The Location of BRICS Foreign Direct Investment in the European Union, 1997 - 2010

by

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Acknowledgments

Looking back to my PhD candidate life, it is full of difficulties, challenges and ups and downs. During these years, I have tried my best to complete my research, but I still cannot solve the problems in my life and research and approach the end if there is no support of many people. I am here to say thank you all for everything that you have done for me.

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I dedicate this thesis to my dear grandparents, mum and dad.

Abstract

The BRICS, comprising Brazil, Russia, India, China and South Africa, accounts for 40 percent of global population and is predicted to be the largest economic group by 2050. Outward foreign Direct Investment (FDI) from the BRICS has grown rapidly, from around US$7 billion in 2000 to US$126 billion in 2012 (UNCTAD, 2013). The European Union (EU) is traditionally a major beneficiary of FDI. However, there is few studies on the BRICS outward FDI, and there is relatively little evidence on how BRICS FDI differs in its characteristics between the BRICS countries and its location at a European level. The purpose of the thesis is to explore BRICS FDI location in the EU countries over the period 1997-2010. The thesis analyses data on over 35,000 FDI projects from the *European Investment Monitor*. The period covers the early stages of BRICS FDI and its growth, and the fifth EU enlargement to include the Central and Eastern Europe countries (CEEC). Conditional Logit, Multinomial Logit and count data methods are used, where the first two consider the dummy for a location as the dependent variable and the last one is used to control for the large number of zeros in the data.

The thesis makes three main contributions. First, it describes BRICS FDI location in the EU countries (i.e. members in 2010), cross-tabulating this according to characteristics such as industry and function. Second, it finds many host country characteristics have an effect on global FDI location, but only a few of these are significant for the BRICS, of which the main factors are the GDP growth rate, higher education (i.e. tertiary education) rate, wage rate, exchange rate and political risk. Furthermore, Multinomial Logit model allows the project characteristics and sources to vary, such as the industry, function, investment type and global source region. The results reveal significant differences in BRICS FDI location between the old and new Member States, except the three main destination countries (i.e. France, Germany and the UK). Russian FDI tends to go to Central and Eastern Europe, Brazil FDI to Spain and Portugal, while there are differences in Chinese and Indian FDI location, both of which have grown strongly.

The third contribution of the thesis is to examine the "follow-the-leader" behaviour, whereby FDI location in a country follows FDI from the same source in the preceding year. This is explored using both the Conditional Logit and count data models. Statistical analysis shows that there is persistence in the country location whether it is considered over a one or two-year time horizon. The logit analysis shows that at the level of the BRICS group, BRICS FDI prefers the location of FDI from the same BRICS country but it tends to avoid the location of other BRICS FDI as a whole. At the individual BRICS level, China and India are the investment leaders of the five BRICS countries. The results are less clear for the count data methods. The exact reason for the 'follow-the-leader' behaviour is not known (e.g. it could be agglomeration economies, linkages or some unobserved heterogeneity, such as cultural factors), but it is worthy of further exploration. Overall, the thesis finds that outward FDI from the BRICS should not be treated as homogeneous. While there is evidence that BRICS FDI spreads out to other countries as it grows, and differences in BRICS FDI location at the European country level are likely to persistent over time.

Chapter 1. Introduction

This thesis explores the location choice of BRICS Foreign Direct Investment (FDI) in the 25 European Union (EU) countries from 1997 to 2010. The BRICS is the group of five emerging and industrializing countries that comprise Brazil, Russia, India, China and South Africa, while the EU is traditionally a major beneficiary of FDI. There are few studies that have examined the outward FDI from BRICS, and there is relatively little evidence on how this FDI differs in its characteristics between the BRICS countries and its location at a European level. A particular focus for this thesis is on whether BRICS investment tends to agglomerate, which is examined by exploring whether there is ‘follow-the-leader’ behaviour in FDI location (i.e. if BRICS FDI tends to locate in the same countries as previous FDI from the same BRICS country or the BRICS as a whole), or whether it ‘avoids’ previous FDI from other BRICS countries, so that there is distinctiveness in its nature. The period 1997-2010 covers the early stages of BRICS FDI and considers the negative effect of financial crisis on the FDI flows. It also includes the fifth EU enlargement, which admitted countries from Central and Eastern Europe.

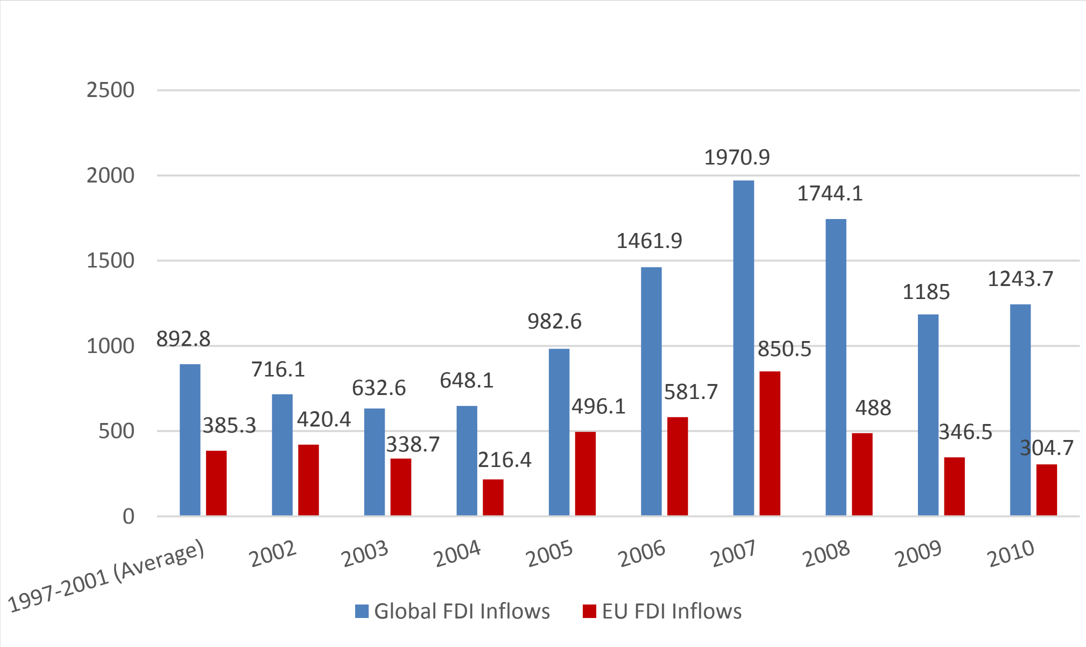
The term ‘BRIC’ was first coined in 2003 by Jim O’Neill, the Head Economist at Goldman Sachs. It originally included the four largest and fastest growing emerging countries (Brazil, Russia, India and China), but in 2010 South Africa was added to this group. There is a common feature for these countries as each has a large population, territory and economic size, such that BRICS countries have 40 per cent of the world population and produce 25 per cent of global GDP. However, they have low levels of income, but fast economic growth. Of course, the study period actually precedes the inclusion of South Africa, but overall it can be viewed as representing the early-stage investment of these countries as they invested abroad. UNCTAD defines FDI as an investment that is controlled by an enterprise resident in one economy of an enterprise resident in another economy, which involves a long-term relationship and represents a lasting benefit in the host economy (see Ranjan and Agrawal, 2011). It is an important sign of economic globalization, which means that it has become one of the main pillars of internationalization for firms and it is treated as the main channel of international competition from the perspective of the micro-economy. The level of global FDI flows is much lower than that of trade flows, but FDI may be a more effective channel by which to promote the diffusion of technology, the transfer of capital, knowledge and other skills (Driffield and Taylor, 2000).

The BRICS are of interest as the emerging economies are playing an increasingly important role in the world economy and are attracting closer attention (e.g. India is now the third highest investor in the UK). Holtbrügge and Kreppel (2012) indicate that most previous research in international business concentrates on the motives and forms of outward FDI from developed countries. More recently, there has been a change in the patterns of FDI, with more companies from emerging markets investing abroad, and BRICS are expected to be the richest countries in the world and largest economic group by 2050. Therefore, they are likely to have an increasing effect on the global economy. The EU is the largest host region for the global FDI inflows, as the summary in Milelli *et al*. (2010) makes clear. In 2007, FDI in the EU occupied 44% of the total global inflows (more than 800 billion US dollars), while EU is a significant trade partner with many other countries. Further, outward FDI from the BRICS has traditionally sought raw materials, such as Chinese FDI in Africa and Australia, but BRICS investment in the EU can be treated as the first step of internationalisation for the BRICS countries (Holtbrügge and Kreppel, 2012). Overall, it is therefore of great interest to concentrate on the EU as the host recipient of BRICS FDI outflows.

1.1. Overview

FDI has increased considerably since the beginning of the 1980s, which is no doubt because it has advantages compared to trade. In general, FDI allows firms in the source country to get access to a foreign market, while for the host country it provides an opportunity to stimulate economic integration and growth. Figure 1.1 shows that both global and EU FDI inflows have trended upwards over the period from 1997 to 2010, albeit with some fluctuation. It reached a peak in 2007, which is when Bulgaria and Romania acceded as part of the fifth enlargement of the European Union.

Figure 1.1: Global and EU FDI Inflows, Billion US Dollars, 1997-2010



Source: Author's own elaboration based on the World Investment Report, UNCTAD (2003, 2005 and 2011).

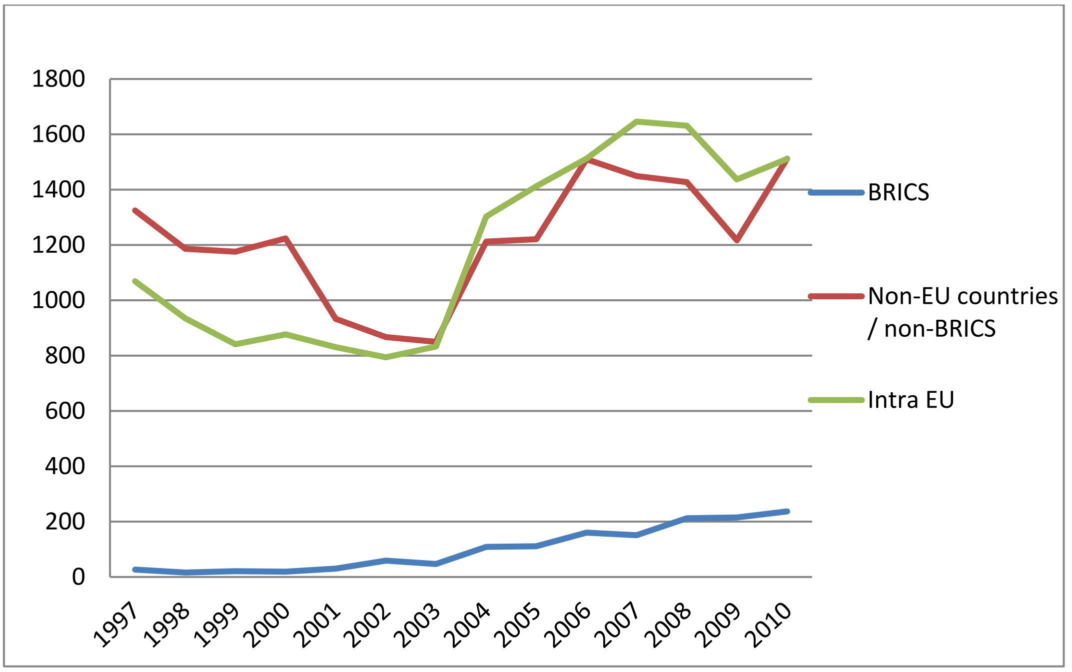
In general, Figure 1.1 shows that global FDI inflows have a relatively lower level with a slight decrease before year 2003, after that there is a sharp increase in the global FDI inflows and it reaches the peak at 1970.9 billion US dollars in 2007. However, a sharp decrease occurs in 2008 and 2009 as the onset of the global financial crisis, where the inflows drop by 40%. In 2010, global FDI inflows recover slightly, rising to $1243.7 billion. The EU shows a similar pattern over the study period. It can be seen that EU FDI inflows occupy nearly 50% of all global inflows in most years, but excluding the period of the financial crisis. EU FDI inflows also increased considerably during the period of enlargement (2004-07), reaching $850.5 billion in 2007 (i.e. 43.2% of global inflows). The figure suggests a delay between the global and EU inflows, as the former decreases up to 2003 and then increases, but EU inflows fall until 2004 due to the decrease in the total flows to the EU-15 countries by 40% from the level of 2003. This is because EU-15 has the relative lower level of economic growth and there are "large scale repayments of intra-firm credits by foreign affiliates to their parent firms abroad in some major host countries" (UNCTAD, 2005). At the end of this period, the global inflows are rising, but EU inflows still decline and account for just 24.5% of global FDI inflows.

Inward FDI has a significant effect on the development of host economies, which can be treated as a catalyst for economic growth. According to de Mello (1999), there are both direct and indirect effects of FDI on economic growth. The direct effects relate to factors that link the source and host countries, such as the exchange rate or import substitution. The indirect effect occurs in the host country, and improves the efficiency of firms through spillovers. These spillovers mean that domestic firms improve their competitiveness in international markets by assimilating the advanced technology and knowledge. FDI could also promote economic development through the innovation and imitation. In addition, there may be changes in the employment and labour costs. It creates employment by building new facilities or by stimulating high technology sectors, but equally it causes the closure of domestic competitor firms, perhaps through higher wages (Moosa, 2002). FDI could also lead to wage inequality and to the use of more highly-skilled labour (Driffield and Taylor 2000).

This thesis focuses on FDI originating from emerging and industrializing countries in the developed economies, so that the reverse spillovers of the inward FDI cannot be ignored. It indicates that the desire of foreign firms investing in developed countries is to acquire the technology from these host countries, rather than spread their own advantages. Driffield and Love (2002) believe that there is the growth in the productivity of foreign firms through the investment in domestic sectors, but this growth is limited to R&D-intensive sectors and the effect of reverse spillovers will be greater at those industries where spatial concentration is greater. Overall, both the host and source countries can benefit from the FDI flows, which means that it is necessary to understand FDI flows more deeply.

The EU is a main destination of global FDI flows, and indeed the growth rate of outward FDI from emerging markets to the EU has exceeded that of developed markets. This trend is likely to continue into the future. Figure 1.2 compares the difference in the number of FDI projects in the EU between the BRICS and other sources, whether arising from the EU or from non-BRICS and non-EU countries. It shows that BRICS FDI increases, but it is not a main source of FDI projects located in the EU. At its height, the number of projects from the BRICS accounts for only 7% of FDI projects received by the EU in 2010.

Figure 1.2: FDI in the EU from Different Sources, 1997-2010

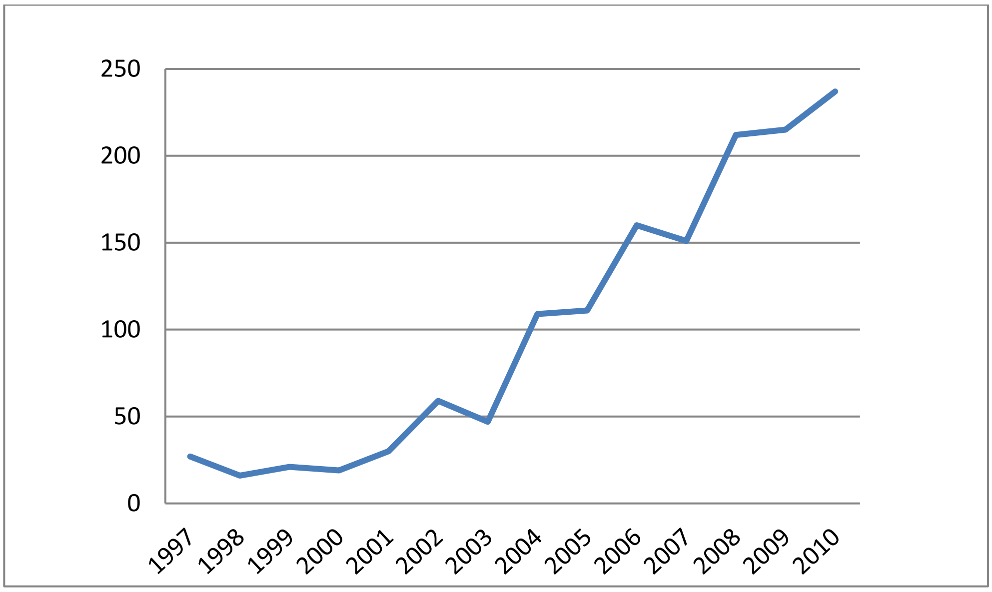


Source: European Investment Monitor (EIM) database.
Note: EU members at 2010 are included, excluding Cyprus and Malta.

Havlik *et al*. (2009) explain the possible reasons for the low level of investment activities of BRICS are that all BRICS countries are still in the process of international expansion during these years, which means that they are not international enough currently. In particular, the targets of FDI from China and India are Asia and Africa, and the activities of Brazil are still limited. Overall, these low level activities can explain that the main activities of BRICS firms in the EU are still exports rather than FDI.

Figure 1.3 shows the tendency of BRICS FDI projects in the EU to increase over the study period from 1997 to 2010. It can be seen that there are very few BRICS projects at the start of the period, but the number increases sharply from about the year 2000, so that there are nearly 250 investment projects from the BRICS per annum by the end of the study period.

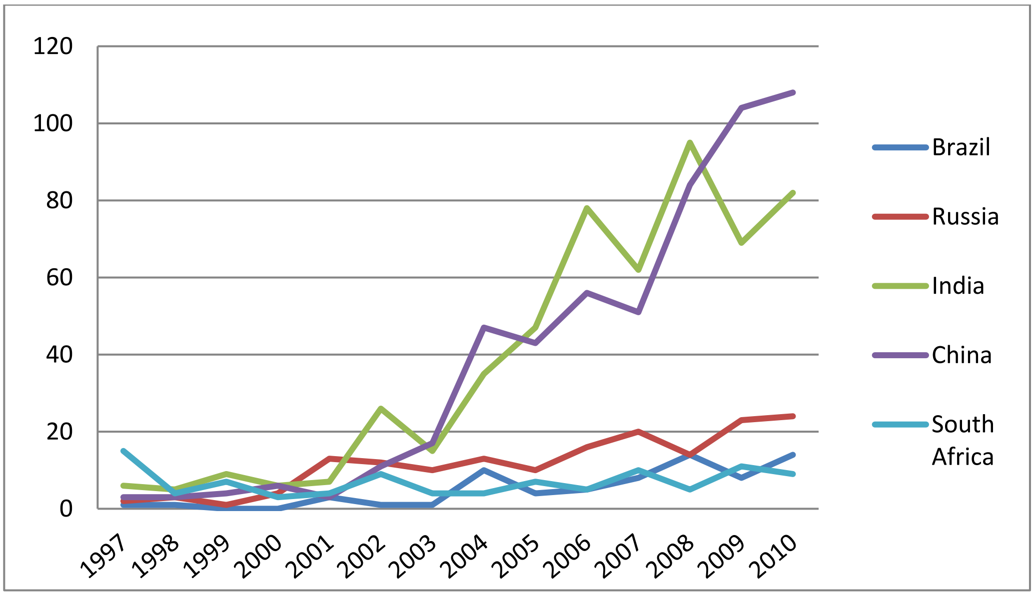
Figure 1.3: Number of projects from BRICS in the EU, 1997-2010



Source: European Investment Monitor (EIM) database.
Notes: EU members at 2010 are included, excluding Cyprus and Malta. Figure 1.3 is the same to Figure 1.2 for the BRICS.

In total, there are 1,415 projects from the BRICS over this period, which means that there is a sufficient number of observations to explore BRICS investment. Figure 1.4 below plots the number of projects from each BRICS country over time, while Table 1.1 shows the number of projects from each BRICS country by sub-period. These show that each BRICS country has experienced an increasing trend for FDI in the EU over time, so that they are each in the process of international expansion over the study period.

Figure 1.4: The Number of FDI Projects from Each BRICS Country in the EU, 1997-2010



Source: European Investment Monitor (EIM) database.
Note: EU members at 2010 are included, excluding Cyprus and Malta.

Table 1.1: BRICS FDI in the EU: Number of Projects, 1997 to 2010

Source	1997 - 2000	2001 - 2005	2006 - 2010	Total
Brazil	2	19	49	70
Russia	10	58	97	165
India	27	130	385	542
China	16	121	406	543
South Africa	29	28	38	95
BRICS	**84**	**356**	**975**	**1,415**

Source: European Investment Monitor (EIM) database.
Note: EU members at 2010 are included, excluding Cyprus and Malta.

Overall, the number of projects from each of the five BRICS countries is very low prior to the year 2000, at under 20 projects a year, but since then the number of projects from China and India starts to increase significantly and reaches a high level in 2010. Table 1.1 shows that in the last sub-period, the projects from China and India have increased by 25.4 and 14.3 times respectively compared to the first sub-period, and that together they account for more than half of all BRICS projects in the EU countries. In total, China and India reach a similar number of projects, with 543 and 542 projects respectively. For the other three countries, their FDI increase is much slower. According to Ranjan and Agrawal (2011), China and India will be the main global supplier of manufactured goods over the coming decades, and Brazil, Russia and South Africa will be the dominant suppliers of raw materials.

FDI flows measured by value from UNCTAD is described in Chapter 3 and Chapter 5 discusses this issue based on the number of FDI projects from EIM database. The former measures the value of FDI in net terms and also includes Merger and Acquisitions. The advantages of EIM database include showing the FDI flows in gross terms and identifying the location choice of FDI based on the discrete projects.

1.2. Aims of the Thesis

Europe is both an important source and host for FDI, but currently most research focuses on outward FDI from the developed economies. It means that there is a gap in our knowledge and understanding of the determinants for the location choice of FDI from both emerging and industrializing economies. The main purpose of this thesis is to explore the determinants for the BRICS FDI location choice in the EU countries. Our dataset is the *European Investment Monitor*, which is compiled by Ernst and Young, comprising more than 35,000 investment projects in Europe over the period 1997-2010, of which 1,415 originate from the BRICS. These are 25 EU countries at 2010, but excluding Cyprus and Malta, for which data were not collected prior to their EU accession in 2004. These are small island economies that receive little FDI. The database covers the fifteen Member States prior to 2004 and the ten countries of Central and Eastern Europe (CEECs) that joined in 2004 or 2007. In total, I refer to these as the EU-25 countries, and the data for these were presented in the above tables and figures.

There are three aims, which correspond to the contributions of this thesis, as follows:

AIM I: To reveal the characteristics of early-stage BRICS FDI in the EU-25 countries by implementing a descriptive statistics analysis over the period 1997-2010.

AIM II: To investigate the locational determinants of BRICS FDI in the EU-25 compared to other global regions, and to examine the probability of FDI location.

AIM III: To analyse the persistence in the location choice of FDI from each BRICS country, and to examine their 'follow-the-leader' behaviour.

The thesis analyses the *European Investment Monitor* (EIM) database. The first aim gives an overview on the nature of BRICS FDI in the EU-25 over the study period, including the spatial distribution of this FDI and how it has changed over time. The second aim seeks to confirm the locational determinants for the FDI in the EU-25 countries using a Conditional Logit model. It focuses on the determinants for BRICS FDI location, which are compared to the general determinants for FDI from elsewhere. To examine heterogeneity of projects, it allows the project characteristics and sources to vary and discusses the relative probabilities of location. Finally, the third aim uses a 'goodness-of-fit' test to examine whether FDI from each BRICS country 'follows' the previous FDI from the same country. Then, the regression analysis (i.e. logit and count data models) further explores the 'follow-the-leader' behaviour of BRICS FDI and whether it 'avoids' the FDI of other BRICS countries.

Overall, these three aims enable me to consider the nature of early-stage BRICS FDI in the EU countries and its location determinants. It allows me to consider whether this FDI has built-up in some countries, such as through the presence of some agglomeration economy of some kind, or whether BRICS FDI from different countries is distinct, so that it is driven by different location factors and tends to 'avoid' the FDI arising from other BRICS countries. If so, it suggests BRICS FDI is distinct and should be considered as heterogeneous.

To the best of my knowledge, the existing literature concentrates on the FDI outflows from developed economies to developing or emerging economies, so that there is little known about the generation of FDI from developing countries (see Gammeltoft, 2008). Therefore, this thesis fills the gap on the location of foreign investment from the developing economies. UNCTAD (2014) indicates that outward FDI from developing economies has been increasing considerably recently, representing nearly 40% of global FDI outflows, compared to just 12% at the beginning of the 2000s. The rapid growth of BRICS outward FDI makes an important contribution to this currently accounting for about a third of developing economies' FDI outflows (UNCTAD, 2013).

Turning to the methodology, the investment characteristics of BRICS countries (**AIM I**) are analysed using descriptive statistics. First of all, the temporal pattern of FDI flows from the world, developed and developing economies are compared to show that outward FDI from developing economies is playing an increasingly important role in the global FDI outflows. This is because their FDI increases and it now account for a considerable share of global FDI outflows. Meanwhile, the outward FDI from developed economies suffers a sharp decline from 2007 to 2009. Second, the FDI trends of the five global regions that contain the five BRICS countries are explored. This analysis includes South America, the Commonwealth of Independent States (CIS), South Asia, East Asia and Southern Africa. Finally, the FDI flows of the BRICS and each country within the BRICS are investigated to show their main location choice, tendency over time and other investment characteristics. It gives us a good understanding of the location choice of BRICS FDI in the EU-25 and it is a good first step towards analysing its locational determinants.

Econometric analysis is implemented for examining the determinants of the location choice of FDI from different sources in the EU-25, especially for BRICS FDI location (**AIM II**). For this aim, a Conditional Logit model is used to capture the discrete location choice of FDI between alternative locations. It is perhaps the main econometric technique for discrete choice, although it is based on the assumption of the Independent of Irrelevant Alternatives (IIA). First, the overall effects of different determinants on the global FDI location is explored to confirm which determinants have a significant effect generally. Second, FDI from different source regions (i.e. Europe, North America, BRICS and Other) are considered to compare the different locational determinants that attract FDI from different source regions. Finally, I explore the locational determinants of BRICS FDI in the EU-25 countries.

The Multinomial Logit model is also used to determine the relative probability of FDI location in each EU-25 country (**AIM II**). This model enables both the project and source characteristics to be explored together, and it calculates the probabilities relative to a base country (i.e. the UK). The characteristics of the projects from different sources are examined and it is explored how this influences the location choice across EU-25 countries. The project characteristics considered are the project industrial sector (i.e. manufacturing and other), the project function (headquarters / R&D and other) and the project investment mode (start-up or other). First I allow only the project characteristics to vary; then I allow only the FDI sources to vary (i.e. each BRICS country and all other global regions); and finally I allow both of these variations simultaneously. The effect of each country variable (i.e. location characteristics) can be examined through this model, for which the same set of variables is considered throughout. The UK is chosen as the base country as it receives the greatest number of projects across all of the EU-25 countries.

To explore 'follow-the-leader' behaviour of each BRICS country (**AIM III**), I first use a simple 'goodness-of-fit' test to compare the observed FDI location data by country with that which is 'expected' based on the previous location of FDI from the same BRICS country. The null hypothesis for this test is that there is no significant difference between the observed and expected data. I examine the persistence in FDI location over a one-year and two-year time horizon. An issue for BRICS FDI is how to deal with the small number of projects in earlier years, including a large number of zero observations. For this purpose the study period is classified into three sub-periods (1997-2000, 2001-05 and 2006-10) to increase the number of observations and to investigate the persistence in FDI location.

This issue is also explored using the Conditional Logit (CL) and count data models. In both these cases, the lagged BRICS term (i.e. number of projects from the whole BRICS locating in each country in the preceding year) is used to capture this effect. In the CL model it is first disaggregated into the five constituent countries to examine whether

BRICS FDI as a whole follows the previous FDI of any individual BRICS country. Further, to explore this for each BRICS country and maintain a sufficiently large number of observations, the projects for each BRICS country are matched with those projects from the same BRICS country in the same host country in the preceding year (i.e. 'Same BRICS Country'). In addition, the difference in the number of projects between the whole BRICS and 'Same BRICS Country' is also introduced (i.e. 'BRICS, excluding Same BRICS Country'). They are used to examine whether BRICS FDI 'follows' the location of previous FDI from the same country, but also whether it 'avoids' the location of FDI from the other four BRICS countries, if so that they are distinct.

To further explore these issues, the FDI projects are analysed as count data using both a log-linear model and other count data models such as the Poisson and Negative Binomial models. To facilitate the comparison of the results the explanatory variables are basically the same as those considered in the CL model. As before, the lagged FDI terms capture whether FDI 'follows' that from the same BRICS country in the following period, and also whether it 'avoids' the FDI from other BRICS countries. OLS estimation of the log-linear model is used as the benchmark, where the FDI dependent variable and lagged FDI terms are measured by the log of original number of projects plus one. This solves the problem caused by the zero observations and reduces the volatility of absolute changes in the number of projects to improve the nature of the regression results. The Poisson and Negative Binomial (NB) models that are in principle more suitable for analysing discrete count data are also used, where the latter allows for over-dispersion in the count data. Several more advanced models are also considered that allow for the large number of zero observations in the count data including the Hurdle, Zero-Inflated and Zero-Truncated models. Results from these models are compared with those of the CL model to examine 'follow-the-leader' behaviour of the BRICS countries.

1.3. The FDI Data

The FDI data analysed in this thesis are from the *European Investment Monitor* (EIM), which provides information on cross-border investment in Europe for each year since 1997.[1] The EIM is compiled by Ernst and Young, which is the leader for providing online information and tracking inward investment across Europe. The sources used to construct

[1] Further details of the EIM database are available at: http://www.eyeim.com/

the EIM are national investment agencies, financial information providers and media outlets (Defever, 2012). Ernst and Young (2012) claim to monitor 20,000 information sources to identify the projects, and to contact the vast majority of firms to validate the data. It captures investment that adds to the gross capacity of a country only, so that it excludes mergers and acquisitions, as well as license agreements and portfolio investments, which are not usually considered as FDI. It classifies investment into three modes or types: new ('greenfield') investment, co-location and expansion ('brownfield') investment. Detailed information on the projects is also supplied, including the host country, ultimate country of origin, industry sector and project function.

The EIM database gives information for 35,105 projects in the 25 EU countries over the study period, where new investments are the main type of project, comprising two-thirds of all projects. Projects originating from the EU-25 make-up nearly half of all projects and the US accounts for around 32% of all projects. The top three destinations are the UK, France and Germany, which combined account for about half of all investments. The industry sectors are classified according to nine industries comprising agriculture, construction, education and health, energy, finance and business services, manufacturing, recreation, retail and hospitality, and transport and communications, with manufacturing accounting for 58% of all projects. Ten project functions are identified, of which the main ones are production (34.7%) and sales and marketing (34.5%). The investment scale is known for 31% of projects, but the number of gross jobs associated with a project (i.e. new jobs) is known for 62% of projects.

The data on the explanatory variables used in this thesis was gathered from *Eurostat*, which provides economic statistics for the countries of the EU on a harmonized basis. Some countries joined the EU over the study period, but the data for these countries were collected from 1997. The determinants for FDI location are classified according to previous studies (e.g. Sun *et al*., 2002). These are organized in my thesis in terms of theories such as the New Economic Geography (NEG) and New Growth Theory (NGT), where the categories includes variables for demand, the labour market, costs, education, trade and EU policy. This thesis focuses on the characteristics of host country for the location choice of FDI. This is the conditional logit model, and differences in the characteristics of source countries are allowed to separately regress for the different BRICS countries based on the multinomial logit model. All variables are at the country level and the previous investment of different global regions is introduced as explanatory variables. Some variables are constructed by the author, so that, for example, a variable is included for EU membership. Finally, the relevant data are in the real terms using the EU country deflator and are in Euros at 2005 prices.

1.4. Structure of the Thesis

Overall, including this Introduction, the thesis is divided into nine chapters. The structure, in relation to the Aims of the thesis, is as follows. Chapter 2 reviews the literature on FDI location determinants, including both theoretical and empirical studies. The beginning of this chapter defines FDI formally and emphasizes its importance in the international economy. After that, Chapter 2 introduces the early theories of FDI, mainly concentrating on the international business literature. The 'eclectic paradigm' is discussed to reveal a more specific locational dimension to this theory. The chapter then turns to more specific location theories to further understand FDI location, including Marshallian agglomeration economies, the New Economic Geography (NEG) and New Growth Theory (NGT). These form the basis for the empirical analysis of the thesis. After discussing the theory, the chapter reviews the empirical evidence on the FDI location choice by discussing the traditional factors and the role of agglomeration economies, including production linkages and knowledge spillovers.

Chapter 3 discusses the location of BRICS FDI, focusing on locations in Europe. It examines the main locations and the special locational determinants for the BRICS FDI using published data from UNCTAD (**AIM I**). There are several aspects to this. First, the chapter describes global FDI flows distinguishing between the developed and developing economies. After this, the location choices and trends in FDI across different global regions are explored. Second, FDI flows for all BRICS countries are explored and compared, providing a general framework and understanding for the empirical analysis on 'follow-the-leader' behaviour (**AIM III**). Third, 'OLI paradigm' in Chapter 2 indicates that the location choice of FDI is determined by the host country characteristics, so that Chapter 3 examines the general locational determinants and special ones for individual BRICS FDI, including the country, industry and firm level factors.

Chapter 4 describes the methodology used for exploring the location choice of FDI in the EU-25 at a country level. These include the discrete choice models such as the Multinomial Logit and Conditional Logit models that analyse the location choice of FDI among a set of alternative locations. This chapter also discusses the models appropriate for count data analysis to capture the number of FDI projects locating in a given country.

Specifically, this chapter describes the models of binary choice to provide a basic understanding of the Conditional Logit and Multinomial Logit models. The former is used to examine the location choice of FDI projects in the EU-25 (**AIM II**), including the 'follow-the-leader' behaviour of BRICS countries' FDI (**AIM III**), and the latter explores the relative probability of FDI location in a country (**AIM II**). After this, count data models (Poisson and Negative Binomial models) are described. Finally, this chapter discusses several more advanced count data models, such as the Hurdle, Zero-Inflated and Zero-Truncated models, which are more appropriate for BRICS FDI count data, which contain many zero observations.

Chapter 5 describes the nature of EIM FDI data and other variables that form the independent variables in the analysis. This chapter gives information on the EIM database, including the nature of the FDI projects that are covered by this database. The characteristics of these FDI projects is then explored in great detail in terms of a range of factors, such as the temporal trend, the destination and source countries, the industry sector and the functional activity. This is followed by a more-detailed analysis of the data through the cross-tabulating various characteristics. The last part of the chapter describes the explanatory variable. This includes the motivation for these terms based on Chapter 2, their measurement and the data source. Summary statistics and correlation matrices for each explanatory variable are presented to check that the variables are not correlated strongly.

In Chapter 6 the importance of BRICS FDI to the EU-25 countries is investigated using the EIM database. This analysis compares BRICS and non-BRICS countries' FDI and also explores the investment by each BRICS country. The comparison between BRICS and non-BRICS FDI makes a distinction between the EU-15 and CEEC-10, given that most FDI projects tend to favour the former. The characteristics of the BRICS investment is explored according to the industry sector, functional activity and project type (i.e. 'greenfield' start-up or 'brownfield' expansion), which contributes towards the first aim (**AIM I**). The persistence in the BRICS FDI location choice over time (i.e. a tendency to locate in the same countries over time) is examined using a 'goodness-of-fit' test (**AIM III**).

Chapter 7 uses regression analysis to explore the determinants for the BRICS FDI location choice (**AIM II**) and also to examine how BRICS investment locates in relation to earlier investment, which is known as the 'follow-the-leader' behaviour (**AIM III**). First, this chapter analyses the effect of the country variables and FDI lagged terms on global FDI location based on the Conditional Logit model. This confirms that different characteristics of the host countries are attractive to FDI from different sources. Second, this chapter explores the same issue for BRICS FDI only, focusing on 'follow-the-leader' behaviour. Two new variables are introduced that capture the number of projects from the same BRICS country and from the other four BRICS countries. Finally, the probability of BRICS FDI locating in each country is examined relative to the UK base case. This uses the Multinomial Logit model, which allows the characteristics of FDI to vary (**AIM II**). These comprise the project characteristics (i.e. industry sector, functional activity and project type) and the investment source (i.e. BRICS countries, Europe and North America).

Different empirical models are used in Chapter 8 to investigate BRICS FDI location using project counts. These models are based on the data on the number of projects in a country in a year. The analysis concentrates on whether there is evidence for supporting the conclusion of Chapter 7 on the 'follow-the-leader' behaviour of BRICS FDI (**AIM III**), and the results are compared to those obtained by logit analysis in Chapter 7. This chapter examines whether FDI from one BRICS country 'avoids' the location of FDI from the other BRICS under the hypothesis that this FDI is interested in different locational determinants. For these purposes, the OLS estimation of a log-linear model gives the benchmark results, which are compared with those from the Poisson and Negative Binomial (NB) models, which are more suitable for discrete count data. In order to deal with the issue of excessive zero observations, two-stage models are used, including the Hurdle, Zero-Inflated and Zero-Truncated models.

Finally, Chapter 9, summarises the main results of the thesis and draws conclusions in relation to the research questions of the thesis. In addition to the main findings, the policy implications are considered, referring to the investment strategy for BRICS countries in the EU and their policy orientation for the development of their economy. Finally, this chapter summarises the advantages and limitations of this thesis, for which it also provides ideas and suggestion for further study.

Chapter 2. A Review of FDI Location Determinants

2.1. Introduction

Foreign Direct Investment (FDI) is seen as a channel for promoting economic growth and assisting the development of economies that are either under-developed or in transition. FDI is also a mechanism used to link national economies and promote an outward-looking international economy that fosters the increased globalization of an economy. In particular, FDI is a tool that can enable lagging countries to overcome their organizational gaps and realise their objectives by introducing new production techniques (Barrell and Holland, 2000), with the most important channel for the transfer of modern technology being spillovers from FDI (Blomstrom, 1989). According to Kok and Ersoy (2009) FDI affects income, production, prices, employment and the economic growth of a host country, while Ho and Rashid (2011) suggest that FDI also improves capital stocks and employment levels by generating new production capacity and promoting the transfer of intangible assets. Overall, the implications of the positive benefits that FDI brings into an economy are that countries will try to create a favourable environment to attract even greater levels of inward FDI (Bhavan *et al*. 2011).

This chapter aims to review the previous theoretical and empirical research on the determinants of FDI location. According to van Aarle and Skuratowicz (2000), the theories related to FDI location can be classified into several types, which are based on the one hand on the international business literature and on the other hand on the economics literature that includes the New Economic Geography and New Growth Theory. The international business literature, mainly in the form of Dunning's eclectic paradigm, shows that firm-specific characteristics are the main driver behind the decision of a firm to locate abroad. However, these characteristics are not sufficient to enable FDI, but instead there must also be incentives to physically undertake the investment rather than to export or to license the product. This leads to the importance of specific locational determinants of FDI, such as the size of the host market and the cost of factors of production in the host economy. The theories of New Economic Geography and New Growth Theory also highlight a number of determinants for FDI location, but their focus on the importance of agglomeration economies, such as inter-firm linkages and knowledge spillovers between firms, rather than the traditional location factors of the international business literature.

Using the above theoretical framework, this chapter then reviews the empirical literature on FDI location. It focuses on both the traditional and agglomeration variables and finds support for a large number of these location determinants. Specifically, the importance of market size and labour costs is found amongst the traditional determinants, while for the agglomeration economies there is evidence to suggest that foreign firms decide to locate near the presence of other foreign firms, providing benefits from inter-firm linkages and knowledge spillovers. In particular, FDI is found to locate in areas where there is a presence of other foreign firms from the investors' same home country, so that there may be a build-up of FDI from particular countries in a given area.

The structure of the literature review is as follows. The next section introduces the early theories of FDI, which are centred on the international business literature. Section 2.3 then covers in detail the main theory of FDI, specifically the OLI paradigm. Section 2.4 discusses the importance of agglomeration economies and Section 2.5 reviews the empirical evidence for FDI location. Section 2.6 concentrates on the issue of 'follow-the-leader' behaviour. Finally, conclusions are drawn in Section 2.7.

2.2. Early Theories of Foreign Direct Investment

Dunning (1981) suggests that FDI is more than the transfer of capital within a firm, because it includes the transfer of technology, organisational and management skills, so that FDI also involves the transfer of a broad range of resources within the firm. There are a number of theories explaining why FDI occurs and these emphasise certain aspects of multinational corporations. These theories include Hymer's (1960) international production, the product life cycle theory of Vernon (1966), horizontal and vertical theories of Caves (1971) and the internalisation theory of Buckley and Casson (1976). These theories form a key part of Dunning's eclectic theory (Dunning, 1977) that has subsequently become the main framework explaining FDI, so an understanding of these early theories is also important for understanding the eclectic paradigm.

2.2.1. The Theory of the International Operations of Firms

According to Hymer (1960), in order to explain FDI, it is necessary to distinguish it from portfolio investment. The key difference is that FDI gives the firm a level of control over its investment. In particular, FDI is used by investors to control the activities of foreign firms, and this is the main basis of Hymer's theory (Dunning and Rugman, 1985). If a firm sets up production abroad, there are barriers to entry in the form of uncertainty and host country risk, such as nationalism and exchange rate risk. Therefore, why does a firm engage in FDI given these barriers to international production? Hymer suggests that by taking over or merging with firms in other countries the firm can reduce competition. However, this is not sufficient to explain why a firm may engage in FDI. The necessary pre-condition is that the firm must access the foreign market to fully appropriate the profits, while FDI may also be important if there are problems in licensing the product.

2.2.2. Product Life-Cycle Theory

Vernon (1966) argues that the decision to produce in a foreign country is not based on the standard factor-cost analysis, but rather on a more complicated process. According to Vernon, the life cycle of a product has three main stages (where only in the second and third stages of a maturing or standardised product is FDI worthwhile):

> *Stage One: Product development phase.* The requirement in the product development phase is certainty, which means that communication between producers, suppliers and customers is important. These give rise to a location decision which means a product is situated close to its market.
>
> *Stage Two: Maturing product phase.* Increases in the demand for the product lead to a greater degree of standardisation, which decreases the dependence on the market. This can promote the development of economies of scale. If the firm seeks to establish a plant abroad and the level of labour costs is lower, it will result in the foreign plant becoming a more cost-efficient location. It may lead the foreign plant to export back to the home country. As rivals of the firm will try to avoid the loss of their market share, it may lead to further FDI into the country from other firms.

Stage Three: Standardised product phase. In this stage, the standardisation of the product arrives at its peak, and now the international market is determined more by price competition. The low level of labour cost in less-developed countries offers an incentive for firms to establish plants in these areas. Besides, since there is no large industrial environment in less-developed countries, the product can take on a high level of standardisation. This means the inputs can be easily specified.

Overall, the product life cycle theory focuses on the dynamics of FDI. It is the first theory that genuinely integrates a location dimension into the process of foreign investment.

2.2.3. Horizontal and Vertical Theories

According to Caves (1971), horizontal FDI occurs when a firm gets access to a product market in a foreign country, whereas vertical FDI takes place when a firm goes into the product market at a different stage of production, i.e. as a supplier or customer. These can be discussed as follows:

Horizontal FDI. If a firm has a unique set of assets that other firms do not have, or there are trade barriers on exports, such as tariffs, then a firm engages in horizontal FDI. Both of these reasons could lead to FDI occurring in market structures that are characterised by oligopoly or product differentiation. Overall, it predicts that a feature of oligopolistic markets or where products are differentiated is the existence of horizontal FDI.

Vertical FDI. If a firm seeks to reduce strategic uncertainty or create entry barriers that prevent foreign firms gaining access to the market then it may engage in FDI at a different stage of the production chain. If profits in the foreign market depend mainly on contracts, then vertical FDI is also more likely to be large in scale in order to avoid negotiating and other costs associated with contracts. However, if there is no technological complementarity between different stages of production and the market is competitive then vertical FDI may not take place at all.

2.2.4. Internalisation Theory

Coase's (1937) theory of the firm highlights the importance of the internalisation of firms' activities, and it was used and developed in the 1970s by a number of authors to explain the role played by transaction costs in forming multinational organisations and hence to explain international production and FDI. One of the leading proponents of the internalisation theory, Buckley and Casson (1976) argue that the multi-national enterprise (MNEs) is essentially an extension of the multi-plant firm. According to Buckley and Casson, the activities of firms are interdependent and connected by intermediate products, especially in the case of large firms. If the market for intermediate products is imperfect, then an incentive may arise for firms to internalise intermediate goods. When this internalisation takes place across national boundaries then a MNE emerges and FDI occurs. An important intermediate product in the internalisation theory of FDI is knowledge, which not only can give rise to internalisation but also internationalisation. Overall, it suggests that MNEs tend to emerge in industries where knowledge is an important intermediate product. The internalisation theory has played an important and popular role in the development of theories of FDI since the 1970s.

2.3. The 'Eclectic Paradigm'

The 'eclectic paradigm' of Dunning (1977) brings together a number of different theories of FDI discussed above into a general framework. However, while these theories have explored questions mainly about why FDI occurs, the eclectic paradigm introduces a more specific location dimension to the theory of FDI, so it attempts to explain where FDI locates.

2.3.1. The 'OLI' Framework

The location choice of foreign investment may be determined by many factors, which are partly external and partly internal to the firm. The best general framework to consider all of these factors together is the so-called 'OLI paradigm' developed by Dunning in 1977. The eclectic paradigm provides the basic outline for FDI theory (Resmini, 2000). Prior to the paradigm there were many competing theories of FDI, so that the main advantage of this approach is that it places these theories in a common framework to generate a single theory or paradigm (Jones and Wren, 2006). The central premise of the eclectic paradigm is that it combines Hymer's 'ownership advantages' theory with the 'internalisation' theory of FDI, while at the same time introducing a 'location' dimension to the FDI decision process. In addition, the theory considers the effects of a range of factors, such as the characteristics of countries or industries on the ownership (O), location (L) and internalisation (I) advantages of FDI, i.e. the OLI framework. Therefore, the eclectic paradigm can be seen as an all-encompassing and comprehensive explanation of FDI (Dunning, 2000).

According to the eclectic paradigm, if a firm seeks to invest directly in a foreign country it must fulfil three necessary conditions. The first condition is that it must have ownership-specific assets that are exclusive to it, so that the firm has an advantage over other firms. This reflects the ownership advantages theory developed by Hymer (1960). Second, reflecting the internalisation theories of FDI (Buckley and Casson, 1976), the firm will internalise these assets within its firm structure rather than through contracting or licensing as long as these other methods have higher transaction costs (Mina, 2007). Finally, the firm must have an advantage in setting-up its production in a particular foreign country rather than exporting, so that there is also a specific location dimension to the paradigm. Therefore, FDI is determined, first, by the extent of net ownership advantages that a firm possesses; second, by the internalisation advantages; and thirdly, by the profitability of locating its production at home or in foreign country (Pelegrín and Bolancé, 2008). Respectively, these are the Ownership, Internalisation and Location advantages, i.e. the 'OLI' framework of the eclectic paradigm, and these advantages are now explored in further details.

2.3.2. The Ownership and Internalisation Advantages

The ownership advantages are treated as particular assets, including both tangible and intangible assets, which are specific to the firm and provide the potential for the firm to earn greater profits in the future (Bevan and Estrin, 2004). The ownership advantages include a range of factors such as the size of the firm, the level or quality of its management and its technological capabilities. These ownership advantages may also strengthen themselves over time, for example due to economies of joint supply or through the possession of greater knowledge and information. Therefore, a multinational enterprise could acquire and develop a number of ownership-specific advantages over time.

The internalisation advantages are ways by which a firm can maximise its gain from the ownership advantages in order to avoid imperfections of the market. According to Jones and Wren (2006), the reasons for internalisation include "the avoidance of transaction costs, the protection of goods, avoidance of tariffs and the ability to capture economies of scale from production, marketing and finance" (p. 37). Internalisation-specific advantages can therefore give rise to a production process becoming internal to the firm. For example, under the theory of internalisation, in order to better adjust existing products to local needs, R&D expenditure by foreign subsidiaries could help a firm adapt technologies that are created at home to the conditions of the host country (Pelegrín and Bolancé, 2008).

According to Mina (2007) both the ownership and internalisation advantages are firm-specific (and home-country specific) as they arise within the firm from the home country, whereas the final set of advantages in the paradigm, the location advantages, tend to reflect the characteristics of the host-country (and are therefore host-country specific advantages). Caves (1996) notes that on the one hand OLI advantages rely on characteristics of the home country that permit a firm to develop its ownership advantages and to become a multinational, but on the other hand they depend on the characteristics of the host country that permit foreign firms that already possess ownership advantages to locate their economic activities there. These location advantages are of interest to this thesis and they are now explored.

2.3.3. The Location Advantages

The location-specific advantages, the 'L' in the OLI paradigm, represent those factors that attract FDI into a particular market (Oxelheim *et al*., 2001). As noted by Rugman and Gestrin (1993), location advantages (host-country specific advantages) are often a country's national factor endowments in its aggregate production function. They can however also include the resources, networks, institutions and other facets that are specific to a given country (McCann and Mudambi, 2004). Dunning (1998) notes the importance of locational advantages in the eclectic paradigm because it is a key determinant of the foreign production of multinational enterprises (MNEs). Thus, if there are immobile factors that are natural or created endowments and a firm needs to use these with their ownership-specific advantages, then this may affect its preference for a foreign rather than a domestic location.

Location advantages include traditional factors such as input prices, transport and communication costs and government incentives, in addition to the other assets that a country possesses, such as natural and skilled resources. However, Dunning (1998) notes that there are many potential country-specific advantages including input cost advantages, labour productivity, access to knowledge-intensive assets such as higher education institutions, market size, transport costs and the (psychic) distance from key markets to the home country of the MNEs, in addition to tariff barriers, taxation, and market competition. Overall, these factors make production in the country more attractive relative to the other means of international operations such as exporting.

Overall, the OLI conditions for FDI are not evenly distributed across countries, which means that location is also determined by the specific factors of the source countries, as well as the host in which FDI locates. In the case of ownership advantages, for instance, the size of the firm is affected by the market size of the source country since larger markets enable the firm to obtain ownership-specific advantages in the form of economies of scale. The degree to which firms can internalise their advantage may also be influenced by country-specific factors, such as institutional arrangements or by the competitive environment. Finally, in the case of the location-specific factors, labour costs vary between developed and developing countries, and transport costs are partly determined by the distance between the source and host countries. Therefore, the location characteristics are central to the OLI framework for explaining not only the underlying motives of why firms become foreign investors but also determining where the investors decide to locate.

2.4. Economic Theories of Location

The theories of FDI discussed above span both the economics and international business literatures and with the eclectic paradigm provide a general framework for explaining the rationale for being a multinational enterprise and engaging in FDI. The location dimension of the eclectic paradigm is however still a relatively neglected element (Dunning, 1998), so that to further understand the location of FDI attention is now turned to more specific location theories from the economics literature. Specifically, these theories comprise traditional neoclassical location factors, Marshallian agglomeration economies and the modern expression of these in the New Economic Geography and New Growth Theory.

2.4.1. Profit Function: Traditional Factors

The traditional neoclassical location factors are those characteristics of host countries that affect a firm's profits, but that are not directly related to the location of other firms, either in the same or different industries. He (2002) indicates that these traditional determinants of FDI include market size (or potential), labour and capital costs, transport costs, and government policies such as financial incentives for FDI. They also include the operating environment of a country, such as its openness to trade, the exchange rate, economic stability and country risk. Reviewing the previous literature, the important traditional factors in the profit function (i.e. characteristics of the host country) mainly refer to the level of market demand (internal and external demand), labour market costs, education level, trade and host country policies. These are included in our regression analysis in Chapters 7 and 8 to explore their effect on investment location.

The internal market demand can be measured by GDP and GDP per capita, which are indicators for the scale of the economy and the benefits received by the citizens respectively. The GDP growth rate reflects the position that an economy is in (e.g. recession, recovery or prosperity), and the population density represents the size of the consumer market. In addition to these, it is necessary to consider the external market demand of the host country that could reflect market access to the host country. Indicators for the labour market are unemployment and wage rates. The former reflects the development of economy and society of the host country, but when it reflects the availability or quality of the labour force, there may be opposite effects on the location of investment. For wage rate, the profit function shows that profits are lower with a higher wage rate as it increases the level of costs.

Turning to the costs of investing in the host country, the profit function shows that the corporate income tax rate is an important factor as it could affect the firms' net profit after-tax directly. Based on the assumption of maximising profits, the corporate income tax rate has a negative effect on the investment location. Better motorway density, reflecting a good road infrastructure could reduce the transport cost and save time, and so improve the level of profits. In addition to these, the profit function also shows that it is necessary to consider the country risk that reflects the economic and social stability and predictability of the host country based on the assumption of risk-aversion of investors. Education level represents the level of labour skills that further affects the wage level considered in the profit function. In this sense, a labour force with a higher level of education normally requires a higher wage (i.e. increase in the cost), which causes a decrease in profits. However, it also represents a higher level of technology, which could attract more investment inflows to the host country.

Trade factors include the host country openness to trade and the exchange rate, where the former reflects the relative level of export and import of the host country. The effect of this on location depends on the relationship with FDI (i.e. whether their relationship is complementary and substitution). The exchange rate reflects the costs of labour and production that are considered in the profit function. In particular, if the domestic currency appreciates there will be an increase in the costs of investing firms. Assuming risk-aversion, exchange rate volatility may also adversely affect FDI location. Finally, certain policies of the host country are considered as they can reduce the costs of investing firms, e.g. if the policy seeks to attract foreign investment.

2.4.2. Agglomeration Economies

Agglomeration economies are location-specific economies of scale (McCann, 2001). They can be classified into three categories: internal returns to scale, localization economies and urbanization economies, where the last two types are external to the investor (Parr, 2002). Internal returns arise from economies of scale in production due to size and are treated as internal to the firm, while external economies provide advantages to firms in a given area but are generated from outside of the firm so that firms' costs decrease when they enter into the location (Rasciute, 2008). Localization economies are industry-specific external economies that cause firms in the same industry to locate in the same area, i.e. economies of scale that are external to the firm but are internal to an industry in an area. Urbanization economies are city-specific economies of agglomeration, that again are external to the firm but differ from localization economies in that they flow across industries, where over larger spatial scales urbanization economies are known as Jacobs economies (Jacobs, 1969). It is the localization economies, associated with Marshall (1920) that have received the greatest attention in the literature and given their importance in modern theories they will be discussed further.

The discussion of agglomeration economies derives mainly from the localization theory of Marshall (1920). Marshall found that when an industry selects a locality, it tends to stay there for a long time. This was because location brought advantages that encouraged other activity in the same industry to locate in the locality and this became mutually reinforcing. In general, localization economies refer to firms in the same industry that are located together. Overall, three sources of agglomeration economies are identified: *local skilled-labour pool*, *non-traded local inputs* and *information spillovers* (see McCann, 2001). They allow firms to experience localized external economies and are as follows:

> *Local Skilled-labour Pool:* A specialized labour pool that can reduce the cost of labour, of which there are two aspects. First, firms often need sufficient quantities of labour in a local area to respond to market conditions, so that they can expand their labour force quickly if market demand conditions improve rapidly, which increases their flexibility. Second, firms also want to ensure that employees carry out tasks correctly and in many sectors the cost of training labour and the acquisition of skills are very high; however, if a firm is located in an area that has a large local labour pool with specialist skills that are required by the particular industry, the costs for the firm expanding its workforce are likely to be low. According to Overman and Puga (2010), if plants in a sector experience shocks then they have the potential to benefit from labour pooling by drawing from other plants in the same industry that use similar workers. Using establishment-level data from the UK Census of Production, and controlling for a range of factors, Overman and Puga (2010) show that these sectors tend to be spatially concentrated.

> *Non-traded Local Inputs:* When some firms from an industry are in the same location, there may be specialist inputs that are provided in this location in a more efficient manner than in the case when firms are dispersed. To distinguish these from *consumed inputs*, these inputs are '*non-traded*'. Firms providing specialist services, such as legal or software firms, tend to be located in certain areas and provide their services to certain market sectors. The provision of specialist services is expensive, but if there are many firms located in the same place, the average cost of providing these services becomes lower. Another type of non-traded local input is the specialist local infrastructure, where the market benefits from the local infrastructure and the cost is spread across all of the beneficiaries. Therefore, non-

traded local input costs will decrease for each firm in this location when there are more firms that have access to this location.

<u>*Information Spillovers:*</u> If firms from the same industry are located in the same location, they have contact with each other through business and other informal meetings, such as lunch meetings, sports activities and other occasions. The exchange of information or knowledge permits each firm to establish a more coherent picture of the market, improving its ability to compete. The advantage of spatial clustering is the mutual accessibility of all firms and therefore the increased availability of information and the greater likelihood of knowledge spillovers. The firms in the location will have an information advantage relative to other firms, and the extent of this will depend on the number of agglomerated firms in the same location.

Agglomeration is important within innovative industries (Cantwell and Iammarino, 2001), where the innovative ability of multinationals strengthens the distribution of technological specification in the local area. Overall, agglomerative sources include access to non-traded inputs, such as infrastructure and local public goods; access to specific labour markets, i.e. labour market pooling; and the presence of knowledge spillovers.

Turning to urbanization economies, they are another type of agglomeration economies that occur to firms among different sectors. In addition to the above sources for agglomeration economies, there are some sources of urbanization economies that operate through the mechanisms of *sharing*, *matching* and *learning* (Puga, 2010), as follows:

<u>*Sharing:*</u> This mechanism includes sharing facilities, suppliers and labour pool. First, in the case of facilities, if there is a large fixed cost associated with the facilities that are being shared, the cost per user will decline when the size of the population that is sharing the facilities increases, encouraging agglomeration. Scotchmer (2002) indicates that the growth of the user base will be restricted by the potential crowding of these facilities. Second, sharing can apply to suppliers; if firms in a sector cluster to share intermediate suppliers, they can make large purchases and these intermediates can achieve economies of scale. Finally, for labour pooling, if some firms have substantial variations in their employment relative to other firms that

have workers with similar skills, there may be an advantage for these firms to locate in places that contain many workers with these skills. It means that an agglomeration may occur, as the concentration of employment can eliminate idiosyncratic shocks and can be conducive to the transfer of labour from low- to high-productivity firms. Ellison *et al*. (2010) find that across sectors, industries that have labour with similar skills also have an agglomeration pattern.

Matching: A larger market is conducive to better matching between employers and employees or consumers and suppliers. For example, the skill-space can be better covered by firms in a large city that can reduce the average cost of mismatches. It improves the opportunity for a suitable match, a match of good quality or a combination of these. Berliant *et al*. (2006) find there is a higher probability of matching taking place in a larger market, which permits firms and workers to become more fastidious. Further, when the average quality of matches increases, the higher probability of matching decreases. For example, by studying the academic recruitment for new PhDs in Economics, Gan and Li (2004) find support that there will be a higher probability of matching if a specialization field has more candidates and vacancies.

Learning: In general, learning as one of the main sources for agglomeration economies has attracted less attention in the New Economic Geography compared to sharing and matching. Glaeser (1999) uses a model to show that young workers prefer to migrate to large cities to interact with experienced workers who may help them obtain valuable skills, and to share the rents of this learning process with experienced workers who stay in these cities. Duranton and Puga (2001) find that younger firms locate in an urban area to get information from experienced firms, such as hiring labour and controlling costs. When these younger firms become mature, they may relocate to other specialized places. In addition to the above transmission of advanced knowledge, large cities encourage the creation of new knowledge and arbitrary flows of information (Puga, 2010). Furthermore, there is a complementary relationship between skills and agglomeration (Glaeser and Resseger, 2010). It means skills can increase the benefits from agglomeration and agglomeration promotes the accumulation of skills. Hence, there is a cumulative process, which leads to an agglomeration of activities.

Overall, all of above sources allow a firm to benefit from locating in the given area or industry where these economies arise. This may lead to a spatial agglomeration of firms or clustering, and in turn can increase the possibility of the transfer of information, the provision of specialist services and the likelihood that the appropriately-skilled labour is available relative to dispersed locations, which increase the likelihood of further spatial agglomeration. Agglomeration economies and the agglomeration of economic activities therefore become a self-reinforcing process. However, it only arises if agglomeration economies are stronger than the opposing forces of competition in the product or labour market that reduce the output price or push up input prices, causing firms to disperse in their location. This is the central premise of the New Economic Geography and is now discussed in greater details.

2.4.3. The New Economic Geography

A modern interpretation of the Marshallian localization advantages helps underpin recent theories of spatial agglomeration. This is the New Economic Geography (NEG) literature of industrial location, e.g. Krugman (1991) and Venables (1996). The NEG is a decentralised model of the economy and resulted partly as a response to dissatisfaction with earlier models of industrial location that were not based on microeconomic foundations. It includes the fundamental trade-off between the agglomeration and dispersion forces in an equilibrium framework. NEG focuses on the importance of market size, trade costs and external economies of scale in location and it is rooted in mainstream economics (Guimaraes *et al.,* 2000). Ultimately, it shows that an uneven location of economic activity can occur, i.e. spatial agglomeration, as an equilibrium process from the above sources of agglomeration economies rather than the standard neoclassical factors.

The NEG emerged in the late 1970s and early 1980s, for which Krugman (1991) indicates that market access or the ‘Home Market Effect’ (HME) was an early and important result of the NEG. It states that an area that has the greatest home demand relative to endowments leads to greater levels of production of the good. This is because inputs are costly to transport, but the goods produced and sold to the home market are not, and so firms locate in the larger markets and export to smaller ones. Market size and transport costs are therefore key variables in the NEG theory that lead to an agglomeration of economic activity. In addition, there are other agglomeration sources that can produce an agglomeration of economic activity. For example, the NEG presents an approach in which the forward and backward linkages (see Hirschman (1958) for a broader discussion on these) are a centripetal source that generates a process of agglomeration whereby producers locate close to their suppliers and customers to reduce transport costs. Therefore, the presence of a variety of intermediate inputs available for final goods, as well as reducing the average transaction costs (Venables, 1996), leads to a greater number of firms in the upstream / downstream markets and in turn leads to a further agglomeration of activity.

Kinoshita and Campos (2003) find that the generation process of agglomeration economies and their role in attracting economic activity (e.g. foreign investments) eventually becomes self-reinforcing process and leads to a process of cumulative causation between agglomeration economies and the agglomeration of activity. In the case of FDI, when host countries receive their first mass investments, the existence of agglomeration economies can make the stock of FDI attract further levels of FDI into the host country and therefore existing FDI can predict future levels of FDI. Overall, the NEG theory of agglomeration of economic activity emphasises the importance of market size, labour markets, inter-firm linkages and knowledge as the main sources of agglomeration economy. The importance of knowledge spillovers for location is also emphasised by the New Growth Theory (NGT) theory as follows.

2.4.4. The New Growth Theory

The New Growth Theory (NGT) indicates that international transfers of technology and knowledge through FDI can affect the performance of host countries and be a reason for FDI location. The transmission mechanism for the NEG mainly depends on pecuniary external effects (i.e. market-based), but for NGT it relies on technological effects (i.e. externalities) in the form of knowledge spillovers. The NGT originates from a labour-augmented production function $Y_i = F(K_i\ A_i L_i)$, where Y_i represents output of firm i, F is a production function, K_i and L_i represent capital and labour respectively, and A_i is an index of knowledge available in firm i. Since knowledge is non-rival, A_i is determined by the gross level of capital K, so that $A_i = K$. If this function has constant returns to scale, the theory reconciles endogenous growth with competitive markets, whereby constant returns occur at the firm level with respect to K_i and L_i.

According to Griliches (1992), there are two main points emphasized by the NGT. First, changes in technology come from investment that arises from decisions made by economic agents. Second, economic growth cannot proceed at a constant and undiminished rate if there are no significant externalities, spillovers or other sources of increasing social returns. As Grossman and Helpman (1991) note, growth theories concentrate on international linkages through trade and FDI that could influence the productivity and economic growth of national economies. Overall, the transmission mechanism of NGT is non-pecuniary and it downplays the importance of classical location factors, so it is sometimes considered as a social network (McCann and Sheppard, 2003). It may give rise to an agglomeration of activity at a different level to that of the NEG. This is because technological externalities that arise from personal interactions may lead to small-scale agglomerations, but pecuniary external effects that occur over large areas will lead to large-scale agglomerations. Martin and Ottaviano (1999) argue that technological externalities in factor accumulation may well strengthen the incentive for agglomeration that comes from local pecuniary externalities.

The NGT model emphasizes the importance of own-industry knowledge spillovers (Romer, 1986), where according to Driffield and Munday (2000) knowledge is an important ownership advantage of FDI that may flow to other firms. In recognition of the earlier work of Marshall (1920) and Arrow (1962) these are known as MAR externalities. These occur at the industry level and arise as know-how and technology are more likely to be transferred between firms if they located in a small area owing to direct contact. As discussed above, in a small area Marshall (1920) refers to these own-industry effects as a localization economy. If knowledge is transferred across industries related to the size of a city it is an urbanisation economy, but, as noted above, over larger areas it is a Jacobs externality whereby firms in an industry may benefit from advanced technology in other industries, so that the variety of industries in an area can create an agglomeration of activity (Jacobs, 1969).

2.5. Empirical Evidence

This section which is divided into two parts reviews the existing empirical evidence for FDI location determinants. First, it discusses the traditional factors, comprising factors such market size, the cost and quality of labour, the role of knowledge, macroeconomic and institutional factors (Sun *et al.*, 2002). Second, it considers the empirical evidence for the role of agglomeration economies that are integral to the NEG and NGT models, including linkages and knowledge spillovers. As discussed above, the traditional factors add to a firm’s profits in a location but are unrelated to the location of other activity, whereas agglomeration economies arise from a location in proximity to other firms either in the same industry or in other industries.

2.5.1. Traditional Locational Factors

The studies from which this section draws upon are summarized in Table 2.1 below. It shows the characteristics of the some of the main studies and briefly summarizes the main results. These studies are now discussed according to the different location factors as follows.

Market Size (Demand)

Market size tends to be measured by the gross domestic product of a country or region (GDP). As it measures market potential, it is expected to have a positive effect on FDI location. Janicki *et al.* (2004) finds that market size is statistically significant, so that FDI flows are greater in larger economies. Furthermore, other studies measure the size of the market by GDP per capita, which is important, as some countries such as China have a very large GDP but a GDP per capita that is much smaller. GDP per capita is an indicator for the average benefits that the citizens receive from the increased output in their countries, and it is expected to have a positive effect on investment location as higher GDP per capita indicates an economy with well-off citizens and higher demand. Shamsuddin (1994) finds that market size, measured using GDP per capita, is the most important FDI determinant, followed (in order of importance) by the wage cost, per capita debt, per capita inflows of public aid and the volatility of price.

Table 2.1: The Characteristics and Results of Empirical FDI Location Studies

Study and Date	Characteristics of Study	Summary of Main Results
Bagchi-Sen and Wheeler (1989)	Metropolitan areas of the United States over 1974-78 and 1979-83.	The level and growth rate of population are important determinants of FDI.
Bevan and Estrin (2000)	Central and Eastern Europe Countries from 1994 to 1998.	A negative relationship between labour costs and FDI.
Bevan and Estrin (2004)	Bilateral data on European Union and Central and Eastern Europe Countries from 1994 to 2000.	FDI is negatively related to the distance between countries and unit labour costs, but positively related to GDP in the source and host countries.
Coughlin *et al.* (1991)	Manufacturing facilities in the United States from 1981 to 1983.	Higher per capita income, unemployment and manufacturing activities attract more FDI inflows, but higher wage levels could obstruct FDI.
Deichman (2001)	FDI in Central and Eastern Europe countries over 1993-97.	Trade volume is the most important determinant, followed by the host environment for investment and transportation infrastructure.
Du *et al.* (2008a)	US multinationals in Chinese regions over 1993-2001.	Higher FDI in regions with lower government role in business operations, lower corruption and better protection of intellectual property rights.
Friedman *et al*. (1996)	Manufacturing branch plants in the United States over 1977-86.	Skilled labour as well as market potential and the expenditure on attracting FDI have a positive effect on the location choice of foreign subsidiaries in the US.
Jadhav (2012)	BRICS countries over 2000-09	The effect of openness on FDI is determined by whether the investment is market-seeking or export-oriented.
Janicki and Wunnava (2004)	European Union and Central and Eastern Europe Countries in transition in 1997.	Market size measured by GDP is statistically significant and FDI flows are larger in larger economies. Country risk, labour costs and trade openness are also important determinants for FDI flows.
Klein and Rosenger (1994)	FDI flows to the United States from seven industrial countries over 1979-91.	When the currency of a country starts to devalue, it leads to a decline in production cost, which is measured by foreign currency. It means that there is an increase in FDI flows and in the wealth of foreign investors.
Kok and Ersoy (2009)	24 developing countries from 1983 to 2005 and 1976 to 2005.	GDP has a positive effect on FDI, along with trade openness and gross capital formation.
Mina (2007)	Six Gulf Cooperation Council (GCC) countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates (UAE) over1980-2002.	A positive relationship between FDI and institutional quality, trade openness and infrastructure, but human capital discourages FDI flows.
Resmini (2000)	Manufacturing sectors of the Central and Eastern Europe Countries from 1990 to 1995.	The formation of a market economy has a significant effect on FDI, especially in more capital and knowledge-intensive sectors.
Shamsuddin (1994)	36 less-developed countries in 1983.	Market size is the most important FDI determinant, but only when measured by GDP per capita.
Wang and Swain (1995)	FDI to China and Hungary over 1978-92.	For both of these two countries, the size of the host country, the cost of capital and the stability of the political environment have significant effects on FDI location. For China, FDI is also determined by the exchange rates and labour costs. For Hungary, averaged real growth rates of OECD countries are an important determinant for FDI inflows.

The GDP growth rate reflects whether an economy is in recession or growing. Resmini (2000) argues that there is a non-linear relationship between the growth rate of GDP and investment. This is because less-developed economies have lower levels of GDP per capita, but a rapid economic growth rate. Kok and Ersoy (2009) find that GDP growth has a positive effect on FDI, along with trade openness and gross capital formation. Other studies measure market size using population. Bagchi-Sen and Wheeler (1989) find that the level and growth of population are important determinants of FDI. Population size is likely to be correlated with GDP, although in larger economies population grows at a slower rate. Population density is the number of residents per land area, and it is a more accurate indicator of the extent of urbanisation than total population. A greater population density indicates a larger consumer market, which could attract more market-seeking investment, but it could also have a negative effect from the perspective of congestion.

Labour Market

For the labour market, there are a number of factors that may affect FDI location. Some studies focus on the cost of labour, which is expected to affect FDI location negatively (see Coughlin *et al.*, 1991). Bevan and Estrin (2000) explore FDI flows between European Union countries and transition economies, and find that there is a negative relationship between labour costs and FDI. Shamsuddin (1994) find that the higher wage costs, a poorer investment climate and economic instability in the host country reduce FDI inflows. Based on a study of Chinese inward FDI, the second largest global host country for FDI from 1994, Wang and Swain (1995) find a positive relationship between the wage level and FDI. This could be because wages indicate greater per capita income and hence demand.

Other studies pay attention to the quality of labour, which can be measured in several ways. One popular measure is the level of education, such as the number of people with degrees or the proportion of the relevant population in secondary education (Gao, 2005), or alternatively the proportion of scientists in the labour force. These are expected to have a positive effect on FDI as the foreign investors seek a skilled labour force. Friedman *et al.* (1996) find that skilled labour has a significant and positive effect on the location choice of foreign subsidiaries in the US, as well as market potential and expenditure on attracting FDI. A potential difficulty with these proxies is that they capture other effects, such as the level of knowledge and hence agglomeration economies. Unemployment refers to the availability or quality of labour but it is an important indicator for the development of economy and society, so that there is uncertainty about the sign of its effect on FDI location.

Knowledge

Knowledge is also an important factor in production. Sometimes it is measured by the level of scientific research, as measured by the number of patents or by expenditure on research and development (R&D). In general, these capture the level of human capital or the level of development, where higher levels of scientific research should attract greater levels of FDI. According to Chung and Alcácer (2002), studies that focus on the location of R&D facilities in research-intensive sectors support the knowledge-seeking motive for FDI. However, by studying FDI location in the Gulf Cooperation Council countries, Mina (2007) finds that human capital significantly discourages FDI flows. This might be because higher education indicates higher production costs, and some industries may be more interested in a lower-quality workforce for simple routine functions. Finally, although knowledge is seen as a traditional location determinant it may also capture the impact of agglomeration economies, so that there is some degree of overlap across these different variables.

Trade Factors

The degree of openness of an economy has *a priori* mixed effects on FDI location because it could lead to increased product-market competition. Many studies find that there is a positive relationship between FDI and trade openness, with Deichman (2001) stating that international trade is the most important determinant of FDI, followed by the investment climate that is measured by the risk rating (see below). Braunerhjelm and Svensson (1996) also find that an important determinant of FDI location of Swedish firms is exports. In general the effect of openness on FDI is determined by whether the investment is primarily market-seeking or export-oriented (Jadhav, 2012). There is also expected to be a positive relationship between exchange rates and FDI, where as stated by Klein and Rosenger (1994) when the currency of a country starts to devalue, it leads to the decline in production costs measured in foreign currency. According to Goleberg (2009), the positive relationship exists because devaluation decreases the wage cost of a country compared to that of another country.

Other Factors

Du *et al.* (2008a) explore the effect of economic institutions on the location choice of FDI from the US to China. Their empirical results illustrate that US MNCs would be likely to invest in those regions in China with better protection of intellectual property rights, lower extent of government intervention in business operations and lower levels of government corruption. It means that regions with stronger economic institutions are more likely to attract US firms to set up business operations in these regions. Other studies focus on the political risk of a country using risk rankings from the Political Risk Services published by the *International Country Risk Guide* (ICRG), which also publishes a measure for the composite risk (Erb *et al*., 1996 and Diamonte *et al*., 1996). These risks include the stability of the economy (e.g. inflation rate), political stability (e.g. no war), government efficiency, regulatory quality and control of corruption (Jadhav, 2012). Li (2008) supports the negative relationship between FDI flows and military conflict. Janicki *et al.* (2004) find that lower political risk leads to higher FDI inflows, using the credit rating as a proxy for risk and assuming a country with a good economic and political environment is characterised by the stability of financial markets.

