.368* *1.94*	37.306 *1.30*	55.974*** *3.66*	37.516** *2.01*
English language	8.228** *2.17*	3.915 *1.10*	5.772 *0.93*	0.347 *0.05*
Distance (logs)	-14.853** *-1.99*	-7.951* *-1.68*	-19.014** *-2.01*	-9.651 *-1.45*
Lagged migration stock (logs)		3.940** *2.38*		5.036** *2.43*
Constant	19.471 *0.41*	99.432 *1.41*	-17.301 *-0.28*	78.885 *1.00*
Observations	204	204	204	204
Adj.R-squared	0.177	0.221		
Log pseudolikelihood			-701.732	-696.685

* p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are under the estimates

A similar analysis is done for the contiguous countries by enlarging our sample size which includes Iran in it. Iran and many other countries are excluded in regressions because they do not have data on tertiary enrolment for 1980 and 1990. The sample was enlarged by including data on tertiary rate of education for the closest years available.

For example, we use tertiary rate in 1978 and 1991 for Iran. The regression results in Table A4.6 in the Appendix indicate that the effect is negative for both China and Iran as a group in the first two columns and as individually in the last two columns. Thus our results indicate that migrants from Pakistan travel to far off countries rather than to neighbouring countries.[180]

Furthermore, although we were unable to investigate the direct effect of different migration policies across countries and time as it is hard to quantify the policy measures adopted there in, we use dummy variables for OECD and non-OECD/Middle East countries and their interaction with the migrant stock variable to see the differential effect of policies adopted in these two groups of countries in a broad sense (Table 4.6 and Table A4.7). It is important to distinguish between the network effects of migrants in these two groups of countries as besides being structurally different, these countries have different policies regarding migration, the former have restrictive policies which allow skilled migrants, the latter has no such restrictions but adopts a guest worker policy. So the migration towards OECD countries is of skilled people from rich backgrounds on permanent basis while poor unskilled people largely go to non-OECD countries mainly to the Middle East countries on contract/seasonal basis.

To explore the role of Pakistani migrant stock in OECD and non-OECD on the emigration rate from Pakistan, two dummy variables are added in the regression. One is for the non-OECD countries and the other is the interaction of this variable with the stock of Pakistani migrant stock in Table 4.6. We hypothesize that stock of migrants are important in reducing the cost for future migrants in both the regions. However, it has been observed that migrants in the non-OECD countries particularly the Middle

[180] The case of migration from Pakistan is different than what we observe for Mexico or any neighbouring countries and the US. Despite China's growth and its good relations with Pakistan, it has not much attracted migrants from Pakistan.

East are from relatively poorer background than migrants going to OECD countries, therefore, it is expected that poor migrants need more financial and other support from the friends and relatives who had previously migrated. The results obtained validate our hypothesis as we explain below. However, since we have no information on any measure of migration policies therefore, we can not explicitly analyse

Table 4.6: Regression Estimates of Gross Emigration Rate from Pakistan, 1980-2000: OECD, Non OECD and the Middle East

	OLS Models		
Independent Variables	Col (1)	Col (2)	Col (3)
GDP per capita of host Countries (logs)	11.631**	7.094***	8.386**
	2.32	*2.65*	*2.34*
Population density of host countries (logs)	-4.424*	-2.607	-2.423
	-1.77	*-1.57*	*-1.43*
Tertiary enrolment rate in host countries population (logs)	-2.863*	-3.840*	-4.645**
	-1.94	*-1.94*	*-2.14*
English language	4.795	7.588**	5.194
	1.32	*1.99*	*1.64*
Distance (logs)	-6.798**	-0.114	-1.561
	-1.99	*-0.05*	*-0.63*
Lagged migration stock (logs)	4.736**	0.457	4.973**
	2.18	*0.44*	*2.57*
Lagged migration stock in non - OECD (logs)	-0.385		-6.247***
	-0.11		*-3.25*
Lagged migration stock in Middle East (logs)		12.772*	14.195**
		1.89	*2.22*
Non – OECD	26.508		-71.886***
	0.45		*-2.76*
Middle East		181.322*	200.073**
		1.90	*2.25*
Constant	-4.576	-88.304*	-48.783
	-0.09	*-1.67*	*-0.78*
Observations	204	204	204
Adj.R-squared	0.276	0.385	0.411

* p<0.10, ** p<0.05, *** p<0.01. Robust t ratios are under the estimates

how would a stricter migration polices affect migration and the network effects of migration. In additions we lack the data on skills of the migrants which could indicate effects of restrictive migration policies.

The results in column 1 indicate that the coefficient on the stock of migrants is positive (4.736) and significant at 5 percent level and the coefficient on the interactive term on non-OECD and migrant stock is negative but is insignificant. This result implies that the marginal effect of migration stock in non-OECD countries is not significant and thus the total effect is not distinguishable from that of the effect of migrant stock in the OECD countries. In the second column to see the specific effect of migrant stock in the Middle East countries, a dummy for the Middle East countries and its interaction with migrant stock has been included. The results seem striking while the coefficients on both of these variables are positive and significant at 10 percent level; the coefficient on the stock of migrants becomes insignificant. This indicates that network effects from the Middle East dominate.[181]

To further investigate the matter in the third column we specify our regression by including both the dummy variable for non-OECD and the Middle East and their interactive terms while the base is the stock of migrants in the OECD countries. The dummy variables for non-OECD and the Middle East countries are negative and positive and both are significant. The coefficient on the stock of migrant which reflects the effect of stock of migrants in the OECD countries is positive and significant (4.973). It implies that 10 percent increase in the migrant stock in the OECD countries will encourage migration of 5 individuals per 100,000 of population. After controlling for the stock of Middle East countries, the coefficient on the migrant stock in non-OECD countries is negative; on the other hand, the marginal effect of the stock of migrants in the Middle East after controlling for the former is still positive and significant. The effect of migrant stock from the Middle East after controlling for the migrant stock in other non-OECD countries is 19.698 (4.973 + 14.195). Thus a 10 percent increase in stock of migrant stock in the Middle East countries leads to 20 more potential emigrants per 100,000 of population.

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[181] The correlation between lagged migration stock and lagged migration stock in the Middle East is -0.1091

Keeping in view the characteristics of Pakistani immigrants in these regions we can derive from the results obtained above that both skilled and unskilled migrant stocks of Pakistani origin are facilitating chain migration in the host regions. The results of Tobit models for these groups of countries confirm the results obtained above and are reported in Table A4.7 in the Appendix.

4.8.1 Robustness Check

To check for the robustness of the results obtained, regressions of Table 4.3 are estimated by using the Weighted Least Squares (WLS). To capture the heterogeneity in the income levels of host countries, their GDP per capita are used as weights. The results of WLS presented in Table 4.7 are consistent with the previous results obtained in OLS and Tobit models in Tables 4.3 and 4.4.

In addition, similar results are obtained when alternate specifications of dependent variables like net emigration rate (consists of both negative and positive values) and gross emigration rate in log form and explanatory variables in differentials are used (See Tables A4.8 and A4.9 in the Appendix). However, dependent variable expressed in log form (in column (2) log of gross emigration rate consider only positive values while in column (3), 1 is added to gross migration values before taking logs) is highly collinear with the log of lagged stock of migrants as explanatory variable. Therefore, we are sceptical about the results obtained using dependent variable in the log form.

Table 4.7: Regression Estimates of Gross Emigration Rate from Pakistan, 1980-2000: Weighted Least Squares (WLS)

Independent variables	Col1	Col2	Col3	Col4
Lagged migration stock (logs)		4.835***		4.682***
		3.80		*3.81*
GDP per capita of host countries	11.527***	4.457	18.166***	10.700***
	5.37	*1.60*	*7.15*	*3.41*
Population density of host countries (logs)	-6.959***	-5.716***		
	-3.60	*-3.01*		
Tertiary enrolment rate in host countries population (logs)	-5.344***	-1.12	-4.905***	-0.846
	-2.95	*-0.54*	*-2.79*	*-0.42*
Commonwealth	-12.166	-7.325	-16.886*	-11.919
	-1.22	*-0.75*	*-1.72*	*-1.25*
Contiguity (China)	-16.194	-7.467	-9.743	-1.327
	-0.46	*-0.22*	*-0.29*	*-0.04*
English language	20.339**	10.394	17.982**	8.96
	2.19	*1.11*	*2.02*	*1.00*
Distance (logs)	-18.200***	-9.245*	-13.690***	-5.728
	-3.57	*-1.69*	*-2.82*	*-1.12*
Percentage of old in working age population			-2.886***	-2.589***
			-5.11	*-4.69*
Constant	28.36	126.352**	-49.687	56.871
	0.47	*1.99*	*-0.88*	*0.93*
Observations	204	204	204	204
Adj.R-squared	0.187	0.239	0.235	0.284

* p<0.10, ** p<0.05, *** p<0.01. t ratios are reported under the estimates

4.9 Additional Results

This section is motivated by miscellaneous ideas that cropped up while doing literature review and which have been overlooked in most of earlier studies. In Table 4.8 we attempt to use different specifications of the lagged migrant stock variable as independent variables which could have different implications and provide us with their different dynamics.

Table 4.8: Regression Estimates of Gross Emigration Rate from Pakistan, 1980- 2000: Some Additional Results.

	OLS Models		
Independent Variables	Col1	Col2	Col3
GDP per capita of host countries **(logs)**	6.683*** *3.18*	2.400* *1.86*	4.850*** *2.80*
Population density of host countries (logs)	-4.507* *-1.72*	-2.612 *-1.44*	-4.810* *-1.76*
Tertiary enrolment rate in host countries population (logs)	-4.320*** *-2.95*	-1.950** *-2.01*	-1.009 *-0.94*
Share of Lagged migration stock in host country population (logs)	4.267** *2.55*		
English language	2.95 *0.70*	-0.286 *-0.07*	5.18 *1.38*
Distance (logs)	-7.165* *-1.67*	-2.247 *-0.84*	-7.904* *-1.67*
Lagged migration stock (logs)		53.589*** *2.87*	
Square of lagged migration stock (logs)		1.870*** *2.85*	
Share of lagged migration stock In host country i in the total			4.156** *2.58*
Constant	23.735 *0.49*	357.971** *2.43*	81.512 *1.22*
Observations	204	204	204
Adj.R-squared	0.232	0.484	0.22

* p<0.10, ** p<0.05, *** p<0.01. Robust t ratios are under the estimates

In the first column we have used the ratio of migrant stock in the population of host countries. According to the political economic literature, immigrants can affect immigration policy of host countries as voters.