2.5.2. Agglomeration Economies

Aside from the traditional factors discussed above, Guimaraes *et al.* (2000) argue that agglomeration economies are a decisive, if not principal, location determinant of investment. As we have seen, an agglomeration economy is external to the firm, but internal to a small area, and comprises specialized labour markets, supplier networks and knowledge spillovers (Marshall, 1920). Overall, Bobonis and Shatz (2007) find that agglomeration economies are an economically significant externality that can attract new foreign investors, while Pelegrín and Bolancé (2008) find that agglomeration economies are the strongest driving factors of FDI location. Porter (1990), Wheeler and Mody (1992), and Dunning (1998) respectively indicate that the role of agglomeration economies in improving the attractiveness of an area to foreign investment increases with the quality of infrastructure, the availability of specialized service suppliers and skilled workers, and the development of industrial clusters, all of which are used as proxies for agglomeration economies. Further evidence is found by Head and Ries (1996) who use a Conditional Logit regression to analyse 931 joint ventures in 54 cities in China from 1984 to 1991. They show that those cities with good infrastructure, an established base for industries and the presence of FDI are likely to be attractive to foreign investors. However, not all firms are attracted by the same factors, so that the nature and importance of the agglomeration economies varies with the location and industry.

One of the important sources of agglomeration economies is inter-firm linkages i.e. backward and forward linkages (Shaver *et al*. 1997; Dunning 1998). Milner *et al*. (2006) explore the effect of industrial linkages between Japanese firms in Thailand on the inter-industry pattern of FDI. The input-output linkages are the interdependencies between firms that are related to their sales and purchases of intermediate products that can be classified into intra-industry and inter-industry linkages. They find that firms in an industry with stronger input-output linkages follow each other, so that there is a positive relationship between the amount of FDI of Japanese firms in Thailand and the intensity of input-output linkages between these firms in Japan. As summarised by Pelegrín and Bolancé (2008), forward and backward linkages can generate a process of agglomeration in that producers locate close to their suppliers and customers. In addition, by studying the agglomeration economies and government institutions on FDI location in China, Du *et al.* (2008b) find that the provinces with a higher level of vertical agglomeration attract more FDI.

Knowledge spillovers are also an important source for generating agglomeration economies, even in competitive markets (Mina, 2007). One way of measuring these is research and development (R&D) expenditure, as discussed above. In general, there are two types of R&D activities of firms (Criscuolo *et al*., 2005). The first type is asset-exploiting, including modification of products and processes, where firms develop the use of their technological assets in a foreign location. The second one is asset-augmenting, where firms improve, obtain or create new technological assets. In this case, the location-specific advantages that are not available in the home country. However, Chung and Alcácer (2002) find that R&D intensity is not attractive for FDI inflows, because most FDI is found in industries with lower levels of technology and in countries with lower R&D intensity, so that these firms are not interested in the technical capabilities of a country. Likewise, Martin (1999) finds that knowledge is generally not a significant determinant of FDI location, although firms in research-intensive industries are more likely to locate in countries with high R&D intensity.

A common way of measuring agglomeration economies that does not specifically distinguish between the different sources of agglomeration economies, such as inter-firm linkages and knowledge spillovers, is through the number of previous foreign investments locating in an area. For example, using count data on the location of Japanese manufacturing firms in the US over 1980-92, Head *et al*. (1995, 1999) find that agglomeration economies affect the location of multinational affiliates within the US significantly. Overall, using this measure for agglomeration economies there is a wide-level of support for agglomeration economies being a significant determinant of FDI location.

In addition, not only the presence of foreign firms but the presence of foreign firms from the same host country may lead to stronger agglomeration economies, which may arise since national similarity promotes closer linkages between customers and suppliers and in general stronger business relationships (Smith and Florida, 1994). Foreign investors may gain information from the location decisions of previous foreign firms, so that the presence of FDI lowers the costs for the foreign investors and so foreign investors imitate previous FDI (Mariotti *et al.*, 2010). Given this, and the cumulative causation that is associated with agglomeration economies, we may well expect to see locations with high levels of FDI from particular countries also having greater levels of FDI from these countries in the future.

Of course, the presence of foreign firms in a location may not be the only indicator that agglomeration economies are present, but rather an agglomeration of domestic activity could signal agglomeration economies. Evidence to support that domestic activity attracts FDI is found by Crozet *et al.* (2004), where the domestic firms may hold location-specific advantages that, if accessed or spillovers into foreign firms will allow these firms to overcome any disadvantages to locating in the host country (Guimaraes *et al*., 2000). Du *et al.* (2008b), also finds that vertical agglomeration gives rise to a concentration of domestic firms that have backward and forward linkages to foreign firms.

In general, access to information and a variety of agglomeration economies available in some areas can reduce the disadvantages that are encountered by foreign investors, such as information asymmetries and internal and external uncertainties (He, 2002). This may arise from the presence of domestic firms, foreign firms or foreign firms from the same home country of the investor. As a final point however, agglomeration of activity can create negative externalities, in the form of congestion costs. Chang and Park (2005) argue that when there is a concentration of firms, the advanced knowledge and technologies of a firm can be transferred to others, giving rise to a loss of technological advantage and therefore foreign firms may wish to locate away from other firms, be it other foreign firms or domestic firms. In addition, the presence of foreign investors can also lead to intensified competition in product and factor markets and hence may act as a disincentive for future FDI location.

2.6. 'Follow-the-Leader' Behaviour

Agglomeration economies are an important motive for the FDI location choice in addition to the traditional determinants, where the purpose of the investor is to choose a location that maximizes its profit. Chung and Song (2004) find that there is a tendency for firms to choose the same host country over time by investing several times, and that they often agglomerate with other investors when investing abroad. In this sense, a question arises as to whether the firms prefer to follow the location of their own previous investment and possibly that of other investors. This potential for 'follow-the-leader' behaviour in FDI location is of great interest as it has implications for the location of this investment and for the economic development of the host economies. In particular, if early-stage BRICS investment locates in some countries then it means that it will build-up in these countries over time. Further, if FDI from different BRICS locates in the same countries or in different countries then it will indicate whether this investment is similar in its characteristics or distinctive in nature. Of course, there may be many reasons why FDI may 'follow' previous investment, so I now consider this.

2.6.1. Explanation for 'Follow-the-Leader' Behaviour

Head *et al.*, (1995) argue that if many foreign firms exist in a country or region then this will have positive effect on the attraction of new foreign firms. Early studies of 'follow-the leader' behaviour emphasize the loose oligopolistic nature of industry, whereby if some firms invest abroad then their competitors will imitate their actions and follow their location choice to maintain the balance of competition and minimize the risks of investing in a foreign market (Knickerbocker, 1973; Graham, 1974). Thus, according to this argument, investment by foreign investors stimulates the actions of rivals and this may cause 'follow-the-leader' behaviour in the location choice of the investment. According to the studies of Lieberman and Asaba (2006), Banerjee (1992) and Baum and Haveman (1997), 'follow-the-leader' behaviour that could achieve economies of scale is promoted by the increase in profits and decrease in uncertainty in a location, superior information of some investors and the purpose of increasing competitiveness or limiting the rivalry.

Because of this behaviour, the following investments have a chance to share the physical infrastructure, advanced technology and the local knowledge in the location (Chung and Song, 2004).

A reason for 'follow-the-leader' behaviour could arise from the economic geography literature (Krugman and Venables, 1994). The location choice of an investment is a trade-off between 'dispersion' factors, such as firm competition or higher labour costs, and agglomeration factors like the production linkages that may be either backwards to other suppliers or forwards to customers. If the latter dominate then it will be profitable for a firm to choose the same location of the previous investment, leading to an agglomeration of activity. This will be more important if there are a large number of previous investments in a location (Altomonte and Pennings, 2008).

There are other important reasons for 'follow-the-leader' behaviour, some of which I have already briefly mentioned above. The first and most important one is information. If some investors have superior information they may be perceived as 'leaders' (Bikhchandani *et al*., 1998). The location of the first investment may be based on the private information of the leader, but this information is revealed to 'followers' through the actions of the leader. Along with the accumulation of this revealed information, the leader may solve many uncertainties and the followers gradually ignore their own information and follow the decision of the leader. In this case, 'follow-the-leader' behaviour results in similar actions, which helps decrease uncertainty and the possibility that one firm may obtain or lose profits relative to the others. It can also be conducive to maintain the current status of all competitors that follow each other in a location, even if they are strong rivals (Lieberman and Asaba, 2006). Altomonte and Pennings (2008) believe that the imitation of the leader helps the followers match the production costs of the leader and avoids mispricing.

Second, in addition to the superior information, there is the higher probability for investors that have a larger size or better profitability to be followed (Haunschild and Miner, 1997), especially in the case of major innovations where there is a high degree of uncertainty (Lieberman and Asaba, 2006). These authors further find that when the uncertainty is high, the information-based factors will play a major role in 'follow-the-leader' behaviour, but rivalry factors will dominate under the condition of low uncertainty. Uncertainty about the revenue is also a motive for 'follow-the-leader' behaviour as the followers could reduce their risks by choosing the same location for investment.

Finally, investors prefer to choose the same location when they are attracted by the similar characteristics of the host country, such as lower costs or greater spillovers (Chung and Song, 2004). Important among these factors may be a similar language and culture, and indeed I find below that Brazil and Russia among the BRICS are good examples. The investment of Brazil is significantly more likely to enter Portugal and Spain in addition to the main host countries of all BRICS countries' investment. This is because these two countries have the similar culture to that of Brazil. For Russia, its investment prefers to be located in Germany and Italy only within the EU-15, but there is a much greater probability of it entering several CEEC-10 countries, which were part of the former Soviet Union (see Chapter 7).

2.6.2. 'Follow-the-Leader' Behaviour of BRICS FDI

In general, more experienced investors might tend to 'follow' the location of their own previous investment. In the case of the BRICS there is still the question whether they 'follow' their own previous investment, or agglomerate, or avoid other BRICS countries' investment. On the one hand, the BRICS countries that are a source for relatively few foreign investments may prefer to follow other countries including other BRICS, as they may not have enough experience and information about where best to invest. On the other hand, the BRICS countries may be distinct and seek locations different to that of other BRICS countries.

In the case of the BRICS, there are characteristics of this investment that suggest that some countries will show a significant tendency to follow the location of their own previous investment (i.e. 'follow-the-leader' behaviour), but possibly avoid that of the other BRICS. In particular, it is argued that Brazilian foreign investment is mainly aimed at acquiring raw materials, natural resources and other resource-related products (Sauvant, 2005), whereas for Russia the unstable economic environment of the domestic market might promote firms to invest abroad, but they may also want to acquire advanced technology (Elenkov, 1995). In addition, as I have noted, historical and political reasons might encourage Russian FDI to locate in Eastern Europe. In the case of Indian investment, it is argued that the main motive is to increase the competitiveness of firms, with Pradhan (2003) describing the relaxation of the restrictions to invest abroad after 2003. Knowledge-seeking, greater market potential and the acquisition of advanced technology are likely to be key factors for Chinese FDI outflows. Policy liberalisation, such as the 1979 Reform and Opening up policy, is another important motive for outward FDI (Naughton, 1996). For South Africa, Gammeltoft (2008) suggests that availability of natural resources in the host countries is a main attraction for its outward FDI.

Generally, for the BRICS as a whole I find that there is the significant 'follow-the-leader' behaviour in the location choice (i.e. FDI from the BRICS follows the location of FDI from the same BRICS country), but this can be insignificant for individual BRICS countries. A possible reason for this is that the 'dispersion' factors are more important. Alegría (2006) finds that some dispersion determinants, such as the wage level and country risk, rather than agglomeration economies play a key role in FDI location choice. It means that these factors could offset the positive effects of agglomeration economies and discourage the FDI from the same source country. As further evidence for these kinds of effect, Crozet *et al*., (2004) study the location choice of foreign investors in France based on a sample with 4,000 investments over ten years, and find that investments from Italy and Netherlands are less likely to be clustered as they are more sensitive to the wage rate. Likewise, for Japanese FDI in the US at the industry level, Hennart and Park (1994) find that the effect of variable that is used to measure 'follow-the-leader' behaviour is insignificant.

Finally, while I find that BRICS FDI 'follows' the location of previous FDI from the same BRICS country, I also find that it tends to 'avoid' the FDI of other BRICS countries as a whole. This suggests that BRICS FDI from different countries is distinct. However, when disaggregated for individual countries, not all BRICS countries' FDI always 'avoids' the FDI location of other countries. The main reason for this is that some economies (i.e. China and India) are able to attract the FDI from other BRICS countries, causing it to 'follow'. This is probably because these countries have a combination of beneficial factors, including large size, rapid economic growth, superior information and greater profitability.

2.6.3. The Way Forward

To explore the 'follow-the-leader' behaviour of BRICS countries' investment, in this thesis I first discuss the persistence in FDI location of each BRICS country through a 'goodness-of-fit' test based on the raw data. After this, I use regression analysis to explore this behaviour by introducing several lagged FDI terms to measure the 'follow-the-leader' behaviour. The goodness-of-fit tests show that there is a tendency for FDI from all BRICS countries to follow the same location over a one-year period, but there are some changes in the location choice for China and India over a two-year period. This is because the longer lag gives FDI sufficient time to respond to earlier FDI flows. The regression analysis shows similar results to that of the ‘goodness-of-fit’ test, but some of them are insignificant as the dispersion factors are considered in the regression analysis. Further, the regression analysis not only explores the ‘follow-the-leader’ behaviour of BRICS FDI, but also can examine whether BRICS FDI ‘avoids’ the location of FDI from other countries through the lagged FDI terms.

2.7. Conclusions

The main purpose of this chapter is to review the determinants of FDI location covering both the theoretical and empirical literature. The OLI paradigm provides a general theoretical framework for the determinants of FDI location, where the location-specific advantages of a host country determine where a foreign investor will locate their overseas facilities. Examples of these advantages include a country’s national factor endowments such as labour costs, productivity and access to knowledge. Indeed, a number of location advantages have been identified in the empirical literature and these include input prices, transport costs, communication costs and government incentives as well the other natural assets that a country possesses such as access to natural resources.

In addition to the above traditional location factors, agglomeration economies are also considered an important factor in the location of FDI. These agglomeration economies differ from the traditional locational factors in that they are external economies of scale that arise from the proximity of other firms in a similar industry or location and their importance have been identified in recent theories of New Economic Geography (NEG) and New Growth Theory (NGT). An implication of agglomeration economies as a location factor is that they can lead to an ever-increasing agglomeration of activity, and thus greater levels of FDI since agglomeration and agglomeration economies are linked in a process of cumulative causation.

A number of mechanisms that lead to agglomeration economies have been identified in the literature. These include the build-up of inter-firm linkages, the importance of market size and locating near final demand as well as the importance of knowledge. In general, the main proxy for agglomeration economies has been the number of previous foreign direct investors in a location as this will pick-up potential firm linkages and knowledge spillovers, given that foreign investors often possess greater levels of skilled labour than their domestic counterparts. Firm linkages may also be stronger, and so FDI may be more likely to occur if there is a presence of foreign firms from the same home country of the foreign investor. Overall, there is a range of support in the literature for FDI being attracted by agglomeration economies, and in particular by agglomeration economies arising from previous foreign firms locating in an area, and especially those from the same home country as the investor.

Chapter 3. Location of BRICS Investment

3.1. Introduction

In recent years there have been significant increases in FDI outflows from developing countries, such that these countries now account for nearly 40 percent of global FDI outflows, compared to 12 percent at the beginning of the 2000s (UNCTAD, 2014). BRICS countries have been an important part of this increase with BRICS outward FDI growing rapidly and now accounting for one-third of developing countries outflows (UNCTAD, 2013). Despite this increase, the main focus of the empirical FDI literature on developing (and BRICS) countries has been on inward rather than outward FDI (Gammeltoft, 2008). There are relatively few studies on the generation of FDI amongst these developing countries, apart from the early research of Wells (1983) and Agarwal (1985).[2] In terms of the locational pattern of outward FDI, Holtbrügge and Kreppel (2012) find that firms from the BRICS countries invest in a range of countries that include their neighbouring developing countries as well as a number of developed countries. Possible reasons for these location patterns include the need to take advantage of growth opportunities outside of their national market and to gain access to knowledge and skills from developed economies in order to improve their competitiveness (Sauvant, 2005).

This chapter aims to explore the trends and main locations of BRICS FDI and to compare these to the general global pattern of FDI. The chapter also attempts to explain the determinants behind the location patterns of BRICS investment by drawing upon the theoretical discussion of Chapter 2. The analysis focuses on the study-period of the thesis, 1997-2010, during which there is a dramatic increase in BRICS outward FDI. This analysis uses the published UNCTAD data, and this is indicated in the notes to the following tables and figures. While as I mentioned in the Introduction, the UNCTAD data based on a broader definition on FDI provide published data in net terms and includes data on mergers and acquisitions, whereas the EIM data are for the location decision. It is

[2] Theoretical discussions on developing countries' FDI highlight that these countries need to attract FDI because they face foreign exchange shortages and capital restrictions (Gammeltoft, 2008).

apparent in Chapter 5 below that the EIM data give a very similar investment pattern. This chapter has two main purposes. First, it seeks to explore the trends of BRICS FDI location by using the published UNCTAD data for FDI outflows. Second, it reviews the literature about the determinants for the FDI location choice to examine whether BRICS FDI location is consistent with the literature review. Therefore, the structure of the chapter is as follows. The next section discusses the trends in global FDI flows. Section 3.3 then examines these trends for each of the BRICS countries. The possible reasons and determinants behind the pattern of this investment are then examined in Section 3.4 which also reveal the dates for Bilateral Investment Treaties (BITs) between each BRICS and each EU country. Conclusions are presented in Section 3.5.

3.2. Global FDI Flows

This section explores global trends in FDI flows, analysing both FDI inflows and outflows. It distinguishes between developed and developing countries, before subsequently examining the main trends and location of FDI across the five global regions that encompass each of the BRICS countries: South America for Brazil, Commonwealth of Independent States (CIS) for Russia, South Asia for India, East Asia for China and Southern Africa for South Africa.[3] In order to explore the investment between EU-25 and BRICS, their bilateral investment agreements are discussed in section 3.4.4.

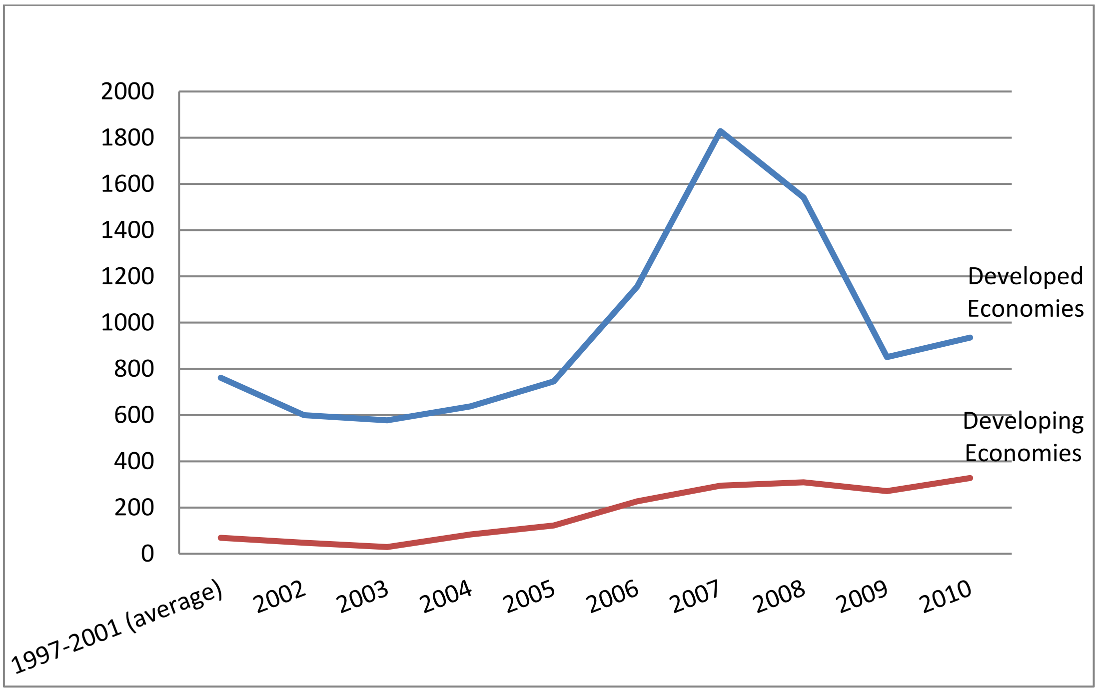
3.2.1. Global Trends in FDI

The pattern of FDI outflows during the 2000s, broken down by developed and developing economies, is shown in Figure 3.1. The developed countries are included as they provide the major source of FDI and provide a useful comparison with that arising from developing countries, and the BRICS in particular. Overall, global FDI flows reached $1.3 trillion dollars by the end of the period and increased by 59% over the decade. However, the breakdown by developed and developing countries in Figure 3.1 shows differing patterns emerging for each of these groups. Following the decline in FDI outflows from developed countries at the turn of the century, FDI generated by developed countries experienced a large boom during the middle part of the 2000s. This increase was

[3] These global regions are used by the United Nations Conference on Trade and Investment (UNCTAD) in the yearly World Investment Report analysis of global FDI trends.

however short-lived as the financial crisis led to a sharp decrease in FDI outflows in 2007 returning FDI to pre-boom levels by the end of the decade. By comparison, developing economies experienced less dramatic fluctuations in FDI outflows over the period, so the large increases in global FDI outflows were driven mainly by the developed economies.

Figure 3.1: Value of FDI Outflows by Developed and Developing Economies



Source: World Investment Report, UNCTAD (2003, 2005 and 2011). The UNCTAD World Investment Reports of 2003, 2005 and 2011 gives the data for 1997-2001, 2002-2004 and 2005-2010 respectively.

Note: FDI is measured in billions of US dollars (current prices and current exchange rates). Constant prices give similar pattern owing to low inflation.

Figure 3.1 shows that the rise in FDI outflows from developing economies is a relatively recent phenomenon, with outflows increasing from $47.8 billion at the start of the period to $327.6 billion by 2010 (current prices and current exchange rates in billions). The figure also shows that the developing countries have increased their share as well as their levels of global FDI outflows over the period, and they now account for 25% of global outflows compared to just 7% at the beginning of the decade. This increase in FDI outflows for the developing economies reflects the changing nature of FDI for these economies as traditionally they have been associated mainly with inflows of foreign direct investment, but now they have started their process of internalization.

The financial crisis causes several shocks. First, the bursting of the housing bubble leads to a relocation of capital and reduction in the wealth and consumption of households.

Second, the sharp increase in the equity risk premium results in the increase of capital cost, decline in the private investment and collapse of demand for durable goods. Third, financial crisis also causes a reappraisal of risk by household, which makes them to discount their future income, increase savings and reduce their consumption (McKibbin and Stoeckel, 2010). UNCTAD (2012) indicates several reasons for the boom in FDI during the period. The main factors are the increase in cross-border mergers and acquisitions in the European Union (EU), driven by the creation of the Single Market, and the large amounts of reinvested earnings from US multinationals enterprises. The continuous appreciation of the Japanese yen over this period increased the purchasing power of Japanese multinationals and was also a factor behind the rise in developed countries outward FDI.

A comparison between FDI inflows and outflows can be made using Tables 3.1 and 3.2, which show FDI inflows and outflows respectively over the study period. The tables also give a breakdown of these FDI flows into different global regions (developed, developing and transition economies) and within these, the regions that contain the BRICS countries. Table 3.1 gives the breakdown of FDI inflows over the 2000s and shows that world inflows are primarily related to the developed countries. Within the developed countries the location of FDI tends to be heavily concentrated in the European Union (EU) and the US. However, compared to the pattern of world outflows in Table 3.2 and Figure 3.1, the difference between developed and developing countries is less pronounced for FDI inflows, with developing countries accounting for 34% of global inflows on average over the period, rising to 46% of total inflows by the end of the period. The increase in FDI inflows to the developing economies is driven mostly by the Asian countries, which after the financial crisis of 1997 have absorbed around 60% of developing countries' inflows of FDI. Latin America and the Caribbean provide another third of inflows, while by comparison Africa and the CIS absorb negligible amounts with FDI inflows at relatively low levels over the period.

Table 3.1: FDI Inflows by Global Region, 1997-2010 (billions of US dollars)

Global Region	1997-2001 (Average)	2002	2003	2004	2005	2006	2007	2008	2009	2010
World total:	892.8	716.1	632.6	648.1	982.6	1,461.9	1,970.9	1,744.1	1,185.0	1,243.7
Developed Economies:	655.3	547.8	442.2	380.0	619.1	977.9	1,306.8	965.1	602.8	601.9
EU	385.3	420.4	338.7	216.4	496.1	581.7	850.5	488.0	346.5	304.7
US	203.8	71.3	56.8	95.9	104.8	237.1	216.0	306.4	152.9	228.2
Developing Economies:	213.9	155.5	166.3	233.2	332.3	429.5	573.0	658.0	510.6	573.6
Asia	113.3	92.0	101.3	147.5	215.8	283.5	339.3	375.7	307.5	357.8
(East Asia)	(-)*	(67.3)	(72.1)	(105.0)	(116.2)	(131.8)	(151.0)	(185.3)	(161.1)	(188.3)
(South Asia)	(-)*	(4.5)	(5.3)	(7.0)	(14.4)	(27.8)	(34.3)	(51.9)	(42.5)	(32.0)
Africa	11.8	13.0	18.0	18.1	38.2	46.3	63.1	73.4	60.2	55.0
(Southern Africa)	(-)*	(1.5)	(1.3)	(1.0)	(14.7)	(10.5)	(18.8)	(28.6)	(20.0)	(15.1)
Latin and Caribbean	88.5	50.5	46.9	67.5	78.1	98.5	169.5	206.7	141.0	159.2
(South America)	(53.6)	(28.5)	(24.4)	(37.9)	(44.3)	(43.9)	(71.5)	(92.1)	(55.3)	(86.5)
SE Europe and CIS:	-*	12.8	24.1	34.9	31.2	54.5	91.1	121.0	71.6	68.2
CIS	-*	9.0	15.7	24.1	26.2	44.6	78.3	108.4	63.8	64.1

Source: World Investment Report, UNCTAD (2003, 2005 and 2011). The UNCTAD World Investment Reports of 2003, 2005 and 2011 gives the data for 1997-2001, 2002-2004 and 2005-2010 respectively.
Notes: Main host countries shown only, so that columns do not sum exactly. * No breakdown available.

Table 3.2: FDI Outflows by Global Region, 1997-2010 (billions of US dollars)

Global Region	**1997-2001 (Average)**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
World total:	833.8	652.2	616.9	730.3	882.1	1,405.4	2,174.8	1,910.5	1,170.5	1,323.3
Developed Economies:	761.3	599.9	577.3	637.4	745.7	1,155.0	1,829.0	1,541.2	851.0	935.2
EU	527.7	384.5	372.4	279.8	606.5	690.0	1,199.3	906.2	370.0	407.3
US	136.5	134.9	119.4	229.3	15.4	224.2	393.5	308.3	282.7	328.9
Developing Economies:	69.1	47.8	29.0	83.2	122.1	226.7	294.2	308.9	270.8	327.5
Asia	48.7	36.0	17.2	69.4	86.1	151.6	221.7	218.4	219.5	244.6
(East Asia)	(-)*	(27.6)	(14.4)	(53.5)	(51.9)	(85.4)	(114.4)	(133.2)	(142.9)	(174.3)
(South Asia)	(-)*	(1.1)	(1.0)	(2.3)	(3.5)	(14.8)	(17.7)	(19.9)	(16.4)	(15.1)
Africa	1.4	0.4	1.2	2.8	2.0	6.9	10.7	9.8	5.6	6.6
(Southern Africa)	(-)*	(-0.4)	(0.8)	(1.9)	(1.2)	(6.3)	(4.0)	(-0.6)	(1.4)	(1.9)
Latin and Caribbean	19.0	11.4	10.6	10.9	34.0	68.1	61.7	80.6	45.5	76.3
(South America)	(5.9)	(4.1)	(5.2)	(10.6)	(11.9)	(35.4)	(12.2)	(34.2)	(4.1)	(30.3)
SE Europe and CIS:	-*	4.5	10.6	9.7	14.3	23.7	51.6	60.4	48.7	60.6
CIS	(-)*	(3.9)	(10.4)	(9.5)	(14.0)	(23.3)	(50.1)	(58.5)	(47.4)	(60.5)

Source: World Investment Report, UNCTAD (2003, 2005 and 2011). The UNCTAD World Investment Reports of 2003, 2005 and 2011 gives the data for 1997-2001, 2002-2004 and 2005-2010 respectively.
Notes: Main origin countries shown only, so that columns do not sum exactly. * No breakdown available.

Turning to the pattern of FDI outflows over the period, Table 3.2 shows that it is the European Union (EU) and US that contribute the majority of developed countries' outflows and in turn also the bulk of global outflows over the period. On average, the EU and the US account for approximately 80% of FDI outflows from developed countries in each year. This suggests that there is a concentrated pattern of FDI in both the generation and location of investment in these countries. By the end of the period, the contribution of the developed countries is nearly three times as large as that of the developing countries for FDI outflows, but this share is much lower compared to the start of the decade. This shift emphasises the changing nature of FDI for developing countries, as they are now not just major recipients of FDI but also engaging in increasing amounts of outward foreign direct investment.

The majority of FDI outflows from the developing economies originate from Asia, which generates more than 60% of all outflows from the developing economies in each year apart from 2003, with most of these outflows coming from East Asia rather than South Asia. Outside of Asia, the Latin American and Caribbean countries provide about a quarter of developing countries' outward FDI, although there is a considerable degree of volatility for this group of countries over the period, especially amongst the South American countries. In contrast, African countries contribute negligible amounts of outward FDI from the developing economies. Finally, the transition economies, of which the CIS is the largest generator of investment, have experienced notable increases in outward FDI over the period, in fact reaching similar levels of investment to the Latin American countries.

3.2.2. Global Regional Trends in FDI

Before exploring the FDI flows of the BRICS countries, this section discusses the FDI trends of the five global regions that include each of the BRICS countries. These are South America (for Brazil), the CIS (for Russia), South Asia (for India), East Asia (for China) and Southern Africa (for South Africa). The aim is to provide a general understanding of FDI from these areas and hence some context to the location of BRICS countries' FDI.

South America

Tables 3.1 and 3.2 show that both inflows and outflows of FDI have increased over the period, but South America remains a net receiver of FDI. Table 3.1 shows that South

America has on average received more than half of all FDI going to Latin America and the Caribbean over the period. However, there is evidence that its importance as a main host of FDI inflows is declining, from 61% of Latin American and Caribbean inflows in 1997-2001 to 54% in 2010. UNCTAD (2012) suggests that the growth of FDI inflows to South America is due to the high economic growth rate, rapid development of its consumer market and endowments of natural resources. The high ratio of investment return in South America has also been identified as an additional incentive for FDI inflows to the region.

Outward FDI from this region, as shown in Table 3.2, has undergone a different pattern compared to inflows during the period with outflows showing a relatively high degree of volatility. For example, the peak of FDI outflows in 2006 is nearly nine times as large as outflows in the years at the beginning and end of the period i.e. 2002 and 2009. The main feature of outward FDI from South America is that more FDI outflows are less relevant to the production activities abroad, which is reflected by the higher percentage of FDI in offshore financial centres to total FDI outflows from South America (UNCTAD, 2012).

Commonwealth of Independent States

Table 3.1 shows a continuous increase in FDI flows to the group of CIS countries until the financial crisis. This suggests that the increasing FDI inflows to this group of transition economies reflect the continuing development of these countries and the resulting investment-friendly environment. After the crisis, there is a decline in FDI inflows to the CIS followed by a slight recovery in 2010. Greenfield investment (i.e. new start-ups) is the most common form of entry into the region (UNCTAD, 2012), although the post-crisis recovery is driven mainly by cross-border Mergers and Acquisitions. Despite the rise in FDI inflows into this region, the overall value of FDI inflows is still at a relatively low level with less than 5% of global FDI inflows per year.

Similar to the pattern of inflows, Table 3.2 shows that FDI outflows from the CIS have increased until the financial crisis. It is however worthy to note that these outflows decline only slightly after the start of the crisis and by 2010 they exceed the pre-crisis level. Throughout the period of analysis inflows of FDI are higher than outflows but after the crisis the levels converge to similar values in 2010. UNCTAD (2012) suggests that the considerable increase in outward FDI from transition economies is due to the recovery of commodity prices in the domestic market, the development of the home economy and the increased number of outward investors from the transition economies.

South Asia

Table 3.1 shows that FDI inflows to South Asia increase over the period. However, the largest share of global FDI inflows to the region in any given year is only 3.6%, which occurs in 2009, so South Asia is not a major location for foreign investment. UNCTAD (2012) indicates that FDI projects to this region are mainly mergers and acquisitions, and these are driven by a series of large acquisitions in extractive industries from the EU and other developing Asian countries. Table 3.2 shows that FDI outflows from South Asia have a similar trend to the inflows, as they increase before the financial crisis and fall continuously after that time. The reduction is partly due to the reduced activities of Indian multinationals acquiring assets abroad, for which UNCTAD (2012) shows that the value of cross-border mergers and acquisitions (i.e. net purchases) has declined by 77% after the crisis in 2011.[4] In general, South Asia generates the relatively little outward FDI, which is much lower than inward FDI.

East Asia

Compared to South Asia, the East Asia region has significantly greater amounts of both inward and outward FDI. Table 3.1 shows that FDI inflows to this region increase over the period and reach a record amount of $188.3 billion in 2010, which is 15.1% of global inflows. The growth rate of inward FDI into East Asia is however lower than that of South Asia, which starts the period of analysis with much lower levels of FDI. After the financial crisis, FDI inflows to East Asia have increased, but UNCTAD (2012) illustrates that there is a mixed picture for the performance of FDI inflows for the different economies within the region. FDI inflows to South Korea and Taiwan have fallen sharply, while China, as the main economy in the region, has experienced a continuing increase after the financial crisis.[5]

Table 3.2 shows that FDI outflows from East Asia fluctuate before 2006, but they increase continuously thereafter, until 2010. This is a notable trend, which is different from that of other regions during the financial crisis. UNCTAD (2012) explains that the considerable growth in the value of FDI outflows from East Asia is driven by the boom of cross-border mergers and acquisitions, which rise sharply from $13 billion to $50

[4] See Annex Table 1.3 in World Investment Report, 2012, UNCTAD, Geneva.
[5] See Annex Table 1.1 in World Investment Report, 2012, UNCTAD, Geneva.

billion over 2005-11.[6] Outward FDI from East Asia now accounts for over 50% of developing countries' outflows and 13% of global outflows, so that it is one of the major global generators of FDI.

Southern Africa

Of all the regions discussed above, Southern Africa has the lowest amounts of both FDI inflows and outflows. Table 3.1 shows that FDI inflows to Southern Africa fluctuate during the period, although inflows increase from 1% of developing countries inward FDI at the beginning of the period to 3% by the end of the period. However, the value of FDI inflows is always relatively low and never rises above $30 billion during the period. This suggests that the region is not a main location choice of global FDI. Inflows continue to decrease after the financial crisis, with UNCTAD (2012) suggesting that this is caused by political unrest and decreased cross-border mergers and acquisitions by foreign investors. However, UNCTAD (2012) predicts better prospects for FDI inflows to Africa, due to the considerable economic growth, continuous economic reform and high commodity prices encouraging investment from abroad.

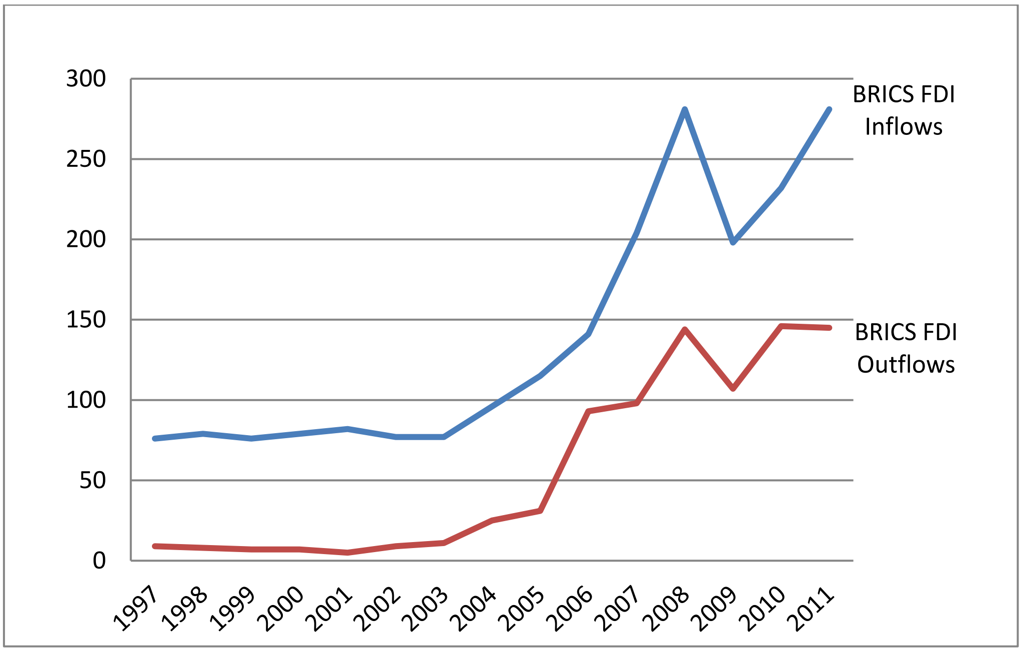
Finally, looking at FDI outflows, Table 3.2 shows that FDI from Southern Africa, as well as Africa in general, is at a low level over the period. Outward FDI fluctuates strongly during the period and turns negative in 2002 and 2008. This highlights the region as the least likely of all the regions discussed to engage in outward FDI and instead shows that it continues to rely on inward FDI, which reflects its current stage of economic development.

3.3. BRICS FDI Flows

This section aims to explore the location and trend of BRICS countries' FDI. In general, China and India dominate the BRICS FDI flows. This is discussed in Chapter 5 associated with Appendix Table 5.1. Figure 3.2 reveals the trends of inward and outward BRICS FDI over the study period. In order to further explore the most recent trends after the crisis, data on 2011 are also included in the figure. It can be seen that FDI inflows and outflows are relatively stable before 2003, after which they increase until the financial crisis, and decrease sharply post-crisis. By 2011 the flows of FDI recover to exceed their pre-crisis levels of $281 billion and $144 billion respectively.

[6] See Annex Table 1.3 in World Investment Report, 2012, UNCTAD, Geneva.

Figure 3.2: Value of BRICS FDI Inflows and Outflows, 1997-2011



Source: UNCTAD (2000, 2003, 2005, 2011 and 2012).
Note: FDI flows are measured in billions of US dollars (current prices and current exchange rates). Constant prices give similar pattern owing to low inflation.

Figure 3.2 also shows that the value of BRICS FDI inflows is always greater than the value of outflows. However, although the gap between these flows is relatively stable, by the end of the period the BRICS countries become an important generator of FDI, with the share of BRICS outward FDI to global FDI outflows reaching 11% in 2010. This reflects the general pattern for developing countries discussed above, which tend to absorb large amounts of FDI from developed countries, but they are also emerging as a source of FDI in their own right (see Utter, 2011, for a further discussion of the recent trends of developing economies' FDI). The high growth rate and increasing share of global FDI outflows reflects the rapid economic development of the BRICS economies, which are predicted to have an increasingly important role in future global FDI outflows (UNCTAD, 2010). Finally, outward FDI from the BRICS tends to prefer developing countries, with UNCTAD (2012) finding that more than half of BRICS FDI outflows went to developing and transition economies before the financial crisis.

3.3.1. FDI Flows for Individual BRICS Countries

Investments from different sources normally have different location preferences. For example, most investments from developing economies normally access the economies that are close to their home country and enter familiar markets based on trade and cultural ties (Gammeltoft, 2008). Battat and Aykut (2005) find that investments from Asia prefer to locate in Africa. However, multinationals from China and India have recently diverged from this pattern and invest high value assets in the US and EU. This section aims to further our understanding of FDI inflows and outflows for each BRICS country. Throughout the discussion it uses Table 3.3, which shows BRICS FDI inflows and outflows by country from 1997 to 2010.

Table 3.3: BRICS FDI Inflows and Outflows by Country, 1997 to 2011 (billons of US dollars, current price)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
FDI Inflows														
Brazil	19.0	28.9	28.6	32.8	22.5	16.6	10.1	18.2	15.1	18.8	34.6	45.1	25.9	48.4
Russia	4.9	2.8	3.3	2.7	2.5	3.5	8.0	11.7	12.9	29.7	55.1	75.0	36.5	41.2
India	3.6	2.6	2.2	2.3	3.4	3.4	4.3	5.3	7.6	20.3	25.4	42.5	35.6	24.6
China[7]	44.2	43.8	40.3	40.8	46.8	52.7	53.5	60.6	72.4	72.7	83.5	108.3	95.0	105.7
South Africa	3.8	0.6	1.5	0.9	6.8	0.8	0.7	0.6	6.6	-0.5	5.7	9.0	5.4	1.6
BRICS	75.5	78.6	75.9	79.5	82.0	77.0	76.6	96.4	114.6	141.0	204.2	279.9	198.5	221.6
FDI Outflows														
	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Brazil	1.1	2.9	1.7	2.3	-2.3	2.5	0.2	9.5	2.5	28.2	7.1	20.5	-10.1	11.5
Russia	3.2	1.3	2.2	3.2	2.5	3.5	9.7	9.6	12.8	23.2	45.9	55.6	43.7	51.7
India	0.1	0.0	0.1	0.3	0.8	1.1	0.9	2.2	3.0	14.3	17.2	19.4	15.9	14.6
China	2.6	2.6	1.8	0.9	6.9	2.5	-0.2	1.8	12.3	21.2	22.5	52.2	56.5	68.0
South Africa	2.4	1.8	1.6	0.3	-3.2	-0.4	0.6	1.6	0.9	6.1	3.0	-3.1	1.2	0.5
BRICS	9.3	8.6	7.3	7.0	4.7	9.2	11.3	24.7	31.5	92.9	95.7	144.5	107.2	146.3

Source: UNCTAD (2003, 2005 and 2011), World Investment Reports, based on Annex Tables.
Note: FDI flows with a negative sign indicate that at least one of three components of FDI (equity, reinvested earnings or intra-company loans) is negative and not offset by positive amount of other components. These are instances of reverse investment or disinvestment.

[7] The data on China excludes Hong Kong, Macao and Taiwan.

Brazil

Table 3.3 shows that FDI inflows to Brazil are subject to a great deal of volatility. It is however the second largest BRICS country after China in terms of attracting FDI inflows throughout the period. Notably, inflows have more than doubled since 2005 despite the financial crisis. In the case of FDI outflows, there is no particular trend over the period and indeed they are volatile after 2003. Brazil lags far behind China and in most years it generates less than Russia. According to Gammeltoft (2008), the main host countries of FDI outflows from Brazil include other countries from Latin America (such as Chile and Venezuela). In addition, the Bahamas, Bermuda and the British Virgin Islands also attract considerable FDI from Brazil. It means that most Brazilian outward FDI prefers to be located in the neighbour countries, but UNCTAD (2004) indicates that the destination countries of market-seeking FDI from Brazil are Western European countries, the US and Mexico. In order to further explore the main host countries of Brazilian outward FDI, Table 3.4 shows the main destinations of Brazilian FDI outflows over 2006-10. A notable feature of Table 3.4 is the rise in the importance of the EU as a main destination for Brazilian FDI. However, Table 3.4 also shows that FDI from Brazil can vary dramatically from one year to another. For example, there is volatility in FDI flows to the US as well as the Caribbean countries, with a sharp decrease in FDI flows to the US in 2010.

Table 3.4: Value of Brazilian FDI Outflows by Host Country (millions of US dollars)

Host	2006	2007	2008	2009	2010
EU	983	711	1,985	2,002	6,594
US	999	3,548	4,217	1,094	-5,784
Bahamas	1,418	995	522	207	-103
Bermuda	24	362	13	-9	754
British Virgin Islands	990	954	327	270	-601
Chile	41	689	547	55	895
Mexico	10	258	54	84	72
Venezuela	-	73	183	1	-

Data Source: Bilateral FDI Statistics 2014, UNCTAD.[8]
Note: Data not available prior to 2006. FDI is measured in current prices and current exchange rates.

Russia

Table 3.3 shows that the value of FDI inflows to Russia increases rapidly over the latter part of the period, and Russia overtakes Brazil to become the second largest destination for FDI within the BRICS group, after China between 2006 and 2009. The main reasons given why Russia is able to attract more FDI are the continuous and considerable

[8] Source: http://unctad.org/en/Pages/DIAE/FDI%20Statistics/FDI-Statistics-Bilateral.aspx last accessed: 12th April 2016.

development of the home market, cheaper labour costs and high returns on energy and other projects related to natural resources (UNCTAD, 2012). For FDI outflows, the trend is similar to that of inflows, i.e. stable at the beginning of the period followed by a steep increase after 2002. Russia is the main generator of FDI amongst the BRICS countries over the period, but EIM dataset shows that the number of projects from Russia is not dominant BRICS outward FDI, and Russian outward FDI is not energy based because table 6.12 in Chapter 6 shows that only 10% of projects in EU-25 from Russia are energy related. According to Kalotay (2003), in addition to the traditional neighbouring countries of the Commonwealth of Independent States (CIS) and the EU, an increasing amount of Russian FDI is likely to enter a range of countries, including Australia, Africa and the US. Table 3.5 shows the main locations of Russian outward FDI, supporting the findings of Kalotay (2003). The table also shows the extent to which Russian FDI primarily enters the European Union.

Table 3.5: Value of Russian FDI Outflows by Host Country (millions of US dollars)

Host	2007	2008	2009	2010
EU	32,301	32,264	26,852	36,107
US	973	7,264	1,634	1,060
Australia	42	47	14	36
Bermuda	2,734	1,305	854	1,056
Africa	75	63	70	118
Belarus	813	1,032	1,370	934
Kazakhstan	107	326	1,029	-225
Ukraine	1,667	146	678	485

Data Source: Bilateral FDI Statistics 2014, UNCTAD.
Note: Data not available prior to 2007. FDI is measured in current prices and current exchange rates.

India

India is one of the largest economies in the BRICS, but Table 3.3 shows that it is not a major destination country for FDI inflows; in fact the value of FDI inflows to India is less than that of Brazil, Russia and China. Similar to inflows, Indian FDI outflows account for only a small share of BRICS outward FDI, but in the EIM dataset, India is one of the main contributors to the FDI projects in the EU-25. The difference means that each project from India is associated with lower value. The value of Indian FDI outflows is at a low level at the beginning of the period and only starts to grow after 2005. Finally in 2010, the value of FDI outflows exceeds that of Brazil, but it is still considerably smaller than either Russia or China. Overall, UNCTAD data show that Russia and China are main generators of outward FDI, but EIM data support that China and India are dominant BRICS outward

FDI. This is because each project from different BRICS countries is associated with different project scales. The main host countries of Indian FDI change dramatically over time. During the period from 1975 to 1990, geography, language and history were important factors for the Indian outward FDI location choice, with Thailand, Sri Lanka and Malaysia accounting for the largest share. In the 1990s, Pradhan (2005) finds that Indian FDI is focused much more on industrialized countries, such as the US, which was the most important host country of Indian FDI between 1996 and 2003. UNCTAD (2014) finds that the US still maintains the position of main location choice of Indian FDI, with the Netherlands and the UK the other two major host countries within the EU. However, the British Virgin Islands and Sri Lanka also continue to attract considerable FDI from India.[9]

China

Table 3.3 shows that China is the main destination for FDI inflows in the group of BRICS countries, and the value of inflows to China increases from $41 billion in 2000 to over $100 billion by the end of the period. UNCTAD (2012) predicts that it will continue to be the leading destination of FDI inflows among all Asian countries. Along with Russia, China is the main generator of outward FDI among the BRICS. Indeed, by the end of the period China becomes the main source of outward FDI from the BRICS. UNCTAD (2005) analyses the location of Chinese FDI and finds that the main destination countries are the developing countries in Asia, Africa and Latin America. Hirt and Orr (2006) suggest that Chinese firms wish to gain access to Western markets in order to engage in knowledge-seeking FDI. These firms will therefore increasingly locate in economies that have rich endowments of advanced technology. From the perspective of the source, Chinese state-owned enterprises (SOEs) are strongly supported by the government (Buckley *et al.*, 2008). This means that they have advantages and priorities to invest abroad. Table 3.6 summarises the main host countries of Chinese FDI outflows from 2005 to 2010. It shows that most Chinese FDI enters Asian countries or regions, predominately locating in Hong Kong. However, less FDI outflows go to traditional host countries like the UK and US. There are also considerable FDI inflows to Australia, Caribbean, Luxembourg and Sweden. Especially for the Caribbean, FDI flows to this region are for the market growth rather than advanced technology.

[9] The same source for Tables 3.4 and 3.5 shows Indian FDI outflows in 2010, 2011 and 2012 only. For these three years, there is the same conclusion to that of UNCTAD (2014). Therefore, no table is shown for India here.

Table 3.6: Chinese FDI Outflows by Host Country (millions of US dollars)

Host	2005	2006	2007	2008	2009	2010
EU:	190	129	1,045	467	2,967	5,963
(UK)	(25)	(35)	(567)	(17)	(192)	(330)
(Sweden)	(1)	(5)	(68)	(11)	(8)	(1,367)
(Luxembourg)*	(-)	(-)	(4)	(42)	(2,270)	(3,207)
Asia:	4,351	7,541	16,174	42,834	39,978	43,962
Hong Kong	(3,420)	(6,931)	(13,732)	(38,640)	(35,601)	(38,505)
Singapore	(20)	(132)	(398)	(1,551)	(1,414)	(1,119)
Thailand	(5)	(16)	(76)	(45)	(50)	(700)
Africa:	392	520	1,574	5,491	1,439	2,112
South Africa	(47)	(41)	(454)	(4,808)	(42)	(411)
Caribbean:	6,416	8,409	4,530	3,591	6,984	9,609
British Virgin Islands	(1,226)	(538)	(1,876)	(2,104)	(1,612)	(6,120)
Cayman Islands	(5,163)	(7,833)	(2,602)	(1,524)	(5,366)	(3,496)
Australia:	193	88	532	1,892	2,436	1,702
US:	232	198	196	462	909	1,308

Source: Bilateral FDI Statistics 2014, UNCTAD.
Note: Luxembourg FDI grows strongly due to Special Purpose Entities for tax reasons (OECD, 2014). The FDI data for Hong Kong are counted separately by UNCTAD because it is a Special Administrative Region of China. FDI is measured in current prices and current exchange rates.

South Africa

Table 3.3 shows that both South African FDI inflows and outflows are at consistently low levels throughout the period. FDI inflows reach their peak at $9 billion in 2008, but this is followed by a continuous decrease to $1.6 billion in 2010, which accounts for just 0.7% of total BRICS FDI inflows. FDI outflows show a decreasing trend over the period with only $0.5 billion of outflows in 2010. It shows that South Africa plays a relatively insignificant role in the development of BRICS FDI. This may be partly due to the lower development of the economy, compared with the other four BRICS countries. Most FDI outflows from South Africa are directly located in neighbouring countries, in addition to the main destinations of world investment such as the UK and US (UNCTAD, 2014), which again emphasises that South African firms are at the early stage of their international operations. Table 3.7 shows the main locations of South African outward FDI. It shows that neighbouring countries attract a large amount of FDI (e.g. Mozambique, Namibia and Uganda), compared with the US.

Table 3.7: South African FDI Outflows by Host Country (millions of US dollars)

Host	2005	2006	2007	2008	2009	2010
Mozambique	12	37	176	160	41	129
Namibia	308	309	586	673	-	-
Uganda	8	13	67	51	90	17
US	-226	131	-325	438	-217	127

Source: Bilateral FDI Statistics 2014, UNCTAD.
Note: Net FDI flows. FDI is measured in current prices and current exchange rates.

3.4. Determinants of BRICS FDI

As discussed in Chapter 2, the location of FDI outflows is determined by many different factors, both external and internal to firms. The 'OLI paradigm' provides a framework to consider all these factors together and indicates three necessary conditions for firms to invest directly in foreign countries: firms must have ownership-specific assets that are exclusive to them, they must establish subsidiaries for production in particular foreign countries instead of exporting, and they must internalise these assets within their firm structure rather than by contracting or licensing. These are ownership, location and internalisation (OLI) advantages. They are affected by the conditions in the home country of the foreign direct investor and the industry the investor operates in (Battat and Aykut, 2005; Gammeltoft, 2008). In addition, the location of FDI depends on the characteristics of the host economies and underlying motives for engaging in FDI. Overall, this suggests that in addition to firm-specific factors, the FDI location determinants can be classified into country and industry level factors.

3.4.1. Location Determinants for General FDI

This section briefly reviews the main determinants for the location choice of FDI. These were discussed at length in Chapter 2, and at the country level they include market size, labour and knowledge. Market size is expected to have a positive effect on FDI location (Janicki *et al.*, 2004) as it captures market potential. Labour factors refer to both the cost and quality of labour. Labour costs are part of overall investment costs and are therefore expected to have a negative FDI effect (Bevan and Estrin, 2000), but labour quality, which is usually measured by the level of education (Gao, 2005), may attract knowledge-seeking

FDI. Knowledge factors in the host countries that may attract FDI include the level of technology, human capital and the scientific research base of the country.

Other country-level determinants are the macroeconomic and institutional factors. Macroeconomic factors include the level of trade openness, which affects export-oriented FDI (Jadhav, 2012), and the exchange rate (in domestic per foreign currency units), which should be negatively correlated with FDI inflows as the depreciation of the host country currency reduces relative wages and other production costs measured in foreign currency (Goleberg, 2007). Institutional factors refer to the protection of intellectual property rights, the extent of government intervention in business operations and government corruption. Protection of intellectual property rights has a positive effect on FDI inflows, while the other two institutional factors have a negative relationship with FDI inflows. Political risk, including political stability, government efficiency and regulatory quality, is also considered among the institutional factors. Most studies support the idea that a country with a stable economic and political environment should attract greater FDI inflows.

At the industry level, agglomeration economies are considered an important factor explaining FDI location. As I explained in Chapter 2, these are external economies that occur across firms in an area. According to Dunning (1998), knowledge spillovers and linkages (i.e. both forward and backward) may stimulate a process of agglomeration. Knowledge spillovers persuade firms to agglomerate around those firms with advanced knowledge and technology, while forward and backward linkages could encourage producers to locate close to suppliers or customers. It generates clustering or agglomeration economies, which in turn can attract more FDI to locate in these economies. Based on previous studies (Pelegrín and Bolancé, 2008; Head *et al*., 1999 and Bobonis and Shatz, 2007), agglomeration economies have been found to be strong drivers for FDI location. In addition, these externalities can reduce the extent of information asymmetries and external uncertainties faced by foreign investors and hence provide an attractive location for FDI.

3.4.2. Location determinants for BRICS FDI

This sub-section discusses the determinants for the location of outward FDI of the BRICS. It is based around the country and industry level determinants, as well as the firm-specific factors identified above. It differs from that of the empirical review in Chapter 2 as it relates more directly to the BRICS countries, and it draws on the international business literature.

Country-Level Determinants

At the country level, the three main determinants of outward FDI from the BRICS are the size of the host market, the potential for forward integration and the level of knowledge and technology in the host market (Holtbrugge and Kreppel, 2012). The size of the host market is seen to be important as firms from the BRICS are thought to be expanding their international markets to obtain more growth opportunities outside their domestic markets (Holtbrugge and Kreppel, 2012). This is especially the case for BRICS countries as the home market of each BRICS country is limited by the relatively low levels of GDP per capita. Therefore, market seeking motives are seen to be the most important factors behind FDI from BRICS countries (Jadhav, 2010). BRICS firms are very active in neighbouring countries and other developing countries, but they are also interested in developed countries in Europe and North America given the large market size and potential of these economies (Luo and Tung, 2007).

The type of forward integration undertaken by firms can vary according to whether the destination of FDI is a developed or developing country. On the one hand, firms from emerging markets that have location advantages in their own country normally prefer to establish foreign subsidiaries in developed host countries (Cuervo-Cazurra, 2007). On the other hand, firms in developed countries that have competitive advantages are more likely to depend on their particular products or well-known brands (Lopez-Claros *et al.*, 2006). In this case, BRICS countries normally invest in developed countries through forward integration, i.e. engage with upstream activities in their home markets, such as producing goods, logistics and operations and downstream activities in developed host countries, such as sales and services. By contrast, developed countries invest in the BRICS and other emerging economies through backward integration. Overall, outward FDI from BRICS countries aims to expand into the international market and increase management skills, rather than seeking cost advantages that can be easily obtained in their own countries.

Most firms from the BRICS (or other emerging economies) have advantages like low labour and resource costs, but are weaker in terms of technology and management skills. In order to solve this problem, one choice is to cooperate with firms in developed countries. In this sense, another important driver for outward FDI from the BRICS is to obtain advanced knowledge in developed host countries and use this to improve the level of technology and innovation ability of the parent firms in emerging economies (Deng, 2009). Based on the knowledge-seeking literature, previous studies indicate that countries with lower technology are more likely to invest in countries that have more advanced technology (Kuemmerle, 1999; Serapio and Dalton, 1999). Further, Szulanski (1996) and Tsai (2001) argue that in order to transfer knowledge from the subsidiaries in the host country, the parent firms in the emerging economies normally increase FDI in the R&D sector, which could further strengthen the technological capability of parent firms.

Overall, the motivation based on knowledge seeking for outward FDI is to gain access to knowledge abroad to reduce the competitive weakness on the international markets (Mathews and Zander, 2007). However, the extent of reducing the competitive weakness may depend on whether spillovers exist in the industry, and if so the extent of the spillovers. This in turn depends on the technology gap between subsidiaries and local firms, where a large gap provides more potential for knowledge spillovers (Findlay, 1978), but also implies lower levels of absorptive capacity.

Industry-Level Determinants

At the industry level, outward FDI from the BRICS countries mainly depends on two factors: the strategic position of an industry for the home country and competitive pressures in the home market. For the former, the development of industries in BRICS countries is promoted by economic and political motives. Holtbrügge and Kreppel (2012) indicate that there is preferential treatment by BRICS governments for strategic industries. For example, the natural resource industry in Brazil and the pharmaceutical industry in India have tax breaks, while only certain Chinese state-owned manufacturing firms have the right to enter the Chinese financial sector (Liu and Li, 2002). In line with the international and government-driven development of these strategic industries, outward FDI from BRICS firms is more likely to occur in those industries that are treated as important by the BRICS governments.

The second determinant for BRICS outward FDI at the industry level is the competitive pressure in the home markets. Along with the internationalization process of the BRICS countries, closed industries gradually become open to foreign investors, and thereby more and more foreign firms get access to the home markets. This in turn should lead to a decline in the market share of domestic firms, an increase in competition from foreign firms, lower demand and a fall in prices (Holtbrügge and Kreppel, 2012). This prompts domestic firms to start seeking growth opportunities abroad. Overall, stronger competitive pressures in the home market can stimulate the development of outward FDI from BRICS countries.

Firm-Level Determinants

According to Bertoni *et al*. (2008), the firm level determinants for outward FDI can be divided into three categories: 'push', 'pull' and management factors. First, the push factors include the increasing costs on the domestic market, internationalization policies for domestic firms and the stronger competition among customers and suppliers on the domestic market. Second, pull factors towards the host countries are growth and investment opportunities, the availability of natural resources and encouragement from host governments. Finally, the management factors are the availability of skills and knowledge to be internationalized.

The most important driver for outward FDI at the firm level is the extent of specific resources owned by the domestic firm (i.e. firm-specific resources), which includes different kinds of assets, specific knowledge, the form of organisation etc. The firm-specific resources can generate a strong competitive advantage for these firms in the home market, which means that they develop rapidly and become leaders in their home markets gradually. The dominant position further facilitates these firms in obtaining skilled employees, achieving scale economies and obtaining priority entry to certain industries in the home market. Therefore, they are available to compete with foreign firms and enter the global markets. It is necessary to note that the firm-specific resources from BRICS countries are different from those from developed countries. In particular, firms in BRICS countries have an advantage in terms of natural resources and raw materials, while those in developed countries mainly rely on advanced technology and management skills. Investors at all levels will invest abroad when they can earn greater returns than at home.[10]

3.4.3. Location Determinants for FDI of each BRICS country

In addition to the above determinants of outward FDI from the group of BRICS countries, there are also specific country-level motives for outward FDI for each BRICS country. These generally encompass economic and political determinants, for example a distinctive feature of outward FDI from Russia, India and China is the strong political support from

[10] The mechanisms for benefiting from outward FDI have been discussed in Sections 2.4 to 2.6 in Chapter 2 and Section 3.4 in Chapter 3.

the home government (Holtbrügge and Kreppel, 2012). This sub-section discusses the determinants of FDI outflows in relation to each BRICS country.

Brazil

In general, access to raw materials, resources and markets is an important driver of outward FDI from Brazil. Sauvant (2005) indicates that most outward FDI from Brazil is dominated by natural resources such as food and beverages and other resource-related products, while manufacturing FDI is minimal. The author also suggests that the sharing of experience and the development of education and knowledge, which can be achieved through training, are important for Brazilian firms completing the process of transnationalization. In addition to this, the Brazilian government supports outward FDI. President Lula in 2003 encouraged the Brazilian merchants to become true multinational merchants, and the Minister also expected that there would be ten transnational companies in Brazil by the end of President Lula's term of office (Sauvant, 2005). This may mean that the government may facilitate the outward FDI of Brazilian firms. However, there are no specific policy measures promoting outward FDI from Brazil like those operating in China and discussed below.

Russia

Specific factors that encourage outward FDI from Russia include both firm-specific pull and push factors, and these factors have changed over time. Kalotay (2008) shows that the pull factors are related to the elimination of monopoly power in the developed host countries. Push factors refer to the unstable domestic market and business environment in Russia, which could motivate Russian firms to invest abroad. Elenkov (1995) indicates that searching for advanced technology (for example, aerospace technology) has a strong impact on outward FDI from Russia. During the 1990s, Russian firms such as bank, energy and metal companies that are given priority access to national resources were supported by the government, so that the control of national resources was another important determinant for Russian outward FDI (Liuhto and Jumpponen, 2002). This is because these firms have more advantages over other firms. Thus, they prefer to invest abroad to seek advanced technology or for markets or sources.

India

An increasing number of Indian firms are involved in FDI because of their growing competitiveness and the increase in their profitability and financial strength (Sauvant, 2005). First, factors related to market seeking are the dominant determinants for the location choice of Indian outward FDI. For example, Milelli *et al*. (2010) and Rasiah *et al*. (2010) indicate that the entry to foreign developed markets is the key driver for outward FDI from emerging countries in Asia, such as China and India. Second, Sauvant (2005) indicates that protecting natural resources is a key incentive for Indian firms to invest directly in other countries that are abundant in relevant resources, such as Australia, Russia and Western and Central Asia. However, Nunnenkamp *et al*. (2012) argue that raw materials or advanced technologies do not attract Indian FDI outflows significantly. The authors find instead that Indian outward FDI is more likely to follow previous investment. The paper finds a positive relationship between FDI outflows and the previous FDI stocks as a percentage of GDP in the host country. The authors also find that geographical distance has a negative effect on Indian outward FDI. While evidence on the effect of political stability of host countries is still inconclusive (for example, Andrés *et al*. (2012) find evidence that investors from emerging economies are more risk averse than other investors), Nunnenkamp *et al*. (2012) find that investors from India prefer to invest in the countries with weak institutions, an unstable economy or political uncertainty. This is because weak institutions, unstable economies and political uncertainty mean the lower level of costs and more opportunities for FDI.

There is also evidence that the government attitude towards FDI outflows from India is important. The government has specific policies for outward FDI, which have changed significantly over time. According to Pradhan (2003), during the period from 1974 to 1991, the government was trying to discourage Indian outward FDI, by obstructing FDI outflows from Indian firms. This is because the scarcity of resources was a problem for India. Outward FDI was obstructed by restricting the cash remittances abroad, as a way to promote exports. During the 1990s, an automatic approval system was established by the Indian government to increase the limit of permissible investment and decrease the regulatory constraints, which aimed to encourage Indian direct investment overseas. After 2003, the Indian government has also relaxed its restrictions to investment in the agriculture sector of other countries directly or through overseas branches.

China

In general, firms from emerging economies prefer to invest in industrialised countries to take advantage of advanced technology and learning (Deng 2003), but during the 1990s

Chinese outward FDI mainly sought natural resources when investing in industrialised countries (Buckley *et al*., 2008). However, knowledge-seeking FDI has become an important motive for Chinese outward FDI in recent years. Overall, Buckley *et al*. (2008) argue that the key motives for Chinese outward FDI in developed countries are to generate global brands, obtain advanced technology, protect natural resources and expand markets abroad.

Chinese firms have established R&D centres abroad to enhance their technological assets, for example, the Chinese firm Haier set up a research centre in India (Sauvant, 2005). Similar to Indian firms, Chinese firms also invest in resource rich countries in order to protect natural resources at home. Fierce competition is an important factor that motivates Chinese firms to invest abroad. In the case of asset-seeking FDI, Dunning (2006) suggests that Chinese firms tend to invest in economies rich in human and intellectual capital, which helps these firms improve their competitiveness on the international market. Because of cultural proximity, Buckley *et al*. (2007) suggest that FDI from Chinese firms prefers to locate in countries that have large ethnic Chinese minorities. It suggests networks play an important role in attracting Chinese investors because they reduce transaction costs. It could explain why Chinese FDI locates in Asian countries such as Singapore, Malaysia and Thailand.

Policy liberalisation can also stimulate FDI outflows. Similar to India, the Chinese government supports outward FDI from domestic firms and promotes the international competitiveness of multinationals through specific policies. Most beneficiaries are the state-owned enterprises (SOEs) that have received strong support from the Chinese government in various ways, such as financial assistance, trade agreements with developed countries and bilateral investment negotiation (Buckley *et al*., 2008). It means that SOEs have priorities to use national resources and enter the international markets. Thus, they have advantages over other firms to earn returns and occupy the market share in the domestic market, which could push them to invest abroad. This support started in 1979 and has continued since then. In particular, many measures have been adopted by the government to simplify the approval procedures and reduce restrictions on foreign exchange. For example, since October 2004, approval for outward FDI applications can be obtained from the official website of the Ministry of Commerce and there is no requirement for firms to submit their investment proposals. In addition, the Chinese government also requires the Export-Import Bank and commercial banks to supply loans with low interest rates to firms that invest abroad. At the same time, fiscal incentives are used to favour these firms. Finally, an online system was created by the government for firms to avoid FDI barriers and discrimination in host countries through bilateral consultations (see Sauvant, 2005).

South Africa

There are few studies of South African outward FDI, but they suggest that the determinants for outward FDI from South Africa are the same as for the other four BRICS countries. They include knowledge-seeking, protection of natural resources and increased competitiveness of domestic firms. South Africa is the largest single source of outward FDI from Africa. Its FDI outflows are mainly motivated by the availability of resources in the host countries and the investment opportunities in neighbouring countries (Gammeltoft, 2008). As a result, most South African investment is concentrated in Africa. Henley *et al*. (2008) show that most investors from South Africa still prefer to invest in Sub-Saharan Africa (SSA) directly, even though there is poor infrastructure and low levels of development of the home markets.

3.4.4. Bilateral Investment Treaties between the BRICS and EU-25

The earlier discussions have found that the BRICS economies are playing an ever more important role in FDI flows and hence the general process of globalisation. They have also highlighted the general determinants that affect the locational pattern of this investment. A recurrent theme for each of the BRICS countries is that outward FDI takes place in specific industries, possibly helped by strategic government policies, and also in specific host countries. These location patterns may arise because of geographical proximity or due to other motives such as market and knowledge-seeking FDI or agglomeration economies. Therefore, this section mainly focuses on the location choice of investment from the BRICS in the EU based on their Bilateral Investment Treaties (BITs). A BIT is an agreement between two countries regarding promotion and protection of investments made by investors from countries in each other's territory. UNCATD provides the data on the signature date that cover 2963 treaties among different countries. This can be used as the extra evidence for the pattern of BRICS investments that is reported in the above sections and to examine whether the locations indeed have the characteristics that attract the investments of BRICS countries. Hence, Table 3.8 shows the signature date for the BITs between each BRICS and each of the EU-25 countries.

Table 3.8: Signature Date for Bilateral Investment Treaties with EU-25 Countries

Partners	Brazil	Russia	India	China	South Africa
Austria	-	Feb. 1990	Nov. 1999	Sept. 1985	Nov. 1996
Belgium	Jan. 1999	Feb. 1989	Oct. 1997	Jun. 2005	Aug. 1998
Bulgaria	-	Jun. 1993	Oct. 1998	Jun. 2007	-
Czech Republic	-	Apr. 1994	Jul. 2010	Dec. 2005	Dec. 1998
Denmark	May. 1995	Nov. 1993	Sept. 1995	Apr. 1985	Feb. 1996
Estonia	-	-	-	Sept. 1993	-
Finland	Mar. 1995	Feb. 1989	Nov. 2002	Nov. 2004	Sept. 1998
France	Mar. 1995	Jul. 1989	Sept. 1997	Nov. 2007	Oct. 1995
Germany	Sept. 1995	Jun. 1989	Jul. 1995	Dec. 2003	Sept. 1995
Greece	-	Jun. 1993	Apr. 2007	Jun. 1992	Nov. 1998
Hungary	-	Mar. 1995	Nov. 2003	May. 1991	-
Ireland	-	-	-	-	-
Italy	Apr. 1995	Dec. 2002	Nov. 1995	Jan. 1985	Jun. 1997
Latvia	-	-	Feb. 2010	Apr. 2004	-
Lithuania	-	Jun. 1999	Mar. 2011	Nov. 1993	-
Luxembourg	Jan. 1999	Feb. 1989	Oct. 1997	Jun. 2005	Aug. 1998
Netherlands	Nov. 1998	Oct. 1989	Nov. 1995	Nov. 2001	May. 1995
Poland	-	Oct. 1992	Oct. 1996	Jun. 1988	-
Portugal	Feb. 1994	Jul. 1994	Jun. 2000	Dec. 2005	-
Romania	-	Sept. 1993	Feb. 2009	Apr. 2007	-
Slovakia	-	Nov. 1993	Sept. 2006	Dec. 2005	-
Slovenia	-	Apr. 2000	Jun. 2011	Sept. 1993	-
Spain	-	Oct. 1990	Sept. 1997	Nov. 2005	Sept. 1998
Sweden	-	Apr. 1995	Jul. 2000	Sept. 2004	May. 1998
UK	Jul. 1994	Apr. 1989	Mar. 1994	May. 1986	Sept. 1994

Source: author's own elaboration based on Bilateral Investment Treaties, UNCTAD.[11]

Table 3.8 shows that most dates of signature are concentrated in the 1990s and that they occur earlier in time if the partner countries are more developed and relatively open to trade. That is, most signature dates between the BRICS countries and Western European countries are earlier than those with the Eastern European countries. The opening of relations between the Central and Eastern European countries (CEEC) and the BRICS occurs after 1989, which is the year when Communism collapsed. All agreements with the CEECs, with one exception, are signed after 1989.

Section 3.2 shows that Russia and China are the two main investors among the five BRICS countries. Table 3.8 shows that many of the treaties between Russia and the

[11] Source: http://investmentpolicyhub.unctad.org/IIA/CountryBits/27
http://investmentpolicyhub.unctad.org/IIA/CountryBits/175
http://investmentpolicyhub.unctad.org/IIA/CountryBits/96
http://investmentpolicyhub.unctad.org/IIA/CountryBits/42
http://investmentpolicyhub.unctad.org/IIA/CountryBits/195 last accessed: 12th April 2016.

EU are in 1989 and that none of them are dated before 1989 because these were also affected by the collapse of Communism. In addition, Russia's treaties with the East are earlier than those with the West owing to geographical and political factors. It also can be seen that the treaty dates between China and the EU countries are concentrated in the 1990s and the beginning of the new century, which is similar to India. However, their agreement dates with specific EU countries can vary greatly. For example, India signed the treaty with Germany in 1995, but the treaty date for China is 2003. By contrast, China signed the treaty with Italy earlier than India did. For Brazil and South Africa Table 3.8 shows that all of the dates for their treaties with the EU countries occurred in the 1990s, although the missing dates indicate that there are still no bilateral investment treaties with many of these. Overall, this table shows that the date of the bilateral investment treaty is not only determined by the economic development of the EU country, but also by the extent of openness of the BRICS countries themselves owing in part to political and geographical considerations.

3.5. Conclusions

This chapter has sought to review the overall pattern of BRICS outward FDI and the global regions that are the main recipients of this investment for individual BRICS countries. It also discusses the reasons and determinants of this outward FDI including the special reasons underlying the FDI from individual BRICS countries, which aims to explore whether the location choice of FDI keep consistent with the literature review. The chapter considers the Bilateral Investment Treaties that are signed between each BRICS and EU country to see what these reveal about the location preference of each BRICS in relation to the European Union.