Therefore, we expect that as the share of immigrants in the population of host country increases, they can be more effective in influencing immigration policies. The results indicate that the coefficient on this variable is positive and significant. However, we are cautious to interpret the results as this variable is highly correlated with the share of migrants in the origin countries in our case. But the idea is that while the latter share reflects the family-friends effect in the country of origin the former reflects the effectiveness of previous immigrants as voters.

Next we explore whether over time as migrant stocks increase, their effects diminish. In column 2 we also add the square of migrant stock with the stock variable. The results indicate that both the coefficients are positive and highly significant implying that the emigration rate is an increasing function of the lagged migrant stock. Thus there seems to be no evidence that there are diminishing returns in the impact of network size on migration costs.

In column 3, migrant stock variable is specified as the share of migrant stock of Pakistani origin in host country i in all the migrant stocks of Pakistani origin in all the host countries in our sample. [182] The idea behind this formulation of migrant stock variable is that a potential migrant considers the opportunities available in all destinations before deciding to go to a given destination.[183] The probability of selecting a particular destination increases as the stock of previous migrants in that country increases relative to all

[182] The share is calculated as: $(STOCKij/\sum_{i} STOCKij)$ where i = host country, j = Pakistan

[183] The idea was motivated by studies on 'alternative opportunities' by Wadycki (1974) and Levy and Wadycki (1974). However, they have studied interstate migration in the US and their proxies for alternative opportunities are wages, unemployment and population in alternative destinations. Our interest is in looking at alternative opportunities available to potential migrants through the previous migrant stock.

the destinations. In other words he selects a destination after considering all the alternatives (including the one he has opted for). The expectation is that as the share of stock of Pakistani migrants in country i increase than in all the host countries, more emigrants from Pakistan will be attracted to that country. The sign on the coefficient is positive and significant implying that as the stock of migrants increase in any host country i relative to other potential host countries, migrants from Pakistan will be attracted towards that country compared to other countries.

4.10 Conclusions

Much of literature on the determinants of migration either takes an origin country's or a host country's perspective. The former have emphasis on the economic and demographic characteristics in the origin countries and the latter puts more emphasis on the immigration policies of the host countries. We attempt to incorporate both the supply side and the demand side of migration in our modified gravity model. We explain the emigration rate (supply of migrants) from Pakistan by the income, population density, dependency rate and tertiary rate of education in the host countries (demand side determinants). The main emphasis of this study is to look on the impact of previous migrant stock on potential emigration rate from Pakistan.

The results of this study are consistent with the theory which considers migration as a human capital investment and imply that migration is more likely to get higher income. The coefficient on the income in the host country is positive and highly significant in all the specifications of regression models and thus an important determinant of migration from Pakistan. The results also support the view of the network theory of migration, the impact of lagged migrant stock on future emigration rate is positive and highly significant and these effects are positive in both OECD and the Middle East countries. Thus networks of family and friends previously migrated have a strong positive impact on current emigration rate.

In addition, the coefficient on distance, which indicates the cost of migration, is negative in all regressions and significant. However, distance loses significance when lagged migration stock is included in the specifications, implying that these networks reduce the cost of migration.

The findings of this study also indicate that high population density is a deterrent and an increase in the rate of tertiary education in the host country also discourages emigrants.

This study also finds mixed effects of traditional gravity variables on emigration rate like many earlier studies on migration. For example, the coefficient on common language is positive and significant as expected but the signs on the coefficients on Commonwealth and neighbouring country are mostly not according to the expectations. When Commonwealth countries are lumped together, their effect on emigration rate turned out to be unexpectedly negative. This may be due to the diverse nature of these countries as Commonwealth countries include both OECD and non-OECD countries. When a dummy variable is used for the UK, the effect turned out to be positive and significant as expected. This implies that migrants find UK more attractive than (some) other Commonwealth countries.[184] Similarly, the effect of China as a neighbouring country is not positive as is expected that it is less costly to travel to neighbouring countries. There are several other types of costs of mobility apart from distance in kilometres, like the type of border terrain and the policies of the neighbouring countries.[185]

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[184] Studies looking from the perspective of the UK would find that Commonwealth countries as a group is facilitating immigration because it is expected that there are large number of migrants from each of these countries in the UK. But from the perspective of these individual countries it is not likely to be true. Migration among these countries (other than the UK) may not be facilitated by being a member of the Commonwealth as is evident from this study.

[185] We can't compare migration process from Mexico and other Latin American countries to the US with migration from Pakistan or any other neighbouring country to China. The reason may be that China had closed policies and did not encourage immigration till the recent past.

Appendices 4.11

Table A4.1: Summary Statistics

Variables	Observations	Mean	Std. Dev.	Min	Max
Emigration rate	309	5.3670	32.0286	0	438.2397
GDP per capita of host countries (logs)	309	7.7026	1.5634	4.8604	11.2185
Population density of host countries (logs)	309	3.8484	1.6781	-1.9179	9.5896
Percentage of old in working age population	292	10.2149	5.8405	1.7689	27.6614
Tertiary enrolment rate in host countries population (logs)	204	-13.7723	1.9396	-20.5903	-9.2102
Lagged migration stock (logs)	309	-14.2566	3.0811	-18.5160	-5.2276
Commonwealth	309	0.2783	0.4489	0	1
Contiguity	309	0.0129	0.1132	0	1
English language	309	0.3236	0.4686	0	1
Distance (logs)	309	8.8230	0.5830	6.5124	9.7229

Table A4.2: Correlation Matrix

	Emigration Rate	GDP per capita of host countries (logs)	Population density of host countries (logs)	Percentage of old in working age population	Tertiary enrolment rate in host countries population (logs)	Lagged migration stock (logs)	Common wealth countries	contig	English language	Distance (logs)
emigration rate	1									
GDP per capita of host countries (logs)	0.2711	1								
Population density of host countries (logs)	-0.1136	0.1599	1							
Percentage of old in working age population	-0.0267	0.6755	0.2423	1						
Tertiary enrolment rate in host countries population (logs)	-0.0248	0.5333	0.0739	0.3686	1					
Lagged migration stock (logs)	0.4489	0.4095	0.0425	0.2014	-0.1796	1				
Commonwealth countries	-0.0795	-0.1156	0.01	-0.1728	0.063	-0.1147	1			
Contiguity	-0.0171	-0.1336	0.0659	-0.0231	-0.3277	0.0342	-0.0507	1		
English language	0.0131	-0.0514	0.1044	-0.0778	0.0422	0.0336	0.7245	-0.0567	1	
Distance (logs)	-0.1792	-0.011	-0.1745	-0.0229	0.063	-0.3182	0.2148	-0.0821	0.2192	1

Table A4.3: Data Sources

Migration Stock: Data on Migration is from the World Bank and University of Sussex and was unpublished when we used it. It was provided by Parsons. However recently, it has been published.

GDP per capita: World Development Indicators (World Bank) for the years 1980 and 1990.

Population Density: People per sq. km of land area. World Development Indicators (World Bank) for the years 1980 and 1990.

Rate of enrolment in tertiary enrolment (% of of gross): World Development Indicators (World Bank) for the years 1980 and 1990.

Percentage of persons of more than 64 years over working age population: World Development Indicators (World Bank) for the years 1980 and 1990.

Common language dummy. Dummy equal to 1 for pairs of countries sharing English as an official language. Source: Centre d'Etudes Prospectives et d'Informations Internationales

Distance: Distance in kilometres between capital cities, taken from Centre d'Etudes Prospectives et d'Informations Internationales, at: http://www. cepii.fr/anglaisgraph/bdd/distances.htm.

15 Middle East Countries:

Algeria, Bahrain, Djibouti, Egypt, Iran Islamic Republic of, Israel, Jordan, Morocco Oman, Saudi Arabia, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, Yemen

The Middle East is Arab world as referred to by the World Bank uses the membership list of the League of Arab States. We have added Israel in this region. Source: http://data.worldbank.org/region/ARB

45 Commonwealth Countries

Australia, Bahamas,Barbados, Belize,Botswana,Brunei Darussalam,Cameroon,

Canada, Cyprus, Dominica, Fiji, Gambia, Ghana, Grenada, Guyana, Jamaica Kenya, Kiribati, Lesotho, Malawi, Malaysia, Malta, Mauritius, Mozambique Namibia, New Zealand, Nigeria, Papua New Guinea, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, Seychelles Sierra Leone, Singapore, Solomon Islands, South Africa, Sri Lanka Swaziland, Tonga, Trinidad and Tobago, Uganda, Vanuatu, Zambia

Source:http://www.commonwealth-of-nations.org/Commonwealth-Home

Non OECD countries are other than OECD member countries as of 2000 at:

^ "Ratification of the Convention on the OECD". OECD.org.

Table A4.4: Regression Estimates of Gross Emigration Rate from Pakistan, 1980-2000: OLS Models (without tertiary enrolment).

Independent Variables	Col1	Col2	Col3	Col4
Lagged migration stock (logs)		3.421***		3.405***
		3.11		*3.06*
GDP per capita of host countries (logs)	5.466***	3.534***	9.321**	6.734**
	2.71	*2.6*	*2.34*	*2.17*
Population density of host Countries (logs)	-3.761*	-3.296*		
	-1.94	*-1.92*		
Commonwealth	-9.240**	-8.377**	-12.406**	-11.007**
	-2.09	*-2.35*	*-2.19*	*-2.37*
Contiguity (China)	-5.008	-11.736	-5.838	-12.717
	-0.64	*-1.23*	*-0.6*	*-1.15*
English language	12.508**	9.874**	10.754*	7.343
	2.49	*2.57*	*1.76*	*1.45*
Distance (logs)	-12.843**	-4.632	-11.237**	-3.466
	-2.18	*-1.37*	*-2.19*	*-1.11*
Percentage of old in working age population			-1.713*	-1.560*
			-1.71	*-1.69*
Constant	89.640*	79.759*	51.257*	49.715*
	1.94	*1.96*	*1.73*	*1.81*
Observations	309	309	292	292
Adj.R-squared	0.107	0.186	0.137	0.207

* p<0.10, ** p<0.05, *** p<0.01. Robust t ratios are under the estimates

Table A4.5: Regression Estimates of Gross Emigration Rate from Pakistan, 1980-2000: OLS Models (without English language).