First of all, to examine whether the patterns of BRICS FDI have the similar tendency to those of global FDI, these global inflows and outflows are discussed, distinguishing between the developed and developing countries. There is no doubt that the developed economies are both the main location of FDI inflows and main source of FDI outflows, particularly the EU and US. In relation to FDI outflows, the developed economies showed a sharp decrease during the Financial Crisis, although over the study period they still increased their amount of FDI and share of global FDI outflow. With regard to global regional trends, FDI flows from East and South Asia and from the CIS are more similar to those of the developing economies, compared with South America and

Southern Africa, which are a net receiver of FDI. Outward FDI from these latter two regions is at a relatively low level and shows a high degree of volatility compared with their FDI inflows.

Second, FDI flows of BRICS is discussed. Both inflows and outflows are increasing over time, but with some slight fluctuations, while the amount of FDI inflows is still greater than that of the FDI outflows. It means that the BRICS countries are at the early stage of internationalisation. At the country level, China and India are the main contributors to the FDI flows of the BRICS and they alternate as the top one over time, but finally reach a similar level by 2010. Compared with China and India, FDI outflows from Brazil, Russia and South Africa maintain a relatively low level and fluctuate considerably, where most Russian outward FDI prefers to be located in the East of EU, which is no doubt due to political and geographical considerations. In addition to the general determinants of BRICS FDI location, there are special motives for outward FDI of each BRICS country including the policies of encouragement by the central government.

Finally, this chapter considers the signature date of Bilateral Investment Treaties between the BRICS and EU countries, to examine which countries are more open to BRICS FDI. An earlier signature date suggests that BRICS FDI is more interested in this country and that the BRICS country starts its international process earlier. Inspection shows that the signature dates between China or India and EU countries are concentrated in the 1990s and the beginning of the 2000s, but the dates with different EU countries vary, so that these two countries have different international processes, although starting around the same time. The treaty dates for Russia are around 1989 and follow the collapse of Communism, and Russia is interested in the Central and Eastern European countries. For Brazil and South Africa, all signature dates are in 1990s, but there are still no treaties between them and some EU countries. Thus, while these two countries started their international process early in relation to Europe at a slower pace, which may be due to their development.

Chapter 4. Methodology

4.1. Introduction

In general, there are three levels of choice that a multinational firm faces when it engages in the international activities. As indicated by Rasciute (2008), the first choice is whether it produces in the home country and exports abroad, or alternatively produces both in the home and overseas country. When a firm decides to locate its production abroad, the second choice it faces is a decision concerning where to locate their production facility between a number of alternative locations. The final choice facing the firm is the scale of the investment. These decisions are to some extent mutually dependent, so that the decision to invest in part depends on the scale of the investment and the nature of the preferred host country. In this thesis I focus on the second choice, and following the relevant literature I generally regard these choices as independent.

The purpose of this chapter is to discuss the methodology used to examine empirically the location of BRICS FDI in the EU countries in the subsequent chapters of this thesis. The EIM database provides data on the number of FDI projects (count data) and also shows the location choice of these projects in the EU associated with other information. These will be discussed in Chapter 5. The applied work involves a number of different frameworks that adopt a range of econometric models used in the empirical literature on FDI location. In particular, these frameworks include a logit specification, such as Multinomial Logit and Conditional Logit models, which capture the discrete location choice of FDI between alternative locations (e.g. Becker *et al*., 2005; Crozet *et al*., 2004; Head and Mayer, 2004). They also include the Poisson and Negative Binomial models that capture the discrete counts of FDI projects that occur in different locations (e.g. Wu, 1999; Roberto, 2004).

The structure of this chapter is organised as follows. Section 4.2 discusses the model of binary choice that is the basis for the logit models of discrete choice. The Multinomial Logit and Conditional Logit models that are used for analysing the location choice are then explored in Section 4.3. Section 4.4 looks in detail at the count data models that encompass the Poisson and Negative Binomial models. This section also includes some more advanced methods such as the Hurdle, Zero-Inflated and Zero-Truncated models that are appropriate if there are a large number of zero observations in the count data, which is the case for our data. In this section, the model selection among standard Poisson, Negative Binomial (NB) and Zero-inflated models is discussed at the end of Section 4.4.5.[12] Section 4.5 sets out the specification of the regression equations for the logit and count data analysis that is used in the following chapters. Finally, conclusions are drawn in Section 4.6.

4.2. Binary Choice Models

Many economic outcomes can be considered as a discrete choice among a finite number of alternatives, such as the location decision of firms across a number of alternative locations. A common feature of discrete data is that the conventional regression analysis of these leads to inconsistent or inefficient estimates, so that alternative estimating techniques should be used. In most cases, these alternative regression methods are based on the interpretation of the probability of the discrete event occurring. The models are constructed to relate this probability to a number of explanatory factors that determine or affect the event occurring. Therefore, the general framework for these probability models can be specified as:

$$\Pr(Event\ j\ takes\ place) = \Pr(Y = j) = F\ (Explanatory\ variables), \qquad (4.1)$$

where event *j* represents a particular choice among a finite set of discrete alternatives and F is a function of the relevant explanatory variables that affect this choice. In specifying this function, this section looks at the simplest class of discrete choice models, which analyse choice between two events. These are known as binary choice models.

4.2.1. Specification of the Binary Choice Model

The binary model, which is a basis for the logit analysis, is used to explain a binary dependent variable, which offers two choices. For example, in the case of FDI the binary model can be used to explore whether an investor chooses to locate abroad or not. If the

[12] Hurdle and Zero-truncated models cannot be run for Brazil. Thus, these two models will not be used for discussing FDI location of each BRICS country. Details are shown in the Introduction of Section 8.5 in Chapter 8.

investor does invest then $Y = 1$, but otherwise $Y = 0$. There are therefore only two possible scenarios ($Y = 1$ or $Y = 0$). These in turn may be affected by many factors, at the firm, industry and country level. The variables for these factors can be expressed together in a vector X, so that the probability of the choice can be written as:

$$\begin{cases} \Pr(Y = 1) = F(X,\ \beta) \\ \Pr(Y = 0) = 1 - F(X, \beta), \end{cases} \tag{4.2}$$

where β are the respective coefficients on the explanatory variables X that affect the probability of the event (i.e. the foreign investment) occurring. It is necessary to specify a suitable model for the right-hand side of equation (4.2), and if a linear regression is used, then $F(X, \beta) = X'\beta$. As $E(Y) = F(X, \beta)$ the regression model can therefore be expressed as (Greene, 2002):

$$Y = E(Y) + [Y - E(Y)] = X'\beta + \varepsilon\ , \tag{4.3}$$

where ε is a random error term. This is the linear probability model. However, because Y equals either 0 or 1, then ε equals -$X'\beta$ or $1 - X'\beta$ with probabilities of $1 - F(X, \beta)$ and $F(X, \beta)$ respectively. Greene (2002) discusses the estimation of the binary choice using the method of maximum likelihood. The discussion of this procedure is considered in Appendix 4.1.

4.2.2. Model Selection

As an alternative of the linear model, the normal distribution is widely adopted, which leads to the probit model:

$$\Pr(Y = 1) = \Phi(X'\beta), \tag{4.4}$$

where the function $\Phi(X'\beta)$ is the standard normal distribution function. Another commonly-used distribution is the logistic distribution, which leads to the logit model. The logit model is widely used owing to its mathematical convenience:

$$\Pr(Y = 1) = \frac{e^{X'\beta}}{1+e^{X'\beta}} = \Lambda(X'\beta) \tag{4.5}$$

where the function $\Lambda(X'\beta)$ gives the logistic cumulative distribution function.

The probit and logit models each have a symmetric bell-shaped distribution, but in addition there are other models that do not assume symmetry.

The natural question to ask is which of these distributions should be preferred. The logistic distribution is similar to the normal distribution, although its tails are much thicker, so that these two distributions give similar predictions of the probabilities for intermediate values of $X'\beta$. However, there tends to be larger probabilities for $Y = 0$ when the value of $X'\beta$ is very small in the logistic function compared to the normal distribution. Amemiya (1981) explores this, but he comes to no definitive conclusion. Overall, from a theoretical perspective, there is not any general basis in the literature for selecting one distribution over another, but researchers may have their own reasons to prefer one distribution, which is perhaps for its mathematical convenience. Nevertheless, the probit and logit models tend to be the most widely used models in econometric applications using count data.

A further issue when looking at the logit and probit models is in the interpretation of the parameters of these models, as in general they do not relate to the marginal effects that are associated with the standard OLS regression. Marginal effects can be estimated at the means of regressors. In the probit and logit models:

$$E(Y) = 1[F(X'\beta)] + 0[1 - F(X'\beta)] = F(X'\beta), \tag{4.6}$$

so that in general, the first derivative of X can be shown to be (Greene, 2002):

$$\frac{\partial E(Y)}{\partial X} = \left\{\frac{dF(X'\beta)}{d(X'\beta)}\right\}\beta = f(X'\beta)\beta, \tag{4.7}$$

where $f(X'\beta)$ represents the density function of the cumulative distribution function $F(X'\beta)$. For the normal distribution, equation (4.7) can be written as:

$$\frac{\partial E(Y)}{\partial X} = \phi\,(X'\beta)\beta \tag{4.8}$$

where $\phi(X'\beta)$ is the standard normal density function. For the logistic distribution it is:

$$\frac{\partial E(Y)}{\partial X} = \Lambda(X'\beta)[1 - \Lambda(X'\beta)]\beta \tag{4.9}$$

It can therefore be seen that these values depend on the values of X, so that to obtain the marginal estimated effects they are often calculated at the sample means (i.e. the means of the regressors). This could be given through econometrics packages such as *Stata*.

4.3. Multiple Location Choice Models

The above section has explored models for binary choices in the discrete choice framework, but in practice there may be a greater number of choices that need to be modelled. These can be classified into ordered and unordered sets of alternatives. For example, the location choice of a foreign direct investor may well encompass a number of different unordered alternatives that cannot be modelled in a simple binary framework. Therefore, this section discusses models of multiple unordered choice models.

Again, Greene (2002) sets up a random utility model for unordered choices. It is assumed that there is a choice between a set of J unordered alternatives for firm i, so that the utility function of choice j for firm i is:

$$U_{ij} = A'_{ij}\beta + \varepsilon_{ij} \, , \tag{4.10}$$

where A'_{ij} is composed of characteristics that relate to both the alternatives and the firms. If U_{ij} is the maximum utility that firm i makes from choosing j in the set of alternatives J then it must follow that the probability of choosing alternative j satisfies:

$$\Pr(U_{ij}) > \Pr(U_{ik}) \, , k \neq j \tag{4.11}$$

where k denotes all other alternatives in J. McFadden (1974) shows that the probability of firm i choosing location j is:

$$\Pr(Y_i = j) = \frac{e^{A'_{ij}\beta}}{\sum_{j=1}^{J} e^{A'_{ij}\beta}} \; . \tag{4.12}$$

Equation (4.10) shows that utility depends on A_{ij}, where $A_{ij} = [X_{ij}, W_i]$ distinguishes between the attributes of the alternatives like the countries (X_{ij}) and the characteristics of firms (W_i). In practice, these are often modelled separately, which is partly because data on the determinants for both of these are often too costly to collect, so that researchers just focus on the attributes of one of these alternatives. This means that two types of model are analysed and these are now considered in turn as follows.

4.3.1. Multinomial Logit Model

The Multinomial Logit model applies to circumstances in which the data includes only the characteristics of the agent making the choice, which in our case is the foreign investor. Hence, only the characteristics W_i appear in A_{ij} in equation (4.12). Schmidt and Strauss (1975) show that in general there are $J + 1$ choices in a set of J alternatives, as the choice starts from 0 to J, rather than from 1 to J. Therefore, the Multinomial Logit model is:

$$\Pr(Y_i = j | W_i) = \frac{e^{\beta'_j W_i}}{\sum_{j=0}^{J} e^{\beta'_j W_i}} \tag{4.13}$$

where $j = 0, 1, \dots, J$. This model shows that there are $J + 1$ choices for the decision maker who has characteristics W_i. If $J = 1$ (i.e. $j = 0, 1$), then clearly equation (4.13) represents the binary choice model that has previously been discussed. It is normal to let $\beta_0 = 0$ as the sum of all probabilities equals unity, which means that $J + 1$ probabilities are determined by J alternatives in the set. Therefore, equation (4.13) can be re-written as:

$$\Pr(Y_i = j) = \frac{e^{\beta'_j W_i}}{1 + \sum_{j=1}^{J} e^{\beta'_j W_i}}, \qquad \beta_0 = 0 \tag{4.14}$$

As indicated above, if $J = 1$, equation (4.14) is the binomial model.

4.3.2. Conditional Logit Model

Compared with the Multinomial Logit model, the Conditional Logit model is used for data that include only the attributes of the alternatives, rather than the characteristics of the agent making the choice, i.e. the inward investor. Thus, only the attributes of the alternatives X_{ij} appear in A_{ij} in equation (4.12), and the model is:

$$\Pr(Y_i = j|X_{ij}) = \frac{e^{\beta' X_{ij}}}{\sum_{j=1}^{J} e^{\beta' X_{ij}}} . \tag{4.15}$$

In order to be consistent with the convention of the previous literature, $j = 1, 2, \dots , J$ for all J alternatives in the set. In the Conditional Logit model, Greene (2002) emphasizes that there is no direct relationship between the coefficients and the marginal effects. However, the latter could be calculated by differentiating equation (4.15) with respect to X:

$$\frac{\partial P_j}{\partial X_k} = \{P_j[\mathbf{1}(j = k) - P_k]\}\beta, \text{ for } k = 1, 2, \dots, J. \tag{4.16}$$

It can be seen that the attributes of the alternatives X_j affect the probabilities through both P_j and P_k. Furthermore, the effect of choice k on P_j with attribute m can be shown to be:

$$\frac{\partial \log P_j}{\partial \log X_{km}} = X_{km}[\mathbf{1}(j = k) - P_k]\beta_m \tag{4.17}$$

Hensher (1986) indicates that it is better to show the elasticity of probabilities, but Greene (2002) argues that this is a personal choice to report the derivative or elasticity of probability “since there is no ambiguity about the scale of the probability itself” (p. 723). Therefore, if marginal effects are preferred to be shown, they can be estimated at the means of regressors. In this thesis, marginal effects are estimated for tables 7.8 and 8.11 as they show the main regression results.

According to equation (4.12), X_{ij} varies between the alternatives and the agents to some extent, but W_i varies only between the agents, but it is constant across all alternatives. It is potentially possible to incorporate both the alternative attributes and agent characteristics into the model, in which case the probability of firm *i* choosing location *j* in equation (4.12) becomes:

$$\Pr(Y_i = j) = \frac{e^{\beta' X_{ij} + \alpha' W_i}}{\sum_{j=1}^{J} e^{\beta' X_{ij} + \alpha' W_i}} = \frac{e^{\beta' X_{ij}} e^{\alpha_i' W_i}}{\sum_{j=1}^{J} e^{\beta' X_{ij}} e^{\alpha_i' W_i}} \tag{4.18}$$

Both the Multinomial Logit and Conditional Logit models are based on the assumption of the Independence of Irrelevant Alternatives (IIA). This imposes the constraint in the model that the ratio of the probabilities between any two alternatives is independent of the presence of a third alternative, where this third alternative may differ from one of the other two only in ways that are irrelevant to the decision being taken. For example, in the case of the well-known travel-to-work transport mode if the choice is between rail and bus travel, but a new bus is introduced that is painted a different colour (it is blue whereas existing buses are red), then the new alternative (of a blue-painted bus) will not affect the estimated odds-ratio (i.e. the ratio of probabilities) between the rail and existing red-painted buses, even though it is reasonable that some commuters will now use the blue-painted bus. This IIA restriction will mean that the probability of using a bus is likely to be over-predicted by the logit model, and that of use the train will be under-predicted. The testing for IIA assumption is considered in Section 7.4.3 of Chapter 7, which shows the main regression results. Details of IIA assumption and the estimation problem caused by the IIA assumption are considered further in Appendix 4.2.

4.4. Count Data Models

In addition to modelling the FDI location as a choice between countries, which is captured by a dependent variable that takes a value of either 0 or 1, it is also of interest to discuss the approach that uses count data to examine FDI location, e.g. where the dependent variable is the count of the number of FDI projects. In principle, multiple linear regression models can be used to examine count data, but as Greene (2002) notes given the discrete nature of the dependent variable it is possible to improve upon the performance of Ordinary Least Squares estimation. In addition, if there is a large number of zero counts within the data then certain methods should be used to take into consideration these particular characteristics.

This section briefly discusses the multiple linear regression techniques that are used to estimate count data and the specification of the Poisson model is then considered. The Poisson framework may however be problematic if the data is characterised by over-dispersion in the data, such as a large number of zero counts. Therefore, two further models are discussed that take into account this problem, comprising the Negative Binomial and Hurdle Poisson models, where the latter explicitly takes into account the effects of excess counts of zeros.

4.4.1. Log-linear Regression Model

In general, the multiple linear regression model aims to explore the relationship between the dependent variable and several explanatory variables. The linearity assumption refers to the way that explanatory variables and the disturbance term enter the equation, rather than the relationship between variables. In this sense, when there is a linear relationship between the logs of *x* and *y*, the *log-linear regression model* arises as follows:

$$\ln y = \beta_1 \ln x_1 + \beta_2 \ln x_2 + \cdots + \beta_K \ln x_K + \varepsilon, \tag{4.19}$$

where y is the dependent variable measured by the number of FDI projects, $x_1, \dots, x_K$ are explanatory variables and ε is a disturbance term that is used to capture the effects of unobserved factors.

This is referred to as the constant elasticity form, since as the elasticity of y with respect to x_K ($\partial \ln y / \partial \ln x_k = \beta_k$) is constant. The log-linear regression function allows a non-linear relationship to be estimated in a linear Ordinary Least Squares (OLS) framework, and also allows the transformation of variables that may be relatively skewed as may be the case when investigating FDI counts, e.g. some locations receive a large number of FDI projects relative to other locations. Estimates of the β can be obtained through either OLS or maximum likelihood estimation, where details are given in Appendix 4.3.

4.4.2. Poisson Regression Model

The log-linear transformation above may not be the most effective way of accounting for the skewed nature of the data, nor does it explicitly take into account the discrete nature of counts of FDI.[13] In practice, the Poisson regression is the most popular technique to model this data. According to Greene (2002), if *Y* is a count variable, it describes how each y_i is selected from a Poisson distribution that is related to the explanatory variables X_i as follows, where λ_i is the Poisson parameter:

[13] It is usually assumed that the linear regression has a normal distribution, which is reasonable if the dependent variable is continuous, because continuous variables can take all values in a large range. However, count data take a relatively limited number of values, so its distribution is Poisson, rather than the normal.

$$\Pr(Y = y_i|\boldsymbol{x}_i) = \frac{e^{-\lambda_i}\lambda_i^{y_i}}{y_i!}, \quad y_i = 0,1,2, \dots , \tag{4.20}$$

where $y_i!$ is the factorial of y_i. Greene (2002) also indicates that the common formulation for the Poisson parameter λ_i is through a log-linear model, so that $\ln \lambda_i = \boldsymbol{x_i'\beta}$. It can then be shown that the expected number of event occurrences in each period is:

$$E(y_i|\boldsymbol{x_i}) = Var(y_i|\boldsymbol{x_i}) = \lambda_i = e^{\boldsymbol{x_i'\beta}} \ . \tag{4.21}$$

Wooldridge (2014) supports the use of the exponential function to model the expected values as they will always be positive, so that the predicted values for the dependent variable y will also be positive. Thus, the first derivative with respected to $\boldsymbol{x_i}$ is:

$$\frac{\partial E(y_i|\boldsymbol{x_i})}{\partial \boldsymbol{X_i}} = \lambda_i \boldsymbol{\beta}. \tag{4.22}$$

The main problem with the Poisson model is that it constrains the variance of the number of event occurrences to be equal to the mean, as shown above in equation (4.21). This restriction is often violated as it is common to observe that the variance exceeds the mean in many count data distributions, and this is called over-dispersion. If the Poisson model ignores the over-dispersion then it under-estimates the standard errors.[14] Kennedy (2008) argues that there are two reasons for the occurrence of over-dispersion. The first is due to heterogeneity across the observations, for which the coefficient estimates cannot be identified for all individuals in the sample. Second, over-dispersion happens when there are ‘redundant’ zeros in the data, which means that there are “more zeros in the data than would be expected if the data were actually following a Poisson” (Kennedy, 2008; p. 244). The next section looks at the way of modelling data over-dispersion.

4.4.3. Negative Binomial Model

The main weakness of the Poisson regression model is the equality of the conditional mean and variance. However, there are alternatives to this model (Cameron and Trivedi, 1998), of which the most popular is the Negative Binomial model. This relaxes the equality of the conditional mean and variance by introducing an individual and

[14] Wooldridge (2014) believes that the Poisson distribution has a good robustness property in that estimates will be consistent and asymptotically normal estimators for β.

unobserved effect:

$$\ln \mu_i = \boldsymbol{x_i'\beta} + \varepsilon_i = \ln \lambda_i + \ln u_i, \tag{4.23}$$

where $\lambda_i$is the variance of the Poisson distribution and the variance of NB is μ_i which exceeds its conditional mean. $\boldsymbol{x_i} = (1, x_{i1}, \dots, x_{ik})$ is a $(k+1) * 1$ covariate vector and $\boldsymbol{\beta} = (\beta_0, \beta_1, \dots, \beta_k)$ is the corresponding parameter vector.

The assumption of the Poisson model is that the conditional mean $E(y_i|\boldsymbol{x}_i) = \lambda_i$ is equal to the conditional variance $Var(y_i|\boldsymbol{x}_i) = \lambda_i$. The disturbance u_i (i.e. ε_i) in equation (4.23) is the specification error in the classical regression model. In this sense, the distribution of y_i still maintains the Poisson distribution and the density function is expressed as the following form based on $\boldsymbol{x_i}$ and the disturbance u_i (see Greene, 2002):

$$f(y_i|\boldsymbol{x_i}, u_i) = \frac{e^{-\lambda_i u_i}(\lambda_i u_i)^{y_i}}{y_i!}. \tag{4.24}$$

The unconditional distribution $f(y_i|\boldsymbol{x_i})$ is expressed as the expected value of the above conditional distribution over u_i as follows:

$$f(y_i|\boldsymbol{x}) = \int_0^{+\infty} \frac{e^{-\lambda_i u_i}(\lambda_i u_i)^{y_i}}{y_i!} g(u_i) du_i. \tag{4.25}$$

It can be seen that the unconditional distribution is defined by a density choice of u_i. Greene (2002) indicates that $g(u_i)$ in equation (4.25) can be defined as the follow according to the normalization:

$$g(u_i) = \frac{\theta^\theta}{\Gamma(\theta)} e^{-\theta u_i} u_i^{\theta-1}. \tag{4.26}$$

Because of the unobserved heterogeneity, the Poisson model is not adequate any more. The probability function of Negative Binomial model as an alternative is shown as (Cruyff and van der Heijden, 2008):

$$\Pr(Y = y_i|\boldsymbol{x}_i) = \frac{\Gamma(y_i + \alpha^{-1})}{\Gamma(\alpha^{-1}) y_i!} \left(\frac{\alpha^{-1}}{\alpha^{-1} + \lambda_i}\right)^{\alpha^{-1}} \left(\frac{\lambda_i}{\alpha^{-1} + \lambda_i}\right)^{y_i} \tag{4.27}$$

where $\Gamma(.)$ represents a gamma function and α is a dispersion parameter that is greater than zero. When α approaches zero, the Negative Binomial model is similar to the Poisson model. However, the key difference is that the conditional variance is now greater than the mean:[15]

$$Var(y_i|\boldsymbol{x}_i) = \alpha + \alpha\lambda_i^2 > E(y_i|\boldsymbol{x}_i) = \lambda_i \tag{4.28}$$

The likelihood-ratio test can be used to select the Poisson or NB model. The null hypothesis is Poisson model should be selected (α approaches zero). In this sense, if the null hypothesis cannot be rejected, it means that Poisson model should be selected. This will be discussed in details in Section 4.4.5.

4.4.4. Hurdle Poisson and Negative Binomial Models

Over-dispersion in the count data can arise due to the large number of zero counts in the data (Kennedy, 2008). If a simple count data model is used when there is an excess of zeros then there will be a misspecification of the counts and biased estimates (Kennedy, 2008). Mullahy (1986), Lambert (1992) and Johnson and Kotz (1993) suggest that the zero outcomes can be derived from one of two regimes. In one regime, the outcomes are always zero, but in the other regime there are both zero and positive outcomes. The Hurdle models are based on the notion that during the process of data generation the zero outcomes (from both regimes 1 and 2) are qualitatively different from the positive outcomes (Mullahy, 1986). Therefore, a binary probability model, as discussed in Section 4.2, is first used to determine whether there is a zero or a non-zero outcome, and a truncated Poisson or negative binomial model (truncated at zero to rule out the zero counts already determined by the probability model) is then used to describe the positive outcomes. It is shown as (Greene, 2002):

$$\Pr(y_i = 0|\boldsymbol{X_i}) = \Pr(regime\ 1) + \Pr(y_i = 0|\boldsymbol{X_i}, regime\ 2)\Pr(regime\ 2),$$
$$\Pr(y_i = j|\boldsymbol{X_i}) = \Pr(y_i = j|\boldsymbol{X_i}, regime\ 2)\Pr(regime\ 2), j = 1,2, \ldots$$

[15] Marginal effects are estimated for the main results in Tables 7.8 and 8.11, rather than all regression results. This is because Greene (2002) argues that this is a personal choice to report the derivative or elasticity of probability.

Hurdle Poisson Model

Greene (2002) shows the Hurdle Poisson model as:

$$\Pr(y_i = 0|\boldsymbol{x_i}) = \omega, \quad j = 0$$

and (4.29)

$$\Pr(y_i = j|\boldsymbol{x_i}) = \frac{(1-\omega)e^{-\lambda_i}\lambda_i^j}{(1-e^{-\lambda_i})j!}, \quad j = 1,2, \dots ,$$

where $\Pr(y_i = 0|\boldsymbol{x_i})$ determines the probability of a zero outcome and $\Pr(y_i = j|\boldsymbol{x_i})$ gives the probability of a positive outcome. The $(1-\omega)$ term in the numerator of (4.34) is the probability of crossing the zero Hurdle and it is multiplied by the truncated Poisson to ensure the sum of the probabilities is equal to one (see Farbmacher, 2011).

Hurdle Negative Binomial Model

If the truncated negative binomial model is used to rule out the zeros, Saffari *et al*. (2012) consider the hurdle negative binomial model as:

$$\Pr(y_i = 0|\boldsymbol{x_i}) = \omega, \quad j = 0$$

and (4.30)

$$\Pr(y_i = j|\boldsymbol{x_i}) = (1-\omega)\frac{\Gamma(y_i + \alpha^{-1})}{\Gamma(y_i+1)\Gamma(\alpha^{-1})}\frac{(1+\alpha\lambda_i)^{-\alpha^{-1}-y_i}\alpha^{y_i}\lambda_i^{y_i}}{1-(1+\alpha\lambda_i)^{-\alpha^{-1}}}, \quad j = 1,2, \dots$$

where ω could have different parameterisation and Greene (2002) defines $\omega = e^{-\theta}$. Bilgic and Florkowski (2007) show their conditional mean as:

$$E(y_i|\boldsymbol{x}_i) = \sum_{y_i=1}^{+\infty} y_i \Pr(y_i = j|\boldsymbol{x_i}), j = 1,2, \dots \tag{4.31}$$

Overall, the logit model explores the occurrence of zero observations at the first stage, and then truncated Poisson or NB model considers the positive observations. With zero-inflated models, dependent variable is modelled by the standard Poisson or NB distribution, which means that all non-negative observations are considered in the second stage. In addition, different explanatory variables can be considered in the first and second stage of zero-inflated models. Details will be discussed in the next section.

4.4.5. Zero-Inflated Poisson and Negative Binomial Models

An extension of the Hurdle models is the Zero-inflated models that is explored by Minami *et al*. (2007). These are frequently mixture distributions of unaggregated count data and extra zero observations, for which the principle is to consider the extra zero observations (zeros from regime 1) separately from the events. It means that only zeros from regime 1 are considered in the first stage, and all observations from regime 2 are modelled in the second stage. This modelling of the zeros is known as the Zero-Inflated Poisson (ZIP) or Zero-Inflated Negative Binomial (ZINB) model, where Zero-Inflated means the incidence of zero observations exceeds that expected (Garay *et al*., 2011).

Therefore, a Zero-inflated distribution for count data consists of two parts: a distribution that considers zero observations only that is called the ‘perfect state’, and a second distribution that considers the non-negative counts that therefore includes the zero observations, which is called the ‘imperfect state’. The mixture distribution will be the ZIP or ZINB, when the corresponding distribution for the imperfect state is the Poisson or Negative Binomial distribution respectively. Therefore, if the mixture distribution is ZINB, the distribution function for both perfect and imperfect states is (Minami *et al*., 2007):

$$f(y|\alpha,\beta) = \frac{\Gamma(\beta+y)}{\Gamma(\mathrm{a})\Gamma(\mathrm{y}+1)}(\frac{\beta}{\beta+\alpha})^{\beta}(\frac{\alpha}{\beta+\alpha})^{y}, for\ y = 0, 1, 2, \dots, \tag{4.32}$$

where α and β are the mean and size of parameters respectively, and $\Gamma(.)$ represents a gamma function. As β approaches +∞ or α approaches 0, the Negative Binomial distribution tends towards the Poisson distribution, and thus the ZINB model can be treated as a flexible extension of the ZIP model. If the probability of a perfect state is *p*, then the probability for imperfect state is *1 – p*, Minami *et al*. (2007) indicated that the mean and variance of ZINB (or ZIP when β approaches +∞) can be written as:

$$E(Y) = (1-p)\alpha \equiv \alpha^*$$

and (4.33)

$$Var(Y) = (1-p)\alpha + (1-p)\left(p + \frac{1}{\beta}\right)\alpha^2 = \alpha^* + \frac{p + (1/\beta)\alpha^{*2}}{1-p}$$

Zero-Inflated Poisson Model

For the ZIP model, Lord *et al*. (2005) defined the Poisson distribution (known as Poisson with extra zeros) as:

$$\Pr(y_i = 0|\boldsymbol{x_i}) = p + (1-p)e^{-\lambda}, \qquad j = 0$$

and (4.34)

$$\Pr(y_i = j|\boldsymbol{x_i}) = (1-p)\frac{e^{-\lambda}\lambda^j}{j!}, \qquad j = 0,1,2,\ldots$$

The Hurdle Poisson and ZIP models in equations (4.29) and (4.34) change the specification of the Poisson model, as the equality of the mean and variance no longer holds. There may a problem of identification when the data are over-dispersed as it is not easy to confirm whether the over-dispersion arises from heterogeneity or from the regime splitting mechanism. A test is available to choose between the simple count data models and extra zero models due to Vuong (1989). This is based on testing for extra zeros in a simple count data model accounting for the over-dispersion.

Zero-Inflated Negative Binomial Model

The above models are based on the Poisson model, but there is may still be over-dispersion in the count data relative to the Poisson distribution (Moghimbeigi *et al*., 2008). This will mean that the parameter estimates of the ZIP model are biased, so that another distribution like the ZINB model is preferred. Minami *et al*. (2007) also believe that the ZINB model gives a better fit to count data when over-dispersion exists compared to other models. It operates under a framework like the ZIP model (Garay *et al*., 2011). The ZINB regression model is based on the ZIP regression model, in which *p* refers to the covariates of a logistic regression model (Lambert, 1992). Lambert also indicates that the Poisson mean is related to the covariates in the imperfect state by using a log-linear model. The NB distribution instead of the Poisson distribution could be used for the imperfect state of count data because count data are "are highly skewed with a heavy right tail" (Minami *et al*., 2007, p. 213). Hence, the probability function of the ZINB model is:

$$\Pr(y_i|B_i, G_i, \rho, \gamma, \beta) = \begin{cases} p_i + (1-p_i)\, f(0|\alpha_i, \beta) & for\; y_i = 0 \\ (1-p_i)\;\, f(y_i|\alpha_i, \beta) & for\; y_i = 1, 2, \ldots \end{cases}, \tag{4.35}$$

where the distribution functions of the imperfect and perfect states $f(y_i|\alpha_i, \beta)$ are defined in equation (4.32). The covariates B_i refer to the mean of the imperfect state (α) in equation (4.35). The probability of the prefect state (p) and α are related to covariates by the ZINB regression model. Therefore, both of these can be expressed as:

$$\log(\alpha_i) = B_{i0} + B_{i1}\rho_1 + \cdots + B_{ik\rho}\rho_{k\rho} = B_i\rho$$

and (4.36)

$$\text{logit}(p_i) = \log\frac{p_i}{1-p_i} = G_{i0} + G_{i1}\gamma_1 + \cdots + G_{ik\gamma}\gamma_{k\gamma} = G_i\gamma, \quad (i = 1, 2, \ldots, n),$$

where B_i and G_i are row vectors for the values of the covariates for observation i. ρ and γ are the corresponding vectors of regression coefficients. The log-likelihood function with respect to ρ, γ and β comes from plugging in equation (4.35) and the dependence of parameters on the covariates is obtained from equation (4.36). The log-likelihood is $L(\rho, \gamma, \beta | \boldsymbol{y}, \boldsymbol{B}, \boldsymbol{G}) = \sum_{i=1}^{n} \log f(y_i | B_i, G_{i,} \rho, \gamma, \beta)$, which can be maximized with respect to parameters ρ, γ and β to obtain their estimates (see Mwalili *et al*., 2008, p. 125).

The remaining issue is how to choose between the ZIP and ZINB regression models. Broadly, the first stage of these is the same, so that the likelihood-ratio test for comparing the standard Poisson and NB models is available for testing the ZIP and ZINB models. Since the ZINB distribution tends to the ZIP distribution as α approaches zero, the hypotheses are H_0: $\alpha = 0$ (ZIP / Poisson model) and H_1: $\alpha \neq 0$ (ZINB / NB model). The Vuong (1989) test involves comparing the ZIP and standard Poisson models. If the ZIP is appropriate based on the Vuong test, then a likelihood-ratio test can be used to select one of the ZIP and ZINB models. Both tests are available in standard econometrics packages such as *Stata*.

4.4.6. Zero-Truncated Models

Another approach to estimating models using count data in which there are zeros is to use a truncated model, in which the zero observations are excluded from the regression. In this section, the Zero-Truncated Poisson (ZTP) and Zero-Truncated Negative Binomial (ZTNB) models are briefly considered. In these two models, the data including zero observations are assumed to satisfy the same distribution of the Poisson and NB models. (Zuur *et al*., 2009) indicate that when zero observations of the dependent variable are dropped by hand and the standard Poisson and NB models are used, there will be the biased estimates for the parameters and standard errors if the mean of dependent variable is too small. In this sense, the ZTP and ZTNB models offer a solution as they exclude the zero observations automatically but through a different regression path. If the mean is relatively large, then the standard Poisson and NB models are less likely to give rise to this problem, which means that the results of them are similar to those of ZTP and ZTNB models. Zero-truncated models rule out zeros and only consider the positive observations.

Zero-Truncated Poisson Model

Cruyff and van der Heijden (2008) note that the ZTP model assumes that each observation on the dependent variable has identical Poisson parameters. According to Section 4.4.2, which considers the Poisson regression model, the Zero-Truncated Poisson model can be written as follows when the assumption of unobserved heterogeneity is made:

$$\Pr(Y = y_i | y_i > 0, \lambda_i) = \frac{\Pr(Y=y_i|\lambda_i)}{1-\Pr(Y=y_i|y_i=0,\lambda_i)} \tag{4.37}$$

where $\Pr(Y = y_i|\lambda_i)$ represents the standard Poisson regression model and $\Pr(Y = y_i|y_i = 0, \lambda_i) = e^{-\lambda_i}$. The conditional mean of ZTP model is:

$$E(y_i|y_i > 0, \lambda_i) = \frac{E(y_i|\lambda_i)}{1-\Pr(y_i=0|\lambda_i)} \tag{4.38}$$

and the log-likelihood function of equation (4.37) is:

$$L = \sum_{i=1}^{n}[y_i \ln \lambda_i - \lambda_i - \ln y_i! - \ln(1 - e^{-\lambda_i})] \tag{4.39}$$

Zero-Truncated Negative Binomial Model

Poisson parameters are required to be homogeneous, but there will be over-dispersed of count data due to the unobserved heterogeneity. Thus, the ZINB model is a better choice. The probability given by the ZTNB model is (Section 4.4.3 shows the expression for the NB model):

$$\Pr(Y = y_i | y_i > 0, \lambda_i, \alpha) = \frac{\Pr(Y=y_i|\lambda_i)}{1-\Pr(Y=y_i|y_i=0,\lambda_i,\alpha)}, \tag{4.40}$$

where the numerator is the NB distribution in Section 4.4.3 and the denominator $\Pr(Y = y_i|y_i = 0, \lambda_i, \alpha) = (1 + \alpha\lambda_i)^{-\alpha^{-1}}$. The conditional mean of y_i is:

$$E(y_i|y_i > 0, \lambda_i, \alpha) = \frac{E(y_i|\lambda_i,\alpha)}{1-\Pr(y_i=0|\lambda_i,\alpha)}, \tag{4.41}$$

and the log-likelihood of equation (4.41) is (Cruyff and van der Heijden, 2008):[16]

$$L = \sum_{i=1}^{n} \left\{ \sum_{j=0}^{y_i} \ln(j + \alpha^{-1}) - \ln y_i\,! - (y_i! + \alpha^{-1}) \ln(1 + \alpha\lambda_i) + y_i \ln \alpha\lambda_i \right.$$
$$\left. - \ln[1 - (1 + \alpha\lambda_i)^{-\alpha^{-1}}] \right\}.$$

Overall, zero-truncated models exclude zero observations from the sample based on truncated distribution, and standard Poisson or NB count data model is used for all positive observations. This means that these models are not based on a two-stage regression process. For the estimated parameters, all explanatory variables in this thesis are classified into the ‘country variables’ (host characteristics) and ‘source variables’ (previous number of projects from global regions), which is discussed in Chapter 5. Count data models in this chapter consider the same number of country variables and different source variables to explore ‘follow-the-leader’ behaviour. The two-stage models consider these variables in two stages, where the hurdle models require that variables in two stages must be the same, but zero-inflated models allows the different variables in two stages. Details are discussed in Chapter 8. Appendix Table 4.1 is formed to compare all above count data models in Appendix B.

4.5. The Choice of Explanatory Variables

According to Carlton (1983), the multinational firm decides where to locate its capital by considering the factors that affect its profits in different locations. In general, decisions on the location choice not only depend on the characteristics of host country, but also on that of the investing firm (Rasciute, 2008). Hence, the main purpose of this section is to explore what factors should be considered in the regression equation for the FDI location choice.

[16] If y_i is an integer then $\sum_{j=0}^{y_i} \ln(j + \alpha^{-1}) = \ln\Gamma(y_i + \alpha^{-1}) - \ln\Gamma(\alpha^{-1})$, where Γ is the gamma distribution (see Cameron and Trivedi, 1998, p. 71).

4.5.1. Specification of the Profit Function

In the choice of location, the profits π that are expected to be earned by firm i in industry s in country c at time t must be greater than that in each other country at that time, denoted by o (since the choice is made at the same time then t is ignored in this expression):

$$\Pr(\pi_{isc} > \pi_{iso}).$$

Profits can be expressed as the after-tax difference between the production revenue and costs, where the tax rate is t_c, but also minus other costs h_c that arise from the political, institutional and macroeconomic environment of the host country:

$$\pi_{isc} = (1 - t_c)(TR_{isc} - TC_{isc}) - h_c, \tag{4.42}$$

where TR and TC are the total revenue and costs. According to Helpman *et al.*, (2004), these profits can be expressed as follows, where in addition to t and h, profits depend on the distance between the source and host country (d_{ce}), the return on capital in the host country (r_c), the market size of host country (M_c) and the wage per hour in the host country (w_{sc}), while the other terms are parameters (see Appendix 4.4 in Appendix A):

$$\pi_{isc} = (1 - t_c)\left(M_c\left(\frac{d_{ce}(w_{sc}^u)^{1-\alpha-\beta}}{\varphi\gamma_i}\right)^{1-\delta}\left(1 - \frac{\varphi}{d_{ce}}\right) - (w_{sc}^s)^{\alpha} r_c^{\beta} f_c\right) - h_c. \tag{4.43}$$

All symbols and details of expression for the profit function are fully discussed in Appendix 4.4 of appendix A. Defever (2012) explains that greater distance increases the transport costs of inputs that need to be shipped between firms in the source and host countries. It means that there is a negative relationship between distance and location choice. Distance can also influence the way in which the investor manages, develops and supervises its investments. However, the effect of distance depends on whether FDI is in production or services, so that it is smaller for services. There is also a negative relationship between the level of profits and wages, while profits increase with the extent of availability of the high-skilled labour force in host countries. The wage variable is included in the empirical work to consider its effect. If it has the significant negative effect, it means that the dominant effect is that a higher level of wage causes higher level of costs in a location and deters FDI. If the effect is positive, higher skill labour attracts FDI. Also, an education variable is included to measure the level of labour skills. The wage rate is an important factor and a negative relationship is expected with profits. These factors can be summarised as:

$$\pi_{isc} = f(t_c, d_{ce}, r_c, M_c, h_c, w_{sc}). \tag{4.44}$$

Furthermore, $t_c, d_{ce}, r_c, M_c, h_c$ and w_{sc} have effects on the location choice at the country level, but they may differ across firms due to differences in productivity γ and the output shares α and β (in equation 4.43). In this sense, when FDI is located in a particular country, it does not mean that the advantages of this country are the same for all investing firms. This is because FDI goes to different industries, while firms have different productivities. In addition to the above, agglomeration economies is another factor in the FDI location choice. Defever (2012) indicates that externalities (e.g. information spillovers) can stimulate firms to cluster in some areas. There are usually two forms of agglomeration: the first one relates to firms that belong to the same industry and the second one relates to firms that share the same function or activity (Duranton and Puga, 2005).

Overall, the location choice of FDI projects is determined by the factors which could maximize the profit, and these factors are also assumed to have a linear form in the profit function. Therefore, the profit function (π_{isc}) in equation (4.44) can be written with an error term as:

$$\pi_{isc} = \beta' A_{isc} + \varepsilon_{isc}, \tag{4.45}$$

where A_{isc} is a vector of location characteristics (i.e. country variables), such as market size, wage rate and tax rate etc. β' is a vector of coefficients and ε_{isc} is an error term.

A limitation is that project characteristics, such as the project type and source are allowed to vary through multinomial logit model, but only the characteristics of host countries are considered as the explanatory variables in the regression analysis.

4.5.2. The Regression Model for Discrete Choice

As discussed at beginning of this section, choosing country c must maximize profits among each of all other locations o (i.e. $o \neq c$ and $o = 1, 2, \ldots, O$), where O represents the EU-25 countries in this thesis. Hence, the probability of choosing country c can be expressed as:

$$\mathrm{P}_{isc} \equiv \Pr[\pi_{isc} > \pi_{iso}] = \Pr[\beta' A_{isc} + \varepsilon_{isc} > \beta' A_{iso} + \varepsilon_{iso}] = \Pr[\beta' A_{isc} - \beta' A_{iso} > \varepsilon_{iso} - \varepsilon_{isc}] = \Pr[\beta'(A_{isc} - A_{iso}) > \varepsilon_{iso} - \varepsilon_{isc}]. \quad (4.46)$$

According to the discussion in section 4.3, McFadden (1974) shows that the probability function of firm i choosing industry s and country c can be expressed as:

$$\mathrm{P}_{isc} = \frac{\exp(\beta' A_{isc})}{\sum_{o=1}^{O} \exp(\beta' A_{iso})} \ \forall\, o \neq c \ and \ o = 1,2, \ldots, O \quad (4.47)$$

Based on equation (4.47) to explore the probability of location in each of the EU-25 countries, the values for the coefficients on the location characteristics A can be estimated by maximizing the likelihood function, which is globally concave in parameters β' (McFadden, 1974). This means that the probability function here aims to get the likelihood function that is used to estimate the coefficients.

In the profit function (4.45), $\beta' A_{isc}$ is the deterministic part, by which the location characteristics A_{isc} linearly influence the probability of investment. In this sense, the dependent variable in logit analysis is the location in one of the EU-25 countries, which means that when FDI is located in a given country the dependent variable is unity, but otherwise it is zero. Explanatory variables are the location characteristics A_{isc} relate to the host country c and include demand, labour costs, education, trade and policy variables etc. The measurement of these variables is discussed in Chapter 5. In addition to these host country characteristics, investments from different sources at time $t-1$ are treated as another one kind of the explanatory variables. Therefore, the regression equation can be shown as the follow:

$$\Pr(FDI_{ict} = 1) = \boldsymbol{\beta A_{ict-1}} + \varepsilon, \quad (4.48)$$

where $\boldsymbol{A_{ict-1}}$ is a vector of host country characteristics (i.e. explanatory variables), $\boldsymbol{\beta}$ are the corresponding coefficients, and ε is an error term.

4.5.3. The Regression Model for Count Data

Models for count data analysis discussed in the above sections are based on the number of FDI project counts rather than the probability of location. The same host country characteristics in equation (4.48) are considered, but the dependent variable is measured by the number of FDI projects in each of the EU-25 countries, instead of the dummy in equation (4.48). The linear regression equation for count data analysis is:

$$FDI_{ict} = \boldsymbol{\beta A_{ict-1}} + \varepsilon, \tag{4.49}$$

where the dependent variable FDI_{ict} is measured by the number of projects from the source country i in host country c at time t. $\boldsymbol{A_{ict-1}}$ and $\boldsymbol{\beta}$ have the same definition to that in equation (4.48), and ε is an error term. For count data analysis, OLS estimation is used, but as the count data is approximately log-normal the dependent variable in equation (4.49) is logged, so that it is in a log-linear form. Each country receives FDI in each year, but where we focus on FDI from particular sources there may be zeros in the data (i.e. no investment is received from individual BRICS countries in a particular year), in which case a single project is added to each count, so that logarithms can be taken.

The count data and logit analysis are based on the same dataset, but the format of the data differs. For logit analysis in *Stata*, the dataset is structured at the project level, which means that the data on all country variables for the EU-25 countries in each year are treated as an observation, which corresponds to the location choice of a specific project in an EU-25 country in a given year. For example, if there are three projects located in the same EU-25 country in one year, the data on all country variables of the 25 EU countries in this year will be repeated three times. There are 35,105 projects in the EU-25 countries (see Chapter 5), and since in each case we observe 24 countries in which a project did not locate, there are 877,425 observations, i.e. 35,105 x 25. For the count data analysis, the data are organised by the number of projects from each BRICS country in each EU-25 country in each year. This means there are 350 observations, i.e. 14 x 25, where 14 is the number of study years.

4.6. Conclusions

This chapter has outlined the main models that will be used to examine the location of FDI. These models are of two main types: the first encompasses the choices facing foreign direct investors when choosing a suitable location across a range of possible alternatives; the second focuses on the count-based nature of numbers of projects in a given location. To examine the choice-based nature of the FDI decision the logit specification is identified as the most appropriate framework. The Multinomial Logit incorporates the characteristics of individual foreign investors when making their location decision and the Conditional Logit model captures the attributes of the alternative locations, which can also be extended to include firm-specific attributes.

To model the numbers of FDI projects in a location the appropriate framework should capture both the discrete nature of FDI location as well as the often skewed nature of the distribution of foreign investors across a range of locations. Ordinary Least Squares regressions of log-linear models can capture the latter feature, but it cannot take into account the discrete nature of the FDI project data. However, the log-linear model is a good approximation to the Poisson model if the mean project count is high. In the OLS framework, the log-linear regression model is used. Thus, the actual number of projects is added by one to include the zero observations (Head *et al.*, 2010). The Poisson framework is a count data model that can capture the discrete nature of FDI location. However the Poisson model is not without limitations as it imposes the restriction that the conditional mean and variance of the count distribution are equal to each other, but which is unlikely to occur given the skewed and over-dispersed nature of the FDI data. Alternatives to the Poisson are the Negative Binomial and the excess zero Hurdle, Zero-Inflated and Zero-Truncated models, where the ZINB model is appropriate if the over-dispersion arises from the excess counts of zeros in the data. Testing procedures can be employed to determine the specification that best fits the data.[17]

[17] Voung test is used to select the model between the standard Poisson and ZIP models. The likelihood-ration test is used to select the model between the Poisson and NB models or between ZIP and ZINB models.

Chapter 5. Data and Variables Used in Econometric Analysis

5.1. Introduction

This thesis investigates the location choice of FDI projects in the EU-25 countries over the period from 1997 to 2010, focusing on the location of outward FDI from the BRICS countries. It uses data from the European Investment Monitor (EIM), which tracks FDI in the EU. The purpose of this chapter is to describe the nature of these data and the other variables that form the independent (explanatory) variables in our analysis. The EIM database contains information on over 35,000 foreign investment projects, arising both from outside the European Union and from within the EU in the form of cross-border FDI. Currently, the EU is the largest destination region in the world for FDI inflows, accounting for nearly half of the global FDI flows, and it is also a significant trading partner of many countries (Milelli *et al.* 2010). This chapter analyses this investment in terms of its main characteristics, and makes a distinction between the EU countries that were Member States throughout the study period and those that joined in 2004 and 2007, and have seen strong increases in FDI.

Overall, the chapter is divided into six sections as follows. Section 5.2 describes the EIM database, including the nature of the FDI projects that are covered by this database. The characteristics of the FDI projects are examined in Section 5.3 according to a range of factors including time, the destination and source country, the industry and function of the project and the project size. Section 5.4 analyses the EIM data in greater detail by cross-tabulating various characteristics such as the temporal pattern of FDI by source, industry and function. The explanatory variables are discussed in Section 5.5 including the definition, data and measurement of each variable. Finally, Section 5.6 concludes.

5.2. The EIM Database

The source of information on FDI used in this thesis is the European Investment Monitor (EIM) database, which gives project-based details of FDI inflows into EU countries on an annual basis for each year between 1997 and 2010. The data cover the 27 countries that were members of the EU in 2010, but we exclude Cyprus and Malta (the 'EU-25').[18] The EIM is a commercial database, which is the leader in providing online information and inward investment tracking across Europe. The data are supplied by Ernst and Young (2012) which compile the data, and claim to monitor 28,000 sources to identify FDI announcements and contact 70% of firms to validate the data.[19] The EIM is project-based and it captures 'productive' investment only, classifying this into three types: 'new' or 'greenfield' start-up investment; 'co-location', where a FDI project is located at or close to an existing activity owned by the same company but in a different function; and 'expansion', which increases the capacity of an existing facility in the same function. It does not include mergers and acquisitions, although joint ventures may be included where the investment satisfies the above definition. It does not include license agreements and portfolio investment, nor certain activities such as retail, hotel, leisure facilities, fixed infrastructure and extraction facilities.[20]

The EIM database gives information on 35,105 FDI projects in the EU-25 countries over the study period. It has found application in other empirical work investigating FDI in the EU (e.g. Alegría, 2006; Defever, 2006 and Rabellotti *et. al*, 2008). It is believed to be a reliable data source, and it covers the countries of Central and Eastern Europe that joined the EU in 2004 and 2007. My analysis distinguishes between the incumbent fifteen EU countries (i.e. the members prior to 2004 and referred to as the 'EU-15') and the 10 Central and Eastern European Countries ('CEEC-10'). The EU-15 comprise Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the UK. The CEEC-10 are Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. The latter have seen an increase in FDI, but the EU-15 still receives the vast majority of FDI projects in the EU.

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[18] These two countries are small island economies, which have received little FDI. FDI is known for these countries from 2004 only, but consists of only 50 projects in total, of which four come from the BRICS.
[19] Source: http://www.eyeim.com/index.htm last accessed on 15th April 2016.
[20] Source: European Investment Monitor, *User Guide*, 2008

5.2.1. The Nature of the FDI Projects

The EIM database provides information on FDI projects in the EU countries from 1997 to 2010. Table 5.1 summarises the number of FDI projects in EU-25 countries by type (i.e. new, co-location and expansion) and by sub-period over the whole study period. Table 5.1 shows that most FDI is in the form of new investments. For the whole study period there are 23,325 projects in this form, which accounts for 66.4% of all projects in the EU-25 countries. The shares of other two types of investment are 6.7% (2,358 projects) for co-locations and 26.8% (9,422 projects) for expansions. Hence, new investment is the most common type of FDI project, followed by the expansions and then by co-location investment.

Table 5.1: Number of FDI Projects in the EU-25 by Type and Sub-period

Investment type	**1997-00**	**2001-05**	**2006-10**	**Total**
New	5,020 (57.6%)	7,346 (69.2%)	10,959 (69.4%)	23,325 (66.5%)
Co-location	1,056 (12.1%)	551 (5.2%)	751 (4.8%)	2,358 (6.7%)
Expansion	2,640 (30.3%)	2,712 (25.6%)	4,070 (25.8%)	9,422 (26.8%)
Total	**8,716 (100%)**	**10,609 (100%)**	**15,780 (100%)**	**35,105 (100%)**

Note: See text for an explanation of these investment types.
Source: EIM Database.

It can be seen from Table 5.1 that in any sub-period, FDI in the form of new investments is always more than half of all projects in the EU-25 countries. The highest share is 69.4%, which is after the CEEC-10 joined the EU. In absolute terms, the numbers of projects in the form of new investments and expansions nearly double over time, but the projects in the form of co-location decrease sharply over the same period. New investment projects increase to nearly 70% of all projects over the study period, while the share of co-location projects is always accounts for the smallest share, and decreases sharply to 4.8% at the last sub-period. The share of expansions also decreases slightly over time.

5.3. The Characteristics of FDI

The information on FDI projects given by the EIM database includes the date that the project was announced, the host and source countries, the industry characteristics of the project and its function (e.g. production, service, R&D or headquarters, etc.). Based on this information, this section describes the characteristics of FDI in the EU-25, as summarised in Table 5.2. The EIM database gives the name of the company that implements the FDI project. It also gives the calendar year, financial year, week and day when the project was announced. Furthermore, it provides data on the employment size and investment scale of the project, and detailed information about the location of the FDI project, including the host country, region and city. The employment size shown as the number of new jobs created measures the scale of FDI projects which is similar to the gross FDI value. The host region is classified by the Nomenclature of Territorial Units for Statistics (NUTS), which is a hierarchical geographical unit for sub-dividing the territory used by the European Commission. There are four categories, from NUTS-0 to NUTS-3 areas, where NUTS-0 is the country level and NUTS-3 represents small areas.

Table 5.2: The FDI Project Characteristics in the EIM Database

Project	Characteristics	Description	Additional Comments
Date	Year	Calendar year when FDI project was announced	From 1997 to 2010.
	Week	Calendar week when FDI project was announced	There are 52 weeks in each calendar year.
	Financial Year	Financial year when FDI Project was announced	The financial year runs from 1 April to 31 March.
	Announcement Date	Day, month and year when FDI project was announced	The announcement date is from 1 January 1997 to 31 December 2010.
	Implementation Date	Date when FDI project was first implemented	This is known for only 22,076 of 35,105 (63%) FDI projects.
Name of Company	Company Name	Name of company implementing FDI project	-
	Parent Company Name	Name of parent company	Several parent company names are listed for joint ventures.
Location	NUTS-3 region	Name of NUTS-3 region in which FDI project locates	-
	NUTS-1 region	Name of NUTS-1 region in which FDI project locates	-
	NUTS-0 region	Name of the country	-
Source	Country of Origin	Name of country or countries from where project originates	Some multiple parent companies originate from different countries, in which case all source countries are listed.*
	Global Region of Origin	Name of region or regions from which the project originates	Some multiple parent companies originate from different global regions, in which case all source regions are listed.
Size	Employment	Number of new jobs created	This is known for only 21,612 of 35,105 (62%) FDI projects.
	Investment Value	Value of the project measured in US dollars	This is known for only 10,738 of 35,105 (31%) FDI projects.
Industrial Activity	Activity	Industry classification of projects at 3-digit level by using the NACE industrial classification system	NACE is the Statistical Classification of Economic Activities in the European Community. It is a standard classification system for European industry and is represented by a 6 digit code.
	Sector Name	The name of sector at 2-digit NACE level	-
	Industry Group	The classification of industry in terms of Standard Industrial Classification (SIC) system	Industry groups include agriculture, construction, education & health, energy, finance & business services, manufacturing, recreation, retail & hospitality and transport & communications.
Function	Activity	Description of the project activity	-
	Function	Function of the project including contact centre, education & training, headquarters, logistics, manufacturing, research & development, sales & marketing, shared services centre and testing & servicing	-
Type	Project Type	New, co-location and expansion investment.	-

Notes: FDI in the EU-25. * The number of projects from single source country and joint source countries is compared in Table 5.3.

The purpose of the NUTS areas is to provide a single and coherent territorial breakdown for EU regional statistics. Table 5.2 shows that the EIM gives the location at the NUTS-0, NUTS-1 and NUTS-3 levels.[21] According to Eurostat (2012), the EU area and its 27 Member States are classified by the 2006 version of NUTS into 97 regions at the NUTS-1 level, 271 at NUTS-2 and 1,303 regions at the NUTS-3 level.

The industry is classified by the NACE code. The information on the industry to which a FDI project belongs contains the sector name, industry group, activity and project type, comprising new, expansion and co-location investments. There are nine industries at the 2-digit level in the database, comprising agriculture, construction, education and health, energy, finance and business services, manufacturing, recreation, retail and hospitality, and transport and communications. For the EU-25, there are 20,351 projects in manufacturing, which accounts for 58% of all projects in the dataset. The EIM database includes the functions of the FDI project, which comprises contact centre, education and training, headquarters, internet data centre (IDC), logistics, manufacturing, research and development (R&D), sales and marketing, shared services centre and testing and servicing. These offer extra information on the nature of FDI and they differ from the industry, as whereas the industry relates to the nature of the plant the function relates more directly to the nature of the project. For example, a plant may be in manufacturing, but a re-investment may be for the purpose of introducing a head office or a sales and marketing function at the plant or it may just be production.

The size of investment is given by the EIM database, in terms of the number of gross jobs associated with the project that are referred to as 'new jobs'. The size of the investment is also measured by the value of the investment. However, Table 5.2 shows that these data are not available for all projects. The new jobs data are available for 62% of projects, while the value of the investment is known for only 31%. They are both known for 46% of projects.

In the case of the source, the EIM database includes information on the name of the parent company and the source country, region and city of this parent. All of these excluding the city are defined in table 5.2. The database not only collects information on FDI projects that are owned by parent company or companies in a given country, but it

[21] NUTS-3 areas are districts or cities with population thresholds limited from 150,000 to 800,000 people. NUTS-2 areas are states or provinces with population from 800,000 to 3 million and are the basic regions for the application of regional policies. NUTS-1 areas are major socio-economic regions, such as groups of states or provinces of a country, for which the maximum population size is 7 million. NUTS-0 are individual countries (Eurostat, 2007).

also collects data for joint venture projects owned by companies in different countries. Table 5.3 shows the number of FDI projects in each of these categories, where there may be more than one investor from the same source country. There are no projects owned by companies in more than three countries. It reveals that virtually all FDI projects are owned by investors from a single source country, with 33,794 out of 35,105 projects in this category (96.3%). There are 1,136 projects originating from two source countries (3.2%), and just 175 (0.5%) projects from three source countries.

Table 5.3: FDI Projects in the EU-25 by the Number of Source Countries

Number of Source Countries	Number of FDI Projects
One	33,794 (96.3%)
Two	1,136 (3.2%)
Three	175 (0.5%)
Total	**35,105 (100%)**

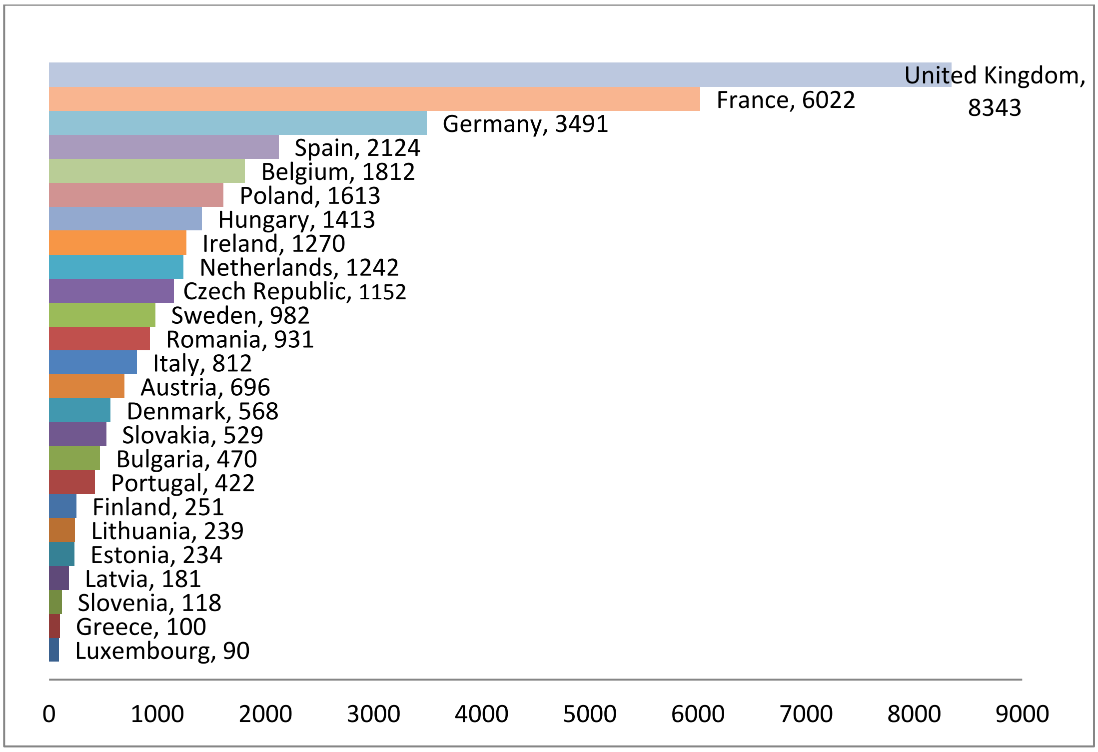
Source: author's own elaboration based on the EIM Database.

These data are now used to describe the nature of FDI in the EU-25. As I indicated above, the EU-25 is distinguished between the EU-15 and CEEC-10, as the latter were not members of the European Union throughout the period. I begin by looking at the host country.

5.3.1. FDI by Destination Country

Figure 5.1 shows the number of FDI projects in each EU-25 country over the whole study period from 1997 to 2010. It shows that FDI is concentrated in a relatively small number of countries. The top three destination countries are the UK (8,343 projects; 23.8% of EU-25 total), France (6,022 projects; 17.2%) and Germany (3,491 projects; 9.9%). These three countries received more than half (50.9%) of all FDI projects in the EU-25 countries.

Figure 5.1: Number of FDI Projects in the EU-25 Countries



Source: author's own elaboration based on the EIM Database.

It also can be seen from Figure 5.1 that there are fewer investments in the CEEC-10 countries. The total number of projects in these countries is just 6,880 (19.6% of the EU-25 total) over the study period, which is similar to the number of projects in France alone. This is because they are smaller and less-advanced economies. In fact, FDI can be very small in some CEEC countries, so that, for example, Slovenia has just 118 projects over the whole period, although this is still more than either Greece or Luxembourg. However, some CEEC-10 countries, such as Poland (1,613 projects), Hungary (1,413 projects) and the Czech Republic (1,152 projects) have a large number of FDI projects, similar to that of the Netherlands (1,242 projects). This is probably because some CEEC countries are emerging as alternative destinations for FDI due to their fast growth and their ability to assemble products and deliver the products and services to neighbouring countries (Milelli *et al*, 2010).

This pattern is consistent with the pattern reported by the World Investment Report of UNCTAD (2011). This report shows that there are more than 40 billion US dollars of FDI in France, Germany and the UK respectively in 2010, which exceeds that of most other EU-15 countries.[22] It also reports that the amount of FDI in most CEEC-10 countries

[22] UNCTAD (2011), see Annex Table I.1.

is between 1 and 9 billion US dollars. The main host countries are the Czech Republic, Hungary and Poland.[23] The reasons for FDI location are discussed in Chapter 2, and it indicates the larger market size of the host economy.

Table 5.4 summarises the main characteristics of FDI projects in the EU-25 host countries over whole study period. This table comprises the number of projects and the new jobs associated with each project, the percentage of projects in the manufacturing sector, the average value of investment in millions of US dollars (current prices) and the main function of the project. It disaggregates the information by EU-15 and CEEC-10 country. Table 5.4 shows that most projects in the EU-25 countries are located in the manufacturing sector, and the main function of these projects is production. It can be seen that the average investment value created by the projects is $44.9 million (current prices) and that on average there are 65.6 new jobs associated with each project in the EU-25. As noted above, the EU-15 countries are the main destinations for FDI. There are 28,225 projects in these countries, which accounts for 80.4% of the total in the EU-25 countries. The CEEC-10 received just 6,880 projects.

[23] UNCTAD (2011), see Table A, page 69.

Table 5.4: FDI Characteristics by Destination Country in EU-25, 1997 to 2010

Host Country	Number of Projects	Mean Jobs per Project	Mean Investment (USD, mill., current prices)	Projects in Manufacturing (%)	Project Function
Austria	696	51.4	39.4	62.5%	Sales & Marketing
Belgium	1,812	40.0	43.7	60.2%	Production
Denmark	568	25.6	58.3	40.8%	Sales & Marketing
Finland	251	14.0	22.3	60.0%	Sales & Marketing
France	6,022	39.2	25.4	62.7%	Production
Germany	3,491	42.4	66.5	54.4%	Sales & Marketing
Greece	100	31.4	54.0	55.0%	Sales & Marketing
Ireland	1,270	115.2	81.6	49.2%	Production
Italy	812	40.8	127.1	47.7%	Sales & Marketing
Luxembourg	90	13.8	20.8	33.3%	Sales & Marketing
Netherlands	1,242	39.8	79.5	50.0%	Sales & Marketing
Portugal	422	99.6	45.0	67.8%	Production
Spain	2,124	49.2	45.3	58.1%	Production
Sweden	982	28.2	56.0	45.5%	Sales & Marketing
UK	8,343	59.3	46.6	48.4%	Sales & Marketing
EU-15	**28,225**	**50.0**	**46.4**	**54.2%**	**Sales & Marketing**
Bulgaria	470	94.0	33.2	66.8%	Production
Czech Republic	1,152	182.1	55.0	78.0%	Production
Estonia	234	55.0	20.4	67.9%	Production
Hungary	1,413	116.7	33.4	78.5%	Production
Latvia	181	25.8	19.8	51.9%	Sales & Marketing
Lithuania	239	47.2	17.2	57.3%	Production
Poland	1,613	137.5	50.2	74.1%	Production
Romania	931	113.5	35.2	68.2%	Production
Slovakia	529	203.6	46.6	82.4%	Production
Slovenia	118	77.2	37.7	75.4%	Production
CEEC-10	**6,880**	**129.6**	**41.4**	**73.6%**	**Production**
EU-25	**35,105**	**65.6**	**44.9**	**58.0%**	**Production**

Notes: Number of jobs and investment scales is for known cases only. Main function is the mode.
Source: author's own elaboration based on the EIM Database.

The third column of Table 5.4 shows that on average each project in the CEEC-10 is associated with nearly 130 new jobs, whereas each project in EU-15 is associated with only 50 jobs. This is probably because of the cheaper labour in the CEEC-10 countries, enabling larger project scales, and because of its greater emphasis on manufacturing FDI. Besides, it can be seen that the mean number of jobs created in each CEEC-10 country is almost always more than that in each EU-15 country. For example, there are 182.1 and 137.5 jobs associated with each project on average in the Czech Republic and Poland respectively, but in the EU-15 countries the largest number of mean jobs per project is 115.2 in Ireland. The smallest mean number of jobs created in any CEEC-10 country (i.e.

25.8 in Latvia) is also larger than the corresponding number for the EU-15 (i.e. 13.8 in Luxembourg).

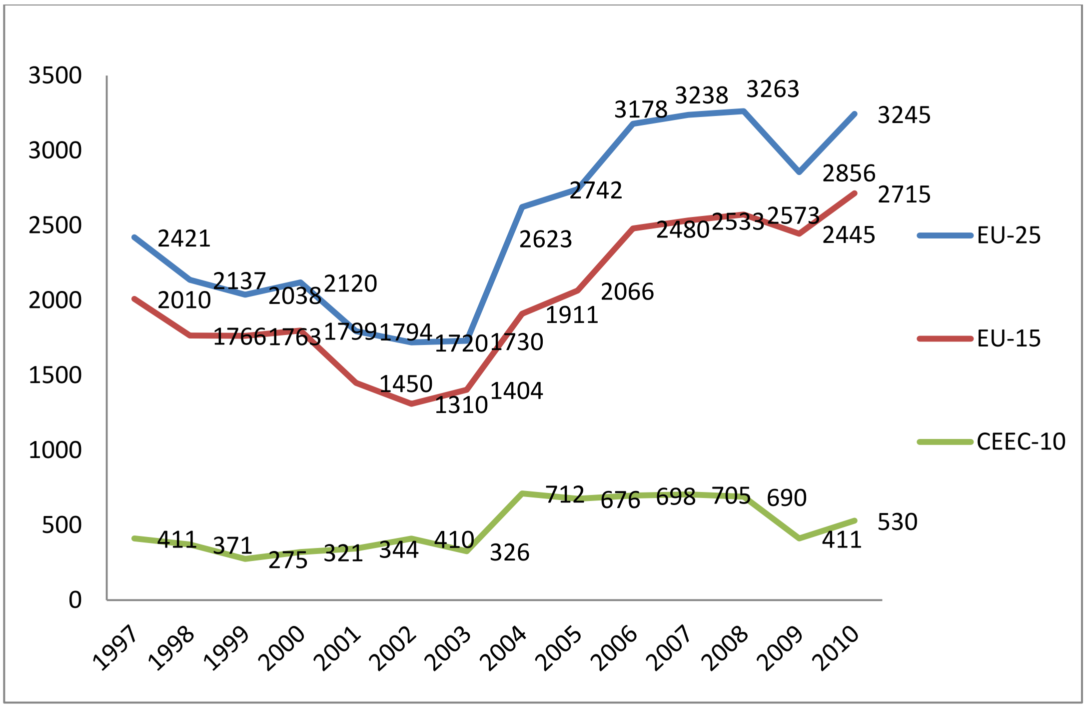
The fourth column shows that the average investment value is similar between the EU-15 and CEEC-10 countries, at $46.4 and $41.4 million respectively. Italy has the largest mean investment scale ($127.1 million) in the EU-15 countries, while the Czech Republic has the largest investment scale ($55.0 million) in the CEEC-10 countries.

By industry, the fifth column shows that manufacturing is the most common destination industry for FDI projects in the EU-25 (58.0%), and that this is the main receiving industry for more than half of the EU countries. It also can be seen from Table 5.4 that the share of manufacturing is higher for most CEEC-10 countries compared to the EU-15 countries. The possible reason is that the economies of the EU-15 countries are more advanced than those of the CEEC-10 countries, so the development of the manufacturing sector in the EU-15 countries is earlier and more advanced than in the CEEC-10 countries. In this sense, most projects in CEEC-10 are invested in the manufacturing sector, but other sectors in EU-15 receive more projects than manufacturing. The last column shows that the main function of projects in the EU-15 is sales and marketing, while the main function of most CEEC-10 countries is production.

5.3.2. The Temporal Pattern of FDI

This section discusses the pattern of FDI in the EU-25 over the study period. Figure 5.2 shows the changes in the number of projects over time in the EU-25 as a whole and disaggregates this by EU-15 and CEEC-10. The number of projects in each EU-15 and CEEC-10 country is graphed in Appendix Figures 5.1 and 5.2 (the numbers are given in Table 5.5 below).

Figure 5.2: FDI Flows for the Number of Projects in the EU-25



Source: author's own elaboration based on the EIM Database.

Figure 5.2 shows that the number of FDI projects in the EU-25 was about 2,400 in 1997, but that it had decreased by 2003, standing at about 1,700 in this year. However, from 2003 to 2008 the number of projects in the EU-25 increased strongly, reaching a peak of nearly 3,300 in the year 2008, and remaining high thereafter. The year 2004 is coincident with the accession of eight of the new Member States, but Figure 5.2 shows that the growth in FDI is largely driven by FDI location in the EU-15. In fact, over the period as a whole the EU-15 account for about 80% of total EU-25, but this does decrease, especially between 1999 and 2004, from 86.5% in 1999 to reach a minimum of 72.9% in 2004. UNCTAD (2000, 2003, 2005 and 2011) shows a similar trend of FDI inflows to EU measured in value terms, although UNCTAD (2011) shows a stronger fluctuations of FDI inflows compared the number of projects after 2005, as the FDI inflows increase to $851 billion in 2007 and then drop sharply to $305 billion in 2010. Table 5.5 below shows the number of FDI projects in each EU-25 country over the study period.