Independent variables	OLS	OLS	Tobit	Tobit
GDP per capita of host countries (logs)	10.681***	4.457**	17.304***	9.230***
	2.98	*2.45*	*3.21*	*2.78*
Population density of host Countries (logs)	-5.259*	-4.516	-5.136	-4.047
	-1.70	*-1.62*	*-1.50*	*-1.34*
Tertiary enrolment rate in host Countries population (logs)	-4.848***	-0.903	-5.320**	-0.659
	-2.81	*-0.79*	*-2.44*	*-0.37*
Commonwealth	2.748	0.493	-1.329	-3.332
	0.85	*0.15*	*-0.22*	*-0.54*
Contiguity (China)	-16.283**	-6.461	9.04	18.587
	-2.39	*-1.23*	*0.82*	*1.55*
Distance (logs)	-13.624*	-6.465	-17.563*	-8.195
	-1.83	*-1.26*	*-1.86*	*-1.17*
Lagged migration stock (logs)		4.415***		5.481***
		2.86		*2.88*
Constant	-2.664	95.673	-42.6	74.539
	-0.05	*1.34*	*-0.66*	*0.93*
Observations	204	204	204	204
Adj.R-squared	0.154	0.214		
Log pseudolikelihood			-703.671	-697.309

* p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are under the estimates

Table A4.6: Regression Estimates of Gross Emigration Rate from Pakistan, 1980-2000: OLS Models (including contiguous countries: China and Iran).

Independent Variables	Col1	Col2	Col3	Col4
GDP per capita of host Countries (logs)	9.603***	5.295***	9.602***	5.219***
	3.03	*2.92*	*3.03*	*2.92*
Population density of host countries (logs)	-4.600*	-4.023*	-4.642*	-4.099*
	-1.82	*-1.75*	*-1.81*	*-1.75*
Tertiary enrolment rate in host countries population (logs)	-4.198***	-1.394	-4.146***	-1.24
	-2.98	*-1.62*	*-3.00*	*-1.44*
Commonwealth	-8.562*	-8.631**	-8.573*	-8.654**
	-1.91	*-2.11*	*-1.91*	*-2.11*
Contiguity	-18.585**	-16.022		
	-2.13	*-1.61*		
English language	14.127***	10.152**	14.179***	10.189**
	2.71	*2.20*	*2.71*	*2.20*
Distance (logs)	-13.073**	-6.361	-13.194**	-6.492
	-2.06	*-1.55*	*-2.05*	*-1.56*
Lagged migration stock (logs)		3.204***		3.259***
		2.76		*2.74*
China			-13.220**	-5.079
			-2.54	*-1.32*
Iran			-23.658*	-26.282*
			-1.93	*-1.96*
Constant	6.065	61.807	7.994	66.685
	0.16	*1.20*	*0.20*	*1.24*
Observations	256	256	256	256
Adj.R-squared	0.157	0.195	0.154	0.193

* p<0.10, ** p<0.05, *** p<0.01. Robust t ratios are under the estimates

Table A4.7: Regression Estimates of Gross Emigration Rate from Pakistan, 1980-2000: OECD, Non OECD and the Middle East.

Independent Variables	Tobit Models		
	Col(1)	Col (2)	Col(3)
GDP per capita of host countries (logs)	17.217*** *2.71*	11.303*** *3.23*	11.274*** *2.86*
Population density of host countries (logs)	-3.524 *-1.40*	-0.899 *-0.53*	-0.336 *-0.21*
Tertiary enrolment rate in host countries population (logs)	-3.564* *-1.86*	-4.547** *-2.18*	-5.507** *-2.46*
English language	1.235 *0.21*	6.131 *1.13*	2.839 *0.59*
Distance (logs)	-7.957 *-1.46*	0.918 *0.19*	-1.052 *-0.23*
Lagged migration stock (logs)	5.815** *2.45*	0.649 *0.51*	6.304*** *3.18*
Lagged migration stock in non - OECD (logs)	-0.496 *-0.13*		-9.099*** *-3.92*
Lagged migration stock in Middle East (logs)		19.140** *2.25*	22.504** *2.58*
Non – OECD	27.91 *-3.92*		-115.167*** *-3.74*
Middle East		245.659** *2.35*	294.176*** *2.74*
Constant	-52.58 *-0.64*	-157.009** *-2.01*	-89.686 *-1.15*
Observations	204	204	204
Log pseudolikelihood	-691.83	-674.406	-669.044

* p<0.10, ** p<0.05, *** p<0.01. Robust t ratios are under the estimates

Table A4.8: Regression Estimates of Emigration Rate from Pakistan, 1980-2000: Alternate Specifications of Emigration Rate.

	Dependent Variables		
Independent Variables	Net emigration rate	Gross emigration rate >0 (logs)	(Gross emigration rate +1) (logs)
Lagged migration stock (logs)	4.055**	0.691***	0.468***
	2.53	*8.68*	*5.67*
GDP per capita of host Countries (logs)	4.859***	0.586***	1.096***
	2.71	*3.59*	*6.14*
Population density of host countries (logs)	-4.941*	-0.102	-0.087
	-1.81	-0.91	*-0.62*
Tertiary enrolment rate in host countries population (logs)	-1.100	-0.331***	-0.277**
	-0.96	*-2.74*	*-2.19*
Commonwealth	-6.723	0.121	-0.505
	-1.08	*0.21*	*-0.67*
Contiguity ((China)	-5.642	-0.395	2.403
	-1.09	*-0.16*	*1.04*
English language	9.738	0.624	0.62
	1.43	*1.13*	*0.86*
Distance (logs)	-7.63	-0.820**	-0.902***
	-1.59	*-2.35*	*-2.73*
Constant	95.652	5.594	5.644
	1.35	*1.41*	*1.20*
Observations	204	127	204
Adj.R-squared	0.213	0.807	0.563

* p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are under the estimates

Table A4.9: Regression Estimates of Gross Emigration Rate from Pakistan, 1980-2000: Explanatory Variable in Differentials.

Independent Variables	OLS Col1	OLS Col2	Tobit Col3	Tobit Col4
Log (ratio of GDP per capita in host to origin)	10.353***	4.793**	16.792***	9.418***
	2.87	*2.47*	*3.10*	*2.74*
Log (ratio of population density in host to origin)	-5.878*	-4.956*	-5.688*	-4.345
	-1.94	*-1.87*	*-1.72*	*-1.54*
Log (ratio of rate of tertiary enrolment in host to origin)	-4.548***	-1.063	-4.914**	-0.727
	-2.70	*-0.91*	*-2.33*	*-0.40*
Commonwealth	-10.574*	-6.787	-14.927*	-9.057
	-1.66	*-1.08*	*-1.75*	*-1.08*
Contiguity (China)	-13.567**	-5.579	11.484	19.079
	-2.07	*-1.06*	*1.10*	*1.65*
English language	17.216**	9.744	17.956**	7.711
	2.42	*1.43*	*2.05*	*0.87*
Distance (logs)	-14.936**	-7.657	-19.376**	-9.517
	-2.01	*-1.58*	*-2.05*	*-1.40*
Lagged migration stock (logs)		4.067***		5.194***
		2.62		*2.65*
Constant	129.036**	120.462**	142.090*	128.285*
	2.05	*2.09*	*1.92*	*1.92*
Observations	204	204	204	204
Adj.R-squared	0.166	0.213		
Log pseudolikelihood			-702.446	-697.067

* p<0.10, ** p<0.05, *** p<0.01, Robust t ratios are under the estimates

Chapter 5: Conclusions

5.1 Summary of Findings

This dissertation investigates the linkages between FDI-trade and migration for a small developing country – Pakistan and seeks to extend the existing literature. The study is motivated by the growing inflows of FDI towards developing countries in the last two decades in the wake of the liberalization of trade and FDI regimes in these countries. Like many other developing countries, Pakistan is also striving to attract more FDI inflows and boost trade to accelerate its development process.

In addition, many of these countries including Pakistan adopt a policy of exporting human resource to get remittances to improve their balance of payments and other economic activities and growth and reduce poverty. However, little is known about the contributions of migrant networks in reducing informal costs and facilitating trade, FDI and future migration.

There seems to be a lack of knowledge in these countries on the relationship between FDI, trade and migration which are crucial in formulating the policies regarding these flows. The goal of this dissertation is to explore the relationship of these flows in the light of the new theories of trade of the multinational and network theory of migration, and to enhance our understanding and provide guidelines for policy making in the developing countries. We summarize the main findings of this thesis below.

The first chapter estimates the Knowledge Capital Model (KK) model for Pakistan, at both aggregate and disaggregate levels to determine the types of FDI and their determinants. We are particularly interested in the specification of the model provided by Carr et al (2001), as it is the basis of much subsequent research and gives us an opportunity to compare our results with earlier works. However, earlier studies focus on OECD countries and pool developing countries with the developed countries, ignoring their distinct structural and institutional setup which determines their trade and FDI. Moreover, most of these studies have been done using data before 1990's which do not include period of structural reforms in the

developing countries. The aim of this study is to see how well the KK model fits to a small developing country data. We also extend this model to explore regional effects, and the effects of liberalization policies by including dummy variables and interactive dummies. Another distinctive feature of our study is to investigate the effects of political and economic instabilities which Pakistan faced during the period of study.

Our results indicate that the KK model fits the data reasonably well and there is evidence of both types of FDI. Most of the explanatory variables, the sum of bilateral GDPs, the endowment differences (GDP per capita difference) and investment and trade costs in the host country have the expected signs and are highly significant in all the specifications except the coefficients on GDP difference square and trade cost in the parent country. While the former is significant, the latter is insignificant in almost all regressions.

It is noteworthy that our estimates for the endowment difference variable are positive and significant in most of the regressions for aggregate FDI inflows and also in the FDI inflows in the manufacturing sub sectors in line with the prediction of the KK model. This suggests the presence of vertical FDI. Thus, this result is in contrast to studies done for large countries where researchers have found more evidence of horizontal FDI and do not find vertical FDI and hence reject the KK model in favour of horizontal (HOR) model.

The evidence of horizontal FDI is indicated by the positive and significant coefficients on trade costs in Pakistan for the inflows at the aggregate level and in the manufacturing sub sectors. However, it is insignificant in most of the models for the services sector (largely non tradable sector).