Table 5.5: Number of FDI Projects in the EU-25 by Country and Year, 1997 to 2010

Host country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total	% change*
Austria	23	84	66	61	53	44	32	35	59	56	45	64	41	33	696	-20.2
Belgium	100	132	109	111	88	73	77	136	179	185	175	142	146	159	1,812	31.1
Bulgaria	13	10	11	16	19	29	29	64	32	68	63	60	27	29	470	241.2
Czech Republic	57	56	53	73	82	96	91	112	116	114	83	87	61	71	1,152	31.9
Denmark	17	33	29	29	27	32	44	70	55	60	59	53	34	26	568	43.0
Estonia	10	10	13	18	21	17	16	35	23	15	7	14	13	22	234	48.5
Finland	12	14	11	14	31	12	9	19	9	15	25	42	15	23	251	116.2
France	426	271	392	353	265	254	313	490	538	565	541	523	529	562	6,022	48.2
Germany	190	197	196	170	171	153	110	163	182	286	305	390	418	560	3,491	134.6
Greece	1	7	4	4	4	5	5	7	8	12	11	13	11	8	100	166.7
Hungary	116	114	88	76	85	100	85	139	115	108	135	100	64	88	1,413	-20.8
Ireland	169	112	115	113	61	51	46	76	67	74	80	108	84	114	1,270	-22.7
Italy	43	36	45	60	52	29	23	33	49	74	69	96	100	103	812	141.1
Latvia	18	9	5	5	10	12	8	18	16	22	16	24	10	8	181	31.3
Lithuania	19	10	4	10	17	20	6	12	29	24	28	19	10	31	239	81.8
Luxembourg	8	4	3	1	5	2	4	8	8	10	13	5	8	11	90	60.0
Netherlands	85	84	87	105	67	61	58	56	82	95	123	116	108	115	1,242	32.4
Poland	142	116	67	85	50	60	46	148	180	152	146	176	102	143	1,613	29.5
Portugal	13	35	19	12	25	32	37	37	29	38	37	39	42	27	422	61.2
Romania	18	22	18	15	39	50	20	91	86	140	150	145	75	62	931	386.2
Slovakia	14	18	14	19	19	25	24	83	70	46	58	48	33	58	529	202.2
Slovenia	4	6	2	4	2	1	1	10	9	9	19	17	16	18	118	325.0
Spain	76	90	139	148	141	122	119	121	147	212	256	211	173	169	2,124	81.3
Sweden	29	28	40	44	90	71	74	97	95	113	81	85	58	77	982	126.8
UK	818	639	508	574	370	369	453	563	559	685	713	686	678	728	8,343	6.5
EU-25	**2,421**	**2,137**	**2,038**	**2,120**	**1,794**	**1,720**	**1,730**	**2,623**	**2,742**	**3,178**	**3,238**	**3,263**	**2,856**	**3,245**	**35,105**	42.0

Source: author’s own elaboration based on the EIM Database.
Note: * Percentage change between 2008-10 and 1997-99.

Figure 5.2 shows different patterns in the number of projects in the EU-15 and CEEC-10 as a whole over time, although in both of these FDI grows at similar rates, i.e. between 1997 and 2010 the number of projects grows by 35% for the EU-15 and by 29% for the CEEC-10. In the case of the EU-15 after a decrease in the number of projects during the first six years, FDI increases sharply to the end of the period. There were few projects in the CEEC-10 prior to 2003, while the number of projects increases dramatically from 2004. After the accession of the other CEEC countries in 2007 (Bulgaria and Romania), there is a sharp decrease as the number of FDI projects falling from 700 to about 500 in the year 2010. The fall coincides with the Global Financial Crisis, but it is not apparent for the EU-15, suggesting that FDI in the CEECs spiked at membership and fell-back afterwards.

Table 5.5 along with Appendix Figures 5.1 and 5.2 reveals that the EU-15 exhibit different trends over time. Some countries, such as France, Germany and the Netherlands, experience a more-or-less continuous increase in FDI, but others are more stable. The number of projects in the UK fluctuates over time, stabilising at about 700 projects per annum towards the end of the period. For most CEEC-10 countries, the number of projects increases strongly over time. The changes in the number of projects of each EU-15 and CEEC-10 country over the study period are shown in Appendix Figures 5.3 and 5.4.

5.3.3. FDI by Source Country

Investments from different source countries may have different location preferences (see Basile *et al.*, 2008). This section explores the FDI in the EU-25 from different global source regions over the study period. These global regions are Europe,[24] America, Asia, Oceania and Africa. Table 5.6 shows the number and share of FDI projects from each global region in the EU-25. If jointly-owned projects arise from parent companies from the same global region this is not problematic, but if they arise from parents in different global regions (see Table 5.3, which is on an individual country basis) then the project is attributed to the first country, which is considered to be the primary source, although there are a relatively small numbers of these. Appendix Table 5.1 summarises the number of projects from the BRICS and compares it to that of the non-BRICS.

[24] Here, Europe includes Russia, but in Chapter 6 Europe excludes Russia as it is included in the BRICS.

Table 5.6: Number of FDI Projects from Each Global Region

Host	Europe	America	Asia	Oceania	Africa	Total
EU-15	13,246 (73.0%)	10,877 (90.2%)	3,622 (83.5%)	387 (94.6%)	127 (92.0%)	28,259 (80.5%)
CEEC-10	4,909 (27.0%)	1,186 (9.8%)	718 (16.5%)	22 (5.4%)	11 (5.0%)	6,846 (19.5%)
EU-25	18,155 (100%)	12,063 (100%)	4,340 (100%)	409 (100%)	138 (100%)	35,105 (100%)

Note: Projects with investors from two or more countries are shown for the primary source only.

Table 5.6 shows that the main source regions are Europe (18,155 projects; 51.7% of all projects over 1997-2010) and America (12,063 projects; 34.4%), followed by Asia (4,340 projects; 12.4%). The total number of projects from these two main source regions is 30,218, which is 86.1% of all FDI projects over the period. The number of projects from America is about three times the number of projects from Asia, which in turn is less than a quarter of European investments in the EU-25 over the study period. The table shows that the EU-15 share of EU-25 FDI projects is more than 70% for each global region. The sum of projects from all regions in the EU-15 relative to the EU-25 is 80.5% and the largest share is for Oceania at 94.6%.

Asia is not a main source region for FDI in the EU-25 during the whole period. There are only 4,340 projects from Asia, which accounts for just 12.4% of the projects received from all global regions. FDI from these countries has evident regional preferences. For example, FDI from China and India mainly flows to developing and emerging markets in Asia rather than go into the European markets (Havlik *et al.*, 2009). The number of FDI projects from Oceania (409 projects) and Africa (138 projects) is low, representing just 1.2% and 0.4% of all projects in the EU-25 respectively. These patterns reflect a number of factors, including different levels of international economic development and proximity to Europe. UNCTAD (2011) indicates briefly that the FDI flows to developed economies maintained their position at pre-crisis levels, but that Europe experienced a sharp decline in 2010. It further shows that developing and emerging economies have been the new drivers for FDI outflows. In 2010, FDI outflows from East, South and South-East Asia start to rise considerably from 2005, and increased by 20% in 2010, which is mainly due to China, Hong Kong, India and South Korea. The US is the main contributor to the FDI outflows from the Americas. Outward FDI from

Latin America and the Caribbean is attributed to Brazil and Mexico.

By country, Appendix Table 5.1 shows that the main host countries for FDI projects are France, Germany and the UK, where the US is the most important investor in the EU countries. The EIM database also shows that the number of projects from the US is 10,987, which accounts for 31.3% of all projects in the EU-25. Another major source is Canada (788 projects). Japan and Australia (2,001 and 339 projects) are the main investors from Asia and Oceania. In addition to the three main EU source countries (i.e. France, Germany and the UK), Switzerland (1,135 projects) is the main investor from within Europe. South Africa is the largest investor from Africa (95 projects), but there are few of projects from this global region.

The following two tables focus on cross-border investment within the EU-25 over the study period. Table 5.7 shows the number of FDI projects from the EU-25 in each EU-15 country and Table 5.8 in each CEEC-10 country. In total, 16,181 projects arise from within the EU-25 (46% of all projects, whereas Table 5.6 shows that 18,155 projects arise from Europe as a whole, which is 52%). The EU-15 is the main investor from within the EU-25, where 15,745 projects come from the EU-15 and the other 436 projects from the CEEC-10.

By the source, these two tables show that France, Germany and the UK are three main EU source countries for cross-border investment in the EU-25, accounting for more than half of all projects from EU-25 countries. It means that the larger host economies are also the main source of FDI in the EU-25. There are a considerable number of investments from Netherlands and Sweden, where the former is concentrated in the EU-15 with 82.2% of all projects from this source. It can be seen that projects from most EU-15 or CEEC-10 countries are located in the corresponding region where these countries are located, but this excludes Austria, Greece and Poland, where the former two countries invest more projects in the CEEC-10 than in the EU-15, whereas most projects from Poland are located in the EU-15.

Table 5.7: Number of Projects in the EU-25: Originating from EU-15 Countries

Host	Austria	Belgium	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Luxem-bourg	Nether-lands	Portugal	Spain	Sweden	UK	EU15
Austria	10	1	8	13	22	277	0	2	38	5	25	0	4	15	23	443
Belgium	12	21	16	13	187	168	3	7	46	18	155	3	11	54	136	850
Denmark	3	7	5	11	31	78	1	1	9	3	23	0	3	42	54	271
Finland	2	3	15	3	10	29	0	1	3	1	6	0	1	43	23	140
France	58	283	80	61	131	976	6	42	279	30	263	12	211	176	542	3,150
Germany	89	39	57	46	192	62	2	22	73	15	168	3	31	89	272	1,160
Greece	0	0	1	2	4	15	6	0	6	0	5	0	2	0	7	48
Ireland	5	9	6	3	35	86	0	5	19	2	22	1	4	6	177	380
Italy	13	11	5	15	72	119	3	6	14	4	42	1	18	26	82	431
Luxembourg	2	7	1	2	9	1	0	0	3	0	6	0	1	0	7	39
Netherlands	10	38	15	28	42	89	0	8	8	3	18	3	9	40	97	408
Portugal	1	9	2	3	58	83	0	4	18	0	8	2	80	10	22	300
Spain	8	40	26	12	308	310	1	20	79	8	69	31	11	60	184	1,167
Sweden	14	4	60	64	48	129	1	8	7	1	37	0	1	11	88	473
UK	49	78	116	62	465	607	7	187	116	15	229	17	87	185	26	2,246
EU15	**276**	**550**	**413**	**338**	**1,614**	**3,029**	**30**	**313**	**718**	**105**	**1,076**	**73**	**474**	**757**	**1,740**	**11,506**
Bulgaria	34	15	6	4	28	71	37	2	35	2	13	1	12	12	20	292
Czech Republic	56	30	18	8	51	285	0	11	29	5	29	1	22	30	84	659
Estonia	4	1	12	64	4	18	0	0	0	0	2	0	1	46	12	164
Hungary	150	15	21	41	74	330	5	5	36	6	53	3	15	46	64	864
Latvia	1	4	7	14	6	27	1	2	0	0	7	0	0	22	6	97
Lithuania	4	1	6	16	11	31	1	4	7	1	6	0	2	19	15	124
Poland	43	34	37	43	114	295	5	13	77	14	62	11	41	93	114	996
Romania	76	18	9	11	99	192	34	2	35	7	42	6	26	30	48	635
Slovakia	46	13	18	9	38	114	0	3	24	4	19	1	9	12	18	328
Slovenia	23	0	4	0	8	28	2	1	6	1	0	0	3	0	4	80
CEEC 10	**437**	**131**	**138**	**210**	**433**	**1,391**	**85**	**43**	**249**	**40**	**233**	**23**	**131**	**310**	**385**	**4,239**
EU-25	**713**	**681**	**551**	**548**	**2,047**	**4,420**	**115**	**356**	**967**	**145**	**1,309**	**96**	**605**	**1,067**	**2,125**	**15,745**

Notes: The period 1997-2010 as a whole. Projects with investors from two or more source countries are included and shown for the primary source only.
Source: author's own elaboration based on the EIM Database.

Table 5.8: Number of Projects in the EU-25: Originating from CEEC-10 Countries

Host	Bulgaria	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Slovakia	Slovenia	CEEC-10
Austria	0	0	0	1	0	0	1	1	3	1	7
Belgium	0	1	1	1	0	1	2	0	1	3	10
Denmark	0	0	0	0	0	0	0	0	0	0	0
Finland	0	0	5	0	2	1	2	0	0	0	10
France	0	5	0	0	1	0	8	1	0	5	20
Germany	1	6	1	2	8	1	19	1	0	1	40
Greece	0	0	0	0	0	0	0	2	0	0	2
Ireland	0	0	0	0	0	0	2	0	0	1	3
Italy	2	1	0	0	0	0	1	1	0	4	9
Luxembourg	0	0	0	0	0	0	0	0	0	0	0
Netherlands	0	2	0	0	0	0	0	2	0	0	4
Portugal	0	0	0	0	1	0	0	0	0	0	1
Spain	0	2	0	1	0	0	2	2	0	2	9
Sweden	0	1	1	0	3	0	3	0	0	0	8
UK	3	6	2	2	3	9	6	1	0	0	32
EU15	**6**	**24**	**10**	**7**	**18**	**12**	**46**	**11**	**4**	**17**	**155**
Bulgaria	14	7	1	5	3	1	0	2	1	4	38
Czech Republic	0	3	0	4	1	1	10	0	3	2	24
Estonia	0	0	6	0	8	3	0	0	0	0	17
Hungary	0	6	0	5	1	0	3	4	1	2	22
Latvia	0	0	25	0	2	10	1	0	1	0	39
Lithuania	0	0	21	2	11	5	3	0	0	0	42
Poland	1	7	1	5	0	2	4	0	1	3	24
Romania	3	4	3	14	0	0	11	7	2	4	48
Slovakia	0	14	0	4	0	0	3	0	2	1	24
Slovenia	0	1	0	1	0	0	0	0	1	0	3
CEEC-10	**18**	**42**	**57**	**40**	**26**	**22**	**35**	**13**	**12**	**16**	**281**
EU-25	**24**	**66**	**67**	**47**	**44**	**34**	**81**	**24**	**16**	**33**	**436**

Notes: The period 1997-2010 as a whole. Projects with investors from two or more source countries are included and shown for the primary source only.
Source: author's own elaboration based on the EIM Database.

There are 11,661 projects from both the EU-15 and CEEC-10 in the EU-15, whereas the number of projects in the CEEC-10 is just 4,520. The three main host countries are France, Germany and the UK. As shown in Appendix Table 5.1, the main host country for FDI as a whole are the UK (8,343 projects), France (6,022 projects) and Germany (3,491 projects). However, Tables 5.7 and 5.8 show that the main hosts for investment from the EU-25 are France (3,170 projects) followed by the UK (2,278 projects). This means that more projects in the UK come from outside of the EU-25, whereas more than half of the projects in France are from the EU-25. Further, while there are 1,613 projects in the Netherlands from all sources, there are only 412 projects from the EU-25. Overall, Europe is the main source region among all FDI sources, and the EU-15 countries are the main investors. France, Germany and the UK are the main source and host countries. FDI projects from the EU-15 and CEEC-10 show different location patterns. FDI from America occupies a large share of investment. Finally, the number of projects from Asia, Africa and Oceania are relatively small since their low level of economy.

5.3.4. FDI by Industry

Table 5.9 shows the number of FDI projects in each EU-25 country by industry according to the classification used in the EIM database. The table disaggregates the information between the EU-15 and the CEEC-10. In the EU-25 as a whole, it can be seen that the modal industry of the projects is manufacturing, with 20,351 projects (58.0% of projects over the period), followed by finance and business services, with 10,497 projects (29.9%). FDI in these two industries accounts for 87.9% of all projects in the EU-25. Otherwise, there are 2,647 (7.5%) and 717 (2.1%) projects in transport and communications and in retail and hospitality respectively. The total number of projects in other industries is just 893, so that these account for only 2.5% of all projects. Globally, the value and share of FDI in manufacturing has increased over time, and it occupies almost half of global FDI inflows (UNCTAD, 2011).

Table 5.9: Number of FDI Projects by Industry in the EU-25

Host	Agriculture	Manufacturing	Energy	Construction	Retail & Hospitality	Transport & Communications	Finance & Business Services	Education & Health	Recreation	Total
Austria	0	435	8	8	21	72	151	0	1	696
Belgium	3	1,091	19	5	43	234	404	4	9	1,812
Denmark	0	232	5	4	18	51	256	1	1	568
Finland	0	128	2	1	5	27	88	0	0	251
France	13	3,776	52	34	132	420	1,564	9	22	6,022
Germany	2	1,900	29	20	88	292	1,112	14	34	3,491
Greece	0	55	1	2	4	8	30	0	0	100
Ireland	0	625	3	0	20	65	546	7	4	1,270
Italy	2	387	13	2	12	95	294	2	5	812
Luxembourg	0	30	1	0	2	6	51	0	0	90
Netherlands	3	621	22	1	16	150	422	1	6	1,242
Portugal	3	286	3	4	4	39	81	2	0	422
Spain	2	1,235	20	6	48	184	607	6	16	2,124
Sweden	1	447	6	14	33	74	398	4	5	982
UK	12	4,036	117	37	150	467	3,429	36	59	8,343
EU-15	**41 (0.1%)**	**15,284 (54.2%)**	**301 (1.1%)**	**138 (0.5%)**	**596 (2.1%)**	**2,184 (7.7%)**	**9,433 (33.4%)**	**86 (0.3%)**	**162 (0.6%)**	**28,225 (100%)**
Bulgaria	6	314	7	2	10	37	94	0	0	470
Czech Republic	1	899	9	6	10	53	172	0	2	1,152
Estonia	0	159	1	2	12	20	40	0	0	234
Hungary	4	1,109	12	10	17	86	168	6	1	1,413
Latvia	0	94	1	3	9	20	53	0	1	181
Lithuania	1	137	6	4	9	26	56	0	0	239
Poland	1	1,195	11	8	25	117	247	7	2	1,613
Romania	4	635	9	9	20	61	170	19	4	931
Slovakia	0	436	2	3	8	31	49	0	0	529
Slovenia	0	89	1	0	1	12	15	0	0	118
CEEC-10	**17 (0.2%)**	**5,067 (73.6%)**	**59 (0.9%)**	**47 (0.7%)**	**121 (1.8%)**	**463 (6.7%)**	**1,064 (15.5%)**	**32 (0.5%)**	**10 (0.1%)**	**6,880 (100%)**
EU-25	**58 (0.2%)**	**20,351 (58.0%)**	**360 (1.0%)**	**185 (0.5%)**	**717 (2.1%)**	**2,647 (7.5%)**	**10,497 (29.9%)**	**118 (0.3%)**	**172 (0.5%)**	**35,105 (100%)**

Note: For the period 1997-2010 as a whole.
Source: author's own elaboration based on the EIM Database.

Table 5.9 also shows that most projects in each industry are focused on the EU-15, but different industries show different degrees of concentration. Of the nine industries, agriculture is the smallest, but over 70% on this FDI in the EU-25 still goes to the EU-15 countries. In the case of manufacturing, around 55% of FDI in the EU-15 is in this industry, whereas for the CEEC-10 it is much higher at around 75% This may reflect different levels of economic development, but also the different labour skills and costs in these countries. Service FDI is much more important for the EU-15, and its share of projects in finance and business services is 33.4%, whereas for the CEEC-10 it is just 15.5%. Transport and communications is another important industry for FDI, and about as equally important for the EU-15 and CEEC-10.

Manufacturing is the most common industry for FDI in the EU-15 countries, although the share differs by country. Thus, there are 4,036 projects in manufacturing in the UK, which makes up 48.4% of all projects in this country, but for Belgium the share is over 60% (1,091 projects). Further, Denmark and Luxembourg on the other hand receive more FDI in finance and business services than in manufacturing, which accounts for 45.1% and 56.7% of all projects in these two countries respectively. In the CEEC-10 countries, there is a similar situation to the EU-15 countries, with manufacturing receiving the most projects, but its share is much higher than that of the EU-15 countries. The shares of projects in manufacturing of most EU-15 countries are around 50%, but these shares for most CEEC-10 countries are more than 70%. An exception is Latvia, which has a smaller share of projects in manufacturing, at just 51.9% of all projects.

5.3.5. Functional Activity of FDI

As well as locating in different industries, FDI projects have different functional activities. The EIM database identifies ten different kinds of function, and these are shown for the EU-25 in Table 5.10, which disaggregates FDI for the EU-15 and CEEC-10 countries. According to Defever (2006), who analyses the EIM data by functional activity for non-EU FDI in the EU over 1997-2002, headquarters includes management, administration and accounting activities. R&D includes fundamental scientific research, but also that related to the production process. Production includes all activities relevant to physical production of a commodity. Defever notes that the logistics function relates to the transport of a commodity, which could be internal or external to the firm. Sales and marketing refers to the wholesale trade and representative offices for the business. Table

5.10 shows that the main functions of FDI across the EU-25 are production (12,184 projects, 34.7%) and sales and marketing (12,125 projects, 34.5%). The corresponding number and share of projects for logistics, headquarters and R&D are 2,752 (7.8%), 2,715 (7.7%), 2,638 (7.5%) respectively. The total number of projects for the other five functions is 2,691, which just accounts for 7.7% of all projects.

Table 5.10: Number of FDI Projects by Function in the EU-25, 1997 to 2010

Function	EU-15		CEEC-10		EU-25	
Contact Centre	948	3.4%	127	1.8%	1,075	3.1%
Education & Training	205	0.7%	29	0.4%	234	0.7%
Headquarters	2,632	9.3%	83	1.2%	2,715	7.7%
IDC	220	0.8%	17	0.2%	237	0.7%
Logistics	2,242	7.9%	510	7.4%	2,752	7.8%
Production	8,032	28.5%	4,152	60.4%	12,184	34.7%
Research & Development	2,334	8.3%	304	4.5%	2,638	7.5%
Sales & Marketing	10,738	38.0%	1,387	20.2%	12,125	34.5%
Shared Services Centre	248	0.9%	125	1.8%	373	1.1%
Testing & Servicing	626	2.2%	146	2.1%	772	2.2%
Total	**28,225**	**100%**	**6,880**	**100%**	**35,105**	**100%**

Source: author's own elaboration based on the EIM Database.

Table 5.10 shows that the CEEC-10 countries have more projects in production (60.4%) than in sales and marketing (20.2%), whereas the opposite is the case for the EU-15 (i.e. 28.5% and 38.0% respectively). In addition to these two main functions, it can be seen from Table 5.10 that the shares of projects in the other eight functions for the EU-15 and CEEC-10 are small and similar to each other, but except for the headquarters function. There are 2,632 projects in headquarters, which accounts for 9.3% of all projects in the EU-15, but the share for the CEEC-10 is 1.2%. Of these other eight activities, the most attractive function for the CEEC-10 is logistics, which receives 510 projects (7.4%). Interestingly, R&D receives a considerable number of projects in both the EU-15 (2,334 projects, 8.3%) and in the CEEC-10 (304 projects, 4.5%).

5.3.6. The Job Size of the FDI Projects

The jobs data are known for 62% of projects.[25] Table 5.11 shows the number of jobs per project in the EU-25 countries, again disaggregating this for the EU-15 and CEEC-10 countries. It also compares the number of jobs per project of each EU-25 country to the average of the EU-25. The first two columns are taken from Table 5.4 for the purpose of comparison, and Table 5.11 focuses on different points.

Table 5.11: Job Size of FDI Projects in the EU-25, 1997 to 2010

Host	Number of Projects	Jobs per Project	Jobs relative to EU-25 average
Austria	696	51.4	-22%
Belgium	1,812	40.0	-39%
Denmark	568	25.6	-61%
Finland	251	14.0	-79%
France	6,022	39.2	-40%
Germany	3,491	42.4	-35%
Greece	100	31.4	-52%
Ireland	1,270	115.2	76%
Italy	812	40.8	-38%
Luxembourg	90	13.8	-79%
Netherlands	1,242	39.8	-39%
Portugal	422	99.6	52%
Spain	2,124	49.2	-25%
Sweden	982	28.2	-57%
UK	8,343	59.3	-10%
EU-15	**28,225**	**50.0**	**-24%**
Bulgaria	470	94.0	43%
Czech Republic	1,152	182.1	178%
Estonia	234	55.0	-16%
Hungary	1,413	116.7	78%
Latvia	181	25.8	-61%
Lithuania	239	47.2	-28%
Poland	1,613	137.5	110%
Romania	931	113.5	73%
Slovakia	529	203.6	210%
Slovenia	118	77.2	18%
CEEC 10	**6,880**	**129.6**	**98%**
EU-25	**35,105**	**65.6**	**0.0%**

Notes: Projects with investors from two or more countries are shown for the primary source only.
Source: author's own elaboration based on the EIM Database.

There are on average 65.6 jobs associated with each project in the EU-25, which is 50 jobs for the EU-15, but 129.6 jobs for the CEEC-10. Table 5.11 shows that the number of jobs per project for the EU-15 is lower than the EU-25 average by 24% (i.e. 1 - 50.0/65.6), but

[25] The investment scale is not considered as it known for only 31% of projects (see Table 5.2).

that for the CEEC-10 it is higher by nearly double, at 98%. By host country, the jobs per project are lower than the average for most EU-15 countries, but except for in Ireland and Portugal, where they exceed the EU-25 average by 76% and 52% respectively. However, for most CEEC-10 countries jobs per project are higher than the EU-25 average, except for the Baltic countries of Estonia, Latvia and Lithuania. The largest number of jobs per project occurs in Slovakia (i.e. about 204 jobs per project), which is higher than the EU-25 average by 210%. It is of interest to see that the CEEC-10 countries that receive more projects generally have more jobs per project, although there is no such relationship for the EU-15 countries. The table shows that three main host countries of France, Germany and UK have smaller projects on average than the EU-25.

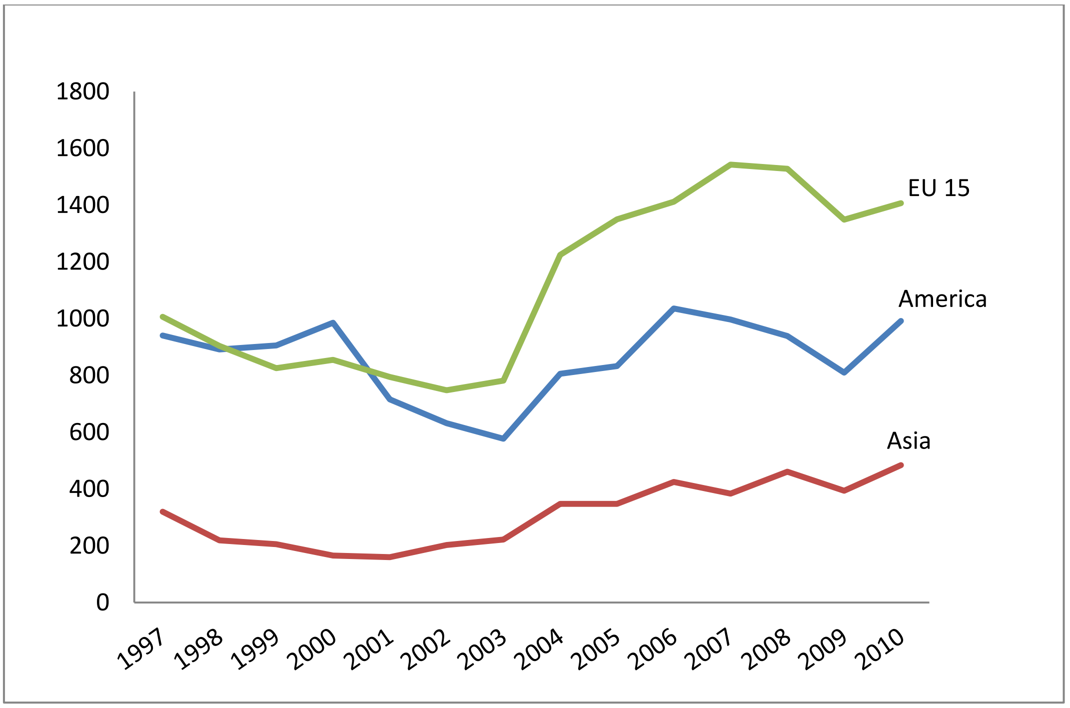
5.4. Multivariate Analysis of FDI Characteristics

The above analysis considers the number of FDI projects by a single characteristic in each case, such as the host country, industry and the function of the project. In order to provide a deeper analysis, this section examines FDI projects by several characteristics together. This is done in three ways, comprising source and time, by industry and time, and by function and industry. The first two of these reveal FDI trends over time, while the last one shows the extent to which the functions are correlated with different industries.

5.4.1. FDI by Source and Time

Figures 5.3 and 5.4 show the trend in FDI projects for the five main global source regions for each year over 1997 to 2010. Figure 5.3 is for America, Asia and the EU-15, which have similar levels of outward FDI, and Figure 5.4 is for the CEEC-10 and Oceania.

Figure 5.3: The Number of FDI Projects by Source over Time (1)



Source: author's own elaboration based on the EIM Database.

The two major source regions for cross-border FDI within the EU-25 are the EU-15 itself and America (also see Tables 5.6 and 5.7). In general, EU-15 and America have a similar trend to that of the EU-25 as a whole over time, which shows a decline in the number of projects before 2003 (see Figure 5.2). Figure 5.3 shows that the numbers of projects reaches a peak in 2006 (1,036 projects) for America and in 2007 (1,543 projects) for EU-15. It is also worth noting that FDI projects from America are greater than those from the EU-15 between 1999 and 2001. Otherwise, EU-15 always occupies the top position among all FDI source regions.

It also can be seen that FDI projects from Asia show a different pattern from that of America and the EU-15. There is a decrease in the number of projects before 2001, and then the number increases until the end of the period with a slight decrease in 2007 and 2009. At the start of the study period, there are few projects from Asia (320 projects), but there are nearly 500 projects from Asia by the end of the period. The increasing investment in the EU can be seen as the first step of internationalisation for the Asian countries (Holtbrügge and Kreppel 2012).

Figure 5.4: The Number of FDI Projects by Source over Time (2)

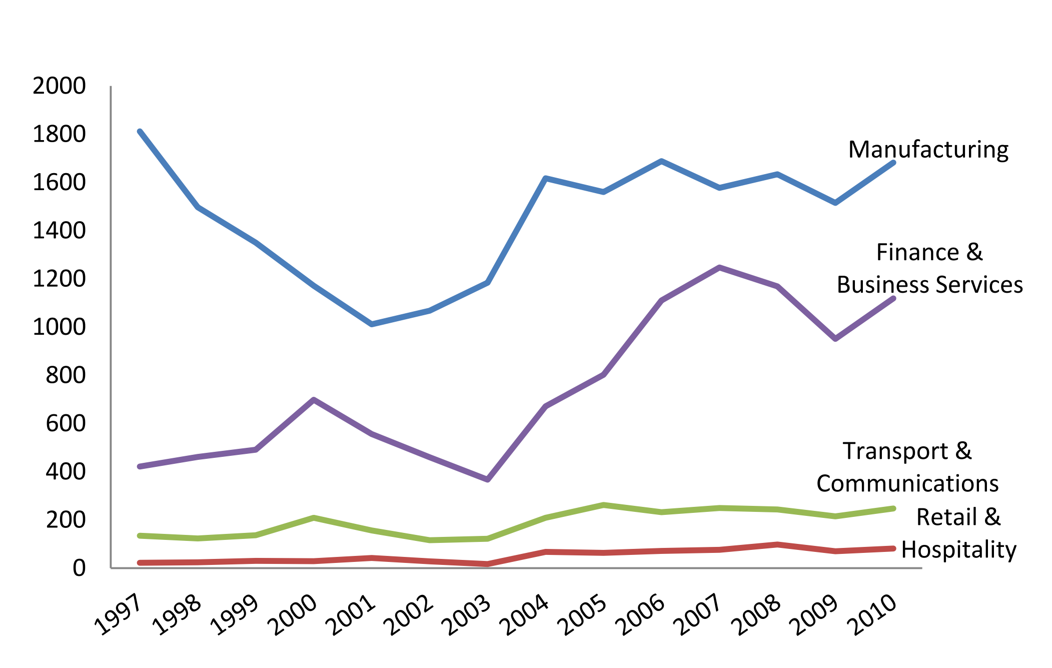
Source: author's own elaboration based on the EIM Database.

The CEEC-10 and Oceania are not the main source regions for cross-border FDI projects in the EU-25 (Tables 5.6 and 5.8). Over the whole period, there are only 843 projects in total from these two regions, which just makes up 2.4% of all projects in the EU-25. Figure 5.4 shows that FDI from these two regions shows a similar trend. The number of investment projects increases sharply from 2005 to 2006 and then decreases considerably in 2008 and 2009. There are just 54 and 50 projects from the CEEC-10 and Oceania respectively at the end of the study period.

5.4.2. FDI by Industry and Time

Figures 5.5 and 5.6 compare the trends of FDI by industry characteristics in the EU-25 over time. These are presented as two figures, with different scale on the vertical axis (see Table 5.9). Most industries experience an increasing trend, although of course different industry characteristics are associated with different numbers of projects.

Figure 5.5: The Number of FDI Projects by Industry and Time (1)

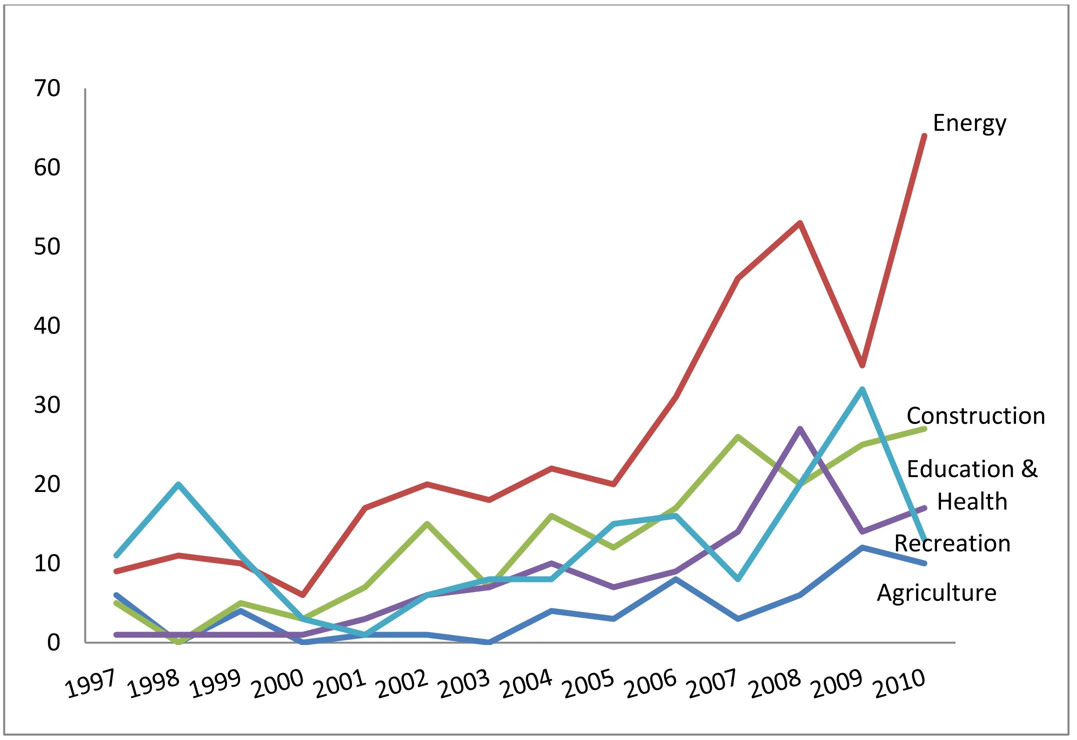


Source: author's own elaboration based on the EIM Database.

Figure 5.5 shows that prior to the year 2000, most industries show an increasing trend in the number of projects, but with the exception of manufacturing, which decreases sharply from about 1,800 to 1,000 projects. After that, the number of projects increases to 1,600 and then remains relatively stable. FDI in manufacturing, and finance and business services have similar trends after 2003: both show an increase from around 2003 to 2006, followed by a decrease from the years 2006 and 2007 respectively. At the end of the period, the number of projects in manufacturing, and finance and business services is 1,682 and 1,119 respectively. It can be seen that number of projects in transport and communications, and retail and hospitality is roughly constant.

Figure 5.6 shows that the number of projects in the other five industries is much smaller than the numbers shown in Figure 5.5. The number of projects in all five industries is less than 100 per annum, but it still varies. It can be seen that projects in construction, education and health, recreation and agriculture increase more or less uniformly over time. By comparison, the number of energy projects increases faster over the period, although it suffers a significant drop in 2009.

Figure 5.6: The Number of FDI Projects by Industry and Time (2)



Source: author's own elaboration based on the EIM Database.

5.4.3. FDI by Function and Industry

This section examines the nature of FDI projects by function and industry in the EU-25 to see whether some functions are associated with particular industries (i.e. how functions vary by industry). Table 5.12 shows the number of projects in each function by all nine industries for the EU-25, and Table 5.13 disaggregates the EU-25 into EU-15 and CEEC-10.

Table 5.12 shows that the three main functions of FDI projects are production (12,184 projects), sales and marketing (12,125 projects) and logistics (2,752 projects). By industry, in addition to the manufacturing and finance and business services, the most common industry is transport and communications (2,647 projects). It can be seen that the main function of FDI differs by industry. Not surprisingly, production is the main function of FDI by manufacturing (i.e. 11,866 projects for this function by manufacturing account for 58.3% of all projects by this industry), and projects for sales and marketing and R&D also occupy the large shares of all projects by manufacturing. The similar situation can be found in the industry of finance and business services. The share of projects for the function sales and marketing (7,172 projects) is 68.3% of all projects by finance and business services. This is because there is a correlation between one specific function and industrial characteristics. For example, finance and business services belong to the tertiary industry, which focus on functions like sales and marketing.

Table 5.13 shows that different industries' FDI prefers different functions in the EU-15 and CEEC-10. The main functions of FDI are production, and sales and marketing by industries manufacturing and finance and business services respectively in both the EU-15 and CEEC-10. However, because of the different levels of economic development, there are some differences in the share of projects used for the main function to all projects in the EU-15 and CEEC-10. There are 7,789 projects for production by manufacturing for the EU-15, which account for 51.0% of all projects by this industry, but this share for the CEEC-10 is 80.5%. Furthermore, there is no obvious difference in the share of projects for sales and marketing by finance and business services for the EU-15 and CEEC-10 (shares are 68.3% and 68.8%).

Table 5.13 shows that most headquarters FDI projects are located in the manufacturing, and finance and business services in both the EU-15 and CEEC-10. The total number of projects in these two industries is 86.6% and 83.1% of all projects in the EU-15 and CEEC-10. The number of headquarters projects for the EU-15 (2,632 projects) accounts for 96.9% of all projects in the EU-25, so that there are only very few such projects in the CEEC-10 (83). However, the headquarters projects are more likely to be in manufacturing for the CEEC-10 (50.6%) compared to the EU-15 (41.2%). This is likely to be partly due to the lagging but rapid development of the economy of the CEEC-10.

Table 5.12: Number of FDI Projects by Function and Industry in the EU-25, 1997 to 2010

Function:	Contact Centre	Education & Training	Head-quarters	IDC	Logistics	Production	R&D	Sales & Marketing	Shared Services Centre	Testing & Servicing	All Functions
Agriculture	0	0	3	0	3	36	4	12	0	0	**58**
Manufacturing	220	105	1,127	46	1,247	11,866	1,712	3,469	163	396	**20,351**
Energy	10	2	42	0	14	95	22	161	5	9	**360**
Construction	0	0	19	0	12	65	1	85	0	3	**185**
Retail & Hospitality	56	2	80	1	287	6	1	259	8	17	**717**
Transport & Comm.	190	13	185	85	1,143	37	79	822	29	64	**2,647**
Finance & Bus Svs.	588	82	1,222	105	44	63	813	7,172	168	240	**10,497**
Education & Health	5	29	8	0	0	1	2	35	0	38	**118**
Recreation	6	1	29	0	2	15	4	110	0	5	**172**
All industries	**1,075**	**234**	**2,715**	**237**	**2,752**	**12,184**	**2,638**	**12,125**	**373**	**772**	**35,105**

Source: author’s own elaboration based on the EIM Database.

Table 5.13: Number of FDI Projects by Function and Industry in the EU-15 and CEEC-10, 1997 to 2010

Function:	Contact Centre	Education & Training	Head-quarters	IDC	Logistics	Production	R&D	Sales & Marketing	Shared Services Centre	Testing & Servicing	Total
Agriculture	0	0	3	0	2	23	3	10	0	0	41
Manufacturing	197	88	1,085	42	1,032	7,789	1,542	3,073	111	325	15,284
Energy	9	1	41	0	13	72	21	135	2	7	301
Construction	0	0	18	0	9	41	1	66	0	3	138
Retail & Hospitality	49	2	75	1	228	4	1	219	5	12	596
Transport & Comm.	175	11	178	76	917	30	67	662	16	52	2184
Finance & Bus Svs.	507	78	1,195	101	39	58	694	6,440	114	207	9,433
Education & Health	5	24	8	0	0	1	2	30	0	16	86
Recreation	6	1	29	0	2	14	3	103	0	4	162
EU-15	**948** **88.2%**	**205** **87.6%**	**2,632** **96.9%**	**220** **92.8%**	**2,242** **81.5%**	**8,032** **65.9%**	**2,334** **88.5%**	**10,738** **88.6%**	**248** **66.5%**	**626** **81.1%**	**28,225** **80.4%**
Agriculture	0	0	0	0	1	13	1	2	0	0	17
Manufacturing	23	17	42	4	215	4,077	170	396	52	71	5,067
Energy	1	1	1	0	1	23	1	26	3	2	59
Construction	0	0	1	0	3	24	0	19	0	0	47
Retail & Hospitality	7	0	5	0	59	2	0	40	3	5	121
Transport & Comm.	15	2	7	9	226	7	12	160	13	12	463
Finance & Bus. Svs	81	4	27	4	5	5	119	732	54	33	1,064
Education & Health	0	5	0	0	0	0	0	5	0	22	32
Recreation	0	0	0	0	0	1	1	7	0	1	10
CEEC-10	**127** **11.8%**	**29** **12.4%**	**83** **3.1%**	**17** **7.2%**	**510** **18.5%**	**4,152** **34.1%**	**304** **11.5%**	**1,387** **11.4%**	**125** **33.5%**	**146** **18.9%**	**6,880** **19.6%**
EU-25	**1,075** **100%**	**234** **100%**	**2,715** **100%**	**237** **100%**	**2,752** **100%**	**12,184** **100%**	**2,638** **100%**	**12,125** **100%**	**373** **100%**	**772** **100%**	**35,105** **100%**

Source: author's own elaboration based on the EIM Database.

5.5. The Explanatory Variables

This section describes the data that are collected on the explanatory variables for inclusion in the regression analysis below. The main source of these data is *Eurostat*, which is the leader in providing high-quality statistics at the European level. Its main task is to supply economic and other statistics for countries and regions of the European Union, including the economy, finance, population and social conditions, so that there is good coverage.[26] As part of the fifth enlargement in 2004 and 2007, some Member States joined the European Union after the start of the study period in 1997, but the data for these countries are collected from the beginning of the study period.

The explanatory variables comprise country control variables and lagged FDI terms. I begin this section by describing the nature of the country-level variables for which the data are collected. These are organised into six groups including the demand, labour market, cost, education, trade and policy terms. The rationale for these variables as location factors is provided in the literature review in Chapter 2, so that here I focus on the data collection only. The information provided below includes the definition of each variable, its coverage and some discussion of the appropriate measurement. Since not all data are available from *Eurostat*, steps were also taken to acquire data from other sources and this is also discussed. Correlation matrices are included that show that these explanatory variables are not strongly correlated with each other.

5.5.1. Data Collection and Description of the Explanatory Variables

In order to select the variables that might affect FDI location, it is necessary to distinguish the FDI type and in particular whether it is market-seeking or not (Asiedu, 2002). The former is promoted by domestic demand factors, such as the scale of markets and the level of income of host country, but the latter includes factors that accelerate the growth of the host country, by affecting things such as productivity. The six variable groups have twenty-one variables in total, all of which have been used in previous work. The data on all explanatory variables are in real terms using an EU country deflator, and are in Euros at 2005 prices.

[26] Source: http://ec.europa.eu/eurostat/about/overview last accessed on 15th April 2016.

Table 5.14 summarises the variables and presents descriptive statistics, including the mean, standard deviation and minimum and maximum values. It also gives the sign of each variable according to its expected effect on FDI location at the country level. The sources of some variables that are not collected from *Eurostat* are given in the note to the table. The table includes a dummy variable for the missing cases on the wage rate, where data are not available from *Eurostat* or elsewhere. I now describe the six groups in turn. At the end of the description of each of these, there is a table giving a summary of the variables in the group. As we see the data on each variable are generally available for all countries, although for a given country it may be missing for some years. For these cases it is interpolated assuming that the data change linearly over time across the missing years.

Table 5.14: Summary Statistics for the Country Variables

Explanatory Variables	Mean	Standard Deviation	Minimum	Maximum	Expected Sign
Country Variables, X_{it-1}:					
Demand Variables:					
Real GDP (€ Million)	424.7	618.0	6.1	2,400	+
Real GDP per capita (€)	20.3	13.9	1.9	70.4	+
Real GDP growth rate (%)	2.8	4.1	-17.7	11.7	+
Population density (n / km^2)	129.5	102.6	16.8	489.7	+/-
External market demand (€ Million /D*d)	37.1	15.8	14.5	83.9	-
Labour Market Variables:					
Unemployment rate (%)	8.3	3.8	1.8	22.1	+/-
Real wage rate (€)	14.0	11.9	0	36.1	+/-
Real wage rate (dummy)	0.2	0.4	0	1	-
Cost Variables:					
Corporate income tax rate (%)	28.3	8.3	10.0	56.8	-
Motorway density (km/1000 km^2)	17.1	19.1	0	78	+
Political risk index (0 to 100)	81.4	6.9	65	96.5	+/-
Education Variables:					
Higher education rate (%)	21.2	8.0	2.3	42.6	+
Secondary education rate (%)	50.7	15.4	10.8	80.2	+
Trade Variables:					
Openness to trade (%)	78.5	34.4	27.1	186.3	+/-
Real exchange rate (2005=100)	98.4	10.2	53.8	134.3	-
Real exchange rate volatility (2005=100)	8.7	66.8	0.02	1090.3	-
Policy terms:					
EU structural funds (€ Million)	1.3	1.9	0	9.8	+/-
Eurozone country (dummy)	0.4	0.5	0	1	+
EU Commitment (dummy)	0.9	0.3	0	1	+
EU Membership (dummy)	0.8	0.4	0	1	+
EU Post-membership (dummy)	1.5	0.8	0	2	+

Notes: Summary statistics calculated across projects. "+ / -" = expected positive / negative effect on FDI. Data on all explanatory variables are collected based on one lagged year from 1996 to 2009.
Source: All data from *Eurostat*, except: wage rate: *International Labour Comparisons*, US Bureau of Labour Statistics; corporate income tax rate: *OECD*; higher and secondary education: World Bank; EU Structural Funds: DG for Regional Policy; political risk: *International Country Risk Guide*, Political Risk Services; and openness to trade: *International Financial Statistics*, IMF.

Demand Variables

According to the Organisation for Economic Cooperation and Development (OECD), Gross Domestic Product (GDP) is the sum of gross value generated by all resident producer units in an economy, plus product taxes but excluding subsidies on products that are not included in the value of output during the reference period.[27] GDP is often treated as a proxy for the economic output of a whole country or region, whether this output belongs to the resident or non-resident population. The Euro is used as the monetary unit for GDP for each country, which is obtained using the nominal exchange rate to convert national currencies into the Euro at the 2005 exchange rates. The official Euro fixed conversion rate is used for Eurozone countries to convert the national currencies to Euros, including the years prior to the formal introduction of the Euro. The source of these exchange rates is the *ECU-activities* website.[28] Normally, the larger economies attract more FDI, so a positive effect of GDP is expected. However, it cannot be confirmed whether the higher level of GDP or the larger population are the reason of attractive for FDI. Hence, country fixed-effects instead of GDP are used to capture the characteristics of host countries.

In addition to the level of output, real GDP per capita is included as a proxy for the benefits that the citizens receive on average from the increased output in their countries. It can be treated as an indicator for the wealth and standard of living of the population in a country or region. In order to facilitate the comparison, GDP per capita is also measured in Euros at constant market prices of 2005. This variable is expected to have a positive effect, which means that economies with richer citizens attract more FDI inflows. Tsai (1994) suggests a positive relationship between these two variables, but Jaspersen *et al*. (2000) hold the opposite view by using the inverse of income per capita to measure the return on capital.

The real GDP annual growth rate is included in the regression analysis as it is an indicator for the position that an economy is in (e.g. recession, recovery or prosperity). The GDP growth rate can reflect the development of an economy, for which Procher (2009, 2011) indicates that real GDP per capita is a proxy for the relative purchasing power of the host market, and real GDP growth rate is an indicator of the sustainability and prospects of the host economy. Some studies find that the growth rate of GDP is a more important determinant for FDI location, which is why it is normally used as a proxy for

[27] Source: https://data.oecd.org/gdp/gross-domestic-product-gdp.htm Last accessed: 18th January 2016.
[28] Source: http://www.ecu-activities.be/ last accessed: 15th April 2016.

the attractiveness of the host market. Asiedu (2002) finds that a higher growth rate of GDP can promote FDI inflows to the host country. There may be a non-linear relationship between the GDP growth rate and FDI inflows. This is because the less-developed economies are normally associated with a lower level of GDP per capita, but they may have rapid economic growth. In this thesis, the GDP growth rate is calculated based on GDP in the current and preceding year that are measured in national currency to remove the fluctuations in the growth rate from changes in the exchange rate, rather than the own fluctuations of economic growth.

Population is the total number of permanent residents in a country regardless of whether they are citizens or have legal status, although it excludes refugees who reside in the country temporarily.[29] By contrast, the number of persons who leave their country of origin temporarily is counted in the total population. The population density is included, which is defined as the total population divided by the land area measured in squared kilometres. It shows the number of residents per land area, and it is a more accurate indicator of the extent of urbanisation than total population, which in any case is likely to be correlated with GDP. The population density employed in the regression analysis is used to explore the extent of urbanization and concentration of consumer demand, which are indicators for the potential of the host market. A greater density of population refers a larger consumer market, which could attract more market-seeking FDI, so that a positive sign is expected. However, it may be negative from the perspective of congestion because it could cause more pressure on the transport infrastructure, increase the cost of land and exacerbate competition. Therefore, the effect of population density in the regression analysis depends on the relative strength of two factors: urbanisation and congestion.

Because of the Single Market, it is important to consider market access across the EU-25 countries. Alegria (2006) notes that firms investing in the EU consider the demand from the economies that make up the Single Market, as well as demand in the domestic market, while real GDP and GDP per capita are used to capture the internal (domestic) market demand. The external market demand is the sum of GDP across all EU-25 countries, weighted by the inverse radius (d) of host country j and multiplied by the inverse distance between the capital cities (D), so that for country j it is:

[29] Source: http://databank.worldbank.org/data/reports.aspx?source=2&series=SP.POP.TOTL&country= last accessed: 15th April 2016.

$$External\ Market\ Demand = \sum_{i=1}^{25} \left(\frac{GDP_i}{d_j} \right) \times \frac{1}{D_{ij}}, \quad i \neq j$$

where GDP is in millions of Euros at constant prices (2005 exchange rate) and:

$$d_j = \sqrt{\frac{Area\ of\ country\ j}{\pi}},$$

is the radius of a circle that has the same land area as country *j* (measured in squared kilometres), as used by Leamer (1997). Amiti and Javorcik (2008) argue that that the land area captures the economic size of a country, while distance captures trade costs. If external market demand is smaller for a country, it means FDI prefers to be located close to this market, so a negative sign is expected. In this sense, if western EU countries are treated as the core of European market, the negative estimation means that FDI prefer to be located in the markets that close to this core.

Table 5.15: Summary of Demand Variables

Demand Variables	Summary	Source
Real GDP	Country level total GDP at constant prices (based on 2005 exchange rates). The currency unit is millions of Euro.	Eurostat
Real GDP per capita	Country level real GDP per capita at constant prices based on 2005 exchange rates. The currency unit is Euro.	Eurostat
Real GDP growth rate	The calculation for the growth rate uses total GDP in the current and preceding year measured in national currency. It is expressed in percentages.	Eurostat
Population Density	The data for this variables is calculated as the total number of persons multiplied the inverse of land area in squared kilometres.	Eurostat
External Market Demand	This variable is measured by the equation shown in the text above.	Author's own calculation based on Eurostat (data on GDP and land area) and AA Route Planner (data on distance)

Note: Data period, 1996-2009.

Labour Market Variables

Unemployment is an important indicator for the development of economy and society, which indicates the availability of labour. There is an argument about its effect on the FDI location. Disdier and Mayer (2004) find that there is a positive effect of the unemployment rate on inward FDI, which they treat as a proxy for the availability of workforce. However, it can be detrimental to FDI if it is a signal of a rigid labour market or a poor quality workforce. It may signal that an area is relatively depressed and so unattractive to FDI. *Eurostat* is the source of data on unemployment, which captures anyone aged 15-74 who: does not have a job, but has been looking for a job actively during the last four weeks and can start work within the next two weeks; or has already found a job that starts within the next three months. The unemployment rate is defined by *Eurostat* as the percentage of unemployed persons in the labour force, where the labour force is defined by the International Labour Office (ILO) as the total number of employed and unemployed persons.[30] The long-term unemployment rate may be a better indicator if the purpose is to reflect the depressed nature of an economy, but it is not considered in this thesis.[31]

Non-market seeking FDI may be motivated by low factor costs since higher wages imply lower profits. Chapter 2 suggests that there is a negative relationship between labour costs and FDI, with Bevan and Estrin (2000) finding evidence for this when analysing FDI flows between EU countries and some transition economies. However, some resource-seeking FDI is mainly looking for high-skilled labour force, which means that this FDI prefers to be in locations with a higher wage rate (i.e. in which case a positive effect is expected). The real wage rate is defined as the hourly compensation in manufacturing expressed at constant Euro prices because most FDI projects from the EIM database are located in manufacturing. This is the main reason for using the wage rate in manufacturing as a measure of the labour cost of a whole country, although the wage rate is different across industries. The data source is the *International Labor Comparisons (ILC) database of US Bureau of Labor Statistics (BLS)*, which provides a common conceptual framework for establishing the labour costs in different countries. The wage is measured in US dollars, so the nominal bilateral exchange rate between the US dollar and the Euro is used to convert the data. There are missing data for Bulgaria, Latvia, Lithuania, Luxembourg, Romania and Slovenia, so a separate wage rate dummy term is generated for these countries to pick these up. The dummy variable equals unity if the data on the wage rate is missing for the above countries in each study year, but otherwise it is zero.

[30] Unemployed persons only consider the persons aged 15-74 that satisfies the definition, but employed persons take all persons with work aged 15 years and over into account.
[31] The definition of long term unemployment rate is related to the number of persons, who are not employed for one year or longer and expressed as a ratio of the total number of unemployed persons.

Table 5.16: Summary of Labour Market Variables

Labour Market Variables	Summary	Source
Unemployment Rate	The ratio of the number of unemployed persons to the total number of employed and unemployed persons. Unemployed persons are persons without work aged 15-74, while employed persons include persons with work aged 15 years and over.	Eurostat
Real Wage Rate	The hourly payment in manufacturing expressed at constant prices in Euro (Price index: 2005=100).	International Labor Comparisons (ILC) database of US Bureau of Labor Statistics (BLS), Eurostat for the exchange rate between US dollar and Euro
Real Wage Rate (Dummy)	Wage data are missing: Dummy = 1; otherwise, Dummy = 0 for each country with missing data in each year.	Author's construction

Note: Data period, 1996-2009.

Cost Variables

In this group, the corporate income tax rate is an important variable that is considered by the multinational firms. This is because it can affect their level of after-tax net profit directly. Further, this rate can influence the preference of firms between locations with higher and lower level of tax. The source for the corporate income tax rate is the OECD.[32] According to Procher (2011), the corporate tax rate is important as it helps to determine the after-tax level of economic rent in a location, so a negative effect is expected. Lipsey (1999) finds that there is no significant effect of the tax rate on FDI on the location choice of the US affiliates in Asian countries, but Gastanaga *et al*. (1998) and Wei (2000) both find that FDI inflows increase with a fall in the tax rate. This is consistent with the Conditional Logit model that is based on profit maximisation (Chapter 4), and a negative sign is expected on this term.

The productivity of FDI could be improved by good physical transport infrastructure, leading to greater FDI. A good measure of infrastructure should reflect both the availability and reliability of infrastructure (Asiedu, 2002). For this purpose, the 'motorway density' is used, which is calculated as the ratio of motorway length (kilometres) to the total land area (1000 km^2), for which the data are available from the *Eurostat*. Motorway density is a good indicator of transport infrastructure as it can attract

[32] Data Source is: http://www.oecd.org/tax/tax-policy/tax-database.htm#C_CorporateCaptial last accessed: 15th April 2016.

resource-seeking FDI by reducing the transport costs. By contrast, a poor road network leads to a decrease in the efficiency and profits of investing firms. In this sense, a positive sign is expected for this variable. Another reason for selecting 'motorway density' as the indicator is because the road transport for passengers and freight is the main method of transport for most EU countries. It is more complete than other possible proxies such as the railway network or navigable waterways (*Eurostat*, 2011).

As discussed in Chapter 2, Jadhav (2012) shows that there are political determinants for FDI location, such as political stability, government efficiency, regulatory quality and the control of corruption. This thesis captures the effect of a comprehensive political risk of the host country using a composite risk index. These data are produced by the *International Country Risk Guide (ICRG)* of the *Political Risk Services Group*.[33] The ICRG seeks to establish an early warning system of country risk by providing ratings of political, economic and financial risks for 140 developed, emerging and frontier markets. The index that aims to capture the effect of political stability on the location choice of FDI is a composite of twelve risk indicators, ranging from 0 to 100, where 100 means no political risk.[34] The investing firms are treated as the risk-averse as the lower political risk represents the higher level of stability and predictability in the political and economic environment of a host country, so that a positive effect on FDI location is expected, although previous work is not conclusive. Schneider and Frey (1985) find that country risk impacts FDI negatively, but Hausmann and Fernandez-Arias (2000) find that there is no significant relationship between these, and small differences in risk may be attractive to FDI as it signals a weak regulatory regime.

[33] Data Source: http://www.prsgroup.com/about-us/our-two-methodologies/icrg last accessed: 25th April 2016.

[34] The political risk composite index includes: Government Stability (12), Socioeconomic Conditions (12), Investment Profile (12), Internal Conflict (12), External Conflict (12), Corruption (6), Military in Politics (6), Religious Tensions (6), Law and Order (6), Ethnic Tensions (6), Democratic Accountability (6) and Bureaucracy Quality (4). The number in parentheses is the weight for each indicator, adding to 100.

Table 5.17: Summary for Cost Variables

Cost Variables	Summary	Source
Corporate income tax rate	Adjusted decretory rate of corporate income tax, measured in percentages (%).	OECD
Motorway density	The ratio of the total motorway length (KM) in a country to the total land area (1000 KM^2).	Eurostat
Political risk index	A composite weighted index for a country including 12 indicators. This index ranges from 0 to 100 (highest level of risk = 0, lowest = 100).	International Country Risk Guide of PRS Group

Note: Data period, 1996-2009.

Education Variables

In general, the skills of the labour force are attractive to FDI flows to the host country. However, different investing firms are interested in locations where the skills of the labour force differ (i.e. unskilled, moderate- or high-skilled labour). In order to consider this heterogeneity, two variables are included, for 'higher education rate' (tertiary education rate) and 'secondary education rate'. These capture the effect of high-skills and moderate-skills on the FDI location.

The rate of educational attainment refers to the number of persons in a given age group who complete a given education level, expressed as a ratio to the total number of persons in this age group. Education programmes are classified by the International Standard Classification of Education (ISCED) of the United Nations Educational, Scientific and Cultural Organization (UNESCO), which has three versions of categories of education level, known as ISCED 1976, 1997 and 2011. ISCED 2011 has nine education levels, rather than the seven levels in ISCED 1997, as it disaggregates the lowest and tertiary pre-doctorate levels of education (see Appendix Table 5.2).[35] The highest education level is calculated for the educational attainment rate to avoid the repeated calculation. The higher (or secondary) education rate is measured as a ratio of the number of persons aged 25-64 who complete the higher (or secondary) education to total number of persons aged 25-64. The data on these are collected from the World Bank, and positive effects are expected according to the discussion in Chapter 2. For example, there is a significant positive effect of the skilled labour force on the location choice of foreign subsidiaries in the US (Friedman *et al.* 1996).

[35] Education levels 3-6 (secondary and higher education) in ISCED 1997 are the same as levels 3-8 in ISCED 2011. Therefore, higher education attainment means completing the education of ISCED (2007) levels 5-6, i.e. ISCED (2011) levels 5-8. Secondary education attainment covers ISCED (2007, 2011) levels 3-4.

Table 5.18: Summary for Education Variables

Education Variables	Summary	Source
Higher education rate	The ratio of the number of persons aged 25-64 who complete higher education to the total number of persons aged 25-64.	World Bank
Secondary education rate	The ratio of the number of persons aged 25-64 who complete secondary education to the total number of persons aged 25-64.	World Bank

Note: Data period, 1996-2009.

Trade Variables

The openness to trade, real exchange rate and its volatility are included in this group. The openness to trade is used to examine the importance of trade liberalisation on FDI location. It is measured by the ratio of the sum of exports and imports to GDP, and is used to capture the level of exports from the domestic producers to foreign markets and the level of imports of the domestic market from foreign suppliers. There is an ambiguous sign on this variable as the effect may vary according to whether FDI is market-seeking or export-oriented (Jadhav, 2012). According to Asiedu (2002), if FDI is market-seeking, openness will have a negative effect on FDI, but if FDI is export-oriented it should be positive as it signals lower trade protection and transaction costs. From the perspective of relationship between the trade and FDI, if they are complements FDI will locate in countries with the more open economy, but conversely substitutes. The data on this variable are collected from the IMF *International Financial Statistics*, and given the importance of the Single Market a positive effect is expected on this variable.

The real exchange rate and its volatility are included as they may affect the location choice of production facilities, especially for risk-averse investors (Goldberg and Kolstad, 1995). The variables have significant effects on production costs as they capture either an appreciation or depreciation of the domestic currency, and so affect the level of profits of FDI. In this sense, they could reflect the stability and strength of the domestic currency in the international market and their effect on FDI location choice. The real exchange rate is measured by the real effective exchange rate (REER) index, calculated for a basket of currencies composed of 36 major trading countries, reflecting the competitiveness of each country.[36] The REER index can be deflated using unit labour costs, but the consumer

[36] The 36 trading countries in the basket include 27 EU countries, Australia, Canada, Japan, Mexico, New Zealand, Norway, Switzerland, Turkey and the US.

price index is used as wage rate is already included as a separate variable. An increase in the index therefore indicates a decrease in the competitiveness of a host country as its domestic currency is appreciated. It means that there may be less FDI located in this country, so that a negative sign is expected.

The exchange rate volatility is measured by the absolute change in the REER index over the previous year. Currently, there are few studies focusing on the effect of exchange rate volatility on FDI location, but I assume that investors are risk-inverse and expect that this variable has a negative effect. This is because more fluctuations of the exchange rate mean that the economy of a country is less stable and hence predictable.

Table 5.19: Summary for Trade Variables

Trade Variables	Summary	Source
Openness to trade	The ratio of the sum of exports and imports to GDP (%).	IMF
Real exchange rate	REER index (36 trading countries, reference year 2005=100).	Eurostat
Real exchange rate volatility	The absolute change in the REER index year on year: $\lvert REER_t - REER_{t-1} \rvert$.	Author's construction

Note: Data period, 1996-2009.

Policy terms

The policy terms comprise EU Structural Funds, Eurozone membership, and terms for the membership of the CEECs, comprising the European Council commitment to accession, EU membership itself and the post-EU membership period. These are each expected to have a positive effect on FDI location, except for the Structural Funds which have an ambiguous effect.

First of all, certain EU policies play an important role in attracting FDI flows to the EU. According to Basile *et al*. (2008), there is no overall policy to attract FDI to the EU, but the EU Structural Funds might serve this purpose as they support economic development and infrastructure provision in the regions of the EU Member States. They aim to encourage economic and social development and to narrow the development gap between EU countries, so less-developed countries are more likely to obtain these Funds. However, the sign on this term is ambiguous as these Funds may just indicate the more depressed areas of the EU. The data are collected from the *Directorate-General for Regional Policy, European Commission* and expressed in millions of European Currency

Units (ECUs) over 1979-98 and millions of Euro over 1999-2009. Again, the reference year is 2005 (=100).

Second, the single currency could further reduce transaction costs and help stimulate the development of a Single Market. This is because the costs of conversion between different national currencies are removed. It means that the Euro within the EU could promote FDI inflows to the EU more efficiently compared with national currencies, so that a positive sign is expected. In order to control for its effect on FDI location, a Eurozone country dummy is added that is equal to unity if the country is an official Member State of the Eurozone, and zero otherwise. Most EU-15 countries have been members of the Eurozone since January 1999, but Greece joined in January 2001 and Denmark, Sweden and the UK still use their own national currencies. Half of the CEEC-10 countries use the Euro i.e. Estonia (January 2011), Latvia (January 2014), Lithuania (January 2015), Slovakia (January 2009) and Slovenia (January 2007).

Third, the enlargement of the EU stimulates the development of the Single Market, which removes trade barriers and reduces transaction costs, so it is expected to have a positive effect on FDI location. Three dummy variables are included: EU announcement, EU membership and EU post-membership. The dummy for EU membership captures the effect of greater access to the Single Market through lower trade costs, as a motive for FDI location. It takes a value of unity for each membership year, but otherwise zero. Each EU-15 country joined the EU by the beginning of the study period so that the EU membership term for these is captured by the country fixed effects. The CEEC-10 countries joined during the study period and the EU announcement dummy is included for the date of the European Council commitment to EU accession, which captures the commitment to political and economic liberalization. It differs across the CEECs, and it is measured like the EU membership term (i.e. it is unity from this date). The other dummy (EU post-membership) is included for up to two years after membership to measure the lagged effect of EU membership on FDI location, and that might fall-off.

Table 5.20: Summary of Policy Terms

Policy Terms	Summary	Source
EU structural funds	An EU policy for the amount of structural funds in each EU country. It is expressed in millions of Euro at constant prices (reference year: 2005=100).	Directorate-General for Regional Policy, European Commission
Eurozone country	Dummy variable that equals one, when FDI location uses the Euro, zero otherwise.	Author's construction
EU Commitment	Dummy variable that equals one from the date of the European Council commitment to accession, zero otherwise.	Author's construction
EU Membership	Dummy variable that equals one for each year of membership, zero otherwise.	Author's construction
EU Post-membership	A combination of two dummies: 'EU post-membership + 1' equals one if the date is one year after accession. 'EU post-membership + 2' equals one, if the date is two years after accession.	Author's construction

Note: Data period, 1996-2009.

Lagged FDI Terms

The explanatory variables shown above capture the effect of the host country characteristics on FDI location. In addition, other variables measured by the number of projects in the preceding year from different global regions or countries (i.e. lagged FDI projects) capture the effect of previous FDI from different sources on current FDI location. These variables should indicate whether the location of projects follows that of previous FDI, in particular whether there is 'follow-the-leader' behaviour of BRICS FDI. The data on these are also taken from the EIM database and they are measured by the number of projects in the same location either from the same source region or country or from different source regions or countries.

Depending on the level of analysis, the source region or country can be measured in several different ways. They include projects from all over the world (All Sources), from four global regions (Europe, North America, the BRICS and Other) and from five BRICS countries (Brazil, Russia, India, China and South Africa). Thus, if the regression is for the full sample and all terms above are included, this could show whether FDI as a whole tends to 'follow' previous FDI from the regions or countries measured by the above terms to particular host countries. Similar, if sub-samples of FDI from different global regions or countries are considered, this could show whether FDI from this region or country follows previous FDI from the regions or countries measured by the above terms. For example, if the sample includes the projects from North America only to the EU-25 and all above lagged FDI terms are included, the results could show whether the North

American FDI follows FDI from All Sources, North America or other global regions or countries.

Another set of source variables focuses on the number of projects from the same source region or country to each EU-25 country. In particular, when a specific project comes from any country to an EU-25 country, the variable 'Same Global Region' is measured by the total number of projects from the global source region that includes this source country (i.e. same source region) in the preceding year to this EU country. For example, if a specific project comes from the US to the UK in 2005, this variable will be measured by the total number of projects from North America in the UK in 2004. Even though the full sample is used, this variable could still explore whether FDI from the North America follows the location of previous FDI from this region.

Finally, in relation to the BRICS, the lagged FDI project term is measured either for the 'Same BRICS Country' or 'BRICS'. Further, as the lagged FDI effect from the same and other BRICS countries may differ for any given project (e.g. Chinese FDI may 'follow' other Chinese FDI, but not follow or even 'avoid' Indian FDI), a variable is also included for 'BRICS, excluding Same BRICS Country'. This is measured using the number of projects in the same host country in the preceding year. The 'Same BRICS Country' is measured by the total number of projects in the respective EU-25 country in the preceding year from the same BRICS country when a specific project comes from any BRICS country. The 'BRICS, excluding Same BRICS country' is the difference in the number of projects between the 'BRICS' and 'Same BRICS Country'. These two variables are used together to show whether the BRICS FDI follows the location of previous FDI from the same BRICS country and whether also avoids the location of FDI from the other four BRICS.

As a further point, the 'Same BRICS Country' captures the average effect across the BRICS countries. To examine the individual BRICS effects I also consider multiplying this by a dummy variable for each BRICS country to disaggregate its effect and to examine which countries' follows their own previous FDI.[37] These disaggregated terms are 'Same Brazil', 'Same Russia', 'Same India', 'Same China' and 'Same South Africa'. On the same basis, 'BRICS, excluding Same BRICS Country' is disaggregated into five variables 'BRICS, excluding Brazil', 'BRICS, excluding Russia', 'BRICS, excluding India', 'BRICS, excluding China' and 'BRICS, excluding South Africa' to

[37] For example, 'Same BRICS Country' is multiplied by a dummy variable for Brazil, which links the previous and current Brazilian investments only.

examine if FDI from individual BRICS countries follows or avoids the location where each other BRICS country invests.

5.5.2. Correlation of the Explanatory Variables

It is important to check that the explanatory variables are not strongly correlated, as this implies that some variables can be replaced by others in the regression analysis, so that the estimates are poorly determined. There are several correlation coefficients, but the most common is the Pearson Product-moment correlation coefficient. It captures both the strength and direction of a relationship between two variables, and can be used even if one variable is not a linear function of the other. The Pearson correlation is defined only when the standard deviations of two variables are not equal to zero. Its absolute value cannot exceed unity, which means that when the correlation is +1, there is a perfect and positive relationship between the two variables and when it is -1, there is a perfect and negative relationship. A zero means that two variables are uncorrelated, while values between -1 and +1 indicate the different extent of linear relationship between variables. Values closer to either -1 or +1 indicate a stronger correlation.

Table 5.21 shows the correlation coefficients for the explanatory variables considered pairwise across all countries and years. It shows a positive relationship between most of the variables, except for real GDP growth rate, unemployment rate and secondary education rate. A coefficient of 0.7 may indicate a high degree of correlation, but Table 5.21 shows that the coefficients are almost always less than this. The exceptions are the correlation coefficients between political risk and real GDP per capita (0.76) and between motorway and population density (0.85). Further, some of the EU membership variables have high correlations, and this should be borne in mind for the analysis in the following chapters.

Table 5.21: Correlation Coefficients for the Explanatory Variables

Correlation	Real GDP	Real GDP per capita	Real GDP growth rate	Population density	Market distance	Unemploy ment rate	Corporate income tax
Real GDP	1.00						
Real GDP per capita	0.27	1.00					
Real GDP growth rate	-0.19	-0.13	1.00				
Population density	0.37	0.34	-0.13	1.00			
Market distance	0.08	0.46	-0.06	0.61	1.00		
Unemployment rate	0.01	-0.49	-0.03	-0.28	-0.27	1.00	
Corporate income tax rate	0.47	0.28	-0.09	0.37	0.11	0.04	1.00
Higher education rate	0.07	0.37	-0.14	0.05	0.19	-0.14	-0.17
Secondary education rate	-0.22	-0.40	0.10	-0.17	0.18	0.12	-0.35
Real wage rate	0.55	0.58	-0.24	0.40	0.25	-0.24	0.40
Real wage rate (dummy)	-0.36	-0.20	0.12	-0.22	-0.13	-0.01	-0.31
Motorway density	0.23	0.58	-0.16	0.85	0.66	-0.37	0.38
Political risk	0.11	0.76	-0.04	0.27	0.31	-0.51	0.27
EU structural funds	0.58	0.04	-0.10	0.07	-0.28	0.19	0.36
Real exchange rate	0.08	0.15	-0.20	0.00	0.12	-0.16	-0.34
Openness to trade	-0.44	-0.15	0.19	0.20	0.53	-0.08	-0.31
Real exchange rate volatility	-0.06	-0.13	-0.17	-0.05	-0.10	0.10	0.11
Euro membership	0.30	0.52	-0.16	0.29	0.20	-0.22	0.26
EU membership	0.28	0.50	-0.13	0.19	0.20	-0.31	0.01
EU commitment	0.23	0.41	-0.06	0.15	0.16	-0.22	-0.09
EU post-membership	0.33	0.58	-0.21	0.23	0.21	-0.35	0.12

Table 5.21 (continued)

Correlation	Higher education rate	Secondary education rate	Real wage rate	Real wage rate (dummy)	Motorway density	Political risk	EU structural funds
Higher education rate	1.00						
Secondary education rate	-0.23	1.00					
Real wage rate	0.38	-0.32	1.00				
Real wage rate (dummy)	-0.11	0.20	-0.66	1.00			
Motorway density	0.18	-0.32	0.39	-0.07	1.00		
Political risk	0.20	-0.28	0.54	-0.38	0.43	1.00	
EU structural funds	-0.10	-0.49	0.23	-0.35	0.05	-0.03	1.00
Real exchange rate	0.23	0.03	0.17	-0.02	0.10	0.05	0.11
Openness to trade	0.12	0.37	-0.18	0.10	0.22	-0.08	-0.50
Real exchange rate volatility	-0.11	0.03	-0.11	0.15	-0.08	-0.14	-0.06
Euro membership	0.15	-0.47	0.45	-0.26	0.49	0.41	0.35
EU membership	0.27	-0.32	0.49	-0.34	0.31	0.42	0.32
EU commitment	0.22	-0.24	0.40	-0.24	0.25	0.33	0.26
EU post-membership	0.30	-0.42	0.58	-0.40	0.36	0.48	0.37

Table 5.21 (continued)

Correlation	Real exchange rate	Openness to trade	Real exchange rate volatility	Euro member-ship	EU member-ship	EU commit-ment	EU post-member-ship
Real exchange rate	1.00						
Openness to trade	0.01	1.00					
Real exchange rate volatility	-0.32	0.07	1.00				
Euro membership	0.13	-0.12	-0.09	1.00			
EU membership	0.60	-0.09	-0.20	0.41	1.00		
EU commitment	0.62	-0.05	-0.24	0.33	0.81	1.00	
EU post-membership	0.55	-0.15	-0.18	0.48	0.88	0.71	1.00

5.6. Conclusions

This chapter discusses the characteristics of the data on FDI projects based on the EIM database. It also focuses on describing other data that are collected on the explanatory variables for inclusion in the regression analysis. In this chapter, there is a distinction between the EU countries that were members throughout the whole study period (EU-15) and those that joined more recently (CEEC-10).