Our results also validate the prediction of the KK model that high investment costs in the host country (Pakistan) discourage FDI. In addition in one of the specifications we also estimated this model by adding an important variable indicating investment cost in the source country which all the previous studies have ignored. We find that as investment costs in the source countries rise there will be more inflows of FDI in Pakistan.

The positive and significant signs on regional dummies for the UK and the Middle East countries provide evidence that historical links and cultural ties have positive effects on the FDI inflows of Pakistan.

This study also contributes to the literature on the KK model as it explicitly investigates the effects of trade and investment reforms and instabilities in the economy. The impact of trade and investment liberalization on FDI inflows are positive as predicted. The coefficient on the dummy for the reform period is positive and significant. In addition, most of the signs of the interactive terms of the dummy on reform period and the explanatory variables indicating the net effects of reforms on both types of FDI are in line with the predictions of the KK model. However, political and economic instabilities during this period negatively affected FDI inflows in Pakistan and undermined the reform process.

The results for FDI inflows by broad sectors are consistent with the results obtained for the aggregate inflows. In the manufacturing sub-sectors, the results of Tobit models are consistent and highly significant as obtained for the aggregate inflows of FDI. To identify the types of FDI in the manufacturing sub sectors, we use separate dummies for electronics (which is considered the most labour intensive and integrated sector) and the chemical sector (which is the least labour intensive and is not highly integrated). The coefficients on these dummies are positive and significant, suggesting that FDI inflows are of both the vertical and horizontal type.

The estimations on FDI inflows in small countries also face problems due to the small number of source countries.[186] Our results indicate that, although at the aggregate level the inflows of FDI are not affected by large source countries, in the broad sectors and sub sectors these flows are affected by the inflows from the three large source countries the USA, UK and UAE.

Our estimations of the model provide strong evidence that Pakistan receives vertical FDI as the estimate of skill variable is positive and significant in all the regressions as stated above. However, there is

[186] Kristjánsdóttir (2010) faces the same problem for Iceland.

relatively weak evidence of horizontal FDI. The sign on the host country trade cost variable is positive and significant, which indicates horizontal FDI which is market seeking and is undertaken to avoid trade costs. The sign on the squared of difference of bilateral GDP is unexpectedly positive and significant, which is against the prediction of the model that as differences in bilateral GDP increase there will be less horizontal FDI. To investigate or 'hunt' for the horizontal FDI in our model, we modify the specification of the KK model and try to capture the non linearities and the 'switch over' regime of the model by an additional explanatory variable of GDP difference. The coefficient on GDP difference is negative and significant indicating that difference in bilateral GDP discourages HOR FDI. However, more research is needed on this aspect of the model in the case of developing countries as has been done in the case of developed countries in search of vertical FDI. It seems that the specification of the KK model faces problems when there are large differences in country size.[187]

Chapter three focuses on informal costs of investment which the foreign investors face while contemplating to invest in other countries. The net work theory of migrants shows that migrant networks play a critical role in providing information on the customs and business practices of their home country to foreign investors. In an augmented gravity model based on the new trade theory of the multinational, this study empirically explores the role of Pakistani immigrants in 32 countries on aggregate FDI inflows from these countries for the period 2002-07. In addition, using data on FDI inflows in the services and manufacturing sectors from 16 countries the effect of migration on sectoral FDI is also investigated for the same period. The results show significant positive impacts of immigrants on FDI inflows in Pakistan both at the aggregate and sectoral levels. A detailed investigation also indicates that immigrants from more distant countries have stronger effects than those in nearby countries, suggesting that immigrants in distant countries are more effective in reducing transaction costs. Further analysis indicates that although the effects of immigrants in both Commonwealth and non-Commonwealth countries are positive and non-distinguishable, there is a wide variation in the effects of immigrants within the former group of countries,

[187] See Kristjánsdóttir (2010)

with immigrants in the UK having the greatest influence. Finally, this study finds that immigrants are effective in promoting FDI from both developed and developing countries, the effects being larger for immigrants in the former. This study contributes therefore to our understanding of the impact of migration on FDI from a small, developing country's perspective which is missing in earlier empirical research.

The data does not allow us to gauge the effect of immigrants according to their skills directly, however, we could conjecture from the results of the sectoral analysis that positive effects of immigrants in FDI inflows in services sectors (which consists of mainly horizontal FDI) and in the manufacturing sector (which is predominantly of vertical type) imply that both skilled and unskilled immigrants contribute in FDI. Moreover, we could also derive that while encouraging vertical FDI these migrants are also indirectly facilitating trade.

Thus our study provides a new perspective and highlights an additional, positive role of migrants on trade and FDI in a developing country besides their contribution in terms of remittances.

The empirical models in chapter four study the determinants of migration in a modified gravity model in the light of neo classical human capital investment and network theories. Our approach is different from Borjas (1987) and others who emphasize only the supply side determinants of the emigration rate. Since we have one country of origin, it is more logical to look at various demand side determinants which vary for different host countries. The advantage of this approach is that we are incorporating both the supply side and the demand side of the model. We attempt to explain the emigration rate by various characteristics of the host countries.

We explain the emigration rate from Pakistan by the income, population density, dependency rate and tertiary rate of education in the host countries. The main emphasis of this study is to look on the impact of previous migrant stock on the potential emigration rate from Pakistan.

The results validate the hypothesis of the human capital investment theory of migration which postulates that people migrate to receive a higher income. The coefficient on the income of the host country is positive and highly significant in all specifications of the estimated regression models and thus an important determinant of the extent and direction of migration from Pakistan. The results also support the view of the network theory of migration, the impact of lagged migrant stock on future emigration rate is positive and highly significant and these effects are positive in both OECD and the Middle East countries. Thus networks of family and friends previously migrated have a strong positive impact on current emigration flows.

It is also noted that the coefficient on distance, a proxy for the cost of migration, is negative in all regressions and significant. However, it loses significance when the lagged migration stock is included in the specification, implying that these networks reduce the cost of migration.

The findings of this study also indicate that high population density and dependency rates are deterrents of migration; implying that migrants seek host countries which provide more amenities and that high dependency rates suggest that the host countries resources are already under pressure to accommodate potential migrants. The study also finds that an increase in the rate of tertiary education in the host country discourages emigrants. However, our measure of skill is the rate of tertiary enrolment which is a kind of general education. There is a need to look into more specific skills and occupational related variables like number of doctors and nurses, number of skilled craftsmen etc. Mostly skill related migration data is recorded in terms of years of education which may lead to the conclusion that skilled manpower is not required in the host countries which may contradict their immigration policy objectives. This finding is also suggestive for the countries in which immigration policies are based on general education and not related to the specific skills related manpower needs.

Furthermore, this study finds mixed evidence of the influence of traditional gravity variables on the emigration rate, like many other studies on migration. While the coefficient on common language is

positive and significant as expected, the signs on the coefficients on Commonwealth and neighbouring country are mostly not according to the expectations. The reason may be the diverse nature of these countries. For example, when Commonwealth countries are lumped together, their effect on the emigration rate turns out to be unexpectedly negative. However, when a dummy variable is used for the UK, the effect is positive and significant as expected. This implies that migrants find UK more attractive than (some) other Commonwealth countries. Similarly, the effect of China as a neighbouring country is not positive, despite it being expected that it is less costly to travel to neighbouring countries. Apart from distance in kilometres, other types of costs of mobility should also be taken into consideration like the type of border terrain etc. These results have important implications and suggest that using regional fixed effects or country pair fixed effects may cost us the loss of valuable information which distance and other gravity variables could provide.

To summarize, the estimations and the analyses of the KK model in chapter 2 sufficiently show that Pakistan received vertical FDI which complements trade. Furthermore, based on the modified new trade theory of the multinationals, the results in chapter 3 indicate that migration network facilitate both horizontal and vertical FDI and through the effects on the latter also affects trade indirectly. Additionally it is found that previous migrant stock facilitates potential migrants. Overall, our results broadly suggest that trade and FDI and migration complement each other in the globalization process. Therefore, developing as well as developed countries should implement coordinated policies regarding these flows.

5.2 Limitations and Future Research

There are a number of shortcomings in this study that need to be addressed in future research. In chapter 2, we faced the challenge of working on a small developing country with relatively limited data set on few sources countries of FDI. This could lead to imprecise estimates. Moreover, we need data on skills which is not available especially for non-OECD countries. Furthermore, to estimate the effects of structural

changes like that of reforms we need a long time series data with sufficient years before and after the reforms.

The analysis on disaggregate level does not include any sector specific explanatory variables which are important in explaining the types of FDI in different sectors according to the production technology and the skill intensities of the sectors and industries. Moreover, sector specific tariff rates could also provide useful insights on the characteristics of FDI in the sectors.

Our analysis to modify the KK model to identify the horizontal FDI is relatively crude. There is a need of a rigorous work on the horizontal aspect of the KK model for the developing countries.

The migration data used in chapters 3 and 4 is not classified according to age, gender and skill of migrants. However, the data is now published and provide some valuable information on gender specific migration rates. Given the growing share of females in migration, this is an important avenue of future research.

To conclude, as globalization is a dynamic process, there is a continuous shift in the pattern, structure and location of international production and trade continuously challenging the "textbook knowledge-capital model of MNEs".[188] For example, FDI seeking as export platform needs multi country models. This is an increasing feature of FDI between South-South countries which needs to be looked into. FDI in new areas for example more recently agriculture sector in Pakistan has been opened up for foreign investors needs to be analysed. Moreover, analyses of heterogeneity at the sectoral and industry level could give additional insights into the determinants of alternate types of international production and the resulting trade. Future research will be motivated by more recent models of FDI focussing on the importance of third countries and the complex integration strategies of multinationals which are neither purely horizontal nor purely vertical. As FDI flows surge overtime, the interest to explore and explain the more complex integration strategies adopted by the MNEs by studying the role of endowments and trade and

[188] Page 4, Baltagi et al. (2005).

investment costs in the rest of the world. Recent theoretical research conducted by Baltagi et al. (2005) suggests the importance of third-country effects as determinants of bilateral MNE sales.

Furthermore, continued refinement of international data on migration for both OECD and non-OECD countries will provide exciting areas for further research. As more data for the developing countries are made available future research could possibly shed some new insights about how these countries are integrating with other world economies and the implications of this process on their own national economies.

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