According to the information supplied by the EIM database, there are several features of FDI in the EU-25. First, the EU-15 is the main host region over the whole study period, and the main host countries are France, Germany and the UK. Projects in the EU-15 show an increase over time but with some variation. Second, FDI in the CEEC-10 only increases sharply from 2004 to 2008, following the EU enlargement to include the CEECs. There is almost no increase in the number of the projects in the CEEC-10 over the whole period. Third, turning to the FDI sources, Europe is the main source region of FDI projects, and the EU-15 countries are the main investors. France, Germany and the UK are the top three source countries within the EU. The projects from America have the second largest share of projects from all global regions because of the large amount of investments from the US. In addition to these, Japan, Switzerland and Canada are also main source countries for FDI projects in the EU-25. However, the total number of projects from Asia, Africa and Oceania is small. Finally, the most common industry characteristic of FDI projects both in the EU-15 and CEEC-10 is manufacturing, but there is a difference in the share of projects by manufacturing to all projects. In the EU-15, the number of projects in manufacturing accounts for half of all projects, but this share for the CEEC-10 is 74%. There is also a difference in the main function of FDI projects for these two regions. For most EU-15 countries, the main function of FDI projects is sales and marketing, but for the CEEC-10 countries most FDI projects are in production.

The details of all explanatory variables used in Chapters 7 and 8 are also discussed, where these variables are classified into the country and source variables. The country variables capture the characteristics of the host countries and examine their effects on FDI location in the EU-25. There are 21 country variables considered in this chapter and all of them are aggregated into six groups including the demand, labour market, cost, education, trade and EU terms. The data source for most of these variables is *Eurostat*, and their definition, special data source, expected sign of coefficients and measurement are described one by one in this chapter. The data on some other variables that are not collected from *Eurostat* are also given in the description for each variable and summarised in the note to Table 5.14. Another set of explanatory variables is represented by the source variables that are constructed by me and measured by the number of projects from different sources in the preceding year in the EU-25 countries or measured by the number of projects that match the projects from the same source region or country, especially for the BRICS countries. The purpose of the source variables is to explore whether the location of FDI from the world or specific regions follows the location of previous FDI from the considered source regions. For BRICS, the matched source variables could examine whether the BRICS FDI follows the location of FDI from the same source country and whether also avoid the location of FDI from other four BRICS countries.

Chapter 6. The Nature of BRICS Investment

6.1. Introduction

Outward FDI from the BRICS countries has increased substantially and it is an important factor in global development. Indeed, BRICS countries are expected to be the largest economic group by gross GDP by the middle of this century (Ranjan and Agrawal, 2011). The main purpose of this chapter is to explore the importance of BRICS FDI in the EU-25 countries, which are defined in Chapter 5. It does this by examining the differences in FDI between the BRICS and non-BRICS countries, and across BRICS countries. The chapter uses the EIM database that was described in Chapter 5 to examine the investment trends from 1997 to 2010, and in particular the location pattern of FDI projects from the BRICS countries in the EU-25. It discusses the features of BRICS FDI, including the employment size associated with the BRICS projects and the characteristics of these projects, such as industry group, functional activity and investment type.

This chapter is organised as follows. Section 6.2 compares the BRICS and non-BRICS investment by host region and over time. The analysis is disaggregated between the EU-15 (i.e. the 'West') and the CEEC-10 (the 'East'). As I have shown most investment overall tends to go to the former, while FDI in the CEEC-10 tends to be later in the study period, reflecting the entry of these countries into the EU. The characteristics of BRICS investment are then discussed in Section 6.3, which includes the host country, industry group, functional activity and project type. The scale of FDI is examined using the employment size. Section 6.4 explores the investment by each BRICS country again focusing on the project characteristics. Finally, as the pattern of FDI suggests that FDI from BRICS has different location choice, Section 6.5 explores whether there is persistence in the country location choice of BRICS FDI over time using statistical tests. Conclusions are shown in Section 6.6.

6.2. BRICS and Non-BRICS Investment

In order to explore the BRICS investment, it is necessary to first compare it with non-BRICS FDI in the EU-25 countries. The first sub-section compares the number of projects from the BRICS and non-BRICS in the EU-25, and the second sub-section examines changes over time.

6.2.1. BRICS and Non-BRICS Investment in the EU

In order to explore the FDI in the EU, a distinction is made between the EU-15 and CEEC-10. Table 6.1 shows the number and share of projects from the BRICS and non-BRICS regions located in these two groups of countries.

Table 6.1: BRICS and Non-BRICS FDI in EU-25

Host	BRICS FDI	Non-BRICS FDI	Total FDI
EU-15	1,281 (90.5%)	26,944 (80.0%)	28,255 (80.4%)
CEEC-10	134 (9.5%)	6,746 (20.0%)	6,880 (19.6%)
EU-25	**1,415 (100.0%)**	**33,690 (100.0%)**	**35,105 (100.0%)**

Note: All years, 1997-2010.
Source: EIM database.

Overall, it can be seen from Table 6.1 that the number of BRICS investments in the EU-25 is much smaller than non-BRICS investment. There are 1,415 projects from BRICS, and they account for just 4.0% of all projects in the EU-25. This is partly because there are only five countries in the BRICS group. Other likely reasons are that BRICS countries are still in the initial phase of international expansion, which means that their investment is relatively small (Havlik *et al*., 2009). Overall, Table 6.1 shows that most projects are located in the EU-15 (28,255 out of 35,105 projects, 80.4%), and this pattern is similar for the BRICS and non-BRICS. However, the table shows that BRICS FDI is more concentrated in the EU-15 (90.5%) compared to non-BRICS (80.0%). In fact there are relatively few projects from BRICS in the CEEC-10 (i.e. just 134 projects, 9.5%).

6.2.2. BRICS and Non-BRICS Investment over Time

It is also of interest to explore the trends of FDI over time. Table 6.2 shows the change in the number of FDI projects from the BRICS and non-BRICS regions in three sub-periods, covering the beginning, middle and end of the study period, i.e. 1997-2000, 2001-05 and 2006-10.

Table 6.2: BRICS and non-BRICS FDI in the EU-25 over Time

Source	1997-2000	2001-05	2006-10	Total
BRICS	84 (1.0%)	356 (3.4%)	975 (6.2%)	1,415 (4.0%)
Non-BRICS	8,632 (99.0%)	10,253 (96.6%)	14,805 (93.8%)	33,690 (96.0%)
All	**8,716 (100.0%)**	**10,609 (100.0%)**	**15,780 (100.0%)**	**35,105 (100.0%)**

Note: All years, 1997-2010.
Source: EIM database.

Table 6.2 shows that overall the number of investments increases continually over the study period. There are about 8,700 projects in 1997-2000, which nearly doubles over 2006-10, at around 15,800 projects. For the BRICS, the increase in FDI is even more dramatic. There are 975 projects from the BRICS over 2006-10, which is nearly a twelve-fold increase on the number of projects in the first sub-period, from 1997 to 2000, of 84 projects. For non-BRICS countries, the number of projects in the absolute term increases from 8,632 to 14,805 from 1997-2000 to 2006-10. However, given the strong growth in BRICS FDI, in relative terms BRICS investments increase from 1.0% to 6.2% of projects over the period.

Table 6.3 divides the non-BRICS countries into the main global regions of Europe, North America and 'Other' (i.e. rest of the world), in order to compare the investment trends from these regions.[38] The global regions of Europe, North America and Other exclude the BRICS countries. The table shows the number of projects from each of these over time.

[38] The main investors for each of these three global regions are: France, Germany and the UK for Europe, the US for North America and Australia, Japan and South Korea for the Other countries.

Table 6.3: BRICS and non-BRICS FDI in the EU-25 by Source over Time

Source	1997-2000	2001-05	2006-10	Total
BRICS	84 (1.0%)	356 (3.4%)	975 (6.2%)	1,415 (4.0%)
Europe	3,987 (45.7%)	5,564 (52.4%)	8,439 (53.5%)	17,990 (51.3%)
North America	3,710 (42.6%)	3,496 (33.0%)	4,569 (28.9%)	11,775 (33.5%)
Other	935 (10.7%)	1,193 (11.2%)	1,797 (11.4%)	3,925 (11.2%)
All	**8,716 (100.0%)**	**10,609 (100.0%)**	**15,780 (100.0%)**	**35,105 (100.0%)**

Note: Europe, North America and Other exclude the BRICS countries.
Source: EIM database.

It can be seen from Table 6.3 that most FDI in the EU-25 arises from Europe (17,990 projects, 51.3%) and North America (11,775 projects, 33.5%). European FDI accounts for half of all foreign investment in the EU-25. Of course, this is not surprising given of the short distance and the integration of these economies through the Single Market. The number of FDI projects from the Other countries is small both in absolute and relative terms, i.e. 3,925 projects, which is 11.2% of total projects in the EU-25.

Over time, Table 6.3 shows that the number of FDI projects from each global region increases over the study period and that the largest increase is from Europe. This is likely to be due to increased economic integration over this time, including the accession of the CEEC-10 countries, which makes cross-border investment within the EU much easier. It also can be seen that while investment from North America increases in absolute terms, it takes a smaller share of total FDI, falling from 42.6% to 28.9% over time.

6.3. The Characteristics of BRICS and Non-BRICS Investment

The above section compares the temporal patterns of BRICS and non-BRICS investment. In order to explore the location choice of investment in the EU-25, this section discusses the characteristics of BRICS and non-BRICS FDI. The non-BRICS countries are again divided into the global regions of Europe, North America and Other (i.e. rest of the world). The following sub-sections discuss the investment by host country, industry group, functional activity and project type. It also considers the employment size of the projects.

6.3.1. BRICS Investment by Destination Country

The previous section found that the EU-15 is the main destination of BRICS and non-BRICS investment. In order to explore this further, Table 6.4 shows the number of FDI projects from the BRICS and other three global sources for each of the EU-25 countries,[39] again distinguishing this by the EU-15 and CEEC-10 countries. Table 6.4 below shows that there are strong differences in the share of projects in the EU-15 from each of the four source global regions, although the EU-15 is still overwhelmingly the main destination for FDI from each source region. European investment in the EU-15 is much smaller in relative terms than that of other three global regions, and most projects received by the CEEC-10 countries come from within Europe (4,888 projects which is 71% of all projects in the CEEC-10).

Within the EU-15 countries, the main destination country is the UK (8,343 projects, 23.8% of all projects in the EU-25), followed by France (6,022 projects, 17.2%) and Germany (3,491 projects, 9.9%). Together these countries account for about 50% of all FDI projects in the EU-25. For the BRICS countries, a similar pattern emerges, although investment is even more concentrated in the UK (40% of all projects from BRICS), and the UK, France and Germany receive 68.5% of BRICS FDI. However, European FDI is more focused on France (3,526 projects) than on the UK (2,553 projects) and it has a less concentrated pattern across the EU-25 countries, as some other EU-25 countries, including Belgium, Ireland and Spain, receive a considerable amount of European FDI.

With regards to the CEEC-10 countries, Table 6.4 shows that the Czech Republic (1,152 projects), Hungary (1,413) and Poland (1,613) receive most projects, and FDI in these three countries is more than that of some economies in the EU-15, such as Ireland and the Netherlands. However, in general, for the BRICS countries, most investment is in the EU-15. This is probably because the CEEC-10 countries have a lower level of economic development and possibly lower openness to investment than the EU-15 countries.

[39] Cyprus and Malta are always excluded as FDI data are not available for these for all years.

Table 6.4: BRICS and non-BRICS FDI in the EU-25 by Source and Country

Host	BRICS	Europe	North America	Other	Total
Austria	10	512	119	55	696
Belgium	74	908	592	238	1,812
Denmark	21	311	177	59	568
Finland	7	171	57	16	251
France	139	3,526	1,904	453	6,022
Germany	264	1,517	1,301	409	3,491
Greece	3	60	30	7	100
Ireland	11	411	758	90	1,270
Italy	32	483	235	62	812
Luxembourg	1	43	38	8	90
Netherlands	52	448	576	166	1,242
Portugal	11	307	63	41	422
Spain	50	1,281	560	233	2,124
Sweden	40	571	292	79	982
UK	566	2,553	3,925	1,299	8,343
EU-15	**1,281 (90.5%)**	**13,102 (72.8%)**	**10,627 (90.3%)**	**3,215 (81.9%)**	**28,225 (80.4%)**
Bulgaria	13	380	58	19	470
Czech Republic	22	727	226	177	1,152
Estonia	7	201	23	3	234
Hungary	23	952	273	165	1,413
Latvia	9	149	16	7	181
Lithuania	12	189	25	13	239
Poland	20	1,092	317	184	1,613
Romania	21	735	114	61	931
Slovakia	6	369	79	75	529
Slovenia	1	94	17	6	118
CEEC-10	**134 (9.5%)**	**4,888 (27.2%)**	**1,148 (9.7%)**	**710 (18.1%)**	**6,880 (19.6%)**
EU-25	**1,415 (100.0%)**	**17,990 (100.0%)**	**11,775 (100.0%)**	**3,925 (100.0%)**	**35,105 (100.0%)**

Notes: All years, 1997-2010. Europe, North America and Other exclude the BRICS countries.
Source: EIM database.

6.3.2. BRICS Investment by Industry

The EIM database categorizes FDI according to nine industry groups. Table 6.5 shows the number and share of FDI projects from the global regions by industry characteristics over the study period. Based on the total number of projects by all nine industries, Table 6.5 shows that manufacturing, and finance and business services are the two main industrial characteristics of FDI projects. There are 20,351 projects (58.0% of projects) and 10,497 projects (29.9%) by manufacturing, and finance and business services respectively, followed by transport and communications with 2,647 projects (7.6%). The total number of projects by the other six industries is just 1,610 projects, which is 4.6% of all projects.

By source region, it can be seen that the tendency of investment by manufacturing, and finance and business services is also the common characteristic of all four global source regions, but BRICS and North America are less focused on manufacturing and more concentrated in finance and business services compared to European and Other FDI. In particular, the main destination industry of more than half of BRICS investment (738 projects, 52.1%) is manufacturing, followed by finance and business services. The total number of projects by these two industries occupies 88.8% of all projects from BRICS. The most common industry characteristic of projects from North America is manufacturing, but there is no significant gap between the investment by manufacturing (5,854 projects, 49.7%), and finance and business services (4,918 projects, 41.7%).

Table 6.5: BRICS and Non-BRICS FDI in the EU-25 by Industry

Industry	**BRICS**	**Europe**	**North America**	**Other**	**Total**
Agriculture	1 (0.0%)	36 (0.2%)	14 (0.1%)	7 (0.2%)	58 (0.2%)
Manufacturing	738 (52.1%)	10,928 (60.7%)	5,854 (49.7%)	2,831 (72.1%)	20,351 (58.0%)
Energy	31 (2.2%)	231 (1.3%)	80 (0.7%)	18 (0.5%)	360 (1.0%)
Construction	7 (0.5%)	149 (0.8%)	19 (0.2%)	10 (0.3%)	185 (0.5%)
Retail and Hospitality	33 (2.3%)	468 (2.6%)	179 (1.5%)	37 (0.9%)	717 (2.0%)
Transport and Communications	73 (5.2%)	1,693 (9.4%)	608 (5.2%)	273 (7.0%)	2,647 (7.6%)
Finance and Business Services	519 (36.7%)	4,344 (24.1%)	4,918 (41.7%)	716 (18.2%)	10,497 (29.9%)
Education and Health	8 (0.6%)	64 (0.4%)	33 (0.3%)	13 (0.3%)	118 (0.3%)
Recreation	5 (0.4%)	77 (0.5%)	70 (0.6%)	20 (0.5%)	172 (0.5%)
Total	**1,415 (100.0%)**	**17,990 (100.0%)**	**11,775 (100.0%)**	**3,925 (100.0%)**	**35,105 (100.0%)**

Notes: All years, 1997-2010. Europe, North America and Other exclude the BRICS countries.
Source: EIM database.

6.3.3. Functional Activity of BRICS Investment

The function of FDI, as discussed in Chapter 5, include whether a project is mainly concerned with headquarters, production, sales and marketing, education and training, R&D and so on. The function differs from the industry, as a plant may be in manufacturing but the FDI project may add some other function, such as a headquarters, logistics, energy or R&D. These functions are shown in Table 6.6 and are defined by Ernst & Young in constructing the EIM database. Table 6.6 shows the number of projects both in absolute and relative terms from the BRICS and the three global source regions over the study period.

Table 6.6: BRICS and Non-BRICS FDI in the EU-25 by Function

Function	BRICS	Europe	North America	Other	Total
Contact Centre	36 (2.5%)	472 (2.6%)	516 (4.4%)	51 (1.3%)	1,075 (3.1%)
Education and Training	9 (0.6%)	87 (0.5%)	114 (1.0%)	24 (0.6%)	234 (0.7%)
Headquarters	179 (12.7%)	744 (4.1%)	1,388 (11.8%)	404 (10.3%)	2,715 (7.7%)
IDC	2 (0.2%)	104 (0.6%)	116 (1.0%)	15 (0.4%)	237 (0.7%)
Logistics	66 (4.7%)	1,837 (10.2%)	561 (4.7%)	288 (7.3%)	2,752 (7.8%)
Production	245 (17.3%)	7,512 (41.8%)	2,983 (25.3%)	1,444 (36.8%)	12,184 (34.7%)
Research & Development	102 (7.2%)	1,014 (5.6%)	1,213 (10.3%)	309 (7.9%)	2,638 (7.5%)
Sales and Marketing	749 (52.9%)	5,662 (31.5%)	4,427 (37.6%)	1,287 (32.8%)	12,125 (34.5%)
Shared Services Centre	6 (0.4%)	155 (0.9%)	177 (1.5%)	35 (0.9%)	373 (1.1%)
Testing and Servicing	21 (1.5%)	403 (2.2%)	280 (2.4%)	68 (1.7%)	772 (2.2%)
Total	**1,415 (100.0%)**	**17,990 (100.0%)**	**11,775 (100.0%)**	**3,925 (100.0%)**	**35,105 (100.0%)**

Notes: All years, 1997-2010. Europe, North America and Other exclude the BRICS countries.
Source: EIM database.

Table 6.6 shows that most projects are in production (12,184 projects, 34.7% of all projects) and sales and marketing (12,125 projects, 34.5%). Headquarters, logistics and research & development (R&D) also attract considerable investment, where the share of projects in each of the three functions to all projects is close to 8% in each case. By source region, most projects from the three global regions and the BRICS are also in production and sales and marketing, but BRICS and North America are more focused on the latter, and Europe and Other on the former. It can be seen that BRICS investment in sales and marketing represents more than half of all its investment, and European FDI in production is close to 42% of its investment, so it is evident that FDI from these two regions shows a considerable concentration by function compared to the FDI from the other two source regions. There is a large number of projects in headquarters from the global source regions, except for Europe, for which it is only 4.1% (i.e. 744 projects).

The temporal pattern of BRICS investment by function is explored in Table 6.7. It shows that the number of projects in all ten functions increases over time, but at different rates. BRICS FDI in sales and marketing receives the most investment, and Table 6.7 shows it increases considerably over the study period. The largest growth rate is in R&D, where the number of projects in the last sub-period increases by a 37-fold of the number in the first sub-period, but the starting point is just 2 projects. Projects in headquarters have also shown a sharp increase over time (8.9-fold compared to the number in the first sub-period), which exceeds the growth of manufacturing, which is the main function (4.0-fold compared the number in the first sub-period).

Table 6.7: BRICS FDI in the EU-25 by Function and Time

Function	1997-2000	2001-2005	2006-2010	Change from 1997-2000 to 2006-10
Contact Centre	0	11	25	25
Education and Training	1	3	5	4
Headquarters	10	70	99	89
IDC	0	1	1	1
Logistics	6	19	41	35
Production	31	60	154	123
Research & Development	2	24	76	74
Sales and Marketing	34	163	552	518
Shared Services Centre	0	1	5	5
Testing and Servicing	0	4	17	17
Total	**84**	**356**	**975**	**891**

Note: All years, 1997-2010. This table shows the number of projects.
Source: EIM database.

6.3.4. BRICS Investment by Project Type

FDI projects are classified into three categories: start-up, co-location and expansion (Section 5.2.1 of Chapter 5). This sub-section compares the different types of FDI from the BRICS and the other three global source regions. Table 6.8 presents the number and share of projects in all three types of investment from each of these sources over the study period. The main FDI type from all sources is the start-up investment (the last column), for which there are 23,325 projects in total, i.e. 66.4% of all projects in the EU-25. It is followed by expansion FDI (9,422 projects, 26.8%) and then by co-locations (2,358 projects, 6.7%).

Table 6.8: BRICS and Non-BRICS FDI in the EU-25 by Project Type

Project Type	BRICS	Europe	North America	Other	Total
Start-up	1,163 (82.1%)	11,646 (64.7%)	7,950 (67.5%)	2,566 (65.4%)	23,325 (66.4%)
Co-location	32 (2.3%)	1,216 (6.8%)	793 (6.7%)	317 (8.1%)	2,358 (6.7%)
Expansion	220 (15.6%)	5,128 (28.5%)	3,032 (25.8%)	1,042 (26.5%)	9,422 (26.9%)
Total	**1,415 (100.0%)**	**17,990 (100.0%)**	**11,775 (100.0%)**	**3,925 (100.0%)**	**35,105 (100.0%)**

Note: All years, 1997-2010. Europe, North America and Other exclude the BRICS countries.
Source: EIM database.

Of course, given their relative small level of FDI, there are not so many start-up projects in absolute terms from the BRICS (1,163 projects), but the table shows the highest concentration of start-up FDI in the EU-25 (82.1%) compared to the other three global source regions. It also can be seen that there is a considerable number of start-up projects in absolute terms arising from North America, Europe and Other, where each share is above 60% of the respective investment. Europe is the leader of start-up investment among all four sources, as it generates 11,646 projects in the EU 25 (49.9% of all start-up projects in the EU-25).

6.3.5. BRICS Investment by Employment Size

The effect of FDI on the economic development of a host country depend on its scale (Kok and Ersoy, 2009). This section compares the size of the projects, as measured by the number of gross jobs. While the investment scale is included in the EIM data, Table 5.2 shows that this is known for only 31% of projects, whereas the number of jobs is known for 62% of projects. Table 6.9 shows the number of gross jobs associated with each project from the BRICS and from the main global regions. It also shows the number of jobs per project between each of these four sources relative to that of all sources.

Table 6.9: BRICS and Non-BRICS FDI by Gross Job Size in EU-25

Source	Number of projects	Number of gross jobs per project			Mean job size relative to all sources
		All	Manufacturing	Finance and Business Services	
BRICS	1,415	38.8	47.4	33.7	59.2%
Europe	17,990	62.5	78.9	27.1	95.4%
North America	11,775	65.9	89.1	38.1	100.6%
Other	3,925	88.9	110.5	33.6	135.7%
Total	**35,105**	**65.5**	**85.1**	**33.0**	**100.0%**

Notes: All years, 1997-2010. Europe, North America and Other exclude the BRICS countries. Final column for BRICS calculated as 38.8 / 65.5 = 59.2%, and so on.
Source: EIM database.

Table 6.9 shows that there are 65.5 jobs created associated with each project in the EU-25. In fact, the mean number of jobs associated with the projects is similar for North America (65.9 jobs) and Europe (62.5 jobs), but much lower for the BRICS, at only 38.8 jobs per project (40.8% lower than the average). The number of jobs created by Other is the largest, at 88.9 jobs per project, which is higher than the average by 35.7%. Overall, this shows that on average the FDI projects from the BRICS are much smaller in scale.

The second and third columns of Table 6.9 show that Europe and North America are the two largest source regions of FDI projects, but they do not create the largest number of jobs per project. To explore this, the fourth and fifth columns disaggregate the number of jobs per project by manufacturing, and finance and business services. This shows that the number of jobs per project by manufacturing is larger for each source compared with finance and business services. Second, it also can be seen that the source region with a larger number of jobs by manufacturing normally has a larger number of jobs per project in total. It means that the number of jobs per project by manufacturing from a particular source region could decide the total number of jobs per project from this region. For example, North America has a smaller number of jobs by manufacturing compared to the Other, and therefore it also has a smaller number of jobs in total, even though it has a larger number of jobs by finance and business services. The BRICS have the smallest number of jobs per project overall (38.8 jobs), and Table 6.9 shows that this arises primarily because it has relatively small manufacturing projects.

6.4. Investment by Each BRICS Country

According to Milelli *et al*. (2010), the EU is an increasingly important destination of BRICS investment, particularly for FDI from India and China. This section explores the FDI location pattern in the EU-25 for individual BRICS countries. This pattern is analysed over time, but also by host region, industry group, functional activity and investment type.

6.4.1. Investment of BRICS Countries over Time

Table 6.10 shows the number and share of projects in the EU-25 from each BRICS country over time, focusing on three sub-periods. Consistent with Milelli *et al*. (2010), it shows that the majority (76.7%) of all projects from BRICS in the EU-25 are from China and India. It can also be seen that all BRICS countries have experienced an increasing trend over time, but at different rates. In fact, at the beginning of the study period, the two main contributors of FDI are India (32.1% of BRICS projects) and South Africa (34.5%), although in absolute terms the number of projects is small (27 and 19 projects respectively). In the second sub-period, 2001-05 the number of projects from China and India increase substantially. Over the three sub-periods, China's FDI experiences the largest increase from 16 to 406 projects, so that in the last sub-period it accounts for 41.6% of all BRICS projects. Investment from India also increases strongly over time, although less strongly in relative terms, reflecting the overall growth in FDI from the BRICS. The other three countries increase their projects in absolute terms much more slowly than China and India, while in relative terms the BRICS share of projects from Russia and South Africa decrease sharply, from 11.9% to 9.9% and from 34.5% to 3.9% respectively.

Table 6.10: BRICS FDI in the EU-25 over Time

Source	1997-2000	2001-2005	2006-2010	Total
Brazil	2 (2.4%)	19 (5.3%)	49 (5.1%)	70 (4.9%)
Russia	10 (11.9%)	58 (16.3%)	97 (9.9%)	165 (11.7%)
India	27 (32.1%)	130 (36.5%)	385 (39.5%)	542 (38.3%)
China	16 (19.1%)	121 (34.0%)	406 (41.6%)	543 (38.4%)
South Africa	29 (34.5%)	28 (7.9%)	38 (3.9%)	95 (6.7%)
BRICS	**84 (100.0%)**	**356 (100.0%)**	**975 (100.0%)**	**1415 (100.0%)**

Note: Projects with investors from two or more countries are shown for the primary source only.
Source: EIM database.

6.4.2. Investment of BRICS Countries by Host Region and Country

This sub-section explores the location choice of BRICS FDI in the West (EU-15) compared to the East (CEEC-10) of Europe. Table 6.11 shows the number and share of FDI projects from each BRICS country. Section 6.3.1 showed that the EU-15 receives about 90% of all projects from the BRICS, which is more than the other three global source regions. Table 6.11 shows that the share of FDI projects from each BRICS country is broadly the same, except for Russia, where nearly a third of its FDI is in the CEEC-10. This no doubt reflects its historical ties and proximity to the countries of Central and Eastern Europe.

Table 6.11: BRICS FDI in the EU-15 and CEEC-10

Host	All FDI	Brazil	Russia	India	China	South Africa	BRICS
EU-15	28,225 (80.4%)	65 (92.9%)	111 (67.3%)	508 (93.7%)	511 (94.1%)	86 (90.5%)	1,281 (90.5%)
CEEC-10	6,880 (19.6%)	5 (7.1%)	54 (32.7%)	34 (6.3%)	32 (5.9%)	9 (9.5%)	134 (9.5%)
EU-25	**35,105 (100.0%)**	**70 (100.0%)**	**165 (100.0%)**	**542 (100.0%)**	**543 (100.0%)**	**95 (100.0%)**	**1,415 (100.0%)**

Note: Projects with investors from two or more countries are shown for the primary source only.
Source: EIM database.

The number of FDI projects from each BRICS country in each EU-25 country is given in Appendix Table 6.1. This shows that the main host countries for the investment of all BRICS and non-BRICS countries are much the same, i.e. France, Germany and UK. Of the BRICS, Russia again stands out, as its main destination is Germany (33 projects) and there are relatively few investments in the UK (26 projects), although the number of projects is small. With regards to the CEEC-10 countries, the Czech Republic, Hungary and Poland receive most projects from non-BRICS countries, while Romania (21 projects) is also a main host country for FDI from each BRICS country, with the exception of South Africa.

6.4.3. Investment of BRICS Countries by Industry

According to Table 6.5, the investment of the BRICS has similar industry characteristics to those of the three main global regions. To explore this issue, this sub-section discusses the FDI of the five BRICS countries by industry, and then explores this for manufacturing by destination country. Table 6.12 gives the number and share of projects from each BRICS country by industry over the study period. It shows that manufacturing is the main activity for four BRICS countries, but that for India the most important industry is finance and business services (327 projects, 60.3% of projects from India). China is more focused on manufacturing (385 projects, 70.9%) than other BRICS. Russian investment is more evenly split between manufacturing, and finance and business services (43.6% and 37.6% of projects).

Table 6.12: BRICS FDI in the EU-25 by Industry

Industry	Brazil	Russia	India	China	South Africa	BRICS
Agriculture	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.2%)	0 (0.0%)	1 (0.1%)
Construction	0 (0.0%)	2 (1.2%)	1 (0.2%)	4 (0.7%)	0 (0.0%)	7 (0.5%)
Education and Health	0 (0.0%)	0 (0.0%)	4 (0.7%)	2 (0.4%)	2 (2.1%)	8 (0.6%)
Energy	3 (4.3%)	17 (10.3%)	2 (0.4%)	9 (1.7%)	0 (0.0%)	31 (2.2%)
Finance and Business Services	16 (22.9%)	62 (37.6%)	327 (60.3%)	82 (15.1%)	32 (33.7%)	519 (36.6%)
Manufacturing	46 (65.7%)	72 (43.6%)	185 (34.1%)	385 (70.9%)	50 (52.6%)	738 (52.1%)
Recreation	0 (0.0%)	0 (0.0%)	1 (0.2%)	4 (0.7%)	0 (0.0%)	5 (0.4%)
Retail and Hospitality	1 (1.4%)	3 (1.8%)	6 (1.1%)	21 (3.9%)	2 (2.1%)	33 (2.3%)
Transport and Communications	4 (5.7%)	9 (5.5%)	16 (3.0%)	35 (6.4%)	9 (9.5%)	73 (5.2%)
Total	**70 (100.0%)**	**165 (100.0%)**	**542 (100.0%)**	**543 (100.0%)**	**95 (100.0%)**	**1,415 (100.0%)**

Note: Projects with investors from two or more countries are shown for primary source only.
Source: EIM database.

The above analysis shows that manufacturing is the most common industry of FDI projects from all sources and the BRICS. BRICS manufacturing FDI location is now explored in greater detail. As subsequently it is necessary to group manufacturing with construction and energy in the mixed logit analysis, these are considered together. Table 6.12 shows that there are only small numbers of projects in these other two industries.

Table 6.13 shows the number of projects in 'manufacturing' over the study period for each of the EU-25 countries from the BRICS as a whole, the five BRICS countries individually and all sources. It shows that China is the most important investor for the manufacturing projects among all five BRICS countries over the study period (398 projects), accounting for more than half of all projects from the BRICS countries. (i.e. 51.3%). It can also be seen that China (92.5% of projects from China) and India (91.5%) are more focused on the EU-15 compared to Russia (50.6%), Brazil (89.8%) and South Africa (86.0%).

Table 6.13: BRICS Manufacturing FDI in the EU-25 by Country

Host	BRICS	Brazil	Russia	India	China	South Africa	All FDI
Austria	7	1	2	2	1	1	451
Belgium	50	5	3	13	25	4	1,118
Denmark	10	0	1	3	6	0	241
Finland	2	0	1	0	1	0	131
France	85	8	7	12	51	7	3,874
Germany	167	3	11	31	117	5	1,951
Greece	1	0	0	0	1	0	58
Ireland	5	0	1	3	1	0	628
Italy	27	1	3	3	20	0	404
Luxembourg	0	0	0	0	0	0	31
Netherlands	28	2	3	7	14	2	647
Portugal	6	5	0	1	0	0	296
Spain	36	13	5	5	13	0	1,263
Sweden	21	0	1	4	16	0	468
UK	228	6	8	88	102	24	4,202
EU-15	**673 (86.7%)**	**44 (89.8%)**	**46 (50.6%)**	**172 (91.5%)**	**368 (92.5%)**	**43 (86.0%)**	**15,763 (75.2%)**
Bulgaria	13	0	7	1	4	1	329
Czech Republic	15	0	4	4	4	3	915
Estonia	5	0	5	0	0	0	162
Hungary	16	0	3	1	11	1	1,135
Latvia	6	0	6	0	0	0	98
Lithuania	11	0	11	0	0	0	148
Poland	14	0	2	5	5	2	1,215
Romania	16	1	6	4	5	0	657
Slovakia	6	4	0	1	1	0	441
Slovenia	1	0	1	0	0	0	90
CEEC-10	**103 (13.3%)**	**5 (10.2%)**	**45 (49.4%)**	**16 (8.5%)**	**30 (7.5%)**	**7 (14.0%)**	**5,190 (24.8%)**
EU-25	**776 (100.0%)**	**49 (100.0%)**	**91 (100.0%)**	**188 (100.0%)**	**398 (100.0%)**	**50 (100.0%)**	**20,953 (100.0%)**

Notes: Projects with investors from two or more countries are shown for primary source only. Manufacturing includes a small number of projects in construction and energy.
Source: EIM database.

By host country, Table 6.13 shows that the main host countries for FDI from Russia, India, China and South Africa are much the same as the host countries for the BRICS as whole. However, Spain replaces Germany as one of the main host countries for FDI from Brazil as Spain receives the largest number of projects (13 projects, 26.5%) from this country, because of their common language and heritage. For China, Germany (117 projects) is the main host country, with a number of projects exceeding that of France and the UK, a pattern that is different from the BRICS group as a whole. The investment of India and South Africa shows considerable concentration, with nearly half of their investment in one country, the UK.

6.4.4. Investment of BRICS Countries by Function

Table 6.6 showed that most projects from the BRICS are in the production function and in sales and marketing. Therefore, it is of interest to explore whether the main functions of each BRICS country's investment are the same to those of the BRICS group. Table 6.14 shows the number of projects from each BRICS country in the ten functions over the study period. Table 6.14 shows that the main functions of each BRICS country's FDI are production, and sales and marketing, although there are differences in the number and share of projects. Most projects from China (324 projects, 59.7%), India (270 projects, 49.8%) and Russia (105 projects, 63.6%) are in sales and marketing, which is similar to the BRICS as a whole, but Brazil (30 projects, 42.9%) and South Africa (32 projects, 33.7%) have greater focus on production. This may be because Brazil and South Africa have less developed economies than the other three countries, so they are more interested in production as the main function of their investment. Russian FDI shows the greatest concentration of the five BRICS countries, with 63.6% of all projects in sales and marketing.

Table 6.14: BRICS FDI in the EU-25 by Function

Function	Brazil	Russia	India	China	South Africa	BRICS
Contact Centre	0 (0.0%)	1 (0.6%)	26 (4.8%)	1 (0.2%)	8 (8.4%)	36 (2.5%)
Education & Training	0 (0.0%)	0 (0.0%)	7 (1.3%)	2 (0.4%)	0 (0.0%)	9 (0.6%)
Headquarters	6 (8.6%)	5 (3.0%)	89 (16.4%)	66 (12.1%)	13 (13.7%)	179 (12.7%)
IDC	0 (0.0%)	0 (0.0%)	2 (0.4%)	0 (0.0%)	0 (0.0%)	2 (0.1%)
Logistics	5 (7.1%)	7 (4.3%)	15 (2.8%)	25 (4.6%)	14 (14.7%)	66 (4.7%)
Production	30 (42.9%)	41 (24.9%)	72 (13.3%)	70 (12.9%)	32 (33.7%)	245 (17.3%)
Research & Development	2 (2.9%)	4 (2.4%)	49 (9.0%)	44 (8.1%)	3 (3.2%)	102 (7.3%)
Sales & Marketing	26 (37.1%)	105 (63.6%)	270 (49.7%)	324 (59.6%)	24 (25.2%)	749 (52.9%)
Shared Services Centre	0 (0.0%)	0 (0.0%)	3 (0.6%)	3 (0.6%)	0 (0.0%)	6 (0.4%)
Testing & Servicing	1 (1.4%)	2 (1.2%)	9 (1.7%)	8 (1.5%)	1 (1.1%)	21 (1.5%)
Total	**70 (100.0%)**	**165 (100.0%)**	**542 (100.0%)**	**543 (100.0%)**	**95 (100.0%)**	**1,415 (100.0%)**

Notes: Projects with investors from two or more countries are shown for primary source only.
IDC = Internet Data Centre
Source: EIM database.

The rest of this section explores the investment of BRICS countries in headquarters and R&D. There are several reasons for selecting these two functions. First, in addition to the two main functions, headquarters (179 projects, 12.7%) and R&D (102 projects, 7.2%) also receive a considerable number of projects from the BRICS. Second, as seen in Table 6.7, FDI in R&D has the largest growth rate among all functions, and the growth rate of headquarters is also larger than that of the main function, i.e. production. Finally, the most important reason is that these projects in headquarters and R&D are of interest as they imply high-value projects using high-skilled labour, and they may be more embedded in the host country due to substantial sunk costs. Table 6.15 combines the number of projects in headquarters and R&D for the EU-25 countries from all sources, the BRICS group and each of the five BRICS countries.

Table 6.15: BRICS FDI in EU-25 Countries for Headquarters and R&D

Host	BRICS	Brazil	Russia	India	China	South Africa	All FDI
Austria	2	1	0	0	1	0	141
Belgium	4	1	0	2	1	0	212
Denmark	10	0	1	4	5	0	179
Finland	3	0	0	2	1	0	35
France	22	0	1	6	15	0	735
Germany	36	2	2	13	18	1	462
Greece	0	0	0	0	0	0	12
Ireland	4	0	1	1	1	1	365
Italy	5	0	0	0	5	0	104
Luxembourg	0	0	0	0	0	0	20
Netherlands	9	0	0	1	6	2	225
Portugal	0	0	0	0	0	0	19
Spain	6	1	2	0	3	0	339
Sweden	13	0	0	4	9	0	184
UK	155	3	1	98	41	12	1,934
EU-15	**269 (95.7%)**	**8 (100.0%)**	**8 (88.9%)**	**131 (94.9%)**	**106 (96.4%)**	**16 (100.0%)**	**4,966 (92.8%)**
Bulgaria	0	0	0	0	0	0	25
Czech Republic	2	0	0	2	0	0	85
Estonia	0	0	0	0	0	0	5
Hungary	6	0	0	2	4	0	91
Latvia	0	0	0	0	0	0	3
Lithuania	1	0	0	1	0	0	8
Poland	2	0	1	1	0	0	85
Romania	1	0	0	1	0	0	60
Slovakia	0	0	0	0	0	0	17
Slovenia	0	0	0	0	0	0	8
CEEC-10	**12 (4.3%)**	**0 (0.0%)**	**1 (11.1%)**	**7 (5.1%)**	**4 (3.6%)**	**0 (0.0%)**	**387 (7.2%)**
EU-25	**281 (100.0%)**	**8 (100.0%)**	**9 (100.0%)**	**138 (100.0%)**	**110 (100.0%)**	**16 (100.0%)**	**5,353 (100.0%)**

Notes: Number of projects and shares in parentheses. Projects with investors from two or more countries are shown for primary source only.
Source: EIM database.

Table 6.15 shows that there are 281 projects in headquarters and R&D invested by the BRICS, which represents 5.2% of all projects in these two functions. Most of this BRICS investment is from India and China, which account for 88.3% of the total number of projects from these five countries. Of the 281 projects, there are just 12 projects in these functions in the CEEC-10 countries, where India is the leader (7 projects, 58.3% to all BRICS projects in CEEC-10). By host country, the investments from India and China in these two functions have the same main host countries as the BRICS group, i.e. France, Germany and the UK. FDI from India shows a high concentration in the UK, with more than half (71%) of projects in these two functions. There is no investment from Brazil and South Africa in France. It also can be seen that Germany and Spain replace France and the UK as the two main host countries for investment in these two functions from Russia.

6.4.5. Start-up Investment by BRICS Countries in the EU-25

This sub-section investigates the distribution of BRICS countries' investment by project type. Table 6.16 shows the number and share of FDI projects for the three different types from each of the five BRICS countries over the study period.

Table 6.16: BRICS FDI in the EU-25 by Project Type

Project Type	Brazil	Russia	India	China	South Africa	BRICS
Start-up	50 (71.4%)	140 (84.9%)	433 (79.9%)	485 (89.3%)	55 (57.9%)	1163 (82.2%)
Co-location	1 (1.4%)	4 (2.4%)	12 (2.2%)	11 (2.0%)	4 (4.2%)	32 (2.3%)
Expansion	19 (27.2%)	21 (12.7%)	97 (17.9%)	47 (8.7%)	36 (37.9%)	220 (15.5%)
Total	**70 (100.0%)**	**165 (100.0%)**	**542 (100.0%)**	**543 (100.0%)**	**95 (100.0%)**	**1415 (100.0%)**

Note: Projects with investors from two or more countries are shown for primary source only.
Source: EIM database.

Table 6.16 shows that most FDI projects are in the form of start-up for each BRICS country. There is a considerable number of start-up projects both in absolute and relative terms from China (485 projects, 89.3%) and India (433 projects, 79.9%). These are the leaders in start-up investment among the BRICS countries, with 918 projects in the EU-25 (78.9% of all start-up projects from the BRICS). The smallest share of start-up projects, from South Africa, is still over 50%, although there are not many projects from this country. The co-location projects occupy the smallest share of all projects from each BRICS country. In fact, Table 6.16 shows that expansions account for a considerable amount of FDI from both South Africa (37.9%) and Brazil (27.1%), so that these invest at existing facilities.

Because start-up investment is the main FDI type from the BRICS the remainder of this sub-section explores the location choice of start-up projects from BRICS countries. Table 6.17 shows the number of start-up projects from the five BRICS countries in the EU-25 countries over the study period. It reveals that the start-up investments of all BRICS countries are concentrated in the EU-15, where the share of projects in the EU-15 to all projects in the EU-25 from each BRICS country is over 90% except for Russia (70.0%). The start-up investment from Russia is more similar to the world investment than that of the other four BRICS countries.

Table 6.17: BRICS FDI by the EU-25 Country for Start-up Projects

Host	BRICS	Brazil	Russia	India	China	South Africa	All FDI
Austria	9	1	5	2	1	0	419
Belgium	61	7	1	22	27	4	1,088
Denmark	19	0	3	7	9	0	460
Finland	6	0	1	4	1	0	182
France	102	5	12	33	46	6	3,392
Germany	244	2	32	58	145	7	2,585
Greece	3	0	1	1	1	0	90
Ireland	7	0	2	1	3	1	751
Italy	26	1	4	4	17	0	629
Luxembourg	1	1	0	0	0	0	73
Netherlands	48	2	5	16	20	5	951
Portugal	7	6	0	1	0	0	249
Spain	38	9	5	7	13	4	1,404
Sweden	33	0	2	12	19	0	758
UK	450	13	25	237	152	23	5,595
EU-15	**1,054 (90.6%)**	**47 (94.0%)**	**98 (70.0%)**	**405 (93.5%)**	**454 (93.6%)**	**50 (90.9%)**	**18,626 (79.9%)**
Bulgaria	11	0	5	1	4	1	344
Czech Republic	18	0	6	5	4	3	773
Estonia	7	0	7	0	0	0	152
Hungary	19	0	3	4	12	0	839
Latvia	9	0	8	0	0	1	162
Lithuania	9	0	8	1	0	0	197
Poland	16	0	2	9	5	0	1,117
Romania	16	1	3	7	5	0	666
Slovakia	4	2	0	1	1	0	370
Slovenia	0	0	0	0	0	0	79
CEEC-10	**109 (9.4%)**	**3 (6.0%)**	**42 (30.0%)**	**28 (6.5%)**	**31 (6.4%)**	**5 (9.1%)**	**4,699 (20.1%)**
EU-25	**1,163 (100.0%)**	**50 (100.0%)**	**140 (100.0%)**	**433 (100.0%)**	**485 (100.0%)**	**55 (100.0%)**	**23,325 (100.0%)**

Note: Projects with investors from two or more countries are shown for primary source only.
Source: EIM database.

By host country, the three main host countries for start-up projects from Brazil are Belgium (7 projects, 14.0%), Spain (9 projects, 18.0%) and the UK (13 projects, 26.0%). It also can be seen that more than half of the start-up FDI of India (237 projects, 54.7%) is concentrated in the UK, while Russia invests more in Germany (32 projects, 22.9%) than in the UK (25 projects, 17.9%). With regards to the CEEC-10, start-up investment is relatively evenly split among these countries.

The preceding sub-sections discuss the location choice of FDI projects from the BRICS countries based on industry group (manufacturing), function (headquarters / R&D) and investment type (start-up). Appendix Table 6.2 considers the number of start-up projects in the headquarters or R&D functions that are by the manufacturing industry. This is for the EU-25 countries over the study period. It shows that there are only 100 projects (7.1% to all BRICS projects) in this category and most are from China (60 projects). Hence, the number of projects that fulfil all these characteristics simultaneously is small, and most are focused on the EU-15 and in particular France, Germany and the UK.

6.5. Persistence in FDI Country Location Choice

BRICS FDI has increased sharply over the study period, and the analysis has shown that it tends to be concentrated in the 'West', i.e. the EU-15, and in certain countries, including France, Germany and the UK. This section examines the extent to which FDI from each BRICS country follows previous FDI from the same source, by locating in the same EU-25 countries. A Chi-square test is used to examine whether this tendency to locate in the same countries over time is significant or not, and hence whether there is any persistence in the location choice of the BRICS investors across the EU-25 countries.

According to Howell (2011), the Chi-square test was introduced by Karl Pearson in the early 1900s. There are two types of the Chi-Square test. The first one is a 'goodness-of-fit' test that is used to compare observed data with the data that is expected to obtain. In this test the null hypothesis indicates that there is no significant difference between the observed and expected data. The second type of Chi-Square test that concerns independence is used to investigate whether observed data on two variables are independent of each other. It is in the first sense that the Chi-square test is used here.

6.5.1. The Chi-Square ('Goodness-of-Fit') Test Statistic

The Chi-square test statistic is calculated as follows, where O_i is the observed value of i, E_i is the expected value of this observation and k is the number of observations on i (Kazmier and Pohl, 1987):

$$\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i}. \tag{6.1}$$

If there is the perfect conformity between the observed and expected values, the test statistic is zero. When the difference between the observed and expected values becomes larger, the value of the test will increase, which means that this is a one-tail test, and the upper-tail of the test distribution is the region of rejection. When the value of χ^2 is equal to or greater than the critical value the null hypothesis (where there is no difference) will be rejected. The critical value is determined by the degrees of freedom and required level of significance.

The degrees of freedom df have the following form, $df = k - m - 1$, where k refers to the number of categories of the data over which i is observed and m is the number of parameters that are estimated based on the sample data. In effect, one further degree of freedom is lost as these frequencies sum to unity. The degrees of freedom represent the number of frequencies, which is decreased by the number of parameters of the sample data. There are several requirements for the Chi-square test, as follows (Gasser, 1975 and Marsh *et al.*, 1988):

(i) *A random sample*. The data must be drawn randomly from a fixed population.
(ii) *A large sample size*. Otherwise the test statistic may be biased.
(iii) *Independence*. The Chi-Square test cannot be used to investigate correlated data, so the data on all observations must be independent of each other.
(iv) *Quantitative data*. The data used must be numerical, rather than percentages or ratios.

The accuracy of the Chi-square test will decrease if the number of data observations O_i on any i is small, although the definition of 'small' is arguable. Kazmier and Pohl (1987) and Howell (2011) both argue that the number of observations on the expected value should not be less than five. Kazmier and Pohl (1987) further elaborate on this by suggesting that if the data do not satisfy this criterion, the adjacent data should be combined to satisfy the requirement. However, Cochran (1952) argues that it is arbitrary to choose five as the criterion. Another way to solve the problem is to increase the size of the whole sample, and therefore to increase the number of observations O_i on any i, but this is not always possible, for example in this case, where the EIM database gives the population of FDI locations in the EU-25 countries.

6.5.2. Test Design for the BRICS Investment

As indicated before, the test explores whether FDI from each BRICS country follows its previous investment in terms of location. To calculate the Chi-square test statistic, it is necessary to address two issues: how to calculate the expected value of i for any BRICS country and how to deal with observations on projects that are less than five.

On the first of these, the expected value of i is calculated as follows:

$$E_{t,i,j} = \frac{T_{t,j}}{T_{t-n,j}}\, O_{t-n,i,j}, \tag{6.2}$$

where E and O are defined above but in terms of the number of FDI projects from BRICS country j in the EU-25 country i in year t. T is the total number of FDI projects in the EU-25. This equation shows that the expected number of projects i at time t is essentially based on the observed number of projects i at time $t-n$. In the empirical work below we use $n = 1$ or $n = 2$, so that I examine persistence in FDI location over one or two years. Of course, in calculating the expected value of i, a difficulty is that the total number of projects changes between time t and time $t-n$, so that $T_t \,/\, T_{t-n}$ in (6.2) adjusts the expected value for this.

On the second issue, we know that while BRICS FDI has grown strongly over time, the number of projects in earlier years can be small, and that when considered across the EU-25 the number of projects in any one country in any year can also be small. Indeed, there is a large number of zeroes, and of course these mean that χ^2 in (6.1) cannot be calculated. To address the issue of zeroes we add '1' to the number of FDI projects in any country and year for each BRICS country. This seems reasonable where the counts are reasonably high, and a reference is added in Section 4.6 where it is first mentioned to support this.[40] On the issue of the small number of observations in a year, one way to address this is to add the years together, so that we look at persistence in FDI location between sub-periods, which is what I consider below. Countries are not grouped together as this reduces the meaningfulness of the test (i.e. the number of locations falls from 25 to just 2). On the direction of bias, since smaller samples are likely to mean that E is measured with less precision then this is likely to increase the test statistic and make the rejection of the null hypothesis more likely.[41]

The hypotheses tested for the BRICS countries are:

$\boldsymbol{H_0}$: There is no significant difference in BRICS FDI project location across the EU-25 countries by year, i.e. current FDI follows the previous FDI location pattern.
$\boldsymbol{H_1}$: Current investment does not follow the previous FDI location pattern.

In this case, there are 25 EU countries and no parameter values, so that $k = 25$, and $m = 0$, and the degrees of freedom df is 24. The critical values are 33.20 at 10%, 36.42 at 5% and 42.98 at 1% levels of significance respectively.

6.5.3. An Example

To illustrate the above issues, FDI from Brazil in the EU-25 in 2010 can be taken as an example, in which persistence is considered over a 1-year period. Table 6.18 presents the observed and expected values for the number of FDI projects from Brazil in EU-25 countries. The second and third columns show the number of projects in 2010 and 2009. As a first point if expression (6.2) is used to calculate the expected values for 2010 based on 2009 then this generates the results in the fourth column, where now there are 14 projects. Table 6.18 shows that if the countries with a number of projects less than five are combined, there are two problems. The first one is that there will be a large change in the degrees of freedom. This is because the number of data categories will decrease from 25 to 2, as shown in the second and fourth columns. The second problem is that the zeroes in the third column mean expression (6.1) cannot be calculated.

[40] Table 6.18 below shows that by this approach a near identical prediction is made of the expected value, so I do not think a serious error has been made.
[41] Denote $y = \sqrt{E}$, where $y > 0$. Then (6.1) can be written as $\chi^2 = (O/y - y)^2$. Since $\partial\chi^2/\partial y < 0$, greater errors in measuring y will result in a lower test statistic, meaning that the null hypothesis is less likely to be rejected.

Therefore, in order to keep the same degrees of freedom and make all expected values exceed zero, the observed values on the number of projects in columns two and three are each increased by 1, giving the fifth and sixth columns in Table 6.18. Therefore, the total number of observed projects in these columns is now 39 and 33. The expected values are calculated in the seventh column using (6.2), which for a value of unity in 2009 is 1.18 once we adjust for the difference in the total number of projects between these years (e.g. consider Austria):

$$E_{2010,Austria,Brazil} = \frac{O_{2009,Austria,Brazil} * T_{2010,Brazil}}{T_{2009,Brazil}} = \frac{1 * 39}{33} = 1.1818$$

Based on the fifth and seventh columns of Table 6.18 the test statistic is as follows, which suggests that the null hypothesis can be rejected in this case but at the 10% level only:

$$\chi^2 = \sum_{i=1}^{25} \frac{(O_i - E_i)^2}{E_i} = 34.5348$$

Table 6.18: Observed and Expected Number of FDI Projects from Brazil in EU-25, 2010

Host Country	O_i in 2010		O_i in 2009	E_i in 2010		O_i in 2010 + 1	O_i in 2009 + 1	E_i in 2010 + 1
Austria	0		0	0		1	1	1.1818
Belgium	2		0	0		3	1	1.1818
Bulgaria	0		0	0		1	1	1.1818
Czech Republic	0		0	0		1	1	1.1818
Denmark	0		0	0		1	1	1.1818
Estonia	0		0	0		1	1	1.1818
Finland	0		0	0		1	1	1.1818
France	0		0	0		1	1	1.1818
Germany	1		2	3.5		2	3	3.5455
Greece	0		0	0		1	1	1.1818
Hungary	0		0	0		1	1	1.1818
Ireland	0	10	0	0	3.5	1	1	1.1818
Italy	0		0	0		1	1	1.1818
Latvia	0		0	0		1	1	1.1818
Lithuania	0		0	0		1	1	1.1818
Luxembourg	0		0	0		1	1	1.1818
Netherlands	0		0	0		1	1	1.1818
Poland	0		0	0		1	1	1.1818
Portugal	0		0	0		1	1	1.1818
Romania	0		0	0		1	1	1.1818
Slovakia	1		0	0		2	1	1.1818
Slovenia	0		0	0		1	1	1.1818
Spain	6		0	0		7	1	1.1818
Sweden	0	4	0	0	10.5	1	1	1.1818
UK	4		6	10.5		5	7	8.2727
Total	**14**		**8**	**14**		**39**	**33**	**38.9996**

6.5.4. Results for the Persistence of FDI Location

The following tables give the values of goodness-of-fit test statistics for the FDI projects of each BRICS country in the EU-25 using $n = 1$ and $n = 2$ in expression (6.2) respectively.

Table 6.19: Test Results for BRICS Countries by Year ($n = 1$)

Year	Brazil	Russia	India	China	South Africa
2010	34.53*	22.18	28.72	24.68	6.04
2009	53.31***	33.25*	22.06	30.42	31.94
2008	11.21	25.65	19.03	73.50***	9.06
2007	4.73	10.19	23.95	32.25	16.07
2006	3.67	26.15	11.04	24.39	5.95
2005	4.39	10.09	13.54	18.95	3.12
2004	19.23	8.67	18.33	11.81	2.33
2003	1.50	8.52	9.13	6.86	3.93
2002	2.54	8.27	67.90***	38.28**	6.51
2001	2.36	14.28	10.07	3.33	1.74
2000	0.00	3.72	0.54	5.95	3.43
1999	0.48	2.90	8.94	2.38	2.89
1998	1.50	1.89	7.20	2.83	7.23

Notes: Evaluation of (6.1) using (6.2) with $n = 1$. *** = 1%, ** = 5% and * = 10% significance level.

Table 6.20: Test Results for BRICS Countries by Year ($n = 2$)

Year	Brazil	Russia	India	China	South Africa
2010	24.53	15.87	36.12*	35.33*	16.07
2009	13.08	19.22	20.19	111.06***	10.70
2008	20.61	24.86	36.73**	41.76**	9.88
2007	5.52	25.26	26.10	26.86	17.39
2006	6.36	32.07	24.75	44.73***	4.32
2005	4.17	12.33	17.80	22.23	4.55
2004	20.34	9.22	26.23	24.63	1.87
2003	2.53	10.15	59.33***	79.33***	2.75
2002	0.92	7.68	11.30	14.98	6.22
2001	2.35	13.66	12.09	3.59	2.63
2000	0.48	3.67	6.13	14.61	1.78
1999	0.48	2.04	2.62	2.22	4.58

Notes: Evaluation of (6.1) using (6.2) with $n = 2$. *** = 1%, ** = 5% and * = 10% significance level.

Overall, Tables 6.19 and 6.20 suggest that the null hypothesis $\boldsymbol{H_0}$ cannot be rejected, so that FDI from the BRICS tends to follow the same location across the EU-25 countries over time. There are several exceptions to this. First, if anything, there are more statistical differences in the FDI location pattern over a 2-year period, compared to a 1-year period. This is possibly because the longer lag allows FDI sufficient time to respond to earlier

FDI flows. Second, Table 6.20 indicates that, so far as they exist, the different temporal location patterns exist for China and India only, and tend to be for the later years of the study period, when FDI from these countries was expanding the most. It suggests that FDI from these countries has spread out to other EU locations as it has grown. Contrary to this, the location choice of investment from Brazil, Russia and South Africa are relatively stable, although with a possible spreading out of Brazilian FDI in recent years. Of course, the results are subject to the problem of small numbers, which makes the acceptance of the null hypothesis more likely, although given this then it adds weight to the significance of the test statistics for China and India.

In terms of the number of projects, the FDI from Brazil, Russia and South Africa is relatively small, so that some spreading out of this FDI to other countries cannot be ruled out. However, as a further exercise the tests in Tables 6.19 and 6.20 were repeated by aggregating the FDI from each BRICS country by year, in order to increase the number of observations. Therefore, the test results, which are calculated based on three sub-periods (1997-2000, 2001-05 and 2006-10), are given in Table 6.21, where the first sub-period is used to calculate the expected values for the second sub-period (and likewise the second for the third).

Table 6.21: Test Results for BRICS Countries by Sub-Period

Period	Brazil	Russia	India	China	South Africa
2006-2010	32.02	39.80^{**}	81.63^{***}	377.66^{***}	7.62
2001-2005	9.21	18.22	54.30^{***}	136.04^{***}	5.26

Notes: Evaluation of (6.1) using (6.2) with three sub-periods. *** = 1%, ** = 5% and * = 10% significance level.

Table 6.21 indicates significant differences in FDI location across countries over the longer time spans in the case of China and India. It implies that these BRICS countries have spread their investments to other EU-25 countries as they have grown over this longer time horizon. However, it can be seen that FDI projects from Brazil and South Africa follow their previous FDI location across all 25 EU countries, while the later FDI projects from Russia also have the same location choice to their own previous investment. Broadly, these results are consistent with those shown in Tables 6.19 and 6.20. Overall, for the BRICS countries that show the strongest growth in FDI over time it suggests that FDI projects tend to be located in other EU-25 countries over time, so that given the initial concentration of this investment in a few countries it suggests that it has become more spread out. In the case of Russia it suggests that its investment has followed a different pattern after the accession of the CEECs.

6.6. Conclusions

This chapter compares the difference in the FDI projects between the BRICS and non-BRICS regions, especially for Europe and North America. Afterwards, it concentrates on describing the characteristics of FDI from the whole BRICS region and from each BRICS country, which gives a general understanding for the regression analysis about the effect of the characteristics of the host countries on FDI location. Finally, this chapter examines the persistence in the BRICS FDI country location choice using the 'Goodness-of-Fit' test, which could be treated as a preliminary attempt for exploring whether there is 'follow-the-leader' behaviour of BRICS FDI prior to the regression analysis.

With regards to the FDI of BRICS and non-BRICS (i.e. Europe, North America and the Other), there is a much smaller number of projects from BRICS as there are only five countries in this group and they are in the initial stage of international expansion. Most projects from both BRICS and non-BRICS prefer to enter the EU-15 countries, with Europe which is the main contributor in the non-BRICS region accounting for half of all projects in the EU-25. In addition, the BRICS FDI increases dramatically over the study period (i.e. there is a twelve-fold increase in the number of projects from 1997-00 to 2006-10), which is same as the individual countries. This increase trend for non-BRICS is smoother, where the main contributor Europe increases from 3,987 to 8,439 projects and this number increases from 3,710 to 4,569 for North America. The sharp increase for the Europe is due to the economic integration over this time, including the accession of the CEEC-10 countries.

Most characteristics of BRICS FDI are the same to those of the other three global regions. The main host countries for all BRICS and individual BRICS countries are France, Germany and the UK. In addition to this, Russia has a considerable number of projects that are located in the CEEC-10 because of cultural and political reasons. For the industry choice, FDI from the four regions is interested in manufacturing, and finance and business services, but BRICS and North America are less focused on manufacturing and more concentrated on finance and business services compared to European and Other FDI. Within the BRICS, only India shows the same tendency as the BRICS, and the common characteristics of other BRICS countries is the manufacturing. Turning to the functional activity, most projects from these four regions are located in production, and sales and marketing, but BRICS (including Russia, India and China) and North America are more focused on the latter, and Europe and Other on the former. The main type of FDI projects for the BRICS as a whole, all individual BRICS countries and the other three global regions is start-up investment. There is the smallest number of start-up projects in absolute terms from the BRICS, but it shows the highest concentration of start-up FDI in the EU-25 (82.2%) compared to other three source regions, where the share is the highest for China at 89%. Finally, BRICS FDI is also featured by the employment size. For all FDI in the EU-25, there are 65.5 jobs created associated with each project. The number for North America and Europe is similar to this, but much lower for the BRICS, at only 38.8 jobs per project, where the number of jobs per project in manufacturing exceeds that in finance and business services. All source regions with a larger number of jobs by manufacturing normally have a larger number of jobs per project in total.

The last section of this chapter examines the persistence in FDI country location choice using the 'Goodness-of-Fit' test. The results show that FDI from all BRICS countries tends to follow the location of previous FDI from the same country over time. There are more statistical differences in the FDI location pattern over a 2-year period compared to a 1-year period, but the different temporal location patterns exist for China and India only, and tend to be concentrated in the later years of the study period. By contrast, the location choice of FDI from Brazil, Russia and South Africa is relatively stable. When the years are aggregated to increase the number of projects, there will be more considerable difference in the location choice of most countries' FDI. It suggests that BRICS FDI tends to disperse across the EU-25 countries along with their growth.

Chapter 7. The Logit Analysis

7.1. Introduction

The purpose of this chapter is to explore the locational determinants of FDI in the EU-25 countries from all source regions, especially for the BRICS, and in particular to examine how this FDI locates in relation to other BRICS investment, including that arising from the same BRICS country. The chapter also considers how this BRICS investment locates according to its characteristics, including FDI that is in manufacturing, in the high-level functions of a headquarters or R&D, and by the investment mode according to a start-up or re-investment, where the former is sometimes known as 'greenfield' investment. The main econometric technique that is used in this chapter is the Conditional Logit model, which was discussed in Chapter 4. It enables FDI location to be considered according to host country characteristics, but I also use a Multinomial Logit model that allows the location determinants to vary according to the project characteristics.

The results that are presented in this chapter not only reveal how the determinants of FDI location vary across different source regions and BRICS countries, but they offer insights on how investment locates in relation to earlier investment from the same or from other BRICS countries. As discussed in Section 2.6, this 'follow-the-leader' behaviour may be an intrinsic unobserved advantage of a country location that is not otherwise captured by the regressors. In Chapter 6, I found that on the whole BRICS FDI tends to 'follow' previous FDI from the same country, although over longer time spans I find that there is evidence that as it grows it changes location across countries, particularly in the case of China and India. Overall, results from goodness-of-fit test keep consistent with the results of logit analysis in this chapter generally. In the analysis of this chapter the full range of explanatory variables is included, as discussed in Chapter 5, including traditional location factors such as market size, education, unemployment and risk. Chapter 3 suggests that market and knowledge seeking are important determinants for BRICS FDI location. These variables can be regarded as controls when exploring 'follow-the-leader' behaviour. Further, the logit analysis allow me to consider the possibility that

BRICS FDI does not ‘follow’ the location of FDI from other BRICS countries, so that in this sense the BRICS investment arising from different countries is not substitutable and is distinct in its nature.

The structure of this chapter is as follows. Section 7.2 focuses on the effects of the country variables and FDI lagged terms on the location choice of FDI projects from all source regions as a whole. Then, FDI location from each global source region is explored in Section 7.3, which also examines the issue of ‘follow-the-leader’ behaviour for these global regions. Section 7.4, which refers to the location choice of BRICS FDI, concentrates on the issue of ‘follow-the-leader’ behaviour for each BRICS country, i.e. if there is a significant tendency for FDI from each BRICS country to follow their own previous FDI or that of other BRICS countries. Section 7.5 investigates the country probability of BRICS FDI location in the EU-25 in terms of both the project characteristics and global source region (i.e. BRICS, Europe and North America). Finally, conclusions are drawn in Section 7.6.

7.2. FDI Location from All Global Source Regions

The purpose of this section is to explore the overall effect of the different determinants on FDI location across the EU-25 countries from all sources over the period 1997-2010. This means it is based on the full sample of investments across the 25 countries. Since there are lagged FDI terms it means it is necessary to drop the observations for 1997, so that are a total of 32,684 (= 35,105 - 2,421) investments, which gives 817,100 (= 32,684 x 25) observations on location (i.e. whether to locate or not in a country). The results from estimating equation (4.48) of Chapter 4 using the Conditional Logit model are presented in Table 7.1.

Table 7.1 has lagged variables FDI_{it-1} that capture the number of FDI projects from different source global regions or countries in the same host country i in the previous year $t-1$. This is to explore the effect of previous investment on the location choice of global current investment (for example, variable ‘Europe’ is measured by the total number of projects from Europe in the EU-25 in the preceding year). These FDI_{it-1} variables are classified under the heading ‘Source Variables’, and include four global regions (Europe, North America, BRICS and Other) and the five BRICS countries. They are shown in Table 7.1, for which different columns consider the different source variables. These are the key variables to assess which source region or country’s previous investment is followed by the global investment. It is the first step to explore whether investment in an EU-25 country follows the previous investment from the same source. All estimations include country fixed-effects to control for differences in the country characteristics, which reduces the problem of omitted variable bias.

Table 7.1: Location Choice for FDI from All Sources

Dependent Variable: = 1 if project locates in country i at time t.	**All Sources**			
	I	**II**	**III**	**IV**
Country Variables, X_{it-1}:				
Demand Variables:				
Real GDP per capita (x10^{-5})	-3.46***	-4.43***	-4.56***	-1.79**
Real GDP Growth Rate (x10^{-2})	2.15***	2.09***	1.90***	2.14***
Population Density (x10^{-2})	-1.57***	-1.11**	-0.67*	-1.22***
External Market Demand (x10^{-2})	-0.61	-1.45*	-1.55**	-1.77**
Labour Market Variables:				
Unemployment Rate (x10^{-2})	-2.23***	-1.60***	-1.61***	-1.93***
Real Wage Rate (x10^{-3})	-2.98	-6.35	-15.61	9.53
Real Wage Rate Dummy	-7.37***	-6.95***	-6.59***	-6.20***
Cost Variables:				
Corporate Income Tax Rate (x10^{-2})	-1.19***	-1.26***	-1.10***	-1.06***
Motorway Density (x10^{-2})	0.90	1.60***	1.27**	0.38
Political Risk (x10^{-3})	-3.42	3.96	1.67	-5.76**
Education Variables:				
Higher Education (x10^{-3})	0.38	2.33	2.22	-1.91
Secondary Education (x10^{-3})	6.45**	1.41	2.36	6.49**
Trade Variables:				
Openness to Trade (x10^{-3})	1.05	1.66	1.28	2.44**
Real Exchange Rate (x10^{-3})	-4.70**	-1.71	-2.53	-5.35***
Real Exchange rate volatility (x10^{-3})	-1.46***	-1.37**	-1.47***	-1.63***
Policy Terms:				
EU Structural Funds (x10^{-5})	-3.13***	-2.42***	-2.00**	-2.82***
Eurozone Country (x10^{-1})	1.11**	1.83***	2.00***	0.94*
EU Commitment (x10^{-1})	3.08***	3.44***	3.65***	2.54***
EU Membership (x10^{-1})	1.87***	1.94***	2.01***	1.99***
EU Post-membership (x10^{-1})	-2.71***	-2.68***	-2.63***	-2.46***
Source Variables, FDI_{it-1} (x 10^{-3}):				
All Sources	0.63***	-	-	-
Europe	-	0.77***	0.80***	-
North America	-	-0.09	-0.08	-
BRICS	-	6.08***	-	-
Other	-	-0.04	-0.40	-
Brazil	-	-	-9.76	-
Russia	-	-	9.28	-
India	-	-	2.11	-
China	-	-	9.06***	-
South Africa	-	-	0.69	-
Same Global Region	-	-	-	2.82***
Number of Observations	817,100	817,100	817,100	817,100
Number of Cases	32,684	32,684	32,684	32,684
Log likelihood	-85140.80	-85116.20	-85110.47	-84856.40

Notes: Location choice of FDI projects in EU-25 countries over 1998-2010. Estimation is using Conditional Logit model. Country fixed-effects included throughout. 10^{-2} means coefficients need to be multiplied by 10^{-2} and so on. All variables are fully described in Section 5.5. * = 10%, ** = 5% and *** = 1% significance level.

Column I of Table 7.1 measures FDI_{it-1} as the total number of investments from all sources in the same host country in the preceding year. Column II disaggregates this lagged FDI term according to four global regions to investigate the relative importance of these four regions, while column III further disaggregates the BRICS term into its constituent countries. Thus, column III identifies whether the number of FDI projects from each BRICS country determines FDI location in the same host country in the next year from all sources. Finally, column IV is different in that includes a single variable, 'Same Global Region', which for each investment matches it to the total number of projects from the same global source region in the same host country in the previous year. Overall, it is through the FDI_{it-1} terms that I assess if FDI in the host country 'follows' FDI in the previous year, whether from a particular source region or country (columns I to III) or the same global region (column IV).

7.2.1. Country Variables

First of all, regarding the country explanatory variables in Table 7.1, the majority of these are significant at the 1% level, in which case they generally each have the same sign in each column. The estimates are plausible in terms of their sign and significance, and better estimates are found below when regressed for the BRICS only. Nevertheless, it is important to discuss the nature of the estimates in Table 7.1.

On the demand variables, the GDP term tends to be negative, but it is positive when country fixed effects are excluded. This suggest larger countries tend to get more FDI on average, but at a decreasing rate with size, perhaps due to negative agglomeration effects. The decision was taken to omit the GDP term altogether. Conventionally, studies include only two of GDP, GDP per capita and population density in order to avoid multicollinearity. The GDP growth rate has a positive and significant effect in each country, which is consistent with the previous studies that investors prefer to invest in those foreign markets with faster growth rate. However, the real GDP per capita term does not attract more FDI inflows to the EU-25 countries, which is found in each column, and this suggests investors prefer locations with lower per capita incomes, which is perhaps due to their lower costs. Generally, higher population density is associated with congestion and higher costs and the estimate on this term is also negative and significant. It implies that greater urbanisation makes these countries less attractive to FDI. The estimates on external market demand show that FDI is interested in locating in markets that are close to the core of the European market. It is to do with access to larger markets as this term is distance weighted. Since this covers the whole period it not just limited to the Single Market, which the new accession countries of the Central and East Europe joined in 2004 and 2007. Association Agreements that were signed by these countries over 1991-95 that already eliminated most tariff barriers prior to their accession.

Turning to the labour market variables, a higher level of unemployment rate deters FDI inflows to a country, which may be partly because these countries have lower levels of economic development and poorer quality of labour force. However, while the wage rate term is generally negative, it is statistically insignificant. Nevertheless, the dummy that is included for missing data on the wage rate is negative and strongly significant throughout. On the cost variables, the corporate income tax has a negative and significant effect, so that FDI avoids countries with a higher tax rate. The last two cost terms are the motorway density and political risk. These are not always significant, but they suggest that better transport links encourage investment, possibly because it is easier to transport goods, while in column IV a negative and significant estimate suggests that investors may actually prefer more risk. After inspection of the data on this variable, the risks are relatively low for the EU-25 and this term tends to capture locations to the South and East of Europe, where higher political risk is associated with higher profits and more opportunities. In the literature, negative signs are often found across countries, although it can be positive where the serious risks are similar (e.g. internal and external conflict), so it captures differences in corruption and government inefficiency, which may actually be preferred by investors.[42] A similar effect is found by Bevan and Estrin (2004), which suggests that investors have a preference for weak administrative control. This may not only imply a higher level of corruption but a weak level of labour market regulation.

Regarding the education variables, the positive and significant education variables mean that FDI seek a more skilled workforce. In particular, secondary education has a positive and significant effect on FDI location in columns I and IV, but the effect of higher education is always insignificant. Again, this supports the cost-based motive for FDI, as it suggests investors like a reasonably educated workforce, but not too educated as the wage rate is likely to be higher. It possibly indicates that investors are interested in a labour force that has ‘middle skills’ rather than ‘higher skills’. Turning to the trade variables, trade openness (i.e. a greater volume of trade relative to GDP) does not affect FDI in general, although there is a positive and significant effect in column IV (i.e. higher

[42] The composition of risk index is fully described in ‘Cost Variables’ part of Section 5.5.1 of Chapter 5.

level of trade openness could get more FDI). The exchange rate and its volatility have negative and significant effect in columns I and IV, and this indicates that there will be less FDI in a country where the domestic currency appreciates or is volatile. These are because a higher exchange rate signals a decrease in national competitiveness of the foreign investors, while the more volatile is the exchange rate the more risky is a country for FDI (i.e. more volatility means higher risk and greater uncertainty,). The depreciation of the currency of a country may have different effects based on the different perspectives. If the country is already exporting to a country and the exchange rate depreciates then this makes exports more costly and FDI more worthwhile. The exit costs may be relevant to the location decision, but these will occur a long way in the future when the discounted value is smaller, while the exchange rate may in any event swing back over a long period.

Several dummies are included for policy and political variables and each of these play an important role in attracting investment to the EU-25. The negative effect of the EU Structural Funds demonstrates that the countries needing greater aid are less developed economically and socially, so that this has a negative effect on FDI location, which is like the unemployment term. Membership of the Euro currency zone country is conducive to reduced transaction costs and may reduce exchange rate risks, so it attracts FDI. Finally, dummies in respect of the CEECs for the commitment to EU enlargement by the European Council of Ministers and EU membership have a positive effect on FDI. The first of these signals a commitment to economic liberalization, while the second may capture the non-tariff barriers that are eliminated at entry. However, the estimates for post-membership suggest FDI inflows into these countries subsequently fall back.

7.2.2. Lagged FDI Terms

As discussed earlier in the section, Table 7.1 measures the lagged number of FDI projects in the host country in several ways, so that the interpretation of this variable differs according to its measurement. Column I shows that FDI prefers to locate in countries that have received significantly greater levels of investment in the previous year, no matter where this previous investment is from. Column II shows that this is particularly strong for cross-border investment within Europe, but interestingly also for the BRICS countries, and this is explored further below. However, there appears to be no strong 'follow-the-leader' pattern for North American investment or for FDI from elsewhere in the world.

Column III disaggregates the BRICS term into its five separate countries, and suggests that China is the only source country in the BRICS for which investment follows FDI in the previous year. This is consistent with Chapter 6 and it is explored further below. Finally, in column IV, the total investment from the same global source region as the investment in the preceding year is measured (for example, if a project comes to the UK from the USA in 2005 this variable measures the total number of projects in the UK from North America in 2004). It comprises four global regions that are the same as those shown in column II. The significant and positive sign on this term suggests strongly that investment from different global regions tends to follow that arising from the same source region, offering support for the 'follow-the-leader' hypothesis at a global regional level at least. Finally, it is necessary to explore which column in Table 7.1 shows the most reliable results. In this sense, the likelihood ratio test is used to compare these columns, for which results are shown in Table 7.2 below.

Table 7.2: Likelihood Ratio Test for Comparing Columns in Table 7.1

Likelihood Ratio Test	**I**	**II**
	Columns I & II in Table 7.1	**Columns II & III in Table 7.1**
df (Number of Restrictions)	3	4
χ^2	49.20	11.46
Critical Value	7.81	9.49

Note: This test is based on the 5% significant level.

Table 7.2 shows that values of χ^2 in both Columns I and II are greater than the critical values at the 5% significant level. It means that restrictions of Columns I and II in Table 7.1 are rejected, which indicates that Column II in Table 7.1 is better than Column I, while Column III is also preferred compared with Column II. However, Column IV in Table 7.1 cannot be compared with other columns as it has a different basis by including a new variable. Therefore, estimates for coefficients in Columns III and IV in Table 7.1 can be considered comprehensively, and details of effects of all explanatory variables have been discussed in Section 7.2.1 and 7.2.2. Overall, FDI from BRICS countries prefer to follow previous FDI from the same country (Column IV), and China is confirmed to keep consistent with this conclusion (Column III in Table 7.1).

7.3. FDI Location from Each Global Source Region

Section 7.2 examines the effect of the determinants of FDI location regardless of where it arises, so that we might expect some degree of heterogeneity across these investors. In order to examine the different effects of country variables on FDI location from different sources and to explore whether the FDI of each global region follows their own FDI or that of other global regions, this section considers the four global sources separately. It enables the issue of 'follow-the-leader' investment to be explored for each of FDI arising from Europe, from North America, the BRICS and from the other source countries. Table 7.3 shows the results from estimating equation (4.48) in Chapter 4 for each of the four global regions. These are basically a disaggregation of the regression results in column II of Table 7.1.

7.3.1. Country Variables

The results for the country explanatory variables in Table 7.3 can be reconciled with those in column II in Table 7.1. In summary, they show that the GDP growth rate has a similar effect across the different global source regions, but that the per capita income term is negative for Europe and the Other countries only. In the case of the BRICS it is insignificant, but the wage rate is now negative and significant. In general, these labour market variables display a different pattern across the global source regions. The tax rate is again an important factor, while motorway density is significant for FDI from North America only. Of the education variables the high-skill term is positive and significant for North America and BRICS, while the results show that the BRICS are risk averse in terms of where they invest. In the case of the exchange rate variable, the positive and significant coefficient for the BRICS means more BRICS FDI projects in a country where the domestic currency of this host country has appreciated. Finally, the policy terms are much more important for cross-border investment within the EU-25.

Table 7.3: Location Choice for FDI from Different Global Source Regions

Dependent Variable: =1 if the project locates in country i at time t.	**Global Source Regions**			
	V (Europe)	**VI (N. America)**	**VII (BRICS)**	**VIII (Other)**
Country Variables, X_{it-1}:				
Demand Variables:				
Real GDP per capita (x10^{-5})	-4.87***	-2.22	-0.06	-8.16***
Real GDP Growth Rate (x10^{-2})	0.36	4.96***	5.73**	3.03*
Population Density (x10^{-2})	-1.44***	-0.70	0.38	1.62
External Market Demand (x10^{-2})	-0.66	-1.91	-1.35	-2.74
Labour Market Variables:				
Unemployment Rate (x10^{-2})	-2.00***	-0.79	2.31	-2.12
Real Wage Rate (x10^{-2})	-1.62	-0.12	-13.31**	0.88
Real Wage Rate Dummy	-6.54***	-6.87***	-9.80**	-4.29**
Cost Variables:				
Corporate Income Tax Rate (x10^{-2})	-1.10***	-1.12***	-1.59	-3.71***
Motorway Density (x10^{-2})	0.70	3.02***	2.64	1.84
Political Risk (x10^{-2})	0.18	0.44	5.90***	-0.21
Education Variables:				
Higher Education (x10^{-2})	-0.34	1.95**	8.61**	-1.61
Secondary Education (x10^{-2})	0.11	-0.07	3.63	0.24
Trade Variables:				
Openness to Trade (x10^{-3})	2.96*	-2.18	-1.44	-0.69
Real Exchange Rate (x10^{-2})	-0.52**	-0.19	3.41***	0.48
Real Exchange rate volatility (x10^{-3})	-1.99***	0.16	-20.90	-1.15
EU Terms:				
EU Structural Funds (x10^{-5})	-3.04***	-0.73	-4.83	0.22
Eurozone Country (x10^{-1})	2.79***	-0.01	-1.02	3.21*
EU Commitment (x10^{-1})	2.93***	4.38***	-7.95*	3.08
EU Membership (x10^{-1})	2.18***	2.07*	-1.02	-1.42
EU Post-membership (x10^{-1})	-2.94***	-1.66***	-3.01*	-1.05
Source Variables, FDI_{it-1} (x10^{-3}):				
Europe	1.03***	-0.19	2.73	2.28***
North America	0.46	-0.66	-1.49	0.03
BRICS	6.57***	5.03***	3.24	10.47***
Other	0.29	1.16	-4.69	-0.76
Number of Observations	421,600	270,925	34,700	89,875
Number of Cases	16,864	10,837	1,388	3,595
Log likelihood	-46,455.29	-25,045.19	-2,923.41	-8,644.00

Notes: Location choice for different number of projects from different sources in 25 countries over 1998 to 2010. Estimation is using the Conditional Logit model. Country fixed-effects are included throughout. 10^{-2} means coefficients need to be multiplied by 10^{-2} and so on. * = 10%, ** = 5% and *** = 1% significance level.

In order to explore whether there is the significant difference in coefficients when FDI from different sources are considered, the Chow test can be used to discuss this issue, where the null hypothesis is that coefficients of different models keep the same between different portions (i.e. different sources in this thesis). The testing results are shown in Table 7.4 below.

Table 7.4: Chow Test for Comparing Coefficients in Table 7.3

LR (Chow) Test	I	II	III	IV
	Full Sample	Europe and BRICS	Europe and North America	North America and BRICS
χ^2	4096.62	945.52	3042.50	295.19
Prob > χ^2	0.0000	0.0000	0.0000	0.0000

Notes: Column I compares the difference in coefficients of all four columns in Table 7.3 based on the full sample. Columns II to IV compare the difference in any two of four columns.

All positive values of χ^2 and significant probabilities in Columns I to IV of Table 7.4 indicate that the null hypothesis is rejected regardless of considering all source regions together or considering any two of them. This means that coefficients are not the same in columns of Table 7.3. Thus, it is necessary to consider FDI projects from these global regions separately. Therefore, the results for different source regions (i.e. columns in Table 7.3) are now briefly discussed in turn.

Europe: Column V shows that the effect of most country variables on this FDI is consistent with that for all investments (column II, Table 7.1), reflecting its importance in the overall number of investments (i.e. 16,864 out of 32,684 investments). The GDP growth rate, external market demand and motorway density are not significant factors, which is probably because most of this FDI in the EU-25 comes from the EU-25 itself and in particular the EU-15 (see Chapter 5). However, the exchange rate and openness to trade are important, which is because some countries are not Eurozone members and the extent of openness of CEEC-10 countries is lower than that of EU-15 countries. The other variables are similar to that of column II of Table 7.1 and so are discussed above.

North America: This investment has special characteristics that reflects the highly-developed and advanced technology of the US economy. Column VI shows that investment from North America is not influenced by the population density and factors such as distance to the core European market (external market demand), nor the unemployment rate. What is important is a high level of higher education. Furthermore, because the US dollar is one of the most important world currencies, the effects of exchange rate volatility and Eurozone country on the location of North American FDI are insignificant. The significant effect of motorway density shows that this FDI is attracted by better physical infrastructure.

BRICS: Overall, column VII of Table 7.3 shows that relatively few of the country variables are important for BRICS FDI location in the EU-25. Fewer significant variables mean that BRICS FDI is only interested in part of all factors considered in the regression analysis. This may reflect its heterogeneity as the individual BRICS countries are quite different. The main location factors are the GDP growth rate (a positive effect on FDI), wage rate (negative), political risk (positive), higher education (positive) and exchange rate (i.e. positive coefficient means more BRICS FDI in a country where the domestic currency has appreciated). Other terms are largely insignificant. This is broadly consistent with the literature, as in Chapter 3 I showed that market access and knowledge-seeking motives are two of the main reasons for BRICS FDI. The large estimated coefficients on the risk and exchange rate terms may indicate that there is correlation between these (possibly other terms), which is shown in Section 5.5.2 of Chapter 5 (the data chapter). However, similar significant effects are found below for these, although smaller in magnitude. Overall, these results suggest that FDI from the BRICS seeks low labour costs and a high-skilled workforce, but distance to the core European market within the EU and the transport road network are unimportant, as are the various political events such as EU membership. It perhaps suggests that on the whole this investment is not market-seeking.

Other: Investment from elsewhere has different characteristics, reflecting its heterogeneity, so that most of the country location factors are insignificant. Column VIII shows that there are only four country variables that have significant effects on its location of FDI: GDP per capita, GDP growth rate, the income tax rate and exchange rate volatility.

7.3.2. Lagged FDI Terms

In terms of the lagged level of FDI from the different global source regions, Table 7.3 shows that there is very little persistence in FDI location from the same source. Of the four global regions only FDI from Europe follows foreign investment from the same global region in the previous year, but otherwise the terms are insignificant. This suggests that investment tends to locate between different countries over the study period, and this includes the BRICS as a whole. It possibly reflects FDI heterogeneity, even when disaggregated by the four global regions. Again, the only real pattern to emerge from the FDI_{it-1} terms is that they suggest the BRICS investment is a good predictor of investment from the other global source regions a year later. The large estimates on this term possibly reflects the fact that BRICS investment is relatively small (i.e. 1,388 out of a total of 32,684 investment projects).

One interpretation of this result is that BRICS investment has been leading the trend of global investment, suggesting that it may be a 'first-mover'. Column VII of Table 7.3 shows that the location of investment FDI from the Other source in the preceding year cannot predict BRICS investment significantly, so that it is consistent with the results in column II of Table 7.1, where the location decision of global investments is not significantly influenced by Other investment. Column VIII again suggests that Other investment does not follow its own previous investment, which may be due to heterogeneity in this group, but that is predicted by BRICS investment. These issues are now explored for individual BRICS countries.

7.4. FDI Location of the BRICS

Table 7.3 shows that the BRICS investment does not follow the previous investment of any global source region, including the BRICS as a whole. This issue is now explored. Section 7.4.1 disaggregates the lagged BRICS FDI term into its five constituent countries to explore whether BRICS FDI as a whole follows the FDI of any individual BRICS country. This also shows if BRICS FDI as a whole avoids the countries where the BRICS previously invested. Further, to explore whether BRICS FDI follows FDI from the same BRICS country, Section 7.4.2 disaggregates each of the matched lagged FDI variables 'Same BRICS Country' and 'BRICS, excluding the Same Country' for the individual BRICS countries (i.e. it matches FDI in Brazil at year t with that in Brazil at year $t-1$, and so on for each BRICS country). It is able to confirm which specific individual countries' FDI 'follows' the location of its own previous FDI and 'avoids' the location of other BRICS. Finally, Section 7.4.3 repeats the analysis of Section 7.4.2, but it estimates the matched terms for each individual BRICS country. In this latter analysis, I also consider the lagged FDI terms for the previous FDI from the global regions.

7.4.1. 'Follow-the-Leader' Behaviour: All BRICS

Table 7.5 regresses equation (4.48) in Chapter 4 for FDI originating from the BRICS as a whole, but including different measures of the lagged FDI term in each column. Column

IX includes previous FDI from the whole BRICS, while column X disaggregates previous FDI into the five individual BRICS countries. The last three columns in Table 7.5 give the results for the matched lagged FDI terms. The likelihood ratio test can be used to select the better model between Columns IX and X as they have a same basis, but nearly all source variables are insignificant in these two columns, which cannot show any trend on 'follow-the-leader' behaviour for BRICS FDI. This means that these two columns are not a good choice. Thus, Columns XI and XII are introduced to further explore this issue, where Column XII has one more source variable which is significant and also reduces the restriction in Column XI. This indicates that Column XII is better than XI. Finally, in order to avoid considering the effect of FDI from the same BRICS country repeatedly, variable 'BRICS, excluding Same BRICS Country' is included in Column XIII instead of variable 'BRICS' in Column XII. Therefore, Column XIII is the best choice in Table 7.5. The sign and significance of the estimates on the country variables in Table 7.5 are like those previously found for the BRICS investment in column VII of Table 7.3, but sometimes much smaller in magnitude. The EU enlargement term is now significant at the 5% level, but its negative sign suggests that the commitment to enlarge made the CEEC-10 countries less attractive to FDI. This is possibly because investors can now source these markets from the EU-15, so that it reflects risk-averse behaviour of BRICS investors. Otherwise the pattern of results is much the same as that found previously.

Turning to the lagged *FDI* variables, column IX of Table 7.5 considers the preceding year's investments of the BRICS as the only source variable, but it is still insignificant. By disaggregating the BRICS into the five countries, column X shows that BRICS FDI as a whole 'follows' the previous investment of South Africa only. This is significant at the 10% level and it may reflect the fact that South African FDI in the EU-25 is long-standing, not least the UK and other advanced economies, although it is the most recent member state of the BRICS (i.e. join in April 2011).[43] Nevertheless, it is perhaps not wholly convincing to treat South Africa as the 'leader' of BRICS FDI as its total number of projects in the EU-25 is quite small.

[43] Source: http://www.bricsforum.com/2011/04/21/bric-becomes-brics-south-africa-joins-at-sanya/ last accessed: 20th April 2016.

Table 7.5: 'Follow-the-Leader' Behaviour for All BRICS FDI

Dependent Variable: =1 if the project locates in country *i* at time *t*.	All BRICS IX	X	XI	XII	XIII
Country Variables, X_{it-1}:					
Demand Variables:					
Real GDP per capita (x10^{-5})	-4.35	-4.96	-11.72*	-5.98	-5.98
Real GDP Growth Rate (x10^{-2})	6.51**	6.88***	7.65***	6.77***	6.77***
Population Density (x10^{-2})	-0.27	-1.76	4.01*	0.43	0.43
External Market Demand (x10^{-2})	1.84	4.04	-3.91	1.67	1.67
Labour Market Variables:					
Unemployment Rate (x10^{-2})	0.83	0.01	3.94	1.12	1.12
Real Wage Rate (x10^{-1})	-1.71***	-1.49**	-2.02***	-1.94***	-1.94***
Real Wage Rate Dummy	-11.41***	-12.56***	-6.23*	-11.21***	-11.21***
Cost Variables:					
Corporate Income Tax Rate (x10^{-2})	-1.39	-1.68	0.22	-0.83	-0.83
Motorway Density (x10^{-2})	1.74	1.04	1.36	1.46	1.46
Political Risk (x10^{-2})	5.49***	4.97**	7.17***	5.55***	5.55***
Education Variables:					
Higher Education (x10^{-2})	8.26**	8.51**	6.29*	7.96**	7.96**
Secondary Education (x10^{-2})	2.87	2.61	-1.11	2.58	2.58
Trade Variables:					
Openness to Trade (x10^{-3})	-4.64	-7.05	1.28	-4.47	-4.47
Real Exchange Rate (x10^{-2})	3.21**	3.37**	4.15***	3.31**	3.31**
Real Exchange rate volatility (x10^{-2})	-2.06	-2.56	-2.25	-2.35	-2.35
Policy Terms:					
EU Structural Funds (x10^{-5})	-9.06	-13.09**	-6.59	-8.68	-8.68
Eurozone Country (x10^{-1})	-4.77	-6.21	-4.69	-4.76	-4.76
EU Commitment (x10^{-1})	-8.77**	-8.69**	-9.78**	-9.15**	-9.15**
EU Membership (x10^{-1})	-0.69	-1.51	0.16	-0.83	-0.83
EU Post-membership (x10^{-1})	-3.21*	-3.14*	-2.54	-3.07*	-3.07*
Source Variables, FDI_{it-1} (x10^{-2}):					
BRICS	0.05	-	-	-1.59***	-
Brazil	-	-5.92	-	-	-
Russia	-	-3.56	-	-	-
India	-	1.04	-	-	-
China	-	-0.16	-	-	-
South Africa	-	7.57*	-	-	-
Same BRICS Country	-	-	3.26***	3.76***	2.17***
BRICS, excluding Same BRICS Country	-	-	-	-	-1.59***
Number of Observations	34,700	34,700	34,700	34,700	34,700
Number of Cases	1,388	1,388	1,388	1,388	1,388
Log likelihood	-2,925.31	-2,920.91	-2,882.09	-2876.51	-2876.51

Notes: Location choice for FDI projects from the BRICS across 25 countries over 1998 to 2010. Estimation is using the Conditional Logit model. Country fixed-effects are included throughout. 10^{-2} means coefficients need to be multiplied by 10^{-2} and so on. * = 10%, ** = 5% and *** = 1% significance level.

7.4.2. 'Follow-the-Leader' Behaviour: Matched BRICS

Column XI aims to determine whether BRICS investors follow the investment pattern of previous investors from the same source country, so that it matches the individual investment for each BRICS country to that all investment projects from the same BRICS country in the same host country in the previous year. The final two columns consider whether BRICS investors locate where there is a high level of FDI from their own source country and from the BRICS as a whole. The latter term is measured in two ways, so that column XII includes all BRICS FDI including the same source country and column XIII includes all BRICS FDI excluding the same BRICS source country. In order to avoid considering the effect of FDI from the same BRICS country repeatedly, variable 'BRICS, excluding Same BRICS Country' is a better choice. Table 7.5 is a re-estimation of the regression shown in column VII of Table 7.3, but including a breakdown of the lagged BRICS FDI and excluding the other global regions.

Column XI shows a positive and significant effect for the BRICS term, which suggests a strong 'follow-the-leader' effect for the BRICS countries. It is in contrast to the insignificant lagged BRICS FDI term in column VII of Table 7.3, suggesting that it is investment from the same BRICS country that matters, and not the investment from the BRICS as a whole.

Column XII of Table 7.5 also includes the term for total BRICS investment in the previous year, for which a negative and significant estimate is obtained. These suggest that investment from the same BRICS country in the previous year increases FDI in the current year, but that from elsewhere in the BRICS actually leads to a lower level of FDI from that country, where each is significant at the 1% level. This implies that FDI from the BRICS is not complementary. The net own-country FDI location effect is given by the difference in the estimates in column XII, so that, for example, for China it is as follows:

$$FDI = 3.76(China) - 1.59(Brazil + Russia + India + China + South\ Africa), \quad (7.1)$$

which gives:

$$FDI = 2.17(China) - 1.59\ (Brazil + Russia + India + South\ Africa). \quad (7.2)$$

Equation (7.1) will indicate whether the gross effect for China and the BRICS as a whole are each significantly different from zero, but it does not reveal whether the net own-country FDI location effect for China is significantly different from zero in equation (7.2). To examine this, column XIII of Table 7.5 introduces a new variable 'BRICS, excluding Same BRICS Country', and this reveals that the net own-country FDI location effect is in fact significant at the 1% level. Thus, Table 7.5 shows that BRICS FDI follows the investment from the same BRICS country, but that it avoids FDI from the other BRICS.

However, it does not confirm whether there is a leader country and how these inter-relate, so that this is now explored.

7.4.3. 'Follow-the-Leader' Behaviour: Individual BRICS

This section investigates the relationship between the BRICS investment in further details to examine the extent of the relationship between BRICS FDI and whether it follows investment from any particular BRICS country. It involves extending the estimation in column XII in Table 7.5 to examine how the estimated coefficients on the BRICS terms in this regression vary between the individual BRICS countries. These results are given in Table 7.8. I now briefly explain the nature of the lagged FDI terms, but before discussing the estimation results for these, I first discuss those for the country variables.

First of all, for ease of comparison, column XIV of Table 7.8 replicates the results from column XIII of Table 7.5. Column XV then disaggregates the 'Same BRICS Country' variable into the five individual BRICS countries to examine which of these countries FDI follows their own previous investment. For example, the variable 'Same Brazil' in Table 7.8 is defined as the variable 'Same BRICS Country' multiplied by a dummy variable for Brazil, which links the previous and current Brazilian investments only and measures the effects of the previous Brazilian FDI only. On the same basis, column XVI disaggregates the variable 'BRICS excluding Same BRICS Country' to determine whether in addition to following their own previous investments they avoid locations where other BRICS countries invest. For completeness, the non-BRICS three global regions (Europe, North America and the Other region) are also added in column XVII to explore the effects of their previous FDI and the changes caused by them in the 'follow-the-leader' behaviour. There is no doubt that Table 7.8 must include all of these columns to explore 'follow-the-leader' behaviour more and more deeply, but there should be a most preferred model among them. In this sense, the likelihood ratio test is used again to select the best model among these columns, and testing results are shown in Table 7.6 below.

Table 7.6: Likelihood Ratio Test for Comparing Columns in Table 7.8

Likelihood Ratio Test	I	II	III
	Columns XIV & XV in Table 7.8	**Columns XV & XVI in Table 7.8**	**Columns XVI and XVII in Table 7.8**
df (Number of Restrictions)	4	4	3
χ^2	13.12	16.12	4.96
Critical Value	9.49	9.49	7.81

Note: This test is based on the 5% significant level.

Columns I and II of Table 7.6 show that values of χ^2 are greater than the critical values at the 5% significant level. It means that restrictions of Columns XIV and XV in Table 7.8 are rejected, which indicates that Column XV in Table 7.8 is better than Column XIV, while Column XVI is also preferred compared with Column XV. However, when three global source regions are considered in Column XVII, the testing result shows that restrictions of Column XVI cannot be rejected, which means that Column XVI is still better than XVII. Therefore, variables 'Same BRICS Country' in Column XIV and 'BRICS excluding Same BRICS Country' in Column XV should be disaggregated to explore 'follow-the-leader' behaviour of BRICS countries' FDI, and Column XVI in Table 7.8 shows the most reliable results.

According to this, details for marginal effects and signs and significance of coefficients are discussed in the following. However, the Hausman test for the Independence of Irrelevant Alternatives (IIA) assumption shows that when Estonia, Germany, Poland or Slovakia is dropped, there is not a significant change in the probability of location choice (i.e. Data meet the IIA assumption). When other countries are dropped by one at each time, the value of Chi2 is negative, which means that model fitted on these data fails to meet the asymptotic assumptions of the Hausman test. Therefore, we cannot confirm whether or not the data meet the IIA assumption, which is a caveat of the regression analysis. The testing results are shown in Appendix Table 7.1 in Appendix B.

Table 7.7: Marginal Effects of 'Follow-the-Leader' Behaviour for Individual BRICS FDI

Dependent Variable: =1 if the project locates in country i at time t.	BRICS			
	XIV	XV	XVI	XVII
Country Variables, X_{it-1}:				
Demand Variables:				
Real GDP per capita	-1.16	-1.03	-0.97	0.05
Real GDP Growth Rate	0.18***	0.19***	0.19***	0.16**
Population Density	0.53	-0.37	-0.77	0.30
External Market Demand	0.59	0.90	1.06	-0.33
Labour Market Variables:				
Unemployment Rate	0.09	0.05	0.03	0.16
Real Wage Rate	-2.60***	-2.50***	-2.50***	-1.93**
Real Wage Rate Dummy	-2.58***	-2.71***	-2.81***	-2.35**
Cost Variables:				
Corporate Income Tax Rate	-0.23	-0.35	-0.40	-0.48
Motorway Density	0.24	0.26	0.31	0.49
Political Risk	4.34***	4.47***	4.53***	4.94***
Education Variables:				
Higher Education	1.62**	1.63**	1.68**	1.74**
Secondary Education	1.26	1.07	1.00	1.39
Trade Variables:				
Openness to Trade	-0.34	-0.38	-0.31	0.01
Real Exchange Rate	3.13**	3.22***	3.23***	3.43***
Real Exchange rate volatility	-0.20	-0.20	-0.19	-0.20
Policy Terms:				
EU Structural Funds	-0.11	-0.13*	-0.15**	-0.09
Eurozone Country	-0.20	-0.2.5	-0.24	-0.07
EU Commitment	-0.77**	-0.78**	-0.76**	-0.69*
EU Membership	-0.07	-0.09	-0.09	-0.11
EU Post-membership	-0.46*	-0.46*	-0.48*	-0.44*
Source Variables, FDI_{it-1}:				
BRICS Country, FDI_{it-1} (x10^{-2}):				
Same BRICS Country	3.94***	-	-	-
Same Brazil	-	0.05	0.13	0.13
Same Russia	-	-0.37	0.07	0.08
Same India	-	2.43***	2.39***	2.64***
Same China	-	1.08**	0.70	0.91
Same South Africa	-	0.17*	0.08	0.09
All other BRICS Countries excluding the Same Country, FDI_{it-1} (x10^{-2}):				
Excluding same BRICS country	-5.64***	-4.30**	-	-
Excluding Brazil	-	-	-0.54**	-0.46**
Excluding Russia	-	-	-1.27***	-1.14***
Excluding India	-	-	-1.05	-0.68
Excluding China	-	-	-0.91	-0.51
Excluding South Africa	-	-	0.01	0.07
Global Source, FDI_{it-1}:				
Europe	-	-	-	0.17*
North America	-	-	-	-0.06
Other	-	-	-	-0.05
Number of Observations	34,700	34,700	34,700	34,700
Number of Cases	1,388	1,388	1,388	1,388
Log likelihood	-2876.51	-2869.95	-2861.89	-2859.41

Notes: Location choice for FDI projects from the BRICS in the EU-25 countries over 1998 to 2010. Estimation in this table is using the Conditional Logit model. Country fixed-effects are included throughout. 10^{-2} means coefficients need to be multiplied by 10^{-2} and so on. Marginal effect is $(1-P_i)\beta$ if x_i is logged or $(1-P_i)\beta x_i$ if x_i is unlogged. * = 10%, ** = 5% and *** = 1% significance level.

Table 7.8: 'Follow-the-Leader' Behaviour for Individual BRICS FDI

Dependent Variable: =1 if the project locates in country i at time t.	**BRICS**			
	XIV	**XV**	**XVI**	**XVII**
Country Variables, X_{it-1}:				
Demand Variables:				
Real GDP per capita (x10^{-5})	-5.98	-5.31	-4.98	0.24
Real GDP Growth Rate (x10^{-2})	6.77***	6.98***	7.08***	6.05**
Population Density (x10^{-2})	0.43	-0.30	-0.62	0.24
External Market Demand (x10^{-2})	1.67	2.54	2.98	-0.93
Labour Market Variables:				
Unemployment Rate (x10^{-2})	1.12	0.62	0.36	1.98
Real Wage Rate (x10^{-1})	-1.94***	-1.86***	-1.86***	-1.44**
Real Wage Rate Dummy	-11.21***	-11.75***	-12.21***	-10.18**
Cost Variables:				
Corporate Income Tax Rate (x10^{-2})	-0.83	-1.27	-1.48	-1.76
Motorway Density (x10^{-2})	1.46	1.58	1.88	2.99
Political Risk (x10^{-2})	5.55***	5.72***	5.80***	6.32***
Education Variables:				
Higher Education (x10^{-2})	7.96**	8.05**	8.28**	8.57**
Secondary Education (x10^{-2})	2.58	2.20	2.05	2.85
Trade Variables:				
Openness to Trade (x10^{-3})	-4.47	-5.00	-4.16	0.14
Real Exchange Rate (x10^{-2})	3.31**	3.41***	3.42***	3.63***
Real Exchange rate volatility (x10^{-2})	-2.35	-2.43	-2.27	-2.33
Policy Terms:				
EU Structural Funds (x10^{-5})	-8.68	-10.79*	-12.01**	-7.19
Eurozone Country (x10^{-1})	-4.76	-5.89	-5.71	-1.76
EU Commitment (x10^{-1})	-9.15**	-9.28**	-8.99**	-8.14*
EU Membership (x10^{-1})	-0.83	-1.13	-1.13	-1.42
EU Post-membership (x10^{-1})	-3.07*	-3.11*	-3.22*	-2.99*
Source Variables, FDI_{it-1}:				
BRICS Country, FDI_{it-1} (x10^{-2}):				
Same BRICS Country	2.17***	-	-	-
Same Brazil	-	4.17	10.81	10.48
Same Russia	-	-5.92	1.21	1.34
Same India	-	2.99***	2.94***	3.25***
Same China	-	1.18**	0.77	1.00
Same South Africa	-	12.73*	5.65	6.75
All other BRICS Countries excluding the Same Country, FDI_{it-1} (x10^{-2}):				
Excluding same BRICS country	-1.59***	-1.21**	-	-
Excluding Brazil	-	-	-2.09**	-1.80**
Excluding Russia	-	-	-2.55***	-2.29***
Excluding India	-	-	-0.85	-0.55
Excluding China	-	-	-0.68	-0.38
Excluding South Africa	-	-	0.03	0.31
Global Source, FDI_{it-1} (x10^{-3}):				
Europe	-	-	-	3.31*
North America	-	-	-	-1.86
Other	-	-	-	-4.85
Number of Observations	34,700	34,700	34,700	34,700
Number of Cases	1,388	1,388	1,388	1,388
Log likelihood	-2876.51	-2869.95	-2861.89	-2859.41

Notes: Location choice for FDI projects from the BRICS in the EU-25 countries over 1998 to 2010. Estimation in this table is using the Conditional Logit model. Country fixed-effects are included throughout. 10^{-2} means coefficients need to be multiplied by 10^{-2} and so on. * = 10%, ** = 5% and *** = 1% significance level.

The magnitude of marginal effects in Table 7.7 represents the percentage change in the probability of location choice from the percentage change in an explanatory variable when other things keep constant. Marginal effects can be directly compared across models, and the signs and significance of coefficients are further discussed in terms of Table 7.8.

Country Variables

In general, all of the columns of Table 7.8 show similar results to those of Table 7.5 when the different source variables are considered. These two tables show that the BRICS investment is interested in only some of the host country characteristics that are considered by the global investors, and the effects of these characteristics on BRICS FDI have a similar sign to those of the global FDI (in Table 7.1). It can be seen that the individual BRICS are interested in one or two country variables in each of all variable groups, such as the GDP growth, lower wages, lower political risk and a depreciation of domestic currency. These are consistent with the discussion in earlier sections, although the exchange rate has the opposite effect on BRICS investment compared to investors more generally.

Table 7.8 suggests that a greater higher education rate is associated with a greater importance of the wage rate for BRICS investment. Most EU terms could affect the location choice of BRICS investments significantly except for membership of the EU and the Euro. This is because most BRICS investments are located in the UK, which is not a member of the Eurozone, while the UK has been a member of the EU throughout the study period. It also can be seen that BRICS FDI is discouraged by the EU Structural Funds, which may indicate a weak investment environment and the risks of a more-depressed economy.

Lagged FDI Terms

Column XIV of Table 7.8, which is the same as column XIII in Table 7.5, shows that BRICS FDI follows the location choice of FDI from the same BRICS country in the preceding year, but avoids the location of previous FDI from the other BRICS countries. In order to identify which BRICS countries follow their own previous investment, column XV disaggregates the variable ‘Same BRICS Country’ into the five individual BRICS countries. It reveals that India, China and South Africa are the countries that follow their own previous investment, but that it is insignificant for Brazil and Russia. Again, column XV shows that the FDI of each BRICS avoids the location of the other BRICS countries when taken as a whole.

To identify which individual countries avoid the location of the other BRICS FDI, column XVI introduces five variables that disaggregate the variable ‘BRICS, excluding Same Country’ for each BRICS country (e.g. when the investor is Brazil, ‘BRICS excluding Brazil’ includes the previous FDI in the same country from Russia, India, China and South Africa). Column XVI shows which individual BRICS countries not only follow their own previous investment, but avoid the other BRICS countries. India is now the country that follows its own investment, but it can be seen that each BRICS country avoids the location of the other four countries except for South Africa, although it is significant for Brazil and Russia only. Column XVII shows that there are no changes in the ‘follow-the-leader’ behaviour across the five individual countries when the preceding year investments of the three global regions are also included. It shows that when the full specification of the model is considered, Europe FDI has a strong effect on the location of BRICS FDI.

Overall, Table 7.8 shows that there is no single BRICS country that simultaneously follows its own investment and avoids the FDI of the other four BRICS countries. Nevertheless, when taken as a whole the results suggest that India, China and South Africa follow their own investment, while Brazil and Russia avoid the location of other BRICS countries.

7.5. The Project Characteristics and the Probability of FDI Location

In considering whether BRICS FDI follows or avoids the location of previous BRICS FDI, the analysis has sought to hold the characteristics of the host country constant, but has largely ignored the project heterogeneity, except for the ultimate country of origin of the investment, including the BRICS. In this section a Multinomial Logit framework is used that enables both the project and source country characteristics to be explored. In particular, this section addresses a different question, as it examines the characteristics of the investors from different source countries and how this affects the location choice across the EU-25. It enables the attractiveness of each host country to be examined, so that in very broad terms the results are related to the estimates for the country controls that are obtained above.

Details of the Multinomial Logit approach are discussed in Chapter 4 and the variables are described in Chapter 5. It shows that the number of project characteristics and classes that can be considered is limited, as it requires the construction of large datasets that requires considerable computing power. For example, if FDI is considered according to a single characteristic that has two classes then the size of the dataset doubles, from 32,684 to 65,368 observations, while if there are three characteristics each with two classes it increases eight-fold to 261,472 observations. Further, if there are eight global regions (North America, Europe, five BRICS and Other sources) then there are already 2,091,776 observations!

The investment project characteristics that are considered in this section comprise the industry (manufacturing and other industries), the project function (headquarters / R&D and other functions) and the project investment mode (start-up or expansions and co-locations). The reasons for selecting these are as follows. First, in the case of manufacturing FDI, the motivations for undertaking investment may differ, leading to different location patterns. In fact, the manufacturing sector receives more projects than any other sector, but the number of service projects is also substantial. Table 5.9 in Chapter 5 shows that the share of projects in manufacturing is 54.2% for the EU-15 and 73.6% for the CEEC-10. Second, the function is of interest, as the location patterns may differ between these (Defever, 2012). Investment in headquarters and R&D functions are of interest as they imply high-value projects using high-skilled labour, which may as a result be more embedded in the host country due to substantial sunk costs and provide greater benefits to economic development. Section 6.4.4 shows that both these functions receive a large number of projects. Finally, the location determinants may differ by the investment mode, leading to different FDI location patterns (Basile, 2004). The main type of FDI project in the EU-25 countries is start-ups, so that these are considered separately from expansion and co-location investments, which are combined.

The Multinomial Logit model is now used to explore FDI location in terms of the project characteristics and the source country or global region of the investment. In so doing, it is important to understand the nature of the estimated coefficients, which are as log-odds ratios relative to the base case. Throughout, the UK is the base-case country as it is the major recipient of FDI within the EU-25 (see Figure 5.1 in Chapter 5). Thus, for example, the significant estimate of 0.62 obtained for manufacturing FDI for Austria in Table 7.9 means that the probability that an investment in Austria is in manufacturing is 86% higher relative to the probability that an investment in the UK is in manufacturing, holding the other characteristics measured by the other regressors constant, i.e. $exp(0.62) - 1 = 85.8\%$.

Section 7.5.1 explores the country location of FDI allowing only the project characteristics to vary, i.e. industry, function and investment mode. Section 7.5.2 explores the country location of FDI by allowing only the BRICS countries as the source to vary, i.e. each BRICS country. Finally, Section 7.5.3 allows both the project characteristics and the sources to vary. The main results are presented in Tables 7.9 to 7.11 respectively. These focus on the estimates for the project characteristics and functions for each EU-25 country, so that the estimates for the country variables for these three tables are presented in Appendix Table 7.2. This shows broadly similar estimates are obtained for these, which are consistent with those reported above, so that they are not our main focus in this section.

7.5.1. Project Characteristics

Table 7.9 gives the results from allowing only the project characteristics to vary, reporting the estimated coefficients for each country for manufacturing, headquarters / R&D and start-ups only. It also splits the locations according to whether they are part of the EU-15 or CEEC-10. Overall, it shows some strong differences between the EU-15 and CEEC-10 countries. In general, and relative to the UK in each case, an investment in CEEC-10 is more likely to be in manufacturing compared to the EU-15, but less likely to be in headquarters / R&D, while investments in the CEEC-10 are more likely to be start-ups, reflecting their status as a new location for FDI following their accession to the European Union.

For the manufacturing column, Table 7.9 shows that only Ireland and Luxembourg are less likely to receive FDI projects in the manufacturing sector compared with the UK. All other EU-15 countries are more likely to receive investment in manufacturing, except for the Scandinavian countries, where there is no significant effect. It can be seen that all the CEEC-10 countries are more likely to receive the manufacturing projects than the UK. This is because of their different levels of economic development and economic structure. Within the EU-15, similarly developed countries such as France and Germany are also more likely to receive FDI in manufacturing, reflecting the highly developed service sector in the UK.

Table 7.9: FDI Location Choice for All Sources: Project Characteristics

Model: Multinomial Logit Model
Country Fixed Effects: Yes
Investment Source Variable (FDI_{it-1}): All Source

Host	**Case Variables**		
	Manufacturing	**Headquarters / R&D**	**Start-up**
EU-15			
Austria	0.62***	-0.22**	-0.16*
Belgium	0.47***	-0.85***	-0.22***
Denmark	-0.09	0.44***	0.70***
Finland	0.19	-0.65***	0.28*
France	0.53***	-0.79***	-0.37***
Germany	0.45***	-0.68***	0.41***
Greece	0.73***	-0.81***	1.62***
Ireland	-0.20***	0.28***	-0.46***
Italy	0.20**	-0.75***	0.54***
Luxembourg	-0.45*	-0.10	0.69**
Netherlands	0.24***	-0.31***	0.54***
Portugal	0.91***	-1.84***	-0.17
Spain	0.47***	-0.45***	0.06
Sweden	0.07	-0.30***	0.46***
UK		Base Alternative	
CEEC-10			
Bulgaria	1.17***	-1.70***	0.53***
Czech Republic	1.50***	-1.38***	0.33***
Estonia	0.88***	-2.63***	0.09
Hungary	1.42***	-1.51***	0.01
Latvia	0.59***	-2.84***	1.48***
Lithuania	0.86***	-2.28***	1.10***
Poland	1.27***	-1.65***	0.39***
Romania	1.14***	-1.51***	0.42***
Slovakia	1.82***	-2.23***	0.52***
Slovenia	1.30***	-1.42***	0.27
Number of Observations		817,100	
Number of Cases		32,684	
Log Likelihood		-83,303.11	

Notes: Location choice for 32,684 projects across the EU-25 countries over 1998 - 2010 estimating using the Multinomial Logit model. Coefficients are log-odds ratios relative to the UK base case. Country terms and Country fixed-effects are included, but not shown in the table. * = 10%, ** = 5% and *** = 1% significance level.

In the case of the headquarters / R&D function, Table 7.9 reveals that compared with the UK, only Denmark and Ireland are more likely to receive investment in these functions across the EU-25 countries. According to Chapter 5, projects with headquarters are decision centres that have accounting, management and administration activities. R&D includes fundamental scientific research and those that have a strong relation to the production process. It suggests that an economy with a more-advanced technology and larger production scale is more likely to attract this investment. A start-up is defined as an investment by a firm in a new location. Table 7.9 shows that there is a greater probability of most EU-25 countries receiving this 'greenfield' investment, but this is because the UK has a greater tradition in receiving foreign investment, so that the UK is more likely to receive FDI as re-investment. The other two main host countries show different patterns, as France is less likely to receive start-up investment than the UK, but Germany more so.

7.5.2. The BRICS Countries

The Multinomial Logit model was used to allow the source country to vary between the five BRICS countries and the global regions of Europe and North America. The estimates allowing the coefficients to vary for each BRICS country are reported in Table 7.10, while Table 7.11 shows the estimates allowing both the project characteristics and sources to vary (i.e. the five BRICS countries, Europe and North America). Again, the base for both these tables is the United Kingdom.

Table 7.10 shows that there is a different pattern for the attractiveness of the EU-15 and CEEC-10 host countries for FDI locations, but this might just reflect the differences in the project characteristics analysed in Table 7.9. In the case of Brazilian investment, Table 7.10 shows that it is significantly more likely to go to Portugal and Spain, no doubt because of cultural similarities, but also to Luxembourg and Slovakia. However, it is no more likely to locate in any other EU-25 country compared with the UK. According to the literature review in Chapter 2, language and culture are important drivers of FDI, and of course, Portugal is the former colonial power in Brazil and they share a similar language. Turning to Russia, it can be seen that this investment is more likely to go to Germany and Italy within the EU-15, but that it has a significant greater probability of locating in several of the CEEC-10 countries compared with the UK. These include Estonia, Latvia and Lithuania, which were formerly part of the Soviet Union, plus Bulgaria.

Table 7.10: FDI Location Choice for All Sources: Each BRICS Country

Model: Multinomial Logit Model Country Fixed Effects: Yes Investment Source Variable (FDI_{it-1}): All Sources					
Host	**Case Variables**				
	Brazil	**Russia**	**India**	**China**	**South Africa**
EU-15					
Austria	-0.37	0.72	-2.70***	-2.80***	-1.32
Belgium	0.54	-0.69	-1.02***	-0.24	-0.27
Denmark	-17.54	0.72	-1.09***	-0.38	-18.08
Finland	-17.55	0.86	-0.95*	-1.74*	-18.09
France	-0.45	-0.26	-1.74***	-0.85***	-1.49***
Germany	-0.39	1.00***	-0.81***	0.56***	-0.93**
Greece	-17.57	1.01	-1.50	-0.91	-18.10
Ireland	-17.51	-0.66	-2.71***	-2.09***	-1.11
Italy	-0.53	0.75*	-2.45***	0.08	-18.08
Luxembourg	1.90*	-16.93	-17.82	-17.56	-18.09
Netherlands	-0.15	0.23	-0.97***	-0.17	-0.22
Portugal	2.29***	-16.92	-2.24***	-17.56	-18.09
Spain	1.25***	-0.24	-2.60***	-1.12***	-1.05**
Sweden	-17.54	-0.51	-0.98***	0.04	-18.07
UK	Base Alternative				
CEEC-10					
Bulgaria	-17.53	1.38***	-3.15***	-1.16**	-0.94
Czech Republic	-17.54	0.56	-1.94***	-1.90***	-0.42
Estonia	-17.56	2.19***	-17.81	-17.54	-18.09
Hungary	-17.52	-0.44	-2.22***	-0.85***	-18.07
Latvia	-17.55	2.53***	-17.81	-17.53	0.15
Lithuania	-17.56	2.66***	-2.28**	-17.55	-18.10
Poland	-17.51	-0.58	-1.90***	-2.02***	-1.41*
Romania	-0.79	0.69	-1.75***	-1.61***	-18.09
Slovakia	1.21**	-16.92	-3.17***	-2.59***	-18.09
Slovenia	-17.56	0.85	-17.82	-17.57	-18.10
Number of Observations	817,100				
Number of Cases	32,684				
Log Likelihood	-84,657.61				

Notes: Location choice for 32,684 projects across the EU-25 countries over 1998 - 2010 estimating using the Multinomial Logit model. Coefficients are log-odds ratios relative to the UK base case. Country terms and Country fixed-effects are included, but not shown in the table. * = 10%, ** = 5% and *** = 1% significance level. The interpretation for the coefficients is as a logs-odd ration. Thus, coefficients which equal to -17 for Brazil are the default. It means that these terms have no effect on the probability of location.

Table 7.10 also shows that there is a similar investment pattern between Chinese and Indian FDI. Across all of the EU-25 countries, investments from these two countries are more likely to go to the UK than any other country, except for Chinese investment in Germany. In the case of the CEEC-10, they are nearly always less likely to invest in the same countries, comprising Bulgaria, the Czech Republic, Hungary, Poland, Romania and Slovakia. The only difference is that Indian investment is less likely to go to Lithuania. In the case of the EU-15, Indian and Chinese investment is less likely to locate in France compared to the UK, although Chinese investment is more likely to go to Germany.

Finally, Table 7.10 shows that the UK is the most attractive destination for FDI from South Africa, possibly due to language similarity and cultural heritage. Although most coefficients are negative, generally they are not significant, except for France, Germany, Spain and marginally Poland.

7.5.3. Project Characteristics, BRICS Countries and Global Regions

Table 7.11 allows the probability of location to vary both by sources (i.e. BRICS countries and two global regions) and by project characteristics. It is encouraging that there are not many differences in the relative probabilities for the location choice of FDI projects compared to the two previous tables. In particular, in the case of the project characteristics there are only a few differences in the estimates, with Austria and Sweden now no longer less likely to be a base for headquarters / R&D and Austria, Spain and Slovenia more likely to be a location for start-up FDI.

Compared with the project characteristics, there are more changes in the probabilities for the BRICS countries. Countries that are now more attractive to FDI once these other factors are controlled for include France and Sweden in the EU-15 and Bulgaria and Romania in the CEEC-10, which are the two 2007 entrants to the European Union. Finally, Table 7.11 also presents the results for the global source regions of Europe and North America. These show that North American investment prefers France and Germany to the UK, but the UK is a more favourable location for this investment compared to many of the CEEC-10 countries. On the other hand European investment is less likely to locate in the UK than in any other country.

Table 7.11: FDI Location Choice for All Sources: Project Characteristics and Source Countries / Regions

Model: Multinomial Logit Model
Country Fixed Effects: Yes
Investment Source Variable (FDI_{it-1}): All Source

Host	Case Variables									
	Project Characteristics			BRICS					Global Regions	
	Manufacturing	**Headquarters / R&D**	**Start-up**	**Brazil**	**Russia**	**India**	**China**	**South Africa**	**North America**	**Europe**
EU-15										
Austria	0.58***	0.10	-0.08	0.43	1.63***	-1.74**	-2.04**	-0.45	-0.20	1.66***
Belgium	0.44***	-0.72***	-0.19***	0.67	-0.50	-0.66***	-0.04	-0.07	-0.13	0.61***
Denmark	-0.13	0.64***	0.75***	-15.86	1.09*	-0.87**	-0.10	-16.23	-0.11	0.98***
Finland	0.18	-0.38**	0.35**	-15.89	1.66**	-0.04	-0.93	-16.27	0.12	1.61***
France	0.53***	-0.62***	-0.31***	0.31	0.59*	-0.73***	-0.01	-0.65	0.50***	1.36***
Germany	0.41***	-0.60***	0.41***	-0.16	1.22***	-0.43***	0.74***	-0.57	0.17**	0.61***
Greece	0.75***	-0.60*	1.69***	-15.92	1.72	-0.53	-0.35	-16.31	0.52	1.50***
Ireland	-0.11	0.30***	-0.41***	-15.86	0.27	-1.89***	-1.19**	-0.33	0.95***	0.82***
Italy	0.17**	-0.54***	0.58***	0.19	1.41***	-1.65***	0.75***	-16.26	0.30*	1.36***
Luxembourg	-0.46*	0.08	0.74**	2.29**	-15.29	-16.01	-15.95	-16.27	0.05	0.88**
Netherlands	0.25***	-0.27***	0.56***	-0.05	0.30	-0.81***	-0.15	-0.01	0.14	0.29***
Portugal	0.85***	-1.54***	-0.10	2.76***	-15.30	-1.39*	-15.97	-16.29	-0.52**	1.33***
Spain	0.43***	-0.24***	0.12**	1.66***	0.21	-2.03***	-0.73***	-0.55	-0.10	1.06***
Sweden	0.04	-0.11	0.50***	-15.87	0.07	-0.35	0.63**	-16.25	0.18	1.26***
UK	Base Alternative									
CEEC-10										
Bulgaria	1.15***	-1.33***	0.61***	-15.91	2.73***	-1.44	0.06	0.68	0.32	2.34***
Czech Republic	1.44***	-1.15***	0.40***	-15.89	0.66	-1.45***	-1.97***	-0.11	-0.58***	0.79***
Estonia	0.86***	-2.19***	0.16	-15.92	5.06***	-16.04	-15.98	-16.29	1.56**	3.88***
Hungary	1.37***	-1.26***	0.07	-15.89	0.02	-1.38***	-0.51*	-16.28	-0.29***	1.17***
Latvia	0.57***	-2.38***	1.55***	-15.91	3.93***	-16.03	-15.97	1.97*	0.22	2.56***
Lithuania	0.82***	-1.86***	1.16***	-15.93	3.50***	-1.06	-15.98	-16.30	-0.30	1.91***
Poland	1.24***	-1.39***	0.46***	-15.89	-0.15	-1.09***	-1.72***	-0.75	-0.21**	1.22***
Romania	1.12***	-1.15***	0.50***	0.12	1.67***	-0.43	-0.77	-16.29	-0.12	1.92***
Slovakia	1.76***	-1.95***	0.60***	1.34**	-15.30	-2.49**	-2.58**	-16.32	-0.62***	1.04***
Slovenia	1.29***	-1.07***	0.37*	-15.94	2.22**	-16.06	-16.00	-16.30	0.36	2.30***
Number of Observations	817,100									
Number of Cases	32,684									
Log Likelihood	-81,467.08									

Notes: Location choice for 32,684 projects across the EU-25 countries over 1998 - 2010 estimating using the Multinomial Logit model. Coefficients are log-odds ratios relative to the UK base case. Country terms and Country fixed-effects are included, but not shown in the table. * = 10%, ** = 5% and *** = 1% significance level.

7.6. Conclusions

This chapter explores three questions based on the Conditional Logit and Multinomial Logit models. The first is about the effect of the country variables (i.e. characteristics of host countries) on the location choice of the foreign investors from different global source regions or countries. Sections 7.2 and 7.3 use the Conditional Logit model to discuss this question based on all sources and four regions (i.e. Europe, North America, BRICS and the Other). The second question is whether BRICS investment has a 'follow-the-leader' pattern across the EU-25 locations. To this end, Section 7.4 explores the effects of locational determinants for the BRICS FDI using the same model. Finally, the third question is how FDI from all sources actually locates across the individual EU-25 countries allowing for differences in project characteristics and sources. This is examined in Section 7.5 using a Multinomial Logit model, which looks at the relative attractiveness of countries.

On the first question, the main conclusions are as follows. First, while there are some changes in the effect of the country variables when different FDI lagged terms are considered, most of these have a significant effect on the location choice of FDI from all sources, including the demand variables, unemployment rate and EU terms, such as EU membership. Second, different country variables are relevant for FDI locating in the EU-25 from different global regions. The location choice of European FDI is similar to that of FDI from all sources because most FDI in the EU-25 countries come from these countries. However, EU membership is not so important for FDI from the other three global regions. Third, BRICS FDI is attracted by only some of the country variables, including the economic growth rate, real wage rate and higher education level. This differs to FDI from all sources, which may be because BRICS has a different level of economic development compared to Europe and North America.

On the second issue, the chapter finds that FDI from all sources prefers locations that are associated with previous investment from Europe and the BRICS, where China is the leader for global FDI across all BRICS countries. When FDI from different global regions is considered, each region has a different pattern with respect to previous investment. Locations with European FDI attract FDI from Europe and the rest of the world (i.e. the Other region). However BRICS FDI as a whole is 'followed' by the investments of all global regions, excluding itself. When the BRICS outward FDI is disaggregated by the individual BRICS countries I find that BRICS FDI 'follows' FDI from the same BRICS country in the preceding year, but it 'avoids' the location of previous FDI from the other four BRICS countries as a whole. When these results are disaggregated for individual BRICS countries, the signs on these effects are almost uniformly consistent with this, although not always significant.

Finally, on the third question, when controls are included for project characteristics and sources, there are significantly different probabilities of FDI from each global region and the BRICS countries locating in each EU-25 countries compared with the base case, which is the UK. In virtually all cases, investment projects are more likely to be located in the UK, which is the main location for FDI in the EU-25 countries. With regards to the BRICS, some heterogeneity is again apparent. Brazilian investment strongly avoids the CEECs, while this region is a strong attraction for Russian FDI owing to its historical ties. Likewise, Brazilian FDI is strongly attracted to Spain and Portugal, and Indian and South African FDI to the UK (although differences in the latter case are not significant), owing to historical and language ties. Chinese FDI tends to favour locations in north-western Europe, mainly larger industrialized countries such as France, Germany and the UK.

Overall, this chapter finds evidence for 'follow-the-leader' behaviour of BRICS, and this suggests that there is distinctiveness in its investment behaviour. Possible explanations for this behaviour are considered in Chapter 9, which concludes the thesis. Before this, count data models are used in Chapter 8 to further explore the location of individual BRICS countries. The chapter examines whether consistent results can be obtained for the 'follow-the-leader' behaviour in this chapter, as well as for the effects of the country variables.

Chapter 8. Count Data Analysis

8.1. Introduction

This chapter aims to explore the locational determinants of the FDI projects locating in the EU-25 countries and originating from the BRICS countries. Again, it considers whether there is evidence of 'follow-the-leader' behaviour, whereby FDI from a BRICS country locates in the same country as earlier FDI originating either from the same or other BRICS countries, whether taken singly or as a whole. This potentially provides evidence of linkages between investments and investigates whether the investment climate in some countries or certain project characteristics are more favourable to FDI arriving from certain BRICS. This chapter also considers whether investment from one BRICS country locates away from other BRICS investment, suggesting that it reflects different location determinants. For these purposes, this chapter uses models of count data analysis, i.e. data on the number of FDI projects that locate in a country in a particular year. These models are different to the logit approach that was used in Chapter 7, but the results of these two chapters are subsequently compared.

The basic econometric technique used in this chapter is a log-linear regression of the FDI project count data. However, as there are many zero investments from the BRICS in some countries (and in the early years of the study period in particular), other count data models are used, such as the Negative Binomial (NB), Poisson, Hurdle, Zero-Inflated and Zero-Truncated models. This chapter considers FDI from the BRICS countries only, whereas in Chapter 7 all investments were considered, regardless of the global source region from which they came. In order to facilitate the comparison of the results with the estimates in Chapter 7, the explanatory variables of this chapter are basically the same as those that were used earlier. The signs and significance of coefficients are discussed in details based on all above models, but marginal effects are only considered for the main results in Table 8.11 based on ZINB model as it is the most preferred model for my data, which is also discussed in this chapter.

The structure of the chapter is as follows. Section 8.2 uses a log-linear model and OLS estimation to give the benchmark results. According to Chapter 6, most BRICS FDI in the EU-25 countries is in manufacturing, so this chapter also investigates the location choice of BRICS FDI projects in this sector.[44] To explore the issue of 'follow-the-leader' behaviour in FDI location, a new variable is introduced for BRICS FDI arising from countries other than the BRICS country that is under consideration, which is similar to Chapter 7. Section 8.3 uses the Poisson and NB models to investigate the locational determinants of BRICS FDI in the EU-25.

To deal with the issue of zero investments, more advanced methods are used in Section 8.4 based on all BRICS FDI only. First, this section considers the Hurdle and Zero-Inflated versions of the Poisson and NB models, estimated on the entire BRICS dataset. These models analyse the location choice of FDI in two stages: in the first stage, factors are explored that determine FDI location in a particular country; and in a second stage, the effects of different locational determinants are explored. These determinants are the same in both stages in the Hurdle model, but the Zero-Inflated model allows for differences in these between the two stages. Second, Section 8.4 drops the zero investment observations from the data and uses the Zero-Truncated Poisson (ZTP) and NB (ZTNB) models to compare with the results based on the whole dataset. Section 8.5 uses the approaches of Section 8.4 to investigate the FDI location for individual BRICS countries, both for all and manufacturing FDI. Conclusions are drawn in Section 8.6.

8.2. Benchmark Results for BRICS FDI Location

This section investigates the effect of the locational determinants of BRICS FDI in the EU-25 countries over the whole study period. The FDI data are lagged, which means that for the years 1998 to 2010 there are 325 observations rather than 350 observations. The dependent variable in this chapter is measured by the number of FDI projects from a BRICS country or countries in an EU-25 country i in year t (FDI_{it}). This is different to the dummy variable that was used in the logit analysis in Chapter 7. This dependent variable captures the number of projects from all BRICS countries going to country i in year t. The BRICS lagged FDI term (FDI_{it-1}) captures the number of projects in the same country i but for the previous year $t-1$. Of course, in considering the project counts one

[44] For simplicity, according to the discussion of Chapter 5, the number of FDI projects in manufacturing is combined with the relatively small number of projects in the energy and construction sector.

difficulty is the large number of zero observations. Table 8.1 shows the number of zero and non-zero observations for BRICS FDI projects in the EU-25 countries for 1997-2010 as a whole, but also for the 325 observations used here.

Table 8.1: Zero and Non-Zero BRICS FDI in EU-25 Countries

BRICS Country	All Observations (1997 - 2010)			325 Observations (1998 - 2010)		
	Non-Zero (cases)	**Zero (cases)**	**Non-Zero / All (%)**	**Non-Zero (cases)**	**Zero (cases)**	**Non-Zero / All (%)**
Brazil	39	311	11.1%	38	287	11.7%
Russia	98	252	28.0%	96	229	29.5%
India	104	246	29.7%	102	223	31.4%
China	107	243	30.6%	105	220	32.3%
South Africa	50	300	14.3%	45	280	13.9%
All BRICS	**197**	**153**	**56.3%**	**189**	**136**	**58.2%**

Note: Number of years for which there are a non-zero and zero number of projects for each country.

The table reveals that the proportion of non-zero projects from each BRICS country over the whole period is less than 35%. China has the largest percentages of non-zero observations, at 32.3% when the shorter period 1998-2010 is considered. The table suggests that the zero observations account for larger share than the non-zero observations (i.e. around two-thirds of observations on FDI counts are zeros), which can lead to problems in estimating the Poisson and NB models, as explained below.

To address the problem of the zero observations, two-stage models are subsequently used (i.e. the Hurdle and Zero-Inflated models). However, in order for these models to work, I find it is necessary to drop the country fixed-effects in the second stage of estimation. This is possibly because these terms are not identified when included in both stages of the regression. Therefore, to capture the effect of country fixed-effects (i.e. larger countries tend to get more FDI in each year) I include the real GDP to replace the country fixed-effects. For consistency, the country fixed-effects are replaced by real GDP in all of the tables presented in the body of the text, while I consider the implication of this in the Appendix Tables.

In addition to the country fixed-effects, I try to include time fixed-effects, although these appear to experience the same problem as the country fixed-effects in the count models. As a consequence, in order to contain time fixed-effects as many as possible, all of them are generally included in the regressions, but some or all of them have to be dropped in the second stage of the regression. To summarise, time fixed-effects are included in the OLS, Poisson and NB models, but other count data models exclude them to obtain results for certain BRICS countries. In order to show that these fixed effects do not impact too much on the estimates of the variables, I again include tables of results with or without these two kinds of fixed effects in the Appendices.

This section uses OLS estimation of a log-linear model of FDI counts. It is divided into three parts. The first part provides the benchmark estimates on the location determinants. The second part explores BRICS FDI in manufacturing only, and the third part introduces a new source variable to analyse the 'follow-the-leader' behaviour. Like the lagged FDI term, all of the country variables are lagged one year.

8.2.1. All BRICS Investment: Log-Linear Model

A log-linear model and OLS estimation is used to give benchmark results on the effects of the locational determinants and the BRICS lagged FDI terms. Since Table 8.1 shows that there are many zero investments by the BRICS in the EU-25, the dependent variable and BRICS lagged FDI terms are measured by the log of the original number of projects plus one, i.e. $\ln(FDI_{it}+1)$ and $\ln(FDI_{it-1}+1)$ respectively. This transformation avoids the problem caused by the zero investments. Notwithstanding the zeros, it reduces the variation in the absolute change of the number of FDI projects, so that it possibly weakens the significance of the results.

Table 8.2 gives the results from the log-linear OLS regression with robust standard errors[45]. Each regression has the same country variables, but whereas each of these includes the real GDP term and time fixed-effects, for the reason outlined above they do not include the country fixed-effects. Columns I to VI show the results based on the different source variables. Column I considers the effect of all BRICS investments in the preceding year in the same host country and columns II to VI consider the effects of previous investments from each BRICS country. In order to examine the effects of the omitting the country fixed-effects, Appendix Table 8.1 gives the results that are based on the OLS estimation including all of the country and time fixed-effects, but excluding the real GDP term. R^2 in this table suggests that China and India provide much better fit to the model, which indicates that they should be estimated separately. However, there is a greater efficiency from estimating the five BRICS countries jointly.

[45] The robust standard errors contribute to make standard deviation is insensitive to heteroscedasticity that could exist in the model. Thus, it is used here for heteroscedasticity.

Table 8.2: BRICS FDI Location: Log-Linear Model (Each BRICS)

Dependent Variable: $ln(FDI_{it}+1)$ in country i at time t.	All BRICS	Brazil	Russia	India	China	South Africa
	I	II	III	IV	V	VI
Country Variables, X_{it-1}:						
Demand Variables:						
Real GDP (x10^{-6})	0.70***	0.01	0.25***	0.20*	0.44***	0.15**
Real GDP per capita (x10^{-5})	-1.24**	-0.55	-0.71*	-0.35	-0.18	-0.40
Real GDP Growth Rate (x10^{-3})	16.50	-2.65	15.70*	-0.05	14.70*	-1.47
Population Density (x10^{-3})	1.25	-1.33**	-0.58	2.03***	-0.36	1.71***
External Market Demand (x10^{-2})	1.42***	0.38	0.07	0.98**	-0.01	0.93***
Labour Market Variables:						
Unemployment Rate (x10^{-2})	-0.80	0.28	-1.30*	-0.75	0.72	-1.01**
Real Wage Rate (x10^{-2})	1.38**	-0.09	0.29	0.08	1.13***	-0.33
Real Wage Rate Dummy (x10^{-1})	1.03	-0.61	1.14	1.07	0.40	0.65
Cost Factors:						
Corporate Income Tax Rate (x10^{-3})	-4.81	-0.78	-6.16	-2.07	2.63	-4.74
Motorway Density (x10^{-3})	-7.55	6.90	3.37	-13.80***	3.87	-12.30***
Political Risk (x10^{-3})	15.90**	-1.05	4.78	10.60*	2.35	7.53**
Education Variables:						
Higher Education (x10^{-3})	5.09	-1.10	8.32**	7.30*	-4.72	6.81**
Secondary Education (x10^{-3})	-12.30***	-4.31*	3.85*	-4.08	-4.85	-5.42***
Trade Variables:						
Openness to Trade (x10^{-3})	-1.84	-0.54	-0.77	-1.79	1.17	-1.00
Real Exchange Rate (x10^{-3})	1.59	-1.67	3.23	4.33	-6.27*	4.33*
Real Exchange rate volatility (x10^{-4})	7.45**	-1.05	3.45	5.34*	0.35	2.86
Policy Terms:						
EU Structural Funds (x10^{-5})	-1.32	1.68	2.64	0.34	-4.17**	-0.63
Eurozone Country (x10^{-2})	-33.30***	6.42	4.85	-12.60	-19.70**	2.15
EU Commitment (x10^{-2})	-18.40	-5.50	11.80	-11.60	-8.99	-2.17
EU Membership (x10^{-2})	3.10	-7.44	12.90	12.40	-21.80	6.56
EU Post-membership (x10^{-2})	-14.70	-1.36	-18.60**	-3.58	4.84	-4.73
Source Variables, $ln(FDI_{it-1}+1)$ (x10^{-2}):						
All BRICS	38.70***	-	-	-	-	-
Brazil	-	12.54	5.22	20.30**	12.60	7.70
Russia	-	-9.05	5.41	9.95	0.98	1.14
India	-	19.60***	1.96	32.80***	27.80***	9.61**
China	-	1.67	10.30*	30.30***	30.00***	5.30
South Africa	-	6.62	18.90**	4.99	9.10	4.59
Constant (x10^{-1})	-9.75	6.36	-6.42	-12.62*	2.74	-7.24*
Number of Observations	325	325	325	325	325	325
R^2	0.79	0.40	0.43	0.78	0.80	0.52
Time fixed-effects	YES	YES	YES	YES	YES	YES
Country fixed-effects	NO	NO	NO	NO	NO	NO

Notes: Location choice of FDI projects across EU-25 countries over 1998-2010. OLS estimation with robust standard errors. * = 10%, ** = 5% and *** = 1% significance level.

Explanatory Variables

In general, column I of Table 8.2 shows that there are not as many significant variables for all BRICS FDI compared to those for FDI from all sources in Table 7.1 of Chapter 7. However, most of the significant variables have the same sign as in Table 7.1 and some of them continue to be significant at the 1% level. It gives us some confidence regarding the results, and it means that the BRICS investors are interested only in some characteristics of the host countries.

With regard to the demand variables, Table 8.2 shows that larger economies, as measured by GDP, attract significantly more BRICS FDI, but with the exception of Brazilian FDI. This is supported by previous studies such as Janicki *et al.* (2004) and Jadhav (2010), who show that larger real output attracts more FDI. The coefficient on GDP per capita has a negative sign across all five countries, but it is significant only for all BRICS and for Russia, which indicates that their investments prefer locations with lower per capita income. The real GDP growth rate and population density are significant for several BRICS countries. Thus, Russia and China are interested in locations with higher economic growth rate, while India and South Africa prefer locations with higher population density. This is in contrast to Brazilian investment, which prefers the less-populated countries. A positive sign on external market demand means that FDI prefer locations close to the core of European market, as discussed in Chapter 7, but it is significant for India and South Africa only.

Turning to the labour market variables in Table 8.2, the unemployment rate and real wage rate are significant for one or two countries only. This may be because most BRICS FDI projects are located in France, Germany or the UK, which suggests that BRICS investors are interested in the size of the internal market at the expense of any other factors. Regarding the cost factors, the BRICS prefer countries with lower company tax rate, although the effects are insignificant. Chapter 7 finds that motorway density has a positive effect on location, although here it is strongly negative and significant for FDI from India and South Africa. It is possible that this term captures other factors, such as congestion. The positive and significant effect of risk in columns I, IV and VI indicates that investments from all BRICS, India and South Africa prefer locations with lower risks, even though the risks are comparatively low for all the EU-25 countries.

The effects of the education variables on BRICS investment are different from those on other global investment. Table 7.1 shows that higher education is always insignificant and secondary education is positive and significant when different source variables are included. However, Table 8.2 shows that all BRICS and each individual country are not interested in secondary education, and that they may even avoid locations with better secondary education. Nevertheless, Russia, India and South Africa prefer locations with better higher education rates, which indicates that they prefer locations where the labour force has ‘higher skills’, rather than ‘middle skills’, which are required by investors from all sources (in Table 7.1).

With regard to the trade variables, Table 8.2 shows that there are the unexpected signs for these variables, although it is generally for at most a single BRICS country, so that overall I can conclude that the BRICS are not as interested in these international trade factors as are the investors from all sources. In particular, the exchange rate volatility should be negative, so that a more stable exchange rate attracts more FDI inflows, but it is significant for India only. The openness to trade, which is insignificant for each BRICS country, should be positive, which indicates that a higher degree of openness prompts more FDI inflows. While the effect of the exchange rate should be negative, so that a country is unattractive to FDI when the domestic currency appreciates, but it is positive and significant for South Africa.

Several EU policy terms are considered in the analysis of BRICS investments in the EU-25. Compared with Table 7.1, an obvious difference is that all five EU policy terms are significant for all investors in Table 7.1, but Table 8.2 shows that only Russia and China are interested in any of these, and indeed may be deterred (e.g. Chinese investment is repelled by the EU Structural Funds and Euro currency membership). A possible reason for this, as discussed in Chapter 7, is that the Structural Funds contribute to less-developed areas and may signal a depressed economy. Further, membership of the Euro is meant to reduce transaction costs and exchange rate risks, but the negative sign of this dummy variable may be due to the fact that most FDI from China is located outside the Eurozone and in the UK, so it captures other effects. The negative and significant effect of the post-membership dummy on Russian FDI indicates that it decreases after EU accession. Table 8.2 shows that the EU membership of the CEECs does not make these countries more attractive for BRICS FDI either in the run-up or afterwards.

The Lagged FDI Term

The lagged number of FDI projects is also used to explore ‘follow-the-leader’ behaviour, like in Chapter 7. Column I of Table 8.2 includes the preceding year’s investment from all BRICS as an explanatory variable, and it shows that BRICS investment ‘follows’ its own previous investment (i.e. the term is positive and significant at the 1% level), whereas in column IX of Table 7.5 it is insignificant. In order to check the robustness of the result in column I of Table 8.2, and to further explore the ‘leader’ hypothesis for BRICS countries, the lagged investment of each individual country is introduced in columns II to

VI. Each column shows a tendency to follow one or more countries' investments. India and China appear to play a role as 'leaders' for FDI from the BRICS countries. Indian FDI is 'followed' by other Indian investment, but also by FDI from Brazil, China and South Africa in the following year. Chinese FDI also shows significant inertia and is 'followed' by Russian and Indian FDI. Brazilian and South African FDI is 'followed' by FDI from one other BRICS country only (India and Russia respectively), while no BRICS investors seem to 'follow' Russian FDI.

Appendix Table 8.1 explores the same issue, but with country fixed-effects instead of the real GDP term. This table shows that there are no substantial changes in the results for the lagged FDI terms, except for South Africa where the own-country term is negative and significant. This is perhaps a perverse result and it is considered further below. Overall, Table 8.2 shows that the BRICS countries prefer EU-25 country locations in which previous FDI from the BRICS has located. At the individual BRICS country level, this is the case for China and India, and these can be regarded as BRICS 'leaders' as FDI from other BRICS countries tends to follow them. The analysis shows some BRICS countries 'avoid' the EU-25 country locations of other BRICS countries, so that these investments are distinct.

8.2.2. BRICS FDI Location: Log-Linear Model with a New Lagged FDI Term

This section further explores the 'follow-the-leader' behaviour of investors by measuring the number of FDI projects originating from the other BRICS countries using a single variable only, potentially reducing any collinearity between the lagged FDI terms in Table 8.2. This variable captures whether the FDI of each BRICS country follows or avoids the investments of the other BRICS countries. It is included for each BRICS country, and for the BRICS as a whole, where in the former case the lagged variables count the number of projects originating from the same BRICS country and from the other four BRICS countries locating in the same country in the previous year. Table 8.3 gives the regression results for the log-linear model using OLS.

Table 8.3: BRICS FDI Location: Log-Linear Model (All BRICS)

Dependent Variable: $ln(FDI_{it} + 1)$ in country i at time t.	All BRICS	Brazil	Russia	India	China	South Africa
	I	II	III	IV	V	VI
Country Variables, X_{it-1}:						
Demand Variables:						
Real GDP (x10^{-6})	0.70***	0.05	0.35***	0.36***	0.52***	0.20***
Real GDP per capita (x10^{-5})	-1.24**	-0.50	-0.78**	-0.44	-0.28	-0.43
Real GDP Growth Rate (x10^{-3})	16.50	-0.56	16.50*	3.60	17.20**	0.57
Population Density (x10^{-3})	1.25	-0.85	-0.23	1.76**	0.26	1.82***
External Market Demand (x10^{-2})	1.42***	0.60*	0.32	1.07**	0.41	1.05***
Labour Market Variables:						
Unemployment Rate (x10^{-2})	-0.80	0.27	-1.44*	-0.67	0.41	-1.05**
Real Wage Rate (x10^{-2})	1.38**	-0.12	0.26	0.25	1.02**	-0.31
Real Wage Rate Dummy (x10^{-1})	1.03	-0.45	1.35	1.08	0.67	0.72
Cost Factors:						
Corporate Income Tax Rate (x10^{-3})	-4.81	0.26	-6.44	-1.75	2.27	-4.52
Motorway Density (x10^{-3})	-7.55	3.25	0.37	-12.40**	-1.21	-13.30***
Political Risk (x10^{-3})	15.90**	1.17	7.00	11.03	5.85	8.53**
Education Variables:						
Higher Education (x10^{-3})	5.09	-1.09	9.43**	6.71*	-2.79	6.96***
Secondary Education (x10^{-3})	-12.30***	-6.10**	1.69	-6.41*	-7.49**	-6.59***
Trade Variables:						
Openness to Trade (x10^{-3})	-1.84	-0.84	-0.87	-1.55	0.36	-1.18
Real Exchange Rate (x10^{-3})	1.59	-2.51	3.54	1.56	-6.65**	3.19
Real Exchange rate volatility (x10^{-4})	7.45**	-0.26	3.83	5.41*	1.74	3.35*
Policy Terms:						
EU Structural Funds (x10^{-5})	-1.32	1.21	2.01	-1.12	-4.32**	-1.03
Eurozone Country (x10^{-2})	-33.30***	2.35	2.65	-16.10	-24.00***	-0.35
EU Commitment (x10^{-2})	-18.40	-9.24	11.50	-10.90	-12.10	-3.49
EU Membership (x10^{-2})	3.10	-8.68	10.80	6.04	-19.80	5.70
EU Post-membership (x10^{-2})	-14.70	0.71	-19.10**	-4.33	4.52	-4.60
Source Variables, ln (FDI_{it-1} + 1) (x10^{-2}):						
All BRICS	38.70***	-	-	-	-	-
Brazil	-	20.70*	-	-	-	-
Russia	-	-	9.85	-	-	-
India	-	-	-	51.60***	-	-
China	-	-	-	-	46.70***	-
South Africa	-	-	-	-	-	11.50
BRICS, excluding the same country	-	9.95***	7.85	13.90**	11.40**	7.12**
Constant (x10^{-1})	-9.75	5.03	-7.87	-10.07	0.81	-7.01
Number of Observations	325	325	325	325	325	325
R^2	0.79	0.35	0.41	0.75	0.78	0.51
Time fixed-effects	YES	YES	YES	YES	YES	YES
Country fixed-effects	NO	NO	NO	NO	NO	NO

Notes: Location choice of FDI projects across EU-25 countries over 1998-2010. OLS estimation with robust standard errors. * = 10%, ** = 5% and *** = 1% significance level.

Compared with Table 8.2, there are few changes in the effects of the country variables. Table 8.3 shows that most BRICS countries are attracted by the economic size of the host country, external market demand and its education level, but they are not interested in EU policy terms. Again, Chinese investment is repelled by the EU Structural Funds and Eurozone membership, while Russian investment falls significantly post-membership.

The lagged FDI terms also show similar results to those in Table 8.2, as all individual BRICS countries follow their own previous investment significantly, but except for Russia and South Africa. However, Table 8.3 also shows that BRICS investors from each country are attracted by the previous investment from other BRICS countries. This is similar to Table 8.2, where each country follows several or all other four individual countries' FDI. This is not opposite to the results of Chapter 7 as Table 7.8 shows that most individual countries cannot avoid the location of other four countries significantly and it does not show which specific country is avoided by others. Appendix Tables 8.2 and 8.3 also explore 'follow-the-leader' behaviour with and without the fixed effects. The results are similar to those in Table 8.3, but again except for South Africa in Appendix Table 8.2, whose investors do not prefer the location of previous South African FDI. This is opposite to the results of Table 8.3 and main conclusion of Chapter 7, which shows that individual BRICS countries prefer to follow the location of their own previous FDI. This further illustrates that it is reasonable to use GDP instead of country fixed effects.

Overall, Tables 8.2 and 8.3 (and the two appendix tables) based on the OLS estimation find consistent results that each BRICS country prefers to follow its own previous FDI. However, Table 8.2 suggests that they do not avoid all locations of FDI that arises from the other four BRICS countries, and Table 8.3 indicates that they even follow the location of FDI from other four countries when these are considered as a group. In this sense, F-test is used to compare the difference between the columns for the same BRICS country in Tables 8.2 and 8.3. Testing results are shown in Table 8.4 below.

Table 8.4: F-Test for Comparing Columns of Tables 8.2 and 8.3

F-Test	I	II	III	IV	V
	Brazil	**Russia**	**India**	**China**	**South Africa**
V_1	298	298	298	298	298
V_2	26	26	26	26	26
F-test Value	0.96	0.40	1.56	1.15	0.24
Critical Value	1.69	1.69	1.69	1.69	1.69

Notes: The test is based on the 5% significant level. V_1 = number of observations – number of regressors. V_2 = number of regressors – 1.

Table 8.4 shows that F-test values for all BRICS countries are less than the critical values at the 5% significant level, which means there is not significant difference between the columns for the same BRICS country in Tables 8.2 and 8.3. However, Table 8.3 considering FDI from other four countries as a whole shows that nearly all BRICS countries not only follow its own previous investment, but also follow other four countries' investment as a whole significantly, excluding Russia. This means that Table 8.3 cannot show the difference in 'follow-the-leader' behaviour among BRICS countries. Therefore, results in Table 8.2 are preferred and there is a greater efficiency from estimating the five BRICS countries jointly in this table.

8.2.3. BRICS Manufacturing FDI Location: Log-Linear Model

According to Chapter 6, most BRICS FDI projects are located in the manufacturing sector. For the whole BRICS, there are 184 zero observations to all 350 observations for the manufacturing FDI. The number of zero observations for Brazil, Russia, India, China and South Africa is 318, 283, 285, 253 and 316 respectively. This section repeats the analysis of Section 8.2.1, rather than Section 8.2.2 to examine whether the results for BRICS manufacturing FDI are similar to those found for all BRICS FDI. This is because Table 8.2 is more preferred than Table 8.3 as mentioned above. Table 8.5 gives the results for BRICS manufacturing FDI based on OLS estimation of the log-linear model.

For the country variables, Table 8.5 shows the results for manufacturing FDI are similar to those of Table 8.2. First, the demand variables are the main country characteristics to attract FDI from the BRICS, where each individual country is interested in one or two variables in this group. Second, all other groups of country variables do not have significant effects on all BRICS countries, which is similar to that of all FDI from the BRICS. Third, all BRICS countries' manufacturing FDI are still not interested in the rate of corporate income tax and the openness to trade (i.e. insignificant). However, one difference between Tables 8.2 and 8.5 is that all BRICS manufacturing FDI is not affected by political risk, whereas it was attracted by this in Table 8.2. Further, Russian and Indian manufacturing FDI is more sensitive to the EU policy terms, although this is not the case for Brazil and South Africa.

Table 8.5: BRICS Manufacturing FDI Location: Log-Linear Model

Dependent Variable: $ln(FDI_{it}+1)$ in country i at time t.	All BRICS	Brazil	Russia	India	China	South Africa
	I	II	III	IV	V	VI
Country Variables, X_{it-1}:						
Demand Variables:						
Real GDP (x10^{-6})	0.68***	0.04	0.10	0.07	0.49***	0.06
Real GDP per capita (x10^{-5})	-1.04**	-0.64**	-0.57*	0.38	-0.40	-0.31
Real GDP Growth Rate (x10^{-3})	28.67**	-1.32	8.28	5.01	13.32	-2.23
Population Density (x10^{-3})	0.68	-1.33**	-0.30	1.85***	-0.30	1.02**
External Market Demand (x10^{-2})	1.30***	0.45	0.08	0.24	0.37	0.68***
Labour Market Variables:						
Unemployment Rate (x10^{-2})	-0.37	0.42	-1.12*	-0.40	0.63	-0.88**
Real Wage Rate (x10^{-2})	1.28**	0.13	0.23	-0.16	0.99***	-0.17
Real Wage Rate Dummy (x10^{-1})	0.75	-0.65	1.28	0.55	0.71	0.43
Cost Factors:						
Corporate Income Tax Rate (x10^{-3})	-3.11	-1.74	-5.44	-1.66	2.90	-1.24
Motorway Density (x10^{-3})	-4.45	6.98*	2.12	-10.20**	0.30	-8.20***
Political Risk (x10^{-3})	6.97	-2.72	-0.87	4.55	5.07	3.69
Education Variables:						
Higher Education (x10^{-3})	0.36	-1.20	8.35**	3.93	-5.11	4.67**
Secondary Education (x10^{-3})	-12.30***	-4.15**	2.10	-0.35	-6.86**	-2.61*
Trade Variables:						
Openness to Trade (x10^{-3})	-1.17	-0.85	-0.03	-0.39	0.96	-0.97
Real Exchange Rate (x10^{-3})	2.04	-2.17	7.58**	2.84	-5.85*	2.88
Real Exchange rate volatility (x10^{-4})	5.52*	-1.00	1.69	3.28	0.46	0.81
Policy Terms:						
EU Structural Funds (x10^{-5})	-2.03	0.08	3.77**	1.96	-4.10*	-0.13
Eurozone Country (x10^{-2})	-28.90***	5.46	6.35	-7.34	-18.50**	3.00
EU Commitment (x10^{-2})	-21.20	-8.27	15.04	-13.81*	-12.10	2.77
EU Membership (x10^{-2})	-13.90	-1.99	4.07	12.20	-19.90	9.17
EU Post-membership (x10^{-2})	-7.92	-1.27	-15.80**	-3.71	5.45	-6.99
Source Variables, ln (FDI_{it-1} + 1) (x10^{-2}):						
All BRICS	30.23***	-	-	-	-	-
Brazil	-	7.84	-3.42	24.30*	4.87	4.50
Russia	-	-9.89**	-8.66	9.89	3.28	-4.10
India	-	16.60**	6.41	24.80***	26.10***	13.10***
China	-	2.22	11.50**	28.50***	30.60***	2.57
South Africa	-	5.91	-0.43	9.04	12.04	6.55
Constant (x10^{-1})	-3.04	8.19*	-5.50	-7.68	0.82	-4.22
Number of Observations	325	325	325	325	325	325
R^2	0.72	0.35	0.28	0.65	0.75	0.40
Adjusted R^2	0.69	0.26	0.18	0.61	0.72	0.32
Time fixed-effects	YES	YES	YES	YES	YES	YES
Country fixed-effects	NO	NO	NO	NO	NO	NO

Notes: Location choice for FDI projects across EU-25 countries over 1998-2010. OLS estimation with robust standard errors. * = 10%, ** = 5% and *** = 1% significance level.

For the lagged FDI terms, Indian and Chinese manufacturing investment follows their own lagged FDI significantly, but the lag is insignificant for Brazil, Russia and South Africa. Each country does not avoid the location of the other four countries' investments significantly, except for that Brazil avoids previous Russian investment. It also can be seen that China and India being the 'leaders' among the five countries. Appendix Table 8.4 uses country fixed-effects instead of real GDP and gives similar results, except for Russia and India. The former avoids locations with its own previous FDI and the latter prefers to follow Chinese investments instead of its own. Overall, regardless of how the previous BRICS investment is measured (Table 8.3) or whether attention is focused on manufacturing (Table 8.5), BRICS FDI appears to be attracted by the same locational determinants in the EU-25 and there is evidence of 'follow-the-leader' behaviour. The results from the OLS estimation are broadly consistent with Chapter 7 as it does not show which specific country is avoided by others.

8.3. BRICS FDI Location: the Poisson and Negative Binomial Models

It is well-known that OLS is more suitable for continuous dependent variables, whereas the Poisson and Negative Binomial (NB) models are generally used for dependent variables that are measured using discrete count data. In this section these other count data approaches are used to repeat the analysis and compare the results with those of the log-linear OLS estimation. In the previous section, the dependent variable is measured by the log of the number of projects plus one, but here the actual number of projects is used as the dependent variable. The signs and significance of coefficients are discussed in following sections, but the marginal effects which can be estimated at the means of regressors and compared directly between models are estimated for the main results in Table 8.11.

8.3.1. Results for the Poisson Model

This sub-section presents the results of the Poisson model, comparing these with those from the OLS estimation of the log-linear model. The Poisson model is set out in Section 4.4.2 and it is estimated using *Stata*. Both the explanatory variables and fixed effects are the same as above, but the difference is that the count of FDI projects is now measured by the actual number of projects, so that there is no need to add one project to FDI_{it} and FDI_{it-1}, and this is the case in following sections. Table 8.6 gives the results for BRICS FDI location using the Poisson model.

It shows that similar results are obtained for the country variables compared to those obtained above from the OLS estimation.[46] Market demand, the labour market variables and education are still the most significant characteristics of the host countries.

[46] In order to make the Poisson regression feasible for Brazil, it is necessary to exclude the time fixed effects for the years 1997 to 2000, but there are few investments from Brazil for these early years.

However, the wage rate becomes significant for more BRICS countries compared with the OLS estimation. It means that these countries prefer locations with a higher wage rate, which may just reflect a greater level of higher education with a more-skilled workforce. Notably, all of the BRICS, except Brazil, are now attracted by at least one of the EU policy terms, so the Poisson regression suggests they play a more important role in attracting BRICS FDI, although the EU enlargement terms are again insignificant in each case.

Table 8.6: BRICS FDI Location: Poisson Model

Dependent Variable: FDI_{it} in country i at time t.	All BRICS	Brazil	Russia	India	China	South Africa
	I	II	III	IV	V	VI
Country Variables X_{it-1}:						
Demand Variables:						
Real GDP ($x10^{-6}$)	1.60^{***}	1.26	0.98^{***}	1.23^{***}	1.98^{***}	1.38^{**}
Real GDP per capita ($x10^{-5}$)	-6.47^{***}	-4.72	-5.95	-13.64^{***}	-12.61^{***}	-5.31
Real GDP Growth Rate ($x10^{-3}$)	49.30^{**}	-67.50	61.80	18.40	113.62^{**}	-83.60
Population Density ($x10^{-3}$)	1.13	-4.57	-1.45	5.10^{**}	-4.03^{*}	8.98
External Market Demand ($x10^{-2}$)	2.25^{***}	6.10^{**}	0.88	3.61^{***}	0.72	7.84^{***}
Labour Market Variables:						
Unemployment Rate ($x10^{-2}$)	-0.33	7.74	-8.39^{**}	-2.05	-1.05	-17.70^{*}
Real Wage Rate ($x10^{-2}$)	5.41^{***}	-7.60	8.00^{**}	13.20^{***}	13.40^{***}	-1.91
Real Wage Rate Dummy ($x10^{-1}$)	-0.66	-17.17	3.80	0.31	-9.31^{*}	-6.61
Cost Factors:						
Corporate Income Tax Rate ($x10^{-3}$)	-23.60^{**}	39.60	-66.00^{**}	-31.10	-37.60	-48.40
Motorway Density ($x10^{-3}$)	0.01	45.40	11.60	-21.70	37.40^{**}	-64.40^{*}
Political Risk ($x10^{-3}$)	48.30^{***}	8.51	-30.60	59.30^{**}	52.10^{**}	33.70
Education Variables:						
Higher Education ($x10^{-3}$)	11.50	-25.60	66.60^{***}	25.60	-33.80^{*}	83.20^{**}
Secondary Education ($x10^{-3}$)	-35.30^{***}	-66.60^{**}	42.80^{***}	-20.40^{**}	-41.80^{***}	-30.90^{*}
Trade Variables:						
Openness to Trade ($x10^{-3}$)	-0.71	-1.32	-6.62	-12.20^{***}	1.18	-3.99
Real Exchange Rate ($x10^{-3}$)	-2.83	47.40	17.40	-14.20	-33.20^{*}	33.03
Real Exchange rate volatility ($x10^{-4}$)	5.76	13.10	-797.93^{**}	60.10	-313.32	24.50
Policy Terms:						
EU Structural Funds ($x10^{-5}$)	-2.94	14.40	25.60^{**}	-8.16	-16.04^{*}	22.20
Eurozone Country	-1.09^{***}	1.63	0.07	-1.25^{***}	-1.77^{***}	0.77
EU Commitment	-0.19	-17.67	0.25	0.04	14.26	0.01
EU Membership ($x10^{-2}$)	19.20	1498.23	-27.70	195.90^{*}	-77.60	127.80
EU Post-membership ($x10^{-2}$)	-32.90^{**}	-155.50	-62.90^{**}	-29.60	13.10	-136.10^{**}
Source Variables, FDI_{it-1} ($x 10^{-2}$):						
All BRICS	0.30	-	-	-	-	-
Brazil	-	-6.72	-9.30	2.05	-7.89	0.65
Russia	-	-39.50^{***}	-13.60^{*}	-3.36	-1.52	-23.99^{*}
India	-	11.20^{***}	-0.85	0.70	0.74	-1.39
China	-	5.74	0.44	-0.18	-0.51	4.68^{*}
South Africa	-	7.94	39.60^{***}	6.04	14.50^{**}	1.54
Constant ($x10^{-1}$)	-0.40	-64.84	-6.12	-35.51	-96.24	-80.77
Number of Observations	325	325	325	325	325	325
Log likelihood	-485.90	-89.18	-216.56	-256.93	-263.50	-114.91
Pseudo R^2	0.80	0.57	0.37	0.79	0.77	0.49
Time fixed-effects	YES	YES	YES	YES	YES	YES
Country fixed-effects	NO	NO	NO	NO	NO	NO

Notes: Location choice for FDI projects across EU-25 countries over 1998-2010. Time fixed-effects for Brazil are from 2001 to 2010. * = 10%, ** = 5% and *** = 1% significance level.

For the lagged FDI terms, the results are markedly different for the Poisson model, and two features stand out in Table 8.5. First, it can be seen that no country follows its own previous investment significantly, and indeed Russian investors are put off by previous Russian FDI. Second, China and India lose their 'leadership' role in most cases. In order to confirm whether there are changes caused by the fixed effects, Appendix Table 8.5 performs the regressions without any fixed effects (i.e. excluding both country and time fixed-effects), but it gives similar results to Table 8.6, particularly regarding the effect of the lagged dependent variables. Overall, the log-linear functional form appears to give a much better fit to the data compared to the Poisson distribution. This is because the FDI data contain a large number of zeros, so it is not distributed as a Poisson. This means that the Poisson is not a particular good model for detecting 'follow-the-leader' behaviour of BRICS FDI in the context of early stage FDI.

Pseudo R^2 is used to evaluate the goodness-of-fit of some logistic and count data models as R^2 does not exist. This is because estimates for these models are not calculated based on minimizing the variance, which means that the OLS approach to goodness-of-fit cannot apply. Pseudo R^2 can be used to evaluate multiple models and predict the outcome on the same dataset, but they cannot be compared across datasets. In this sense, pseudo R^2 reported in tables but without explanation only aims to make tables more complete.

8.3.2. Results for the Negative Binomial Model

This sub-section uses the Negative Binomial model instead, which is discussed in Section 4.4.3. It is a more general model than the Poisson model as it enables us to examine from a statistical point of view whether the Poisson model is suitable, for which the over-dispersion parameter reported by the NB model is used. The Poisson model imposes the restriction that the conditional variance is equal to the conditional mean, but if there is over-dispersion in the FDI count data (i.e. conditional variance is greater than the conditional mean) then the NB model should be used, as it allows for these to differ. However, if the over-dispersion parameter is insignificant, so that the variance equals the mean then there is no loss from using the Poisson model as it gives the same results as that of the NB model.

Table 8.7 shows that the NB results for all of the BRICS are similar to those of Table 8.6. The over-dispersion parameter is significant at the 10% level for all BRICS and it suggests that the Poisson model is inappropriate (i.e. the count data are over-dispersed). However, the results for most individual BRICS countries indicate that the count data are not over-dispersed, so that there is no difference between using the Poisson and NB models. In fact, the results in Table 8.7 for the individual BRICS are identical to those reported in Table 8.6. The exception to this is China, because the time fixed-effects from 1997-2000 are dropped for China in Table 8.7, and the results are different to that of Table 8.6. The over-dispersion parameter for China is also insignificant. Appendix Table 8.6 repeats the NB regressions without either country or time fixed-effects. Data over-dispersion exists for India and China, but similar results are found for both the country variables and lagged FDI terms for each individual BRICS country. Overall, the NB model seems to give the same results as those that were obtained from the Poisson model since the same reason that BRICS FDI data have a large number of zeros. Thus, it is not an improvement.

Table 8.7: BRICS FDI Location: Negative Binomial Model

Dependent Variable: FDI_{it} in country i at time t.	**All BRICS**	**Brazil**	**Russia**	**India**	**China**	**South Africa**
	I	**II**	**III**	**IV**	**V**	**VI**
Country Variables, X_{it-1}:						
Demand Variables:						
Real GDP (x10^{-6})	1.52***	1.26	0.98***	1.23***	2.02***	1.38**
Real GDP per capita (x10^{-5})	-6.68***	-4.72	-5.95	-13.60***	-12.20***	-5.31
Real GDP Growth Rate (x10^{-3})	42.10*	-67.50	61.80	18.40	96.80**	-83.60
Population Density (x10^{-3})	1.14	-4.57	-1.45	5.10**	-3.08	8.98
External Market Demand (x10^{-2})	2.27***	6.10**	0.88	3.61***	0.95	7.84***
Labour Market Variables:						
Unemployment Rate (x10^{-2})	-0.32	7.74	-8.39**	-2.05	-1.24	-17.70*
Real Wage Rate (x10^{-2})	5.97***	-7.60	8.00**	13.20***	12.40***	-1.91
Real Wage Rate Dummy (x10^{-1})	-0.96	-17.17	3.80	0.31	-8.87*	-6.61
Cost Factors:						
Corporate Income Tax Rate (x10^{-3})	-25.10**	39.60	-66.00**	-31.10	-45.30*	-48.40
Motorway Density (x10^{-3})	0.54	45.40	11.60	-21.70	28.80*	-64.40*
Political Risk (x10^{-3})	43.80***	8.50	-30.60	59.30**	60.60***	33.70
Education Variables:						
Higher Education (x10^{-3})	10.50	-25.60	66.60***	25.60	-22.80	83.20**
Secondary Education (x10^{-3})	-34.30***	-66.60**	42.80***	-20.40**	-39.10***	-30.90*
Trade Variables:						
Openness to Trade (x10^{-3})	-1.84	-1.32	-6.62	-12.20***	1.71	-3.99
Real Exchange Rate (x10^{-3})	3.16	47.40	17.40	-14.20	-35.30*	33.03
Real Exchange rate volatility (x10^{-4})	4.91	13.10	-797.92**	60.10	-501.63	24.50
Policy Terms:						
EU Structural Funds (x10^{-5})	-3.01	14.40	25.60**	-8.16	-13.90*	22.20
Eurozone Country (x10^{-2})	-108.50***	163.30	6.86	-124.60***	-158.10***	76.80
EU Commitment (x10^{-2})	-20.40	-1739.40	25.30	4.03	1427.72	1.47
EU Membership (x10^{-2})	15.40	1470.22	-27.70	195.90*	-89.30	127.80
EU Post-membership (x10^{-2})	-34.20**	-155.50	-62.90**	-29.60	16.10	-136.10**
Source Variables, FDI_{it-1} (x10^{-2}):						
All BRICS	0.53	-	-	-	-	-
Brazil	-	-6.72	-9.30	2.05	-6.57	0.65
Russia	-	-39.50***	-13.60*	-3.36	-2.73	-23.99*
India	-	11.20***	-0.85	0.70	0.79	-1.39
China	-	5.74	0.44	-0.18	-0.79	4.68*
South Africa	-	7.94	39.60***	6.04	11.70**	1.54
Constant (x10^{-1})	-2.35	-64.84	-6.12	-35.51	-143.8	-80.77
Number of Observations	325	325	325	325	325	325
Log likelihood	-484.66	-89.18	-216.56	-256.93	-266.06	-114.91
Pseudo R^2	0.33	0.46	0.29	0.41	0.41	0.38
Over-dispersion Parameter (χ^2)	2.47*	0.00	0.00	0.00	0.00	0.00
Time fixed-effects	YES	YES	YES	YES	YES	YES
Country fixed-effects	NO	NO	NO	NO	NO	NO

Notes: Location choice for FDI projects across EU-25 countries over 1998-2010. Time fixed-effects for Brazil and China are from 2001 to 2010. * = 10%, ** = 5% and *** = 1% significance level.

8.4. Methods for Handling Zero FDI Project Counts

So far, it has been found that the log-linear estimation gives results that are broadly consistent with those found in Chapter 7, but that the Poisson and NB models are less likely to show the consistent results. This is possibly because of the large number of zeros in the count data. To further investigate the effect of the lagged FDI terms on BRICS FDI location, this section introduces more advanced methods to analyse the BRICS FDI location. These are based on the discrete count data approaches that allow for the large number of zeros present in the FDI data. Table 8.1 shows that half the countries and years receive no BRICS FDI.

Initially, Hurdle and Zero-Inflated models are used, which are based on a two-stage approach (see Sections 4.4.4 and 4.4.5), but subsequently the zeros are removed using the Zero-Truncated Poisson and NB models (Section 4.4.6). Like in previous sections, the country fixed-effects are replaced by real GDP, while time fixed-effects are dropped from this section. This is due to the limited degrees-of-freedom for BRICS outward FDI, which means that in some cases the regressions do not otherwise yield results at all (as discussed in Section 8.2).

8.4.1. Results for the Two-Stage Models

Table 8.8 gives the results for the locational determinants of BRICS FDI based on the Hurdle and Zero-Inflated models. As discussed in Chapter 4, in both cases, in the first stage a logit analysis is used to find what factors decide the location within a country and year (i.e. 1 = *yes* and 0 = *no*), and in the second stage the Poisson or NB model is used to explore the determinants of BRICS FDI location. In the case of the Hurdle model, the regression variables must be the same in the first and second stages, but in the Zero-Inflated model these variables can differ between stages. After running many regressions for individual BRICS countries, I found that this model works when including real GDP only in the first stage but all the country variables in the second stage and without country or time fixed-effects. This means that the economic size of a host country is used to decide whether the BRICS FDI will be located in a country, and then the host country characteristics determine where FDI goes in the second stage.

Table 8.8: All BRICS FDI Location: Hurdle and Zero-Inflated Models

Dependent Variable: FDI_{it} in country i at time t.	Hurdle Models		Zero-Inflated Models	
	Poisson	Negative Binomial	Poisson	Negative Binomial
	I	II	III	IV
Country Variables, X_{it-1}:				
Demand Variables:				
Real GDP (x10^{-6})	1.62***	1.40***	1.63***	1.45***
Real GDP per capita (x10^{-5})	-5.43***	-8.94***	-4.85***	-6.92***
Real GDP Growth Rate (x10^{-3})	10.50	31.50	-4.09	-2.69
Population Density (x10^{-3})	-0.22	-1.95	0.15	-1.38
External Market Demand (x10^{-2})	1.49***	1.03	2.05***	2.22***
Labour Market Variables:				
Unemployment Rate (x10^{-2})	-4.70*	-5.67*	-5.14**	-5.83**
Real Wage Rate (x10^{-2})	4.50**	10.18***	3.36**	5.96***
Real Wage Rate Dummy (x10^{-1})	-5.52**	-6.51*	-4.98**	-4.85*
Cost Factors:				
Corporate Income Tax Rate (x10^{-3})	-69.30***	-85.80***	-66.20***	-74.30***
Motorway Density (x10^{-3})	5.72	19.80	3.30	15.80
Political Risk (x10^{-3})	-17.30	-22.90	-11.80	-5.51
Education Variables:				
Higher Education (x10^{-3})	62.00***	27.20	66.30***	46.50***
Secondary Education (x10^{-3})	-19.30***	-25.90***	-13.20***	-14.40**
Trade Variables:				
Openness to Trade (x10^{-3})	4.61*	1.87	2.76	-1.36
Real Exchange Rate (x10^{-3})	-0.70	12.80	5.28	17.30*
Real Exchange rate volatility (x10^{-4})	-69.60	101.80	-62.50	-25.50
Policy Terms:				
EU Structural Funds (x10^{-5})	4.30	2.22	4.47	4.81
Eurozone Country (x10^{-2})	-64.70***	-77.80***	-58.20***	-63.50***
EU Commitment (x10^{-2})	49.70	21.10	65.10*	42.10
EU Membership (x10^{-2})	25.10	18.90	13.96	25.80
EU Post-membership (x10^{-2})	-1.16	-9.78	-21.50	-37.60**
Source Variables, FDI_{it-1} (x10^{-2}):				
All BRICS	0.77***	2.22***	0.64**	1.84***
Constant (x10^{-1})	23.42	37.33*	11.40	8.16
Number of Observations	325	325	325	325
Log likelihood	-529.97	-498.70	-552.57	-520.33
Vuong Test (z-value)	N/A	N/A	2.08**	N/A
Time fixed-effects	NO	NO	NO	NO
Country fixed-effects	NO	NO	NO	NO

Notes: Location choice for FDI projects across EU-25 countries over 1998-2010. All country and time fixed-effects excluded throughout. Results for the first stage of these models not shown. For Zero-Inflated model the first stage includes real GDP only. * = 10%, ** = 5% and *** = 1% significance level.

For the country variables, Table 8.8 shows similar results to those of Table 8.2. Real GDP, GDP per capita, nearly all labour market and education variables, the corporate income tax rate and Eurozone membership are significant in each regression. It suggests that these factors attract BRICS FDI to a host country regardless of what method is used for the analysis. For the lagged FDI, the regressions show that there is a significant tendency for BRICS investment as a whole to follow previous BRICS investment, consistent with the results in Table 8.2. Column III shows a significant value of the Vuong test, which indicates that the Zero-Inflated Poisson is more suitable than the simple Poisson model for analysing BRICS investment location.[47]

8.4.2. Results for the Zero-Truncated Models

The Zero-Truncated model drops the zero investments from the regression. The presence of a large number of zero cases can lead to over-dispersion in the data, and this invalidates the assumptions of the Poisson model. Further, it may be that the factors that determine whether a country receives FDI differ to the country characteristics that determine whether a country that gets FDI attracts a large or small positive number of projects, so that the location factors are different. An easy way to deal with this is to drop the zero observations and focus on the second of these. In this case, the coefficients on the country variables do not measure any effect on whether a country receives FDI or not in any particular year. Like Table 8.8, Table 8.9 shows the effects of the same country variables on BRICS FDI location based on the Zero-Truncated models. It also compares these results with those for the simple Poisson and NB models, but where these are regressed for positive (and unadjusted) FDI counts only. Table 8.9 shows that there are 189 observations for each model instead of the 325 observations in the previous tables. All country and time fixed-effects are excluded from these regressions.

For the country variables, the results of Table 8.9 are consistent with those from the Poisson and NB models based on the whole dataset (Tables 8.6 and 8.7). For the lagged FDI terms, the table also shows that the results are similar to these earlier Poisson and NB results. An obvious difference is that BRICS FDI is more attracted by labour market variables based on the Zero-Truncated models than those based on the simple Poisson and NB models. In this sense, Table 8.9 gives us an important finding that the results based only on the positive counts of the investment projects from the BRICS as a whole give similar results to those in Table 8.8 (that uses different methods) and Tables 8.6 and 8.7 (that use the whole dataset). It suggests that inferences about the BRICS FDI location can be based on regressions including the zero investments rather than just the positive investment counts only.

[47] The Vuong test is used to investigate whether there is a significant difference between the standard Poisson and ZIP models. It is not available for the other models in Table 8.8.

Table 8.9: All BRICS FDI Location: Zero-Truncated Models

Dependent Variable: FDI_{it} in country i at time t.	Poisson Model	Negative Binomial Model	Zero-Truncated Models	
			Poisson	Negative Binomial
	I	II	III	IV
Country Variables, X_{it-1}:				
Demand Variables:				
Real GDP ($\times10^{-6}$)	1.37***	1.11***	1.62***	1.40***
Real GDP per capita ($\times10^{-5}$)	-2.99**	-4.11**	-5.43***	-8.94***
Real GDP Growth Rate ($\times10^{-3}$)	3.30	13.50	10.50	31.47
Population Density ($\times10^{-3}$)	-0.06	-1.07	-0.22	-1.95
External Market Demand ($\times10^{-2}$)	1.86***	1.64***	1.49***	1.03
Labour Market Variables:				
Unemployment Rate ($\times10^{-2}$)	-2.72	-2.39	-4.70*	-5.67*
Real Wage Rate ($\times10^{-2}$)	2.06	4.29**	4.50**	10.18***
Real Wage Rate Dummy ($\times10^{-1}$)	-2.62	-2.32	-5.52**	-6.51*
Cost Factors:				
Corporate Income Tax Rate ($\times10^{-3}$)	-54.20***	-53.90***	-69.30***	-85.80***
Motorway Density ($\times10^{-3}$)	3.40	10.26	5.72	19.79
Political Risk ($\times10^{-3}$)	-1.90	0.30	-17.30	-22.90
Education Variables:				
Higher Education ($\times10^{-3}$)	41.20***	18.10	62.00***	27.20
Secondary Education ($\times10^{-3}$)	-14.90***	-17.20***	-19.30***	-25.90***
Trade Variables:				
Openness to Trade ($\times10^{-3}$)	2.87	1.12	4.61*	1.87
Real Exchange Rate ($\times10^{-3}$)	-0.17	10.50	-0.70	12.84
Real Exchange rate volatility ($\times10^{-4}$)	-110.80	-45.60	-69.60	101.80
Policy Terms:				
EU Structural Funds ($\times10^{-5}$)	3.54	2.35	4.30	2.22
Eurozone Country ($\times10^{-2}$)	-47.70***	-46.90***	-64.70***	-77.80***
EU Commitment ($\times10^{-2}$)	20.70	-5.10	49.70	21.05
EU Membership ($\times10^{-2}$)	-5.10	-5.30	25.10	18.88
EU Post-membership ($\times10^{-2}$)	-6.34	-10.33	-1.16	-9.78
Source Variables, FDI_{it-1} ($\times10^{-2}$):				
All BRICS	1.24***	2.51***	0.77***	2.22***
Constant ($\times10^{-1}$)	15.40	13.80	23.40	37.33*
Number of Observations	189	189	189	189
Log likelihood	-429.23	-401.11	-390.03	-358.75
Pseudo R^2	0.74	0.30	0.76	0.26
Time fixed-effects	NO	NO	NO	NO
Country fixed-effects	NO	NO	NO	NO

Notes: Location choice for FDI projects across EU-25 countries over 1998-2010. Poisson and NB models include positive FDI project counts only for comparison. * = 10%, ** = 5% and *** = 1% significance level.

8.5. Results for Individual BRICS Countries

The OLS estimations in Section 8.2 give consistent results to those of Chapter 7, whereas the results based on the Poisson and NB models in Section 8.3 are not consistent. The previous section considers some more-advanced methods for count data analysis. This section aims to use these methods to explore the location choice of investments for each BRICS country, and to compare these with those for the OLS estimation. Similar to Section 8.2, this section also examines the effects of all the country variables and the lagged FDI terms. The first two sub-sections consider different ways of accounting for the lagged FDI terms as used in Section 8.2, while the third sub-section repeats the analysis for manufacturing FDI only.

As pointed out in Section 8.4, the regressions based on the Hurdle and Zero-Truncated models in Tables 8.8 and 8.9 cannot be run for Brazil, even if all the country and time fixed-effects are excluded. This is owing to the large number of zero FDI cases for this country (see Table 8.1). In this section, the Zero-Inflated Negative Binomial (ZINB) model is used to explore FDI location for individual BRICS. It is preferred to the Zero-Inflated Poisson (ZIP) model, as the NB model is more suitable than the Poisson model if the data are over-dispersed, while in the Zero-Inflated models regressed above the first stages are based on identical specifications for the Poisson and NB models. Hence, the ZINB model is used to examine FDI location for the individual BRICS countries, and results are compared with that of log-linear model. This is because BRICS FDI data contain a large number of zeros, so that it is not distributed as a Poisson or NB, and the second stage of ZINB model is based on the NB distribution. Therefore, ZINB model may also cannot give an improvement for exploring 'follow-the-leader' behaviour of BRICS FDI.

8.5.1. BRICS FDI Location: The ZINB Model

Table 8.10 shows the marginal effects of variables which are expressed as the Incidence Rate Ratios (IRRs) in count data models. IRRs is the ratio of x to y, where x is the number of projects when a variable is considered, and y represents the number of projects when it is not considered. Thus, if IRRs equals one, there is no difference in the number of projects in a location. If the estimates of coefficients are negative, then IRRs will be less than one, and conversely. As mentioned, marginal effects can be compared directly across models. Table 8.11 gives the signs and significance of coefficients for BRICS FDI location in the EU-25 based on the ZINB model. Column I reproduces the result for all BRICS FDI in column IV of Table 8.8, while columns II to VI estimate the location effect for each individual BRICS country in turn.

Regarding the country variables, Table 8.11 shows consistent results with those found above. Like column I, which focuses on the investment of all BRICS, it shows that GDP, the labour market and education variables are significant. The results in columns II to VI show that GDP and education are attractive for FDI location in the individual BRICS, but that the different labour market terms have different effects. The GDP per capita and the corporate income tax rate are significant for many BRICS, but the population density is always insignificant and the trade terms are largely insignificant. The other country variables and EU terms are significant for one or two BRICS only. Overall, Table 8.11 shows that broadly consistent estimates are found across the individual BRICS countries.[48]

For the lagged FDI terms, the results in Table 8.11 are also broadly similar to those for the Poisson and NB models in Tables 8.6 and 8.7, with many of these terms are insignificant. There is no clear 'leading-country' for other BRICS countries' investments, but equally there is no BRICS country that seems to be avoided by the other BRICS countries. There is also no tendency for investors to follow their own country's investment, except for the case of the Russian investors, but who seem to avoid the country location of previous Russian FDI, albeit at the 10% significance level. Overall, many variables are insignificant in Table 8.11, which suggests that very few variables are important factors for each of the BRICS investment.

[48] Chow test is also used here to confirm that coefficients in last five columns are not the same. Thus, the five BRICS countries should be considered separately. It is same to the results of Chow test for Table 7.3.

Table 8.10: Marginal Effects for BRICS FDI Location: Zero-Inflated NB Model (Each BRICS)

Dependent Variable: FDI_{it} in country i at time t.	**All BRICS**	**Brazil**	**Russia**	**India**	**China**	**South Africa**
	I	**II**	**III**	**IV**	**V**	**VI**
Country Variables, X_{it-1}:						
Demand Variables:						
Real GDP	1.00^{***}	1.00	1.00^{***}	1.00^{***}	1.00^{***}	1.00^{***}
Real GDP per capita	1.00^{***}	1.00	1.00^{**}	1.00^{***}	1.00^{**}	1.00
Real GDP Growth Rate	1.00	0.91	1.00	1.06^{**}	0.99	0.95
Population Density	1.00	0.99	1.00	1.00	1.00	1.01
External Market Demand	1.02^{***}	1.06^{**}	1.01	1.03^{**}	0.99	1.05^{*}
Labour Market Variables:						
Unemployment Rate	0.94^{**}	1.01	0.90^{**}	0.96	0.93	0.87
Real Wage Rate	1.06^{***}	0.93	1.10^{**}	1.06^{*}	1.07	0.87^{*}
Real Wage Rate Dummy	0.62^{*}	0.09	1.60	1.38	0.41	0.38
Cost Factors:						
Corporate Income Tax Rate	0.93^{***}	0.96	0.92^{***}	0.95^{**}	0.92^{***}	1.02
Motorway Density	1.02	1.09^{*}	1.01	0.99	1.03	0.95
Political Risk	0.99	0.99	0.98	0.98	0.94^{**}	1.06
Education Variables:						
Higher Education	1.05^{***}	0.96	1.07^{***}	1.15^{***}	1.11^{***}	1.15^{**}
Secondary Education	0.99^{**}	0.93^{***}	1.04^{***}	1.01	0.99	0.96^{**}
Trade Variables:						
Openness to Trade	1.00	1.00	0.99	1.00	1.01^{**}	1.01
Real Exchange Rate	1.02^{*}	1.06^{*}	1.01	1.01	1.01	1.02
Real Exchange rate volatility	1.00	1.05	0.96	1.00	0.99	1.00
Policy Terms:						
EU Structural Funds	1.00	1.00	1.00^{**}	1.00	1.00	1.00
Eurozone Country	0.53^{***}	6.52	1.21	0.44^{***}	0.36^{***}	1.76
EU Commitment	1.52	0.00	1.59	0.94	0.40	0.37
EU Membership	1.29	0.36	0.86	5.64	0.86	1.81
EU Post-membership	0.69^{**}	0.08^{**}	0.49^{***}	0.86	0.94	0.39
Source Variables, FDI_{it-1}:						
All BRICS	1.02^{***}	-	-	-	-	-
Brazil	-	0.89	0.97	1.04	1.00	0.88
Russia	-	0.86	0.89^{*}	1.04	0.97	0.95
India	-	1.12^{***}	1.00	1.01	1.00	0.98
China	-	1.01	1.00	1.00	1.01	1.01
South Africa	-	1.35^{**}	1.31^{***}	1.00	0.96	1.05
Constant	2.26	1.02	0.50	0.03	0.00	0.00
Number of Observations	325	325	325	325	325	325
Non-zero Observations	189	38	96	102	105	45
Log likelihood	-520.33	-104.65	-227.19	-267.82	-293.54	-119.85
Time fixed-effects	NO	NO	NO	NO	NO	NO
Country fixed-effects	NO	NO	NO	NO	NO	NO

Notes: Location choice for FDI projects across EU-25 countries over 1998-2010. The first stage of this model includes the real GDP only and the results for this stage are not shown in this table. Dependent variable and BRICS terms measured by the original number of projects. * = 10%, ** = 5% and *** = 1% significance level.

Table 8.11: BRICS FDI Location: Zero-Inflated NB Model (Each BRICS)

Dependent Variable: $\boldsymbol{FDI_{it}}$ in country $\boldsymbol{i}$ at time $\boldsymbol{t}$.	All BRICS	Brazil	Russia	India	China	South Africa
	I	II	III	IV	V	VI
Country Variables, $\boldsymbol{X_{it-1}}$:						
Demand Variables:						
Real GDP (x10^{-6})	1.45^{***}	1.39	1.07^{***}	1.52^{***}	2.38^{***}	2.23^{***}
Real GDP per capita (x10^{-5})	-6.92^{***}	-3.26	-8.71^{**}	-9.08^{***}	-8.46^{**}	-4.53
Real GDP Growth Rate (x10^{-3})	-2.69	-99.10	2.93	62.40^{**}	-10.30	-52.50
Population Density (x10^{-3})	-1.38	-10.70	-1.89	3.45	-2.63	6.26
External Market Demand (x10^{-2})	2.22^{***}	6.25^{**}	1.26	2.55^{**}	-1.27	4.44^{*}
Labour Market Variables:						
Unemployment Rate (x10^{-2})	-5.83^{**}	0.88	-10.90^{**}	-3.69	-7.66	-14.30
Real Wage Rate (x10^{-2})	5.96^{***}	-6.72	9.27^{**}	6.27^{*}	7.07	-13.90^{*}
Real Wage Rate Dummy (x10^{-1})	-4.85^{*}	-23.74	4.69	3.26	-8.80	-9.57
Cost Factors:						
Corporate Income Tax Rate (x10^{-3})	-74.30^{***}	-39.50	-86.50^{***}	-53.98^{**}	-83.30^{***}	17.30
Motorway Density (x10^{-3})	15.80	84.40^{*}	10.30	-13.50	26.80	-51.70
Political Risk (x10^{-3})	-5.51	-9.40	-17.90	-18.60	-66.10^{**}	59.03
Education Variables:						
Higher Education (x10^{-3})	46.50^{***}	-39.30	70.60^{***}	137.66^{***}	102.00^{***}	142.84^{**}
Secondary Education (x10^{-3})	-14.40^{**}	-77.30^{***}	34.80^{***}	8.47	-9.44	-37.10^{**}
Trade Variables:						
Openness to Trade (x10^{-3})	-1.36	2.75	-5.17	-3.48	12.20^{**}	14.10
Real Exchange Rate (x10^{-3})	17.30^{*}	55.50^{*}	12.70	10.30	8.40	23.80
Real Exchange rate volatility (x10^{-4})	-25.50	479.25	-454.87	-12.90	-109.14	5.87
Policy Terms:						
EU Structural Funds (x10^{-5})	4.81	15.70	22.80^{**}	-3.86	-11.20	-6.29
Eurozone Country (x10^{-2})	-63.50^{***}	187.50	19.20	-82.20^{***}	-102.10^{***}	56.30
EU Commitment (x10^{-2})	42.10	-1532.21	46.10	-6.33	1520.73	-98.40
EU Membership (x10^{-2})	25.80	1509.32	-14.98	173.02	-14.50	59.10
EU Post-membership (x10^{-2})	-37.60^{**}	-254.50^{**}	-70.50^{***}	-15.20	-5.74	-94.20
Source Variables, $\boldsymbol{FDI_{it-1}}$ (x10^{-2}):						
All BRICS	1.84^{***}	-	-	-	-	-
Brazil	-	-11.60	-3.50	3.47	-0.16	-13.30
Russia	-	-15.60	-11.70^{*}	4.19	-3.20	-5.44
India	-	11.20^{***}	-0.18	0.83	0.15	-2.12
China	-	1.06	0.41	-0.25	0.64	1.40
South Africa	-	30.10^{**}	27.40^{***}	0.24	-4.40	4.45
Constant (x10^{-1})	8.16	0.19	-6.96	-35.28	-98.09	-81.57
Number of Observations	325	325	325	325	325	325
Non-zero Observations	189	38	96	102	105	45
Log likelihood	-520.33	-104.65	-227.19	-267.82	-293.54	-119.85
Time fixed-effects	NO	NO	NO	NO	NO	NO
Country fixed-effects	NO	NO	NO	NO	NO	NO

Notes: Location choice for FDI projects across EU-25 countries over 1998-2010. The first stage of this model includes the real GDP only and the results for this stage are not shown in this table.[49] Column I in this table is same to the column IV in Table 8.8. Dependent variable and BRICS terms measured by the original number of projects. * = 10%, ** = 5% and *** = 1% significance level.

Undoubtedly, the smaller samples do not help as they are likely to produce larger standard errors. As such, the issue of 'follow-the-leader' behaviour is further explored in Table 8.12, which replaces the lagged investment of each individual BRICS in Table 8.11 with

[49] The ZINB model allows different variables to be considered in the two stages. The rationale for choosing GDP is that different variables were tried, but when only the GDP term is included in the first stage, the regression can be run and shows the results.

a single variable that is for the lag of FDI for all BRICS countries but excluding the FDI of the own country.

Table 8.12: BRICS FDI Location: Zero-Inflated NB Model (All BRICS)

Dependent Variable: FDI_{it} in country i at time t.	All BRICS	Brazil	Russia	India	China	South Africa
	I	II	III	IV	V	VI
Country Variables, X_{it-1}:						
Demand Variables:						
Real GDP ($x10^{-6}$)	1.45^{***}	1.25	1.22^{***}	1.56^{***}	2.33^{***}	2.06^{***}
Real GDP per capita ($x10^{-5}$)	-6.92^{***}	0.70	-6.07^{*}	-8.81^{**}	-8.20^{**}	-5.49
Real GDP Growth Rate ($x10^{-3}$)	-2.69	-63.40	2.00	61.30^{**}	-9.55	-45.70
Population Density ($x10^{-3}$)	-1.38	-6.99	1.13	3.68	-2.72	5.40
External Market Demand ($x10^{-2}$)	2.22^{***}	6.10^{**}	1.42	2.64^{**}	-1.38	4.64^{*}
Labour Market Variables:						
Unemployment Rate ($x10^{-2}$)	-5.83^{**}	-0.30	-9.58^{**}	-3.76	-7.82	-12.95
Real Wage Rate ($x10^{-2}$)	5.96^{***}	-8.55	6.82^{**}	5.84	6.95	-11.40^{*}
Real Wage Rate Dummy ($x10^{-1}$)	-4.85^{*}	-29.72^{**}	4.64	3.63	-9.35	-7.62
Cost Factors:						
Corporate Income Tax Rate ($x10^{-3}$)	-74.30^{***}	-32.70	-68.50^{***}	-52.30^{**}	-81.20^{***}	4.62
Motorway Density ($x10^{-3}$)	15.80	62.30	-6.12	-15.50	27.40	-45.30
Political Risk ($x10^{-3}$)	-5.51	-65.60	-21.10	-20.96	-71.30^{**}	83.20^{*}
Education Variables:						
Higher Education ($x10^{-3}$)	46.50^{***}	-19.80	74.20^{***}	142.41^{***}	102.21^{***}	115.49^{**}
Secondary Education ($x10^{-3}$)	-14.40^{**}	-94.10^{***}	25.05^{**}	9.52	-8.05	-35.90^{**}
Trade Variables:						
Openness to Trade ($x10^{-3}$)	-1.36	2.52	-5.26	-3.35	12.20^{**}	11.90
Real Exchange Rate ($x10^{-3}$)	17.30^{*}	54.60	16.80	9.46	6.17	28.20
Real Exchange rate volatility ($x10^{-4}$)	-25.50	1362.99^{**}	-289.35	-67.40	-74.20	27.95
Policy Terms:						
EU Structural Funds ($x10^{-5}$)	4.81	10.30	20.40^{**}	-3.26	-11.70	-5.13
Eurozone Country ($x10^{-2}$)	-63.50^{***}	81.70	-1.10	-81.30^{***}	-99.40^{***}	55.50
EU Commitment ($x10^{-2}$)	42.10	-1409.72	55.40	-6.25	1680.70	-91.20
EU Membership ($x10^{-2}$)	25.80	1447.44	-1.98	171.50	-14.30	67.80
EU Post-membership ($x10^{-2}$)	-37.60^{**}	-209.40^{**}	-71.80^{***}	-15.03	-5.14	-101.40
Source Variables, FDI_{it-1} ($x10^{-2}$):						
All BRICS	1.84^{***}	-	-	-	-	-
Brazil	-	-1.22	-	-	-	-
Russia	-	-	-9.55	-	-	-
India	-	-	-	0.54	-	-
China	-	-	-	-	0.73	-
South Africa	-	-	-	-	-	3.01
BRICS, excluding the same country	-	4.05^{**}	0.25	0.26	-0.27	-0.30
Constant ($x10^{-1}$)	8.16	39.74	-14.65	-34.65	-108.80	-99.52^{*}
Number of Observations	325	325	325	325	325	325
Non-zero Observations	189	38	96	102	105	45
Log likelihood	-520.33	-109.37	-231.03	-268.21	-293.78	-120.76
Time fixed-effects	NO	NO	NO	NO	NO	NO
Country fixed-effects	NO	NO	NO	NO	NO	NO

Notes: Location choice for FDI projects across EU-25 countries over 1998-2010. The first stage of this model includes the real GDP only and the results for this stage are not shown in this table. Dependent variable and BRICS terms are measured by the original number of projects. * = 10%, ** = 5% and *** = 1% significant level.

Table 8.12 gives similar results for the country variables to those of Tables 8.3 and 8.11, with GDP, labour market and education variables significant both for all BRICS investments and for at least some of the individual countries. On the lagged FDI term, column I of Table 8.12 shows that there is a tendency for BRICS investment to follow previous BRICS investment in aggregate at the 1% significance level. However, in all other columns, the lagged FDI terms are insignificant, except for Brazil, which seems to follow the investment of the other BRICS countries significantly. Overall, the results for the lagged FDI terms may be weak as most of them are insignificant, so that it does not offer support for the results in Section 8.2.

8.5.2. BRICS Manufacturing FDI Location: The ZINB Model

As service and manufacturing FDI may locate differently, then to allow for the heterogeneity this section focuses on manufacturing investment only. According to Chapter 6, most BRICS FDI is in the manufacturing sector. Broadly, this section repeats the analysis of Table 8.11 using the ZINB model, but for manufacturing FDI only. The results are given in Table 8.13. In general, China has the most non-zero observations, but there are still many zeros. For South Africa, there is nearly not any point in the estimating models.

For the country variables, Table 8.13 shows that broadly similar results are obtained to those of Table 8.11, with the exception of the GDP per capita and secondary education terms. Table 8.11 shows that GDP per capita has significant effects on FDI from Russia, India and China, but in Table 8.13 it is significant for Russia only. In the case of education, Table 8.11 shows that Brazil, Russia and South Africa are attracted by secondary education, which is in addition to a significant effect for higher education in most BRICS. However, in the case of manufacturing FDI, Table 8.13 shows that secondary education is quite unimportant (there is a significant, but negative effect for Brazil), while higher education is important for Russia, India and China only. It suggests that manufacturing FDI from the BRICS is more attracted by higher education compared to all BRICS' FDI, so that 'higher' skills rather than 'moderate' skills seem to be more important for manufacturing FDI.

For lagged FDI terms, Table 8.13 shows that aggregate BRICS manufacturing FDI seems to follow its own past investment, but at the individual BRICS country level this is the case for South African manufacturing investment only. For the other countries, this is insignificant, but except for Russia, where there is a negative effect. Regarding investment from other BRICS countries there is a mixed pattern, with Russia FDI seeming to 'avoid' Brazilian FDI, while the South African FDI has the opposite effect. Overall, I am of the view that the results are not consistent with Chapter 7 as there is a large number of zeros in BRICS FDI data, so it is not distributed as a NB model. They do not offer strong support for 'follow-the-leader' behaviour in BRICS manufacturing FDI location at the EU-25 country level.

Table 8.13: BRICS Manufacturing FDI Location: Zero-Inflated NB Model

Dependent Variable: FDI_{it} in country i at time t.	All BRICS	Brazil	Russia	India	China	South Africa
	I	II	III	IV	V	VI
Country Variables, X_{it-1}:						
Demand Variables:						
Real GDP ($x10^{-6}$)	1.53***	0.94	0.82**	1.49***	2.24***	0.03
Real GDP per capita ($x10^{-5}$)	-6.45***	-9.76	-9.84*	0.56	-6.73	-11.50
Real GDP Growth Rate ($x10^{-3}$)	11.50	-141.68*	45.20	73.60	-10.70	-24.10
Population Density ($x10^{-3}$)	-1.20	-9.66	-0.94	3.68	-1.57	18.10**
External Market Demand ($x10^{-2}$)	1.62**	11.20***	1.79	1.67	-1.59	11.04***
Labour Market Variables:						
Unemployment Rate ($x10^{-2}$)	-4.78*	-7.27	-10.90**	2.54	-9.23*	-9.64
Real Wage Rate ($x10^{-2}$)	6.10**	-4.42	10.10**	1.71	5.74	11.00
Real Wage Rate Dummy ($x10^{-1}$)	-6.24*	-28.15*	5.07	5.54	-15.95*	17.38
Cost Factors:						
Corporate Income Tax Rate ($x10^{-3}$)	-76.80***	-72.04	-85.04**	-56.50	-72.20**	13.50
Motorway Density ($x10^{-3}$)	17.70	80.50	10.70	-8.55	10.20	-120.23*
Political Risk ($x10^{-3}$)	-41.20**	-102.96	-47.60	-38.10	-92.70***	53.70
Education Variables:						
Higher Education ($x10^{-3}$)	49.10***	0.36	72.20***	91.70**	100.06***	-31.80
Secondary Education ($x10^{-3}$)	-13.20*	-52.80*	19.50	5.45	-7.12	0.17
Trade Variables:						
Openness to Trade ($x10^{-3}$)	1.22	-21.20	-3.81	5.97	15.50***	-20.96
Real Exchange Rate ($x10^{-3}$)	22.70**	18.40	36.70*	30.80	30.80	-3.47
Real Exchange rate volatility ($x10^{-4}$)	-6.64	3.97	-688.80	519.66	34.05	-81.83
Policy Terms:						
EU Structural Funds ($x10^{-5}$)	4.73	31.60**	30.30**	6.14	-13.40	12.40
Eurozone Country ($x10^{-2}$)	-62.30***	284.70*	-4.82	-90.70**	-65.10*	94.60
EU Commitment ($x10^{-2}$)	39.50	-1444.45	41.10	306.10	1607.25	-12.60
EU Membership ($x10^{-2}$)	12.50	1514.04	-64.10	1642.86	-69.60	208.20
EU Post-membership ($x10^{-2}$)	-44.30**	-288.98**	-66.10**	-33.80	-16.10	-162.70
Source Variables, FDI_{it-1} ($x10^{-2}$):						
All BRICS	2.47**	-	-	-	-	-
Brazil	-	11.80	-7.71	21.40	-5.26	8.95
Russia	-	-90.50***	-35.20**	21.50	-6.22	-36.60
India	-	34.50***	2.78	-1.19	-2.31	2.01
China	-	-1.63	0.18	1.50	1.28	6.32
South Africa	-	67.90**	7.96	-8.00	-8.39	37.10**
Constant ($x10^{-1}$)	26.50	104.14	-2.91	-237.46	-104.59	-86.95
Number of Observations	325	325	325	325	325	325
Non-zero Observations	159	31	66	63	96	30
Log likelihood	-428.41	-80.60	-168.26	-171.08	-264.83	-75.32
Time fixed-effects	NO	NO	NO	NO	NO	NO
Country fixed-effects	NO	NO	NO	NO	NO	NO

Notes: Location choice for FDI projects across EU-25 countries over 1998-2010. The first stage of this model includes the real GDP only and the results for this stage are not shown in this table. Dependent variable and BRICS terms are measured by the original number of projects. * = 10%, ** = 5% and *** = 1% significant level.

8.5.3. Omitting the Early Years

Finally, as another way of dealing with the zero cases, I exclude the first seven years of the study period, during which the zeros are much more prevalent, so that I focus on the years 2004-10. I rerun the regressions for each of the NB and ZINB models, but measuring the lagged BRICS FDI terms in two different ways, as in Tables 8.11 and 8.12, i.e. for each individual BRICS and for all BRICS countries but excluding the FDI of the own country. Of course, the drawback is that the smaller number of observations further reduces the degrees of freedom, and in the case of Brazil it was not possible to get estimates at all and for South Africa it was not possible to run the NB model. The results for the estimates on the lagged FDI terms for the other BRICS countries are reported in Table 8.14. They show consistent patterns to previous two tables, but overall few of the terms are significant, which suggests that there is no advantage to using the smaller sample.

Table 8.14: Results for Lagged BRICS FDI Terms: 2004-10

Source Variables, FDI_{it-1} (x10^{-2}):	Brazil	Russia	India	China	South Africa
Negative Binomial:					
Brazil	-	-	-	-	-
Russia	-	-16.29**	-	-	-
India	-	-	-0.11	-	-
China	-	-	-	-0.92	-
South Africa	-	-	-	-	-
BRICS, excluding same country	-	1.53	0.84	1.20	-
Brazil	-	-1.54	1.26	-1.77	-
Russia	-	-15.78**	1.36	-3.45	-
India	-	0.79	0.59	1.32	-
China	-	1.50	0.15	-0.84	-
South Africa	-	26.13**	10.32	18.46*	-
ZINB:					
Brazil	-	-	-	-	-
Russia	-	-13.06*	-	-	-
India	-	-	-0.23	-	-
China	-	-	-	-0.91	-
South Africa	-	-	-	-	-2.12
BRICS, excluding same country	-	1.23	0.41	0.36	0.26
Brazil	-	-0.63	-6.00	-5.84	-27.85
Russia	-	-14.20*	-0.63	-2.57	2.95
India	-	0.67	-0.17	0.66	-4.40
China	-	1.23	0.32	-0.64	5.03*
South Africa	-	23.92*	11.64**	15.01*	-1.50
Time fixed-effects	NO	NO	NO	NO	NO
Country fixed-effects	NO	NO	NO	NO	NO

Notes: Models regressed for 2004-10 and coefficients on lagged BRICS FDI terms shown only. No convergence for Brazil using both the NB and ZINB models and for South Africa using NB model. For each country, there are four regressions in total based on the two models. * = 10%, ** = 5% and *** = 1% significant level.

8.6. Conclusions

This chapter uses a log-linear model and different count data models to analyse the BRICS FDI location in the EU-25 countries. The purpose is to further investigate the potential for 'follow-the-leader' behaviour among the BRICS countries. The same country variables are considered as in Chapter 7, which facilitates a comparison, but with different lagged FDI terms to capture the own-country and cross-country effects to see whether FDI location 'follows' FDI from the same BRICS country in the next period, while 'avoiding' the FDI from other BRICS countries. These are explored for all FDI and manufacturing FDI. The count data models include the Poisson and Negative Binomial models, where the latter allows for over-dispersion in the count data, and more advanced models that allow for the large number of zero observations in the FDI count data. These are the Hurdle, Zero-Inflated and Zero-Truncated methods.

The count data models produce results, while in general they offer some but not overwhelming support for the results obtained in Chapter 7. In terms of the country variables, this chapter shows that FDI from each BRICS country is generally attracted by some location factors, and especially the GDP of the host country, the labour market and the education terms. These are significant in many of the analyses, but the other country variables are either generally insignificant or affect FDI location for one or several BRICS countries only, such as the population density in the log-linear model. This may be compared with Chapter 7 where we find that the BRICS investors are interested in the countries with better economic growth rates and higher education, but also lower wage rates and political risks, in addition to some EU policy terms (Table 7.5). These kinds of variable are significant for some BRICS countries in this chapter, so that there is some support, but it is not overwhelming.

Of course, my interest is in the lagged FDI terms. Using the logit model in Chapter 7, I find evidence of 'follow-the-leader' behaviour, but this applies only to FDI from the same BRICS country. That is, there is a tendency for each BRICS country's FDI to follow the FDI from the same BRICS country in the preceding year, but to avoid the location of FDI from the other BRICS countries. In this chapter, for the benchmark log-linear model, I find that the FDI of a BRICS country follows the previous FDI from the same country, but it is not significant for all countries. Indeed, most of the analyses in this chapter reveal that there is an insignificant tendency for BRICS countries to either follow or avoid the investment of other BRICS countries, although in this respect we do find some strong results that China and India may be ‘leaders’ across all of the BRICS countries, confirming the earlier findings.

In this latter respect the results of this chapter are consistent with those found before in this thesis, but overall they are not especially strong. The generally weak results found for the count data models may reflect the presence of a very large number of zeros, especially in the early years of the study period and the much smaller number of observations that are brought to bear in the count data analysis. A further difficulty is that for these regressions to converge, I had to omit the country fixed effects, although in general through the inclusion of the country GDP I do not believe that this accounts for the weaker results. While methods were used to try to deal with the issue of zeros, these seem to be only partially successful. Also, when I focus on the latter half of the study period there are limited degrees of freedom and the results are not particularly strong either. As such, I believe that the better results are probably obtained using the log-linear model in this chapter, in which the zero observations are dealt with by adding one project to each FDI count. As BRICS FDI takes off, particularly from China, future research may be able to better deal with this issue, as there are likely to be fewer zeros in the data and more observations on the counts. In this thesis I focus on the early stage of BRICS investment.

Chapter 9. Conclusions

This thesis studies the location choice of BRICS outward FDI in the twenty five EU (EU-25) countries over the period from 1997 to 2010. The reason to select the BRICS as the main source is because the BRICS countries are rapidly-industrializing economies with low levels of per capita income but very large populations. They comprise Brazil, Russia, India, China and South Africa, and they are expected to be the largest economic group by the middle of this century (Ranjan and Agrawal, 2011), and hence potentially a major source of outward FDI. This thesis focuses on the EU as a host for the early-stage investment from the BRICS, as recently it has been a major host for the global FDI inflows. The thesis not only considers the fifteen EU Member State countries in the West as locations for the early-stage investment from the BRICS, but also the ten Central and Eastern European Countries (CEECs) that joined the EU in 2004 and 2007. The large Western European countries are the dominant FDI recipients, but the CEECs are a relatively low-cost destination (Milelli *et al*., 2010).

There is considerable interest in the literature on FDI inflows to the developing and emerging economies, but BRICS outward FDI is relatively neglected, so that the focus in this thesis on the BRICS fills an important gap. There are three main contributions of the thesis. First, it analyses the nature of BRICS FDI in the EU-25 according to its characteristics. Second, it explores the locational determinants of the BRICS FDI in the EU-25 countries relative to FDI originating from other major global regions (Europe, North America and elsewhere). Third, logit and count data analysis are used to examine the 'follow-the-leader' behaviour, whereby the investment from each BRICS country is similar in its country location choice to its own earlier investment in the preceding year and earlier sub-periods. It examines if there is a 'leader' country among the five BRICS countries and also whether the BRICS tend to 'avoid' each other in their location, so that there is distinctiveness across the five countries. In addition, the thesis reviews the theoretical and empirical literatures on FDI location.

9.1. The Main Findings

As discussed in Chapter 5, the European Investment Monitor (EIM) database that is the basis for the empirical analysis of this study gives information on project-based FDI inflows into the EU countries for each year over the period from 1997 to 2010. It classifies projects into three types ('new', 'co-location' and 'expansion' investments). It excludes mergers and acquisitions, license agreements and portfolio investments. It does include some joint ventures that satisfy the above definition. Overall, there are 35,105 projects in the EIM that relate to the EU-25 countries. The analysis distinguishes between the EU-15 and CEEC-10. The main findings of this thesis arise from the analysis of this database.

9.1.1. Descriptive Statistical Analysis

The descriptive statistical analysis describes BRICS FDI in the EU-25 countries. It reveals the characteristics of BRICS FDI projects and gives an overview of the spatial distribution of these projects both across the EU and over time. It compares BRICS and non-BRICS investment in the EU-25. It analyses the projects by its characteristics, such as the industry group and functional activity. The characteristics of the investments for each BRICS country are explored to investigate the main investors among these five countries and their choice based on different indicators.

The analysis of the BRICS investment shows that the main type of project is the start-up or 'greenfield' investment. This is the same as for the other major global source regions, but values of BRICS investment (i.e. measured by the number of gross jobs associated with each project) is much smaller in scale compared with the non-BRICS. The BRICS is by no means a significant investor in the EU-25 countries as a whole, as the EIM identifies just 1,415 investment projects (4.0% of the total number of projects) from BRICS in the EU-25. However, BRICS investment experiences a nearly twelve-fold increase over the study period, from 84 projects in 1997-2000 to 975 in 2006-10.

This descriptive statistical analysis of the BRICS investment reveals further interesting results. First, the EU-15 is the major location for the BRICS investment over the whole study period, of which the UK, Germany and France receive more than half of these projects. Among the CEEC-10 countries, Hungary, Czech Republic, Romania and Poland are the main host countries. Second, investment in manufacturing is a common characteristic of both BRICS FDI and that arising from elsewhere. However, there are the different functional activities for BRICS investment, especially when compared with the cross-border investment that arises from within the Europe Union. The BRICS countries focus on sales and marketing, whereas the more-mature investment from Europe prefers production activity, so that this latter investment may serve as an 'export-platform' for the wider European Union market. Third, individual BRICS countries have different industry characteristics and functional activities, which may arise from the differences in the economic development of BRICS countries. BRICS countries (apart from India) have the same main industry sector as the whole BRICS (i.e. manufacturing), whereas early studies find that it is mainly aimed at acquiring natural resources (see Hirt and Orr, 2006). Turning to the project function, most projects from China, India and Russia are in sales and marketing, which is similar to that of the BRICS group.

Fourth, Chapter 2 shows that locations with more rapid economic growth or larger economic size attract more FDI inflows. It means that there should be more FDI inflows to EU-15 countries, compared to the CEEC-10 countries. As mentioned above, the UK, Germany and France are the main three host countries as they have the greatest economic size. Other Western countries receive a smaller number of projects as they have a smaller economic size, including Finland, Greece and Luxembourg. Generally, the CEEC-10 countries should receive a smaller number of projects because of their smaller economic size. However, the FDI located in some CEEC-10 countries exceeds that of some EU-15 countries. For example, Czech Republic, Hungary and Poland attract more FDI because of their rapid economic growth. Overall, the BRICS chooses similar locations across the EU-15 and CEEC-10 countries as the major global source regions, and China and India account for main investors across all of the BRICS countries, at around three-quarters of all investments.

9.1.2. Locational Determinants

This thesis explores the effect of host country characteristics on the location choice of BRICS FDI in the EU-25, comparing these to the location choice of other global FDI in these countries. I use a Conditional Logit model to examine the location choice of all FDI across the 25 countries, and also for FDI in manufacturing only. In general, this logit model does not take into account the project and source characteristics. To allow for differences in these characteristics, I also use a Multinomial Logit model to allow project characteristics including industry sector, function and investment type to vary. This model also allows the sources including the global source region (Europe, and North America) and each of the five BRICS countries to vary. For each host country it calculates the probability of location in each of EU-25 countries, which is relative to the base case of the UK. I begin with the host country characteristics in Chapter 6, and then turn to the Conditional and Multinomial Logit in Chapter 7. Subsequently, 'follow-the-leader' behaviour in BRICS FDI location in the EU-25 is explored based on the 'Goodness of Fit' test in Chapter 6 and the lagged source variables that are used in Chapters 7 and 8.

Effects of Host Country Characteristics

One of the contributions of this thesis is to explore the determinants of FDI location from different sources in the EU-25, and in particular the special determinants for FDI location from the BRICS. In the logit models each location choice is made across twenty-five countries, so that in total there are 817,100 observations (i.e. to either locate or not locate in a country). This discussion focuses on inward FDI to the EU-25 as a whole, as well as that originating from the four different global regions, i.e. the BRICS, Europe, North America and Other, where 'Other' excludes FDI from the BRICS. I highlight certain differences in the host country variables for the BRICS when taken as a whole in this section. I consider the host country characteristics according to the main location factors identified in the literature review, which in this thesis are classified as the demand, labour market, cost, education, trade and policy variables.

I find that nearly all of the demand and policy variables have a significant effect on FDI location from the different global source regions. This is in line with other studies such as Holtbrugge and Kreppel (2012). A higher real GDP per capita does not attract cross-border FDI from within Europe, which is in contradiction to other studies such as Shamsuddin (1994) and Janicki *et al.* (2004). It may reflect that this investment is made as an 'export-platform' for the EU-25 market, so that investors prefer locations with lower per capita incomes as it signals lower costs. This interpretation is supported by the external market demand term, which is significant for the global FDI, although insignificant for the FDI from each global source region. This is the same for the effect of population density on North America, BRICS and the Other, which captures more dense markets.

With regard to the labour market variables, a higher unemployment rate discourages FDI inflows, which may be because these countries have weaker economic development and a poorer quality of the labour force. The wage rate, which is a measure of labour costs, has an expected negative effect, which is supported by Coughlin *et al.* (1991) and Bevan and Estrin (2000). Its effect is insignificant for investments from the global regions and is only significant for BRICS investment when the previous FDI of these four source regions is taken into account. Regarding the cost variables, FDI from the different global regions avoids countries with higher tax rates and less dense motorway networks, as it is more difficult to transport goods. The negative and significant coefficient on political risk suggests that investors prefer risk, but these risks are relatively low for the EU-25. In this sense, there are the positive coefficients of political risk for FDI from all four global regions. Bevan and Estrin (2004) find that investors prefer locations with weak administrative control, as it implies a weaker level of regulation and lower political risk.

Turning to education variables, secondary education has a positive and significant effect on the location of FDI from all sources as a whole, but the effect of higher education is always insignificant. This supports the cost-based motive for FDI as it suggests that investors prefer a reasonably educated workforce, but not too educated as the wage rate is likely to be higher. However, there is no significant effect of secondary education on the FDI from all four global source regions, and North America and BRICS prefer those countries with 'higher skills' labour force. Regarding the trade variables, trade openness does not affect global FDI in general because EU-25 considered as a whole has been more open than many other regions or countries. Within the EU-25, there is a difference in the openness of different countries and most FDI from Europe comes from the EU-25. Hence, European FDI is interested in trade openness. The negative and significant effects of the exchange rate and its volatility on the global and European FDI means that there is less FDI in a country where the domestic currency appreciates or is volatile. BRICS FDI is attracted by countries with a depreciation of the domestic currency.

With regards to the EU policy terms, most variables in this group have the expected effects on the BRICS, except for the EU Structural Funds and EU post-membership terms. The negative effect for the former may be because countries receiving European aid are less-developed economically and socially, so that it works in the same way as the unemployment term. EU membership has a positive effect on FDI location, which may capture the lower border costs, such as a reduction in waiting times and border checks. These are non-tariff barriers, whereas the tariff barriers for the CEEC-10 were eliminated by the Association Agreements with these countries that were signed in the

1990s. The negative coefficient on the post-membership term suggests that FDI in these countries later fell back, so that there was a surge at membership.

Overall, the effect of most country variables on European FDI is consistent with that for FDI from all sources as a whole, reflecting the high share of European FDI in the total number of FDI projects. The GDP growth rate, external market demand and motorway density are not significant for European investment. North American investment is not influenced by the population density, external market demand and the unemployment rate, but higher education has a significant effect that reflects its highly-developed economy and advanced technology. Finally, relatively few of the country variables are important for BRICS FDI location in the EU-25. The main location factors are the GDP growth rate, wage rate, political risk, higher education and exchange rate, which indicates that the BRICS seek countries with lower labour costs and a high-skilled labour force. It is consistent with the literature that shows that market access and knowledge-seeking motives are two of the main reasons for BRICS FDI location. BRICS FDI is also not interested in the EU policy terms as most of their projects are located in three West European countries only (i.e. France, Germany and the UK), partly reflecting their economic size. For the Other region (i.e. elsewhere), there are the different characteristics of FDI because of its heterogeneity, so that most of the locational determinants are insignificant for FDI from this source.

Probability of FDI Location: the Project Characteristics and Sources

Studies of the locational determinants tend to consider the characteristics of the host country, but the heterogeneity of the projects is often ignored, except for the ultimate country of origin. Hence, this thesis explores the probability of FDI location in each of the EU-25 countries by allowing project characteristics to vary, as well as the investment sources, i.e. the five BRICS countries, Europe and North America. The Multinomial Logit framework enables both the project characteristics and sources to be considered. It expresses the estimates as log-odds ratios relative to the base case, where this is the UK, owing to its status as the main host country for FDI within the EU-25.

First, when the BRICS source countries are allowed to vary only, there is a mixed pattern between the EU-15 and CEEC-10 countries. Compared to the UK, Brazilian FDI is more likely to invest in Spain and Portugal, as these have similar cultures, but it also prefers Luxembourg and Slovakia. The literature review in Chapter 2 has shown that language and culture are important determinants for FDI location. In case of Portugal, it was the former colonial power in Brazil and they share a similar language. Regarding to Russia, there is a greater probability for its FDI to locate in Germany and Italy within the EU-15, but its FDI is more likely to invest in several CEEC-10 countries compared to the UK. This is because these CEEC-10 countries were formerly part of the Soviet Union. Chinese and Indian FDI show a similar investment pattern to each other. Across all of the EU-25 countries, investments from these two countries are more likely to go to the UK than to most other countries. In the case of CEEC-10, they are nearly always less likely to invest in the same countries. For the EU-15, there is a smaller probability of FDI from both China and India to locate in France compared to the UK, but Chinese FDI is more likely to go to Germany. In case of South Africa, the UK is also the most attractive destination for FDI, possibly due to language similarity and cultural heritage, but South African investment is significantly less likely to choose the other major hosts of France and Germany.

Second, when the project characteristics are allowed to vary only, I find strong differences between the EU-15 and CEEC-10 countries. Relative to the UK in each case, an investment in the CEEC-10 is more likely to be in manufacturing compared to the EU-15, but headquarters / R&D less so. Indeed, there are two countries among the EU-15 (i.e. Ireland and Luxembourg) that are less likely to receive FDI projects in manufacturing, while Scandinavian countries do not show a significant tendency to do so. For the headquarters / R&D functions, only Denmark and Ireland among the EU-25 are more likely to get investments in these functions compared to the UK. This is because these two functions refer to the decision centre, fundamental scientific research and the production process, which means that only economies with a more-advanced technology and larger scale of production are more likely to attract this kind of investment. Meanwhile, there is a greater probability for investments in the CEEC-10 countries to be start-ups, reflecting their status as a new location for FDI following their accession to the EU. This is also the case for most EU-15 countries as there is a greater tradition for FDI in the UK, so that it is more likely to receive its FDI as a re-investment.

Finally, when both the project characteristics and sources vary, there are not too many changes in the probabilities for the FDI location choice in case of the project characteristics. However, turning to the sources, there are considerable differences in the probabilities for the BRICS countries. By considering global regions of North America and Europe, an investment in the UK is less likely to come from Europe, while there is a greater probability for investments in France and Germany from North America.

Compared to the CEEC-10, the UK is a more favourable location for investments from North America.

9.1.3. 'Follow-the-Leader' Behaviour of BRICS FDI

To examine 'follow-the-leader' behaviour in FDI location, whereby FDI from the same source tends to locate in the same countries over time, the thesis first uses a 'Goodness-of-Fit' test to investigate this for each BRICS country. This is carried out over a period of 1-year, 2-years and different sub-periods. Subsequently, lagged FDI terms are introduced in the regression analyses using both the logit models and count data estimations to explore if earlier FDI from the same country or different countries or global regions has a significant effect on the location choice of current BRICS FDI. The signs and significance of these estimates could indicate that BRICS FDI 'follows' or 'avoids' previous FDI location. Within the BRICS, if BRICS FDI 'avoids' that of other BRICS countries then it suggests distinctiveness in this investment between the BRICS, while if it 'follows' its own investment then there could be a number of possible interpretations.

Persistence in the Location Choice: 'Goodness-of-Fit' Test

A further contribution of this thesis is to use a 'goodness-of-fit' test to explore if there is persistence in the location choice of the BRICS investors across the EU-25 countries. This test compares the observed location pattern with that which is expected based on earlier FDI location, where the null hypothesis is that there is no significant difference between these. One issue is that the number of BRICS projects in earlier years can be small, especially for the number in any one country in any year. For these cases Kazmier and Pohl (1987) argue that when the data are less than 5, adjacent data should be combined. However, I choose not to combine these cases as the criterion for doing so is arbitrary (Cochran, 1952) and it reduces the meaningfulness of the test if countries are combined. In these cases, small samples mean that the expected value is measured with less precision, so the direction of bias is towards increasing the test statistic and increasing the probability of rejecting the null hypothesis. A second issue is the large number of zero projects from several BRICS countries in a host country in a year, which makes it impossible to calculate the test statistic for the 'goodness-of-fit' as the values for both the observed and expected data are zero. Hence, the number of projects from each BRICS country is increased by adding one project in each country and each year to solve the issue of zeroes.

Different time intervals are considered, as a longer lag gives the investor sufficient time to respond to earlier FDI flows. In this thesis, a 1-year and 2-year period are considered, as well as several sub-periods (i.e. 1997-2000, 2001-05 and 2006-10), where the sub-periods help address the two issues above. First of all, I find that in most years the null hypothesis cannot be rejected, so that FDI from each BRICS country tends to 'follow' its own previous location pattern across the EU-25 countries over a 1-year and 2-year period. Second, there are more statistical differences in the location pattern over a 2-year period compared to a 1-year period. In particular, there are obvious differences for China and India based on the 2-year period, and these differences in the location patterns tend to occur for the later years of the study period, suggesting that FDI from China and India has spread out to other EU locations as it has grown. By contrast, the location patterns of FDI from the other three BRICS countries are relatively stable, although results based on the 1-year period show a possible spreading out of Brazilian FDI in recent years.

It is necessary to emphasize that there is a significant tendency for all BRICS countries to follow the location of their own previous FDI in most years, but the above results are subject to the problem of small numbers of projects, which potentially increases the probability of acceptance of the null hypothesis. The analysis based on the three sub-periods to aggregate the numbers shows that China and India spread their FDI to other EU-25 countries in each of the latter two sub-periods when more FDI takes place, while Brazil and South Africa still follow the location choice of their previous FDI. Russian FDI has the same location to its previous FDI in 2001-05, but spreads to other EU-25 countries over 2006-10, which is after the CEEC-10 countries joined the EU. Overall, the 'Goodness-of-Fit' test suggests that the FDI by the BRICS countries tends to 'follow' their own previous investment in its location choice across the EU-25 countries, but that as it has grown in the case of China and India it has spread out. Russian FDI may also have spread out but that may reflect its weakening economic ties with the countries of Central and Eastern Europe.

'Follow-the-Leader' Behaviour: Lagged FDI Terms as the Explanatory Variables

The final contribution of this thesis is to examine 'follow-the-leader' behaviour in BRICS FDI location using lagged FDI terms as the explanatory variables in the logit and count data analyses. It enables me to investigate whether the investments of individual BRICS countries 'follow' the previous investment of the same BRICS country, but also whether they 'avoid' or 'follow' the investments of other countries, with the aim of identifying a possible 'leader' among the five BRICS countries. The descriptive statistical analysis suggests that there is 'follow-the-leader' behaviour for some of the BRICS countries, but such simple analysis does not include controls for other country characteristics.

The analysis proceeds in several stages. First, the lagged BRICS FDI term, which is measured by the total number of projects locating in the same country in the preceding year, is disaggregated into five individual countries to explore whether BRICS FDI as a whole follows the FDI of any individual BRICS country. This disaggregation also shows whether BRICS FDI as a whole differs from the previous investment of individual BRICS countries. Second, to determine whether each BRICS country follows the investment pattern of previous investors from the same BRICS country and avoids (or follows) the investment of the other four BRICS countries, two new variables are introduced. These are: 'Same BRICS Country' and 'BRICS, excluding same BRICS country', where the former matches the individual FDI project from each BRICS country to all FDI projects from the same BRICS country in the same host country in the preceding year, and the latter is measured by all BRICS FDI projects in the preceding year, excluding those from the same BRICS country. Third, each of these two matched lagged FDI variables is further disaggregated for the five BRICS countries to examine whether there is 'follow-the-leader' behaviour for each individual country and whether they 'avoid' or 'follow' other BRICS countries.

Regarding the logit model, in relation to the first analysis, when the lagged BRICS FDI term is disaggregated into five individual countries, I find that BRICS FDI as a whole 'follows' the previous investment of South Africa only. This is significant at the 10% level and it may reflect the fact that South African FDI in the EU-25 is long-standing, not least to the UK and other advanced economies, although it is the most recent member state of the BRICS. Nevertheless, it is perhaps not wholly convincing to treat South Africa as the 'leader' of BRICS FDI as its total number of projects in the EU-25 is quite small. It is to address this issue that the matched variable 'Same BRICS Country' is introduced in the second analysis. The positive and significant estimate on this term suggests 'follow-the-leader' behaviour, so that across the BRICS there is a tendency for FDI from a given BRICS country to follow its own previous FDI. When the variable 'BRICS, excluding Same BRICS Country' is included, 'Same BRICS Country' is still significant, while the estimate for the new variable is negative and significant at the 1% level. Thus, across the BRICS countries, BRICS FDI 'follows' previous FDI from the same country, but it ‘avoids’ the previous investment from the other four BRICS countries when considered together.

In the third analysis, these two variables are further disaggregated to examine which individual countries have the strong ‘follow-the-leader’ behaviour. For completeness, the lagged FDI terms for the three global source regions (Europe, North America and elsewhere) are included to explore the effect of their previous FDI and the changes caused by them in the ‘follow-the-leader’ behaviour. There are three main findings for the individual BRICS countries. First of all, when only the variable ‘Same BRICS Country’ is disaggregated into five same BRICS countries, I find that India, China and South Africa ‘follow’ their own previous investment significantly. Second, when ‘BRICS, excluding Same BRICS Country’ is also disaggregated, each BRICS country ‘avoids’ the location of the other four countries except for South Africa (this is consistent with the above finding regarding the role of South African investment as a ‘leader’). However, this term is significant for Brazil and Russia only, while only India follows its own previous investments significantly. Third, when the preceding year investments of the three global regions are included, the ‘follow-the-leader’ behaviour of all five individual BRICS countries is still apparent.

Furthermore, the ‘follow-the-leader’ behaviour of BRICS investment is also considered in the count data analysis of the number of FDI projects that locate in each country in a particular year. It is based on the FDI from the BRICS only, for which the basic technique is a log-linear regression, while other count data models are used for the problem on zero observations. All of the explanatory variables in the logit analysis are considered in the count data analysis to facilitate the comparison. The OLS regression of the log-linear regression model is used to provide the benchmark results with different lagged FDI terms. This is followed by the Poisson and Negative Binomial models, which are more suitable for discrete observations, and subsequently by more-advanced methods to deal with the issue of extra zero observations.

For the country variables, the benchmark estimations show that there are not as many significant variables for all BRICS FDI as those for FDI from all sources based on the logit analysis. However, most of the significant variables have the same sign as for global FDI (i.e. from all sources) and some of them continue to be significant at 1% level. It means that the BRICS investors are attracted by much the same characteristics of the host countries. The lagged FDI terms for the five BRICS countries give the following main results. First, there is a tendency for each BRICS to ‘follow’ the investment of one or more BRICS countries. Second, India and China are the 'leaders' in 'attracting' FDI from all BRICS countries, where Indian FDI 'attracts' FDI from Brazil, China and South Africa in the following year and China plays a role in 'attracting' Russian and Indian FDI to a country in addition to 'attracting' their own following FDI. Third, there is no significant tendency for all BRICS countries to 'avoid' the previous FDI of other countries, although Brazil appears to 'avoid' the location of Russian FDI. This appears to contradict the analysis of the logit analysis, but the result obtained in logit analysis was for the BRICS countries as a whole and not for individual BRICS. When the number of FDI projects originating from the other four BRICS countries is measured as a whole using a single variable, FDI from one BRICS country still cannot avoid location of FDI from other four countries as a whole. Finally, the analysis shows that there are similar results for manufacturing FDI when modelled as count data to that of all FDI.

The results for the Poisson and Negative Binomial models are not as convincing as those of the OLS estimation because FDI data have too many zeros, so it is not distributed as a Poisson or NB. Furthermore, these two models show that no BRICS country 'follows' its own previous investment significantly and indeed Russian investors are put off by previous Russian FDI, which is opposite to the results of above benchmark and previous logit analysis. When dealing with zero project counts, the Zero-Truncated models give similar results to the standard Poisson and Negative Binomial models based on BRICS FDI as a whole, suggesting that the inclusion of the zero investments is not problematic. For two-stage models, the Hurdle model cannot be run for Brazil, even if all the Country and Time fixed-effects are excluded because of the large number of zero project counts for this country, which reduces degrees-of-freedom drastically. The Zero-Inflated Negative Binomial (ZINB) model is preferred to the Zero-Inflated Poisson (ZIP) model, but even so this also produces weak results as most regressors are insignificant, and this is the same for manufacturing FDI. It means that these results cannot provide strong support or otherwise for 'follow-the-leader' behaviour. This may be due to the large number of zeros, and possibly the explosive growth in FDI from China and India in particular, so the logit analysis is preferred, which has many more observations.

9.2. Implications

With increased globalization, international relations between countries in the form of trade and investment have become much stronger. Compared with trade, FDI may be a more effective channel to promote the diffusion of technology, knowledge and other skills across international boundaries (Driffield and Taylor, 2000), thereby creating job opportunities and greater productivity and economic growth in the host countries (Driffield *et al.*, 2002). More narrowly, as stated by Cave (1971), the entry of foreign firms into a domestic market increases competition which may create more active rivalry and improve the performance of local firms. Thus, FDI can have many positive effects on the host country economy.

Europe is the main source of FDI in the EU-25. This reflects the short distance and the integration of these economies through the European Single Market. Indeed, the study period of this thesis covers the fifth enlargement of the European Union, which occurred in two stages in 2004 and 2007, and this was undoubtedly a further spur to inward FDI, particularly in the ten countries of Central and Eastern Europe. Thus, the number of projects originating from Europe increases from 3,987 over 1997-2000 to 8,439 over 2006-10. FDI from North America has also increased in absolute terms, although it has taken a smaller share of total FDI than that of Europe, while the number of BRICS projects has increased substantially from 84 to 975 projects, but its share of all FDI projects in the EU-25 is small, increasing from 1.0% to 6.2% between the periods. A finding of the thesis is that there is a drift of investment to the CEECs, especially within Europe, suggesting that these countries are an 'export-platform' for the enlarged Single Market. This has implications for trade imbalances in the EU, while the recent introduction of border controls resulting from the 2015-16 'migrant crisis' may in future reduce investment flows to the CEECs and hence FDI within the European Union.

One difference in the BRICS FDI compared to that from Europe or North America is the sharp growth in BRICS FDI in the EU-25 over the study period. By the end of the period the BRICS countries are an important generator of inward FDI, with the share of BRICS FDI reaching 11% of total inward FDI projects in 2010. This high growth rate and increasing share of global FDI flows reflects the rapid economic development of the BRICS economies. These are predicted to have an increasingly greater role in future global FDI flows (UNCTAD, 2010) and Ranjan and Agrawal (2011) believes that the BRICS will be the largest economic group by the middle of this century. It not only makes this investment increasingly of interest to the EU countries to aid their own development, but a challenge for policymakers in the BRICS countries is to promote this investment as a source of economic development. This is because there are 'reverse spillovers', whereby foreign firms can acquire advanced technology in the host countries. Driffield and Love (2002) find that the growth in the domestic sectors is limited in relatively R&D-intensive

sectors and that the effect of any 'reverse spillover' will be greater for those industries where the spatial concentration is greater.

The thesis finds distinctiveness in the FDI originating from the BRICS compared to the other major global regions of Europe and North America. In addition, in terms of attracting the investment it finds that BRICS investment as a whole is interested in different characteristics of a host country compared to the other global investors. These partly reflect its different nature: it is more likely to be in production and in the manufacturing sector, but also different motives. The factors that are important for BRICS FDI location are a higher GDP growth rate, a greater higher education rate, a stronger exchange rate, a greater political risk and a lower wage rate. Economic growth and higher education suggest that market access and knowledge-seeking are important motives for BRICS investors. While a weaker currency is important for European FDI for the purpose of an 'export-platform', as it makes the investment and subsequent exports cheaper, the opposite is the case for the BRICS. It is probably because currency appreciation reflects a stable economic environment and lower risk. The political risk estimate suggests that BRICS investors probably like a weaker regulatory environment, while the wage rate term also suggests that the BRICS investors seek location with a lower level of labour costs.

The location choice of FDI is a trade-off between 'dispersion' factors and agglomeration determinants. If the latter plays the major role, the 'follower' will choose the same location for more profits. In general, the reasons for the 'follow-the-leader' behaviour include the superior information, larger size and better profitability of the 'leader' and characteristics of a location that are interested by different investors (e.g. similar language and culture). In addition, seeking for the raw materials and advanced technology, support of the government and greater market potential are main motives for BRICS FDI to follow their previous investment. The results for 'follow-the-leader' behaviour indicate that when the investments of the rest four BRICS countries are considered together, each BRICS country prefers to 'follow' the previous investment from the same BRICS country, but 'avoid' the investment of the other BRICS. At the level of the individual BRICS, China and India appear to be the 'leaders' in the investment location among all BRICS countries and their FDI grows stronger than other countries, while there is some evidence that South African investment may perform a similar role owing to the more long-standing nature of its investment. Therefore, there is distinctive purpose and location choice of BRICS FDI, which suggests that BRICS countries should be considered separately, while China and India have rapid growth in FDI projects and similar number in the EU-25 over the study period. They also become increasingly similar in the location choice during the dispersion periods. In this sense, these two countries could be considered together and are comparable to each other to some extent.

9.3. Future Work

This thesis uses cross-sectional data to explore the locational determinants for the BRICS FDI in the EU-25 from 1997 to 2010 covering enlargements in 2004 and 2007 of the European Union. It also examines 'follow-the-leader' behaviour of the BRICS FDI, whether they follow their own previous investments and also avoid or follow locations of other BRICS countries' investments. According to Holtbrügge and Kreppel (2012), most previous research in international business concentrated on the motives, directions and forms of outward FDI from developed countries. However, more recently, there has been a change in the patterns of FDI, with more companies from emerging markets investing abroad. Therefore, the thesis fills this gap, where there is few research on the outward FDI from emerging or developing economies. However, there are still limitations to my research, which could give suggestion for future research.

First of all, this thesis explores the determinants for FDI location choice in the EU-25. It considers the characteristics of the host country only, whereas future research could concentrate on the characteristics of the host and source countries, and deepen the research by focusing on the industry level. This is because outward FDI from the BRICS countries mainly depends on two factors: the strategic position of an industry in the source country and competitive pressures in the home market. In addition, there are firm-level factors that focus on projects has tended to ignore, such as the specific resources owned by the domestic firms. It may explain why firms become leaders in their home markets and then compete in foreign markets. The difficulty with analysing firm-level factors is that it would require greater data on the firm-level characteristics, while an industry-level analysis may be limited by the number of observations on investments in the case of the BRICS, although this problem may ease over time as BRICS investment continues to grow. Of course, effects of financial crisis should be considered in the regression analysis.

Second, the thesis finds evidence of 'follow-the-leader' behaviour in BRICS investment. Future research could explore the exact source of this behaviour through the collection of other data, and explore whether it is agglomeration economies that underlie this or some other factor. I also find distinctiveness in FDI location from different BRICS countries, with FDI tending to ‘avoid’ the country location of the other BRICS. It raises the issue of whether the BRICS form a cohesive unit and if they are worth studying as a single group of countries or not. Further, the future global importance of the BRICS may be called into question, with serious recessions in some of these countries (i.e. Brazil and Russia) and others facing economic uncertainties (China and South Africa), although India looks set to grow strongly in future.

Third, the Independence of Irrelevant Alternatives (IIA) assumption is a limitation for the Conditional Logit model as it assumes that all of the alternatives are independent of each other. This may be implausible for some of the location alternatives (i.e. the EU-15 and the CEEC-10), which may be close substitutes, but nesting techniques (e.g. Nest Logit Model that relaxes this restriction) for such a large dataset has precluded me from considering this issue in this thesis. Likewise, the Poisson and Negative Binomial models give weak results for the BRICS investment in the EU-25, so that they cannot be used to offer a strong support or opposition to the results of the logit analysis. This weakness may arise from the large number of zero counts on projects (i.e. countries receiving no BRICS investment in a given year), especially in the early years of the study period. More advanced models for count data are used to deal with the large number of zeros but the results are still weak. Good results are obtained for the log-linear model using OLS estimation, but this may be more suitable for continuous rather than discrete data. Future research could study this topic using count data models, but for which the zero observations are likely to be less important as BRICS FDI grows.

Finally, the EIM database classifies the FDI projects into three types: new, expansion and co-location investment. The different types of projects may be interested in different host country characteristics, and may be a dimension to ‘follow-the-leader’ behaviour. For example, an expansion is an investment at an existing location of a foreign firm, which means that it is more likely to ‘follow’ previous investment by the same multinational enterprise, as well as less likely to be attracted by some host country characteristics as a new investment. While the number of expansion and co-location projects is small for the BRICS, it is a dimension has not been considered in this thesis, but it is seems likely to be more important to future research, again as BRICS investment grows and becomes more important over time.

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Appendix A: Text and Equations

Appendix 4.1: Estimation of Binary Choice Models

The estimation of binary choice models is usually derived from the method of maximum likelihood. As indicated by Greene (2002), each choice can be considered as a single draw from the Bernoulli distribution that is subject to the binomial distribution. If the models have independent observations with the probability of success $F(X'\beta)$, the joint probability is:

$$\Pr(Y_1 = y_1, Y_2 = y_2, \dots, Y_n = y_n | X) = \prod_{y_i=0}[1 - F(X_i{}'\beta)] \prod_{y_i=1} F(X_i{}'\beta). \quad \text{(A.4.1)}$$

where X represents $[X_i]$. When a sample has n observations, the likelihood function is:

$$L(\beta) = \prod_{i=1}^{n}[F(X_i{}'\beta)]^{y_i}[1 - F(X_i{}'\beta)]^{1-y_i} \quad \text{(A.4.2)}$$

Hensher *et al.*, (2005) note that if there are very small values, then multiplication will lead to even smaller values so that the log of the likelihood function is adopted to replace the original likelihood function. Thus, equation (A.4.2) is written as:

$$\ln L = \sum_{i=1}^{n}\{y_i \ln F(X_i'\beta) + (1 - y_i) \ln[1 - F(X_i{}'\beta)]\} \quad \text{(A.4.3)}$$

The maximum likelihood estimation gives the values of β. The first derivative of β equals zero:

$$\frac{\partial \ln L}{\partial \beta} = \sum_{i=1}^{n}[\frac{y_i f_i}{F_i} + (1 - y_i)\frac{-f_i}{1-F_i}]X_i = 0 \quad \text{(A.4.4)}$$

where $f_i = dF_i/d(X_i{}'\beta)$, is the density function. Different forms for F_i result in different empirical models. In order to get the likelihood function for the logit model, equations (4.5) and (4.9) are substituted into (A.4.4) giving:

$$\frac{\partial \ln L}{\partial \beta} = \sum_{i=1}^{n}(y_i - \Lambda_i)\, X_i = 0 \quad \text{(A.4.5)}$$

Appendix 4.2: Independence of Irrelevant Alternatives

If in the Multinomial Logit or Conditional Logit models, the odds ratio (P_j/P_k) for alternatives j and k is irrelevant to other alternatives it is known as the independence of irrelevant alternatives (IIA). This is convenient for parameter estimation, and it is based on assumption of independent and homoscedastic disturbances.

Both the Multinomial Logit and Conditional Logit models are subject to the IIA assumption, and this can lead to a problem with the estimation. A famous example relates to transport economics (see Rasciute, 2008), as discussed in Section 4.3.2, but here we consider it in the context of FDI location. The UK and Poland are assumed to be the only two location choices (the two largest host countries of FDI in the West and East respectively) for a project in the EU-25. Suppose there are the same probabilities for these choices, i.e. $\Pr(uk) = \Pr(po) = 1/2$, so that the ratio of probabilities equals one, i.e. $\Pr(uk)/\Pr(po) = 1$. Further, suppose Hungary (*hun*) is introduced as a new location for the project in the East only, and that there is the same probability of location in Hungary, so $\Pr(hun)/\Pr(po) = 1$.

When there are three location choices, IIA supposes that the probabilities of choosing any one of the three locations is still the same, so that $\Pr(uk) = \Pr(po) = \Pr(hun) = 1/3$. However, the probability of choosing the UK should be the same as before the introduction of the third alternative, as Hungary is an alternative for Poland only. In particular, the probability of choosing Hungary should account for half of the original probability of choosing Poland and equal to 1/4. By introducing Hungary there is a change in the ratio of the probability of choosing the UK to that of choosing Poland, i.e. $\Pr(uk)/\Pr(po) = \frac{1/2}{1/4} = 2$, so that IIA breaks down. Hence, the logit models underestimate the probability of choosing the UK, while they overestimate the probability of choosing Poland or Hungary.

A test is proposed to examine this assumption, where the principle is that if a subset of all choices is independent of the remaining choices, the estimation parameters will not be changed systematically when the subset is excluded from the estimation. However, if the omitted choices are relevant, the parameter estimation will change dramatically. This is the basis for the Hausman specification test, which is as follows:

$$\chi^2 = \left(\hat{\beta}_s - \hat{\beta}_f\right)'\left[\widehat{M}_s - \widehat{M}_f\right]^{-1}\left(\hat{\beta}_s - \hat{\beta}_f\right),$$

where s is the estimator for the restricted subset of choices, f is the estimator for the full set, and $\widehat{M}_s$ and $\widehat{M}_f$ represent the corresponding estimates of the asymptotic covariance matrices. This statistic is subject to the Chi-squared distribution.

Appendix 4.3: Maximum Likelihood Estimation

Given the linear regression model:

$$y_i = \boldsymbol{X}_{\boldsymbol{i}}'\boldsymbol{\beta} + \boldsymbol{\varepsilon}_{\boldsymbol{i}} \tag{A.4.6}$$

Greene (2002) indicates that the likelihood function for a sample with n disturbances that are independent to each other and that have the normal distribution is:

$$L = (2\pi\sigma^2)^{-n/2} e^{-\varepsilon'\varepsilon/(2\sigma^2)}.$$

Because $\boldsymbol{\varepsilon}_{\boldsymbol{i}} = y_i - \boldsymbol{X}_{\boldsymbol{i}}'\boldsymbol{\beta}$, the likelihood function for the n observations is:

$$L = (2\pi\sigma^2)^{-n/2} e^{\frac{-1}{2\sigma^2}(y-\boldsymbol{X\beta})'(y-\boldsymbol{X\beta})}.$$

When logs are taken, the log-likelihood function for the classical regression model arises:

$$\ln L = -\frac{n}{2}\ln 2\pi - \frac{n}{2}\ln \sigma^2 - \frac{(\boldsymbol{y}-\boldsymbol{X\beta})'(\boldsymbol{y}-\boldsymbol{X\beta})}{2\sigma^2}.$$

The necessary conditions for maximizing the above function are:

$$\begin{bmatrix} \dfrac{\partial \ln L}{\partial \beta} \\ \dfrac{\partial \ln L}{\partial \sigma^2} \end{bmatrix} = \begin{bmatrix} \dfrac{\boldsymbol{X}'(\boldsymbol{y}-\boldsymbol{X\beta})}{\sigma^2} \\ \dfrac{-n}{2\sigma^2} + \dfrac{(\boldsymbol{y}-\boldsymbol{X\beta})'(\boldsymbol{y}-\boldsymbol{X\beta})}{2\sigma^4} \end{bmatrix} = \begin{bmatrix} \boldsymbol{0} \\ 0 \end{bmatrix}.$$

Appendix 4.4: The Profit Function

As discussed in Section 4.5, the location choice is decided to maximize profits, so that,

$$\Pr(\pi_{isc} > \pi_{iso}), \tag{A.4.7}$$

where i, s and c are for firm i in industry s and host country c respectively, and o denotes all other locations. It is necessary to explore the expression for the profit function, which is the difference between revenue and cost. This exploration starts with the revenue function.

Total Revenue

According to Helpman (2006), the demand for the product of firm i in the host country c is:

$$q_{ic} = M_c * p_{isc}^{-\delta}, \tag{A.4.8}$$

where q_{ic} is the product quantity of firm i in host country c, p_{isc} is the product price, M_c is a measure for the level of demand in the host country c, and δ is the demand elasticity, which always equals $1/(1-\varphi)$, where φ is the mark-up. It is assumed that demand elasticity is constant and that M_c is exogenous. Therefore, the total revenue (TR), which equals the price level times the quantity of products, can be expressed as:

$$TR_{isc} = p_{isc} * q_{ic} = p_{isc} * M_c * p_{isc}^{-\delta} = M_c * p_{isc}^{1-\delta}. \tag{A.4.9}$$

In order to achieve the maximum profits, it is necessary to maximize the total revenue, which means that the maximum price level should be found. Let γ_i be the productivity of firm i, where γ_i varies between zero and one. The variable cost, which increases with each unit of output shown by Rasciute (2008) is b/γ_i, where b represents the cost of resources. Therefore, the price that maximizes the profits for firm i can be expressed as $p_{isc} = b/\varphi\gamma_i$.

Total Costs

In addition to maximizing the revenue, it also needs to confirm the minimum total costs. It is assumed that production is carried out by using three main factors: unskilled and skilled labour, and capital (Defever, 2012). Denote f_c as a measure for the fixed production costs of the host country c that is relevant to the cost of resources b, so that the fixed costs are bf_c, which are the same for all firms, but the variable costs b/γ_i changes with the firm productivity. This is because the fixed costs (e.g. the costs of establishing factories or facilities) are less able to vary substantially with firm productivity (Bernard *et al.*, 2007).

Skilled labour and capital are assumed to be relevant to fixed costs (i.e. they are used for R&D and for setting up factories and facilities), whereas the unskilled labour corresponds to the variable costs. Based on cost minimization using a Cobb-Douglas production function, the expression for the minimum total cost can be derived as:

$$TC_{isc} = (w_{sc}^{s})^{\alpha}(r_c)^{\beta} f_c + \frac{(w_{sc}^{u})^{1-\alpha-\beta}}{\gamma_i} q_{ic}\ , \qquad \text{(A.4.10)}$$

where α and β are the shares of skilled labour and capital to the total costs respectively, w_{sc}^{s} is

the wage rate per hour of skilled labour in industry s and country c, and w_{sc}^{u} is for unskilled labour, while r_c is the return from capital in country c. The first term on the right-hand side of equation (A.4.10) represents the fixed costs for a firm entering foreign country c, which relates to developing distribution networks and generating marketing strategies, in addition to establishing factories or facilities as mentioned above.

The Specification for the Profit Function

In the labour market, equilibrium means that labour supply should equal to the labour demand. The former is assumed to be exogenous and expressed as $\bar{L}$. The labour force is classified into skilled (L^s) and unskilled labour (L^u). At the same time, the price for maximizing the profits ($p_{isc} = b/\varphi\gamma_i$) can be expressed as a mark-up over the marginal cost:

$$P_i(\gamma) = \frac{d_{ce}(w_{sc}^{u})^{1-\alpha-\beta}}{\varphi\gamma_i}, \qquad \text{(A.4.11)}$$

where d_{ce} is the transport cost between the source country e and host country c. Samuelson (1954) finds that only $1/d_{ce}$ of goods can arrive in the host country when these goods are transported from source country e to the host c. Thus, when other things are maintained constant, more distant locations have a smaller role in profits.

The after-tax profit in country c is specified as the after-tax difference between total revenue and costs, and minus some other costs arising from environment of the host country:

$$\pi_{isc} = (1 - t_c)(TR_{isc} - TC_{isc}) - h_c, \qquad \text{(A.4.12)}$$

where t_c is the tax rate and h_c are the costs arising from the political, institutional and macroeconomic factors in the host country c. As shown in equation (A.4.9), the total revenue comes from selling a quantity of products (q_{ic}). Equation (A.4.10) reveals the total costs caused by producing these products. Substituting them in the above equation gives:

$$\pi_{isc} = (1 - t_c)\left(M_c P_{isc}^{1-\delta} - (w_{sc}^{s})^{\alpha} r_c^{\beta} f_c - \frac{(w_{sc}^{u})^{1-\alpha-\beta}}{\gamma_i} q_{ic}\right) - h_c. \qquad \text{(A.4.13)}$$

Further, substituting equations (A.4.11) and (A.4.8) for P_{isc} and q_{ic} leads to:

$$\pi_{isc} = (1 - t_c)\left(M_c \left(\frac{d_{ce}(w_{sc}^{u})^{1-\alpha-\beta}}{\varphi\gamma_i}\right)^{1-\delta}\left(1 - \frac{\varphi}{d_{ce}}\right) - (w_{sc}^{s})^{\alpha} r_c^{\beta} f_c\right) - h_c \qquad \text{(A.4.14)}$$

According to this, when the price level is given, the attributes of the profit function (π_{isc}) that determine FDI location are the tax rate in the host country (t_c), the distance between the source and host country (d_{ce}), the return on capital in the host country (r_c), the market size of host country (M_c), the wage rate in the host country (w_{sc}) and other costs (h_c).

Appendix B: Tables

Appendix Table 4.1: Summary for Count Data Models

Model	First Stage (Zero filter)	Second Stage	Marginal effects	Treatment of zeros	Comments
Basic Count Data	No first stage	Standard Poisson or NB count data model for all observations including zeros.	No	Included, no distinction.	Basic model. Dispersion determines distribution choice. NB for over-dispersion.
Hurdle	Binary choice model for zero or non-zero (positive) observations - logit.	Zero truncated Poisson or NB for all non-zero (positive) observations.	No	Zeros included in estimation, but filtered out statistically with impact corrected for at stage 2.	Different process for non-zero observations allowed for. Second stage is model of non-zero observations only.
Zero inflated	Binary choice model for zeros and observations from range including zero (i.e. part of zeros and all positive observations) - logit.	Standard Poisson or NB count data model for all possible observations.	No	Zeros included in estimation, but only extra zeros filtered out statistically. Modelled as either from zero only process or more general all value process.	Two processes for all observations: Stage one is model of extra zero observations. Stage two is model of all possible observations from Poisson or NB.
Zero truncated	No first stage	Standard Poisson or NB count data model for all non-zero (positive) observations.	No	Zero observations excluded from sample with model based on truncated distribution.	Count data models based on zero-truncated Poisson or NB distributions i.e. distributions for non-zero observations only.

Note: coefficients do not represent marginal effects in non-linear regression models, but they have the same significant level and directions of the sign. Marginal effects that can be evaluated at the means of the regressors are estimated for BRICS countries based on the ZINB model in Chapter 8.

Appendix Table 5.1: BRICS Investment in the EU-25, 1997 to 2010

Host	China	India	Russia	South Africa	Brazil	BRICS	Non-BRICS	Total
Austria	1	2	5	1	1	10	686	696
Belgium	31	26	3	7	7	74	1,738	1,812
Denmark	9	8	4	0	0	21	547	568
Finland	1	4	2	0	0	7	244	251
France	61	45	16	9	8	139	5,883	6,022
Germany	151	66	33	9	5	264	3,227	3,491
Greece	1	1	1	0	0	3	97	100
Ireland	3	3	2	3	0	11	1,259	1,270
Italy	21	4	6	0	1	32	780	812
Luxembourg	0	0	0	0	1	1	89	90
Netherlands	22	18	5	5	2	52	1,190	1,242
Portugal	0	2	0	0	9	11	411	422
Spain	17	7	6	4	16	50	2,074	2,124
Sweden	23	15	2	0	0	40	942	982
United Kingdom	170	307	26	48	15	566	7,777	8,343
EU-15	**511** **94.1%**	**508** **93.7%**	**111** **67.3%**	**86** **90.5%**	**65** **92.9%**	**1,281** **90.5%**	**26,944** **80.0%**	**28,225** **80.4%**
Bulgaria	4	1	7	1	0	13	457	470
Czech Republic	4	7	7	4	0	22	1130	1,152
Estonia	0	0	7	0	0	7	227	234
Hungary	13	6	3	1	0	23	1390	1,413
Latvia	0	0	8	1	0	9	172	181
Lithuania	0	1	11	0	0	12	227	239
Poland	5	10	3	2	0	20	1593	1,613
Romania	5	8	7	0	1	21	910	931
Slovakia	1	1	0	0	4	6	523	529
Slovenia	0	0	1	0	0	1	117	118
CEEC-10	**32** **5.9%**	**34** **6.3%**	**54** **32.7%**	**9** **9.5%**	**5** **7.1%**	**134** **9.5%**	**6,746** **20.0%**	**6880** **19.6%**
EU-25	**543** **100%**	**542** **100%**	**165** **100%**	**95** **100%**	**70** **100%**	**1,415** **100%**	**33,690** **100%**	**35,105** **100%**

Note: Projects with investors from two or more source countries are shown for the primary source only.
Source: EIM Database.

Appendix Table 5.2: Summary for Education levels of ISCED 2011

Level	ISCED 2011	Description	ISCED 1997
0	Early childhood educational development	Promotes early development of preparation for participating in school and society (0-3 year old children).	-
0	Pre-primary education	Has the same purpose to above, but for children from 3 years old to the start of primary education.	Level 0: Pre-primary education
1	Primary education	Help students have fundamental skills (reading and writing) and form a good foundation for learning.	Level 1: Primary education or first stage of basic education
2	Lower secondary education	(First stage) The purpose is to build on primary education with a more subject-oriented curriculum.	Level 2: Lower secondary education or second stage of basic education
3	Upper secondary education	(Second stage) The purpose is to prepare for tertiary education and develop skills relevant to employment.	Level 3: Upper secondary education
4	Post-secondary non-tertiary education	Develop learning experiences to build on secondary education and in preparation for the entry to the labour market or tertiary education.	Level 4: Post-secondary non-tertiary education
5	Short-cycle tertiary education	Provide short first tertiary programmes with practically-based and occupationally-specific characteristics to prepare for entry to labour market and supply a pathway to other tertiary programmes.	Level 5B: First stage of tertiary education: shorter, practical and occupational programmes for professional qualifications.
6	Bachelor or equivalent	Provide programmes to obtain intermediate academic and professional knowledge, skills and competencies for a first tertiary degree or equivalent qualifications.	Level 5A: First stage of tertiary education: large and theoretical programmes for getting more advanced research programmes and professions with higher skills requirements.
7	Master or equivalent	Provide programmes to obtain advanced academic and professional knowledge, skills and competencies for a second tertiary degree or equivalent qualifications.	Level 5A: The same to above
8	Doctoral or equivalent	Provide programmes to get an advanced research qualification when a thesis which meets the requirement for publication based on original research is produced. It aims to achieve independent research and contribute to current knowledge.	Level 6: Second stage of tertiary education (leading to an advanced research qualification).

Source: The International Standard Classification of Education (ISCED) of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

Appendix Table 6.1: BRICS FDI in the EU-25 by Country

Host	Brazil	Russia	India	China	South Africa	BRICS	Non-BRICS	Total
Austria	1	5	2	1	1	10	686	696
Belgium	7	3	26	31	7	74	1,738	1,812
Denmark	0	4	8	9	0	21	547	568
Finland	0	2	4	1	0	7	244	251
France	8	16	45	61	9	139	5,883	6,022
Germany	5	33	66	151	9	264	3,227	3,491
Greece	0	1	1	1	0	3	97	100
Ireland	0	2	3	3	3	11	1,259	1,270
Italy	1	6	4	21	0	32	780	812
Luxembourg	1	0	0	0	0	1	89	90
Netherlands	2	5	18	22	5	52	1,190	1,242
Portugal	9	0	2	0	0	11	411	422
Spain	16	6	7	17	4	50	2,074	2,124
Sweden	0	2	15	23	0	40	942	982
UK	15	26	307	170	48	566	7,777	8,343
EU-15	**65 (92.9%)**	**111 (67.3%)**	**508 (93.7%)**	**511 (94.1%)**	**86 (90.5%)**	**1,281 (90.5%)**	**26,944 (80.0%)**	**28,225 (80.4%)**
Bulgaria	0	7	1	4	1	13	457	470
Czech Republic	0	7	7	4	4	22	1130	1,152
Estonia	0	7	0	0	0	7	227	234
Hungary	0	3	6	13	1	23	1390	1,413
Latvia	0	8	0	0	1	9	172	181
Lithuania	0	11	1	0	0	12	227	239
Poland	0	3	10	5	2	20	1593	1,613
Romania	1	7	8	5	0	21	910	931
Slovakia	4	0	1	1	0	6	523	529
Slovenia	0	1	0	0	0	1	117	118
CEEC-10	**5 (7.1%)**	**54 (32.7%)**	**34 (6.3%)**	**32 (5.9%)**	**9 (9.5%)**	**134 (9.5%)**	**6,746 (20.0%)**	**6,880 (19.6%)**
EU-25	**70 (100.0%)**	**165 (100.0%)**	**542 (100.0%)**	**543 (100.0%)**	**95 (100.0%)**	**1,415 (100.0%)**	**33,690 (100.0%)**	**35,105 (100.0%)**

Notes: Number of projects in all years, 1997 to 2010. Projects with investors from two or more countries are shown for the primary source only.
Source: EIM database.

Appendix Table 6.2: Start-up Manufacturing FDI for Headquarters / R&D

Host	BRICS	Brazil	Russia	India	China	South Africa	All FDI
Austria	2	1	0	0	1	0	41
Belgium	2	1	0	0	1	0	77
Denmark	5	0	0	1	4	0	63
Finland	1	0	0	0	1	0	17
France	9	0	0	1	8	0	232
Germany	19	0	0	4	14	1	207
Greece	0	0	0	0	0	0	7
Ireland	1	0	0	0	1	0	88
Italy	3	0	0	0	3	0	45
Luxembourg	0	0	0	0	0	0	7
Netherlands	5	0	0	1	3	1	82
Portugal	0	0	0	0	0	0	10
Spain	3	1	2	0	0	0	125
Sweden	4	0	0	1	3	0	62
UK	43	1	0	21	19	2	543
EU-15	**97 (97.0%)**	**4 (100.0%)**	**2 (100.0%)**	**29 (96.7%)**	**58 (96.7%)**	**4 (100.0%)**	**1,606 (93.4%)**
Bulgaria	0	0	0	0	0	0	4
Czech Republic	1	0	0	1	0	0	25
Estonia	0	0	0	0	0	0	0
Hungary	2	0	0	0	2	0	29
Latvia	0	0	0	0	0	0	1
Lithuania	0	0	0	0	0	0	3
Poland	0	0	0	0	0	0	22
Romania	0	0	0	0	0	0	21
Slovakia	0	0	0	0	0	0	7
Slovenia	0	0	0	0	0	0	1
CEEC-10	**3 (3.0%)**	**0 (0.0%)**	**0 (0.0%)**	**1 (3.3%)**	**2 (3.3%)**	**0 (0.0%)**	**113 (6.6%)**
EU-25	**100 (100.0%)**	**4 (100.0%)**	**2 (100.0%)**	**30 (100.0%)**	**60 (100.0%)**	**4 (100.0%)**	**1,719 (100.0%)**

Notes: Number of FDI projects for years, 1997 to 2010. Projects with investors from two or more source countries are shown for the primary source only.
Source: EIM database.

Appendix Table 7.1: Hausman Test for Independence of Irrelevant Alternatives Assumption

Dropped Country	Value of Chi2	Prob > Chi2	Comments
Austria	-4.39	N/A	When this country is dropped, the negative value of Chi2 means that model fitted on these data fails to meet the asymptotic assumptions of the Hausman test. No conclusion can be made.
Belgium	-7.61	N/A	Same to the above.
Bulgaria	-3.22	N/A	Same to the above.
Czech Republic	-2.11	N/A	Same to the above.
Denmark	-0.87	N/A	Same to the above.
Estonia	1.01	1.0000	The positive value of Chi2 and insignificant Prob > Chi2 indicate that the null hypothesis cannot be rejected. It means that there is not a significant difference in probability of location choice when Estonia as one location choice is included or not (i.e. Data meet IIA assumption).
Finland	-3.27	N/A	Same to the case above of Austria.
France	-3.08	N/A	Same to the case above of Austria.
Germany	2.57	1.0000	Same to the case above of Estonia.
Greece	-0.28	N/A	Same to the case above of Austria.
Hungary	-4.39	N/A	Same to the case above of Austria.
Ireland	-2.37	N/A	Same to the case above of Austria.
Italy	-0.02	N/A	Same to the case above of Austria.
Latvia	-0.37	N/A	Same to the case above of Austria.
Lithuania	-1.65	N/A	Same to the case above of Austria.
Luxembourg	-3.50	N/A	Same to the case above of Austria.
Netherlands	-1.87	N/A	Same to the case above of Austria.
Poland	10.60	0.9999	Same to the case above of Estonia.
Portugal	-4.56	N/A	Same to the case above of Austria.
Romania	-3.73	N/A	Same to the case above of Austria.
Slovakia	3.11	1.0000	Same to the case above of Estonia.
Slovenia	-2.71	N/A	Same to the case above of Austria.
Spain	-4.55	N/A	Same to the case above of Austria.
Sweden	-4.55	N/A	Same to the case above of Austria.
UK	-158.86	N/A	Same to the case above of Austria.

Notes: The null hypothesis: There is not the systematic difference in coefficients. Hausman test is for the main results in Column XIV of Table 7.8. All country fixed-effects are considered when each of EU-25 countries is dropped, excluding the UK as country fixed-effects are dropped to get the regression results.

Appendix Table 7.2: FDI Location Choice for All Sources: Country Variables

Dependent Variable: = 1 if project locates in country i at time t.	**All Sources with Different Case Variables**		
	Table 7.9	**Table 7.10**	**Table 7.11**
	Project Characteristics	**BRICS Countries**	**Both, Europe and North America**
Country Variables, X_{it-1}:			
Demand Variables:			
Real GDP per capita ($\text{x}10^{-5}$)	-4.42***	-3.71***	-3.86***
Real GDP Growth Rate ($\text{x}10^{-2}$)	2.13***	2.09***	2.02***
Population Density ($\text{x}10^{-2}$)	-1.91***	-1.57***	-1.77***
External Market Demand ($\text{x}10^{-2}$)	0.43	-0.46	0.96
Labour Market Variables:			
Unemployment Rate ($\text{x}10^{-2}$)	-2.31***	-2.31***	-2.31***
Real Wage Rate ($\text{x}10^{-3}$)	-5.72	-3.71	-0.44
Real Wage Rate Dummy	-8.86***	-7.31***	-9.92***
Cost Variables:			
Corporate Income Tax Rate ($\text{x}10^{-2}$)	-1.15***	-1.18***	-1.29***
Motorway Density ($\text{x}10^{-2}$)	1.28**	1.12**	1.39**
Political Risk ($\text{x}10^{-3}$)	-3.32	-2.17	-3.67
Education Variables:			
Higher Education ($\text{x}10^{-3}$)	2.43	0.62	3.07
Secondary Education ($\text{x}10^{-3}$)	7.46***	5.49*	6.92**
Trade Variables:			
Openness to Trade ($\text{x}10^{-3}$)	0.93	0.60	-0.34
Real Exchange Rate ($\text{x}10^{-3}$)	-5.18***	-4.24**	-5.44***
Real Exchange rate volatility ($\text{x}10^{-3}$)	-1.51***	-1.45***	-1.48***
Policy Terms:			
EU Structural Funds ($\text{x}10^{-5}$)	-3.67***	-3.14***	-3.39***
Eurozone Country ($\text{x}10^{-1}$)	1.48***	1.20**	1.43***
EU Commitment ($\text{x}10^{-1}$)	3.00***	3.35***	3.01***
EU Membership ($\text{x}10^{-1}$)	2.53***	1.94***	2.37***
EU Post-membership ($\text{x}10^{-1}$)	-2.61***	-2.69***	-2.48***
Source Variables, FDI_{it-1} (x 10^{-3}):			
All Sources	0.61***	0.62***	0.628***
Number of Observations	817,100	817,100	817,100
Number of Cases	32,684	32,684	32,684
Log likelihood	-83,303.11	-84,657.61	-81,467.08
Country Fixed Effects	YES	YES	YES

Notes: The table shows the estimates on the country variables and lagged FDI term corresponding to the results reported in Tables 7.9 to 7.11 respectively. * = 10%, ** = 5% and *** = 1% significant level.

Appendix Table 8.1: BRICS FDI Location Choice:
Log-Linear Model with Country and Time Fixed-Effects

Dependent Variable: $ln(FDI_{it}+1)$ **in country** i **at time** t.	**All BRICS**	**Brazil**	**Russia**	**India**	**China**	**South Africa**
	I	**II**	**III**	**IV**	**V**	**VI**
Country Variables, X_{it-1}**:**						
Demand Variables:						
Real GDP per capita (x10^{-5})	-10.50***	-4.06**	-3.83**	-4.06**	-4.36**	-1.32
Real GDP Growth Rate (x10^{-3})	15.50	-9.00	16.90	8.69	11.10	-13.20**
Population Density (x10^{-3})	-2.48	11.10	-17.90	-12.20	6.78	-0.26
External Market Demand (x10^{-2})	5.75*	1.12	2.45	7.20**	3.71	2.56
Labour Market Variables:						
Unemployment Rate (x10^{-2})	-0.04	-1.59*	-0.66	0.06	0.10	-2.00**
Real Wage Rate (x10^{-2})	-2.96	-4.37**	-2.94	-0.58	0.15	-1.81
Real Wage Rate Dummy (x10^{-1})	-33.15***	-28.53***	-4.66	-6.67	-13.58	-4.63
Cost Factors:						
Corporate Income Tax Rate (x10^{-3})	-3.83	1.32	-17.70**	1.37	0.02	-6.15
Motorway Density (x10^{-3})	-12.80	-0.28	11.70	-16.40	-22.50*	6.76
Political Risk (x10^{-3})	11.10	-6.61	20.70**	-7.99	4.29	5.72
Education Variables:						
Higher Education (x10^{-3})	19.60*	-0.59	6.86	13.50*	2.27	4.14
Secondary Education (x10^{-3})	5.59	2.96	-1.45	12.90*	0.77	-0.19
Trade Variables:						
Openness to Trade (x10^{-3})	-3.96	-2.33	-4.57	-8.36**	-0.48	2.93
Real Exchange Rate (x10^{-3})	0.26	-0.48	2.93	0.10	-8.54**	1.54
Real Exchange rate volatility (x10^{-4})	8.91**	0.33	10.60***	5.46*	1.37	-0.79
Policy Terms:						
EU Structural Funds (x10^{-5})	-4.52	-1.71	5.34	2.77	-11.20***	-5.17**
Eurozone Country (x10^{-2})	-11.40	5.04	-0.32	-8.35	-10.40	0.75
EU Commitment (x10^{-2})	-32.10	-4.08	-0.05	-23.50*	-4.78	-1.70
EU Membership (x10^{-2})	0.32	-11.80	10.30	17.30	-28.50*	2.98
EU Post-membership (x10^{-2})	-17.80*	-1.76	-23.20***	-4.06	8.74	-9.11*
Source Variables, $ln(FDI_{it-1}+1)$ **(x 10^{-2}):**						
All BRICS	25.20***	-	-	-	-	-
Brazil	-	0.46	7.60	14.10	12.70	1.77
Russia	-	-10.40*	-4.48	11.20*	2.40	1.26
India	-	17.90***	5.23	16.10*	31.20***	1.27
China	-	1.90	14.70**	28.00***	22.80***	3.05
South Africa	-	2.81	24.30**	-8.90	12.20	-18.90**
Constant (x10^{-1})	17.59	22.02**	9.30	8.56	3.34	-2.18
Number of Observations	325	325	325	325	325	325
R^2	0.81	0.46	0.50	0.81	0.81	0.64
Time fixed-effects	YES	YES	YES	YES	YES	YES
Country fixed-effects	YES	YES	YES	YES	YES	YES

Notes: Location choice for FDI projects across EU-25 countries over 1998-2010. OLS estimation with robust standard errors. * = 10%, ** = 5% and *** = 1% significance level. This can be compared with Table 8.2.

Appendix Table 8.2: BRICS FDI Location Choice:
Log-Linear Model with New Source Variable and Country and Time Fixed-Effects

Dependent Variable: $ln(FDI_{it}+1)$ in country i at time t.	**All BRICS**	**Brazil**	**Russia**	**India**	**China**	**South Africa**
	I	**II**	**III**	**IV**	**V**	**VI**
Country Variables, X_{it-1}:						
Demand Variables:						
Real GDP per capita ($x10^{-5}$)	-10.50***	-4.23***	-5.04***	-5.46***	-6.06***	-1.48
Real GDP Growth Rate ($x10^{-3}$)	15.50	-6.30	15.90	10.50	15.40	-12.97**
Population Density ($x10^{-3}$)	-2.48	6.63	-18.70	-18.30	-2.55	-1.14
External Market Demand ($x10^{-2}$)	5.75*	3.05	4.46*	10.10***	7.66***	3.02
Labour Market Variables:						
Unemployment Rate ($x10^{-2}$)	-0.04	-1.67*	-1.07	-0.61	-0.40	-2.09**
Real Wage Rate ($x10^{-2}$)	-2.96	-4.79**	-3.49	-0.69	-1.31	-1.90
Real Wage Rate Dummy ($x10^{-1}$)	-33.15***	-27.89***	-8.65	-8.51	-17.58	-4.86
Cost Factors:						
Corporate Income Tax Rate ($x10^{-3}$)	-3.83	4.16	-16.70**	0.79	1.39	-6.07
Motorway Density ($x10^{-3}$)	-12.80	-2.10	9.61	-18.90	-25.60**	6.33
Political Risk ($x10^{-3}$)	11.13	-11.07	19.60**	-12.60	-1.07	5.14
Education Variables:						
Higher Education ($x10^{-3}$)	19.60*	-0.90	8.26	14.10*	5.18	4.17
Secondary Education ($x10^{-3}$)	5.59	3.94	0.83	17.10**	5.62	0.25
Trade Variables:						
Openness to Trade ($x10^{-3}$)	-3.96	-3.64	-4.72	-9.84**	-4.42	2.70
Real Exchange Rate ($x10^{-3}$)	0.26	-2.33	1.72	-4.80	-10.80**	1.05
Real Exchange rate volatility ($x10^{-4}$)	8.91**	0.40	9.98***	5.90*	2.97	-0.75
Policy Terms:						
EU Structural Funds ($x10^{-5}$)	-4.52	-1.90	3.36	0.08	-10.70***	-5.46**
Eurozone Country ($x10^{-2}$)	-11.40	3.47	-2.02	-9.82	-12.60	0.62
EU Commitment ($x10^{-2}$)	-32.10	-8.07	-1.25	-21.70*	-11.70	-1.85
EU Membership ($x10^{-2}$)	0.32	-12.50	6.93	11.10	-25.50*	2.43
EU Post-membership ($x10^{-2}$)	-17.80*	-0.45	-24.60***	-5.44	6.32	-9.31*
Source Variables, $ln(FDI_{it-1}+1)$ ($x 10^{-2}$):						
All BRICS	25.20***	-	-	-	-	-
Brazil	-	4.11	-	-	-	-
Russia	-	-	1.43	-	-	-
India	-	-	-	30.70***	-	-
China	-	-	-	-	36.50***	-
South Africa	-	-	-	-	-	-17.50**
BRICS, excluding same country	-	7.16**	9.30	12.01*	9.83*	2.46
Constant ($x10^{-1}$)	17.59	26.30**	11.41	17.29	14.47	-1.20
Number of Observations	325	325	325	325	325	325
R^2	0.81	0.43	0.47	0.79	0.80	0.64
Time fixed-effects	YES	YES	YES	YES	YES	YES
Country fixed-effects	YES	YES	YES	YES	YES	YES

Notes: Location choice for FDI projects across EU-25 countries over 1998-2010. OLS estimation with the robust standard errors. * = 10%, ** = 5% and *** = 1% significance level. This can be compared with Table 8.3.

Appendix Table 8.3: BRICS FDI Location Choice: Log-Linear Model with New Source Variable and No Fixed-Effects

Dependent Variable: $ln(FDI_{it}+1)$ in country i at time t.	**All BRICS**	**Brazil**	**Russia**	**India**	**China**	**South Africa**
	I	**II**	**III**	**IV**	**V**	**VI**
Country Variables, X_{it-1}:						
Demand Variables:						
Real GDP (x10^{-6})	0.63***	0.04	0.35***	0.34***	0.41***	0.22***
Real GDP per capita (x10^{-5})	-1.32**	-0.52	-0.69*	-0.53	-0.35	-0.46
Real GDP Growth Rate (x10^{-3})	-0.08	-2.14	0.55	2.89	-1.46	1.38
Population Density (x10^{-3})	1.00	-0.93	-0.18	1.67**	0.04	1.92***
External Market Demand (x10^{-2})	1.69***	0.69**	0.29	1.16***	0.64	1.00***
Labour Market Variables:						
Unemployment Rate (x10^{-2})	-2.35**	-0.07	-1.38*	-0.97	-0.72	-0.80*
Real Wage Rate (x10^{-2})	0.81	-0.20	0.14	0.11	0.52	-0.24
Real Wage Rate Dummy (x10^{-1})	0.45	-0.61	1.32	0.98	0.18	0.93*
Cost Factors:						
Corporate Income Tax Rate (x10^{-3})	-19.08 ***	-3.22	-8.19*	-6.47	-8.99*	-1.88
Motorway Density (x10^{-3})	-6.40	3.85	-0.13	-11.54**	-0.15	-14.05***
Political Risk (x10^{-3})	6.97	-1.29	4.92	8.72	-1.02	11.30***
Education Variables:						
Higher Education (x10^{-3})	16.56***	1.36	10.25***	10.21***	5.74*	5.40**
Secondary Education (x10^{-3})	-6.74**	-5.09**	1.75	-4.47	-3.02	-7.43***
Trade Variables:						
Openness to Trade (x10^{-3})	-2.79*	-1.21	-0.54	-2.09	-0.65	-0.90
Real Exchange Rate (x10^{-3})	3.55	-2.21	3.04	0.84	-3.06	2.46
Real Exchange rate volatility (x10^{-4})	7.36**	0.74	1.88	5.42**	2.55	2.14
Policy Terms:						
EU Structural Funds (x10^{-5})	1.63	1.94	1.77	-0.35	-1.40	-1.63
Eurozone Country (x10^{-2})	-9.82	6.09*	3.93	-9.93	-6.21	-2.44
EU Commitment (x10^{-2})	0.31	-6.76	11.30	-6.84	4.11	-4.56
EU Membership (x10^{-2})	29.44*	4.31	7.52	17.80	2.57	1.65
EU Post-membership (x10^{-2})	-24.80***	-4.28	-16.10**	-6.64	-4.32	-3.76
Source Variables, $ln(FDI_{it-1}+1)$ (x 10^{-2}):						
All BRICS	46.63***	-	-	-	-	-
Brazil	-	21.24*	-	-	-	-
Russia	-	-	10.47	-	-	-
India	-	-	-	53.46***	-	-
China	-	-	-	-	60.08***	-
South Africa	-	-	-	-	-	9.84
BRICS, excluding same country	-	11.13***	7.70	16.30***	13.42**	5.62*
Constant (x10^{-1})	-0.77	7.32	-5.09	-6.75	5.85	-8.86**
Number of Observations	325	325	325	325	325	325
R^2	0.76	0.30	0.38	0.74	0.75	0.48
Time fixed-effects	NO	NO	NO	NO	NO	NO
Country fixed-effects	NO	NO	NO	NO	NO	NO

Notes: Location choice for FDI projects across EU-25 countries over 1998-2010. OLS estimation with robust standard errors. * = 10%, ** = 5% and *** = 1% significance level. This can be compared with Table 8.3.

Appendix Table 8.4: BRICS Manufacturing FDI Location Choice: Log-Linear Model with Country and Time Fixed-Effects

Dependent Variable: $ln(FDI_{it}+1)$ in country i at time t.	**All BRICS**	**Brazil**	**Russia**	**India**	**China**	**South Africa**
	I	**II**	**III**	**IV**	**V**	**VI**
Country Variables, X_{it-1}:						
Demand Variables:						
Real GDP per capita (x10^{-5})	-10.30***	-3.63**	-2.70	-1.43	-6.21***	-0.58
Real GDP Growth Rate (x10^{-3})	28.10**	-7.48	9.92	11.70	10.50	-6.29
Population Density (x10^{-3})	1.77	12.10	-1.99	-4.11	-4.60	-2.90
External Market Demand (x10^{-2})	5.37*	0.96	-0.90	4.14	6.42**	0.80
Labour Market Variables:						
Unemployment Rate (x10^{-2})	-0.03	-1.25	-0.96	0.11	0.05	-0.93
Real Wage Rate (x10^{-2})	-4.24	-3.99**	-1.06	-3.28	0.11	-1.45
Real Wage Rate Dummy (x10^{-1})	-37.76***	-25.71***	-8.63	-12.29	-11.23	-2.28
Cost Factors:						
Corporate Income Tax Rate (x10^{-3})	-2.19	0.08	-9.64*	-0.21	-1.22	-1.10
Motorway Density (x10^{-3})	-13.60	-1.38	6.76	-16.90	-16.60	4.82
Political Risk (x10^{-3})	2.15	-7.24	7.72	-11.90	5.75	2.08
Education Variables:						
Higher Education (x10^{-3})	20.10*	-0.67	10.90*	9.61	7.06	2.91
Secondary Education (x10^{-3})	9.05	-0.13	6.07	14.40**	3.99	2.75
Trade Variables:						
Openness to Trade (x10^{-3})	-3.20	-1.49	-1.86	-7.27**	-0.98	1.60
Real Exchange Rate (x10^{-3})	2.89	-0.06	9.07**	0.19	-9.54**	1.62
Real Exchange rate volatility (x10^{-4})	7.56*	0.21	5.92**	4.30	1.65	-1.85
Policy Terms:						
EU Structural Funds (x10^{-5})	-6.61	-3.58	4.66	3.73	-10.02**	-0.47
Eurozone Country (x10^{-2})	-10.30	2.84	0.06	-3.51	-7.42	9.06*
EU Commitment (x10^{-2})	-32.30*	-6.70	8.51	-17.70**	-11.50	0.87
EU Membership (x10^{-2})	-19.40	-6.34	2.70	12.90	-26.70*	5.75
EU Post-membership (x10^{-2})	-9.15	-1.40	-16.80**	-1.45	6.38	-10.10**
Source Variables, $ln(FDI_{it-1}+1)$ (x10^{-2}):						
All BRICS	18.60**	-	-	-	-	-
Brazil	-	-3.22	-6.14	17.01	2.80	1.46
Russia	-	-12.20**	-16.10**	11.20	3.80	-2.97
India	-	14.10**	9.15	8.46	28.10***	6.83
China	-	2.33	14.50**	29.90***	21.50**	0.19
South Africa	-	4.32	2.45	-3.15	7.78	-9.23
Constant (x10^{-1})	20.32	20.15**	0.51	12.75	6.50	0.30
Number of Observations	325	325	325	325	325	325
R^2	0.75	0.42	0.34	0.70	0.77	0.49
Time fixed-effects	YES	YES	YES	YES	YES	YES
Country fixed-effects	YES	YES	YES	YES	YES	YES

Notes: Location choice for FDI projects across EU-25 countries over 1998-2010. OLS estimation robust standard errors. * = 10%, ** = 5% and *** = 1% significance level. This can be compared with Table 8.5.

Appendix Table 8.5: BRICS FDI Location Choice: Poisson Model without Country and Time Fixed-Effects

Dependent Variable: FDI_{it} in country i at time t.	**All BRICS**	**Brazil**	**Russia**	**India**	**China**	**South Africa**
	I	**II**	**III**	**IV**	**V**	**VI**
Country Variables, X_{it-1}:						
Demand Variables:						
Real GDP (x10^{-6})	1.52***	1.71*	1.04***	1.09***	2.08***	1.37***
Real GDP per capita (x10^{-5})	-4.97***	-4.85	-8.08**	-6.12**	-6.11**	-5.79
Real GDP Growth Rate (x10^{-3})	-3.17	-91.80	4.78	35.20	-3.71	-39.60
Population Density (x10^{-3})	0.59	-8.55	-1.42	7.60***	-3.97**	8.70*
External Market Demand (x10^{-2})	2.76***	7.38***	1.37	4.43***	1.27	6.38***
Labour Market Variables:						
Unemployment Rate (x10^{-2})	-3.94**	2.94	-10.30**	-4.45	-4.44	-11.60
Real Wage Rate (x10^{-2})	4.96***	-8.59	8.85**	10.10***	8.85***	-1.90
Real Wage Rate Dummy (x10^{-1})	-2.46	-24.63*	4.60	0.61	-10.10**	-4.15
Cost Factors:						
Corporate Income Tax Rate (x10^{-3})	-72.50***	-29.90	-79.80***	-65.60***	-108.38***	-17.60
Motorway Density (x10^{-3})	3.31	74.90*	8.72	-42.50***	33.10**	-60.50*
Political Risk (x10^{-3})	-5.29	-3.17	-19.70	-21.60	-22.40	72.90*
Education Variables:						
Higher Education (x10^{-3})	57.60***	-28.20	72.20***	100.62***	48.03***	54.04
Secondary Education (x10^{-3})	-13.60***	-77.20***	35.30***	17.50*	-15.01*	-33.20**
Trade Variables:						
Openness to Trade (x10^{-3})	-1.04	0.57	-6.58	-9.49**	5.82	-1.23
Real Exchange Rate (x10^{-3})	1.35	67.70**	13.60	-9.21	-2.71	18.50
Real Exchange rate volatility (x10^{-4})	-26.70	18.30	-419.44	-11.60	-153.81	15.80
Policy Terms:						
EU Structural Funds (x10^{-5})	9.12***	21.10*	22.80**	12.10*	2.83	9.76
Eurozone Country (x10^{-2})	-59.50***	204.30*	20.60	-62.30**	-93.10***	58.30
EU Commitment (x10^{-2})	61.30*	-1667.89	49.30	57.40	1430.99	-27.95
EU Membership (x10^{-2})	52.40*	1640.13	-9.04	220.50**	7.39	75.40
EU Post-membership (x10^{-2})	-42.10***	-258.30**	-72.02***	-37.40	-21.20	-90.90
Source Variables, FDI_{it-1} (x10^{-2}):						
All BRICS	0.74***	-	-	-	-	-
Brazil	-	-10.90	-3.43	0.52	0.46	-2.36
Russia	-	-25.70**	-12.04*	-0.24	-3.09	-9.24
India	-	12.10***	-0.36	-0.45	0.95	-0.38
China	-	1.46	0.68	0.45	0.20	1.88
South Africa	-	31.50**	26.50***	3.07	4.26	6.06
Constant (x10^{-1})	8.48	-28.50	-10.94	-31.70	-110.10	-90.71**
Number of Observations	325	325	325	325	325	325
Log likelihood	-565.80	-104.78	-227.65	-290.42	-336.57	-123.34
Pseudo R^2	0.76	0.50	0.33	0.76	0.71	0.46
Time fixed-effects	NO	NO	NO	NO	NO	NO
Country fixed-effects	NO	NO	NO	NO	NO	NO

Notes: Location choice for FDI projects across EU-25 countries over 1998-2010. Dependent variable and BRICS terms are measured by the original number of projects. * = 10%, ** = 5% and *** = 1% significance level. This can be compared with Table 8.6.

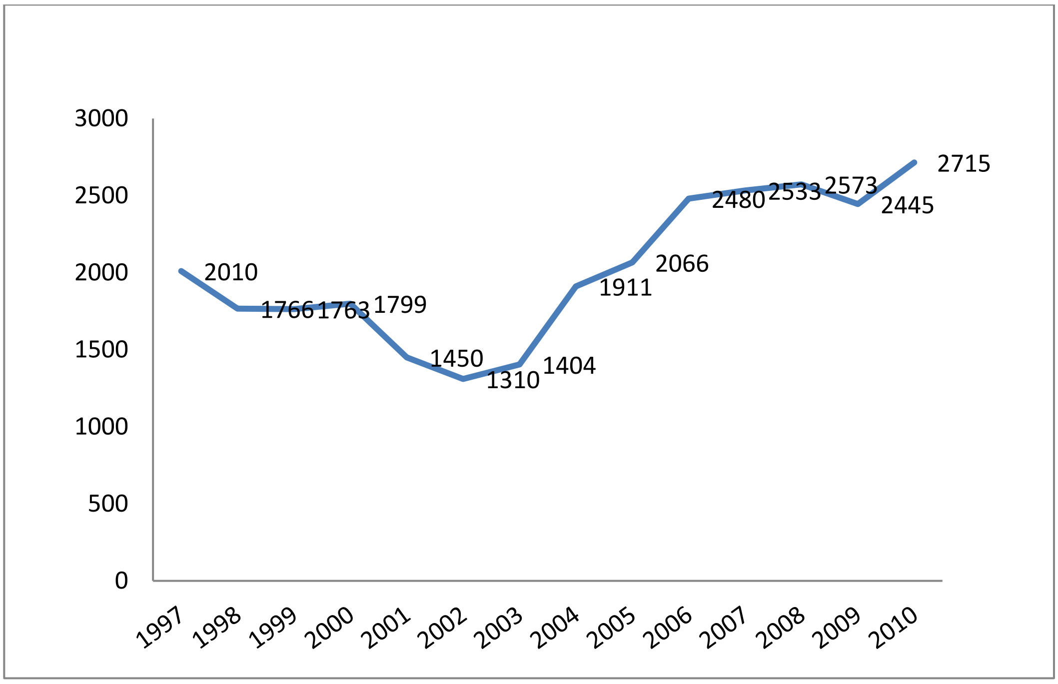
Appendix Table 8.6: BRICS FDI Location Choice:
Negative Binomial Model without Country and Time Fixed-Effects

Dependent Variable: FDI_{it} in country i at time t.	All BRICS	Brazil	Russia	India	China	South Africa
	I	II	III	IV	V	VI
Country Variables, X_{it-1}:						
Demand Variables:						
Real GDP (x10^{-6})	1.29***	1.71*	1.04***	0.98***	1.97***	1.37***
Real GDP per capita (x10^{-5})	-6.99***	-4.85	-8.08**	-9.62***	-10.70***	-5.79
Real GDP Growth Rate (x10^{-3})	-1.31	-91.80	4.78	41.80	3.13	-39.60
Population Density (x10^{-3})	-0.89	-8.55	-1.42	5.26*	-3.04	8.70*
External Market Demand (x10^{-2})	2.72***	7.38***	1.37	3.69***	0.62	6.38***
Labour Market Variables:						
Unemployment Rate (x10^{-2})	-4.91**	2.94	-10.30**	-2.83	-4.77	-11.60
Real Wage Rate (x10^{-2})	7.45***	-8.59	8.85**	13.60***	15.90***	-1.90
Real Wage Rate Dummy (x10^{-1})	-3.31	-24.63*	4.60	-2.25	-9.25*	-4.15
Cost Factors:						
Corporate Income Tax Rate (x10^{-3})	-79.20***	-29.90	-79.80***	-85.98***	-135.69***	-17.60
Motorway Density (x10^{-3})	13.60	74.90*	8.72	-22.90	33.80*	-60.50*
Political Risk (x10^{-3})	1.22	-3.17	-19.70	-3.60	-33.80	72.80*
Education Variables:						
Higher Education (x10^{-3})	36.70***	-28.20	72.20***	66.10***	36.70*	54.05
Secondary Education (x10^{-3})	-14.40**	-77.20***	35.30***	3.35	-12.50	-33.20**
Trade Variables:						
Openness to Trade (x10^{-3})	-4.25	0.57	-6.58	-10.60**	2.65	-1.23
Real Exchange Rate (x10^{-3})	14.50	67.70**	13.60	10.10	-7.23	18.50
Real Exchange rate volatility (x10^{-4})	-18.70	18.30	-419.45	31.30	-18.80	15.70
Policy Terms:						
EU Structural Funds (x10^{-5})	8.79*	21.10*	22.80**	9.21	4.87	9.75
Eurozone Country (x10^{-2})	-60.50***	204.30*	20.60	-78.40***	-114.03***	58.30
EU Commitment (x10^{-2})	43.70	-1464.13	49.20	14.40	1500.94	-27.96
EU Membership (x10^{-2})	46.10	1436.36	-9.04	214.60**	-5.40	75.40
EU Post-membership (x10^{-2})	-49.90***	-258.30**	-72.02***	-41.40	-19.20	-90.90
Source Variables, FDI_{it-1} (x10^{-2}):						
All BRICS	2.10***	-	-	-	-	-
Brazil	-	-10.90	-3.43	12.50	7.39	-2.35
Russia	-	-25.70**	-12.04*	5.76	-7.27	-9.24
India	-	12.10***	-0.36	2.19	1.54	-0.38
China	-	1.46	0.68	-0.32	0.91	1.88
South Africa	-	31.50**	26.50***	-1.16	-2.00	6.06
Constant (x10^{-1})	4.90	-28.50	-10.94	-34.97	-92.06	-90.71**
Number of Observations	325	325	325	325	325	325
Log likelihood	-524.40	-104.78	-227.65	-284.48	-307.70	-123.34
Pseudo R^2	0.28	0.36	0.26	0.35	0.32	0.33
Over-dispersion Parameter (χ^2)	82.80***	0.00	0.00	11.88***	57.74***	0.00
Time fixed-effects	NO	NO	NO	NO	NO	NO
Country fixed-effects	NO	NO	NO	NO	NO	NO

Notes: Location choice for FDI projects across EU-25 countries over 1998-2010. Dependent variable and BRICS terms are measured by the original number of projects. * = 10%, ** = 5% and *** = 1% significance level. This can be compared with Table 8.7.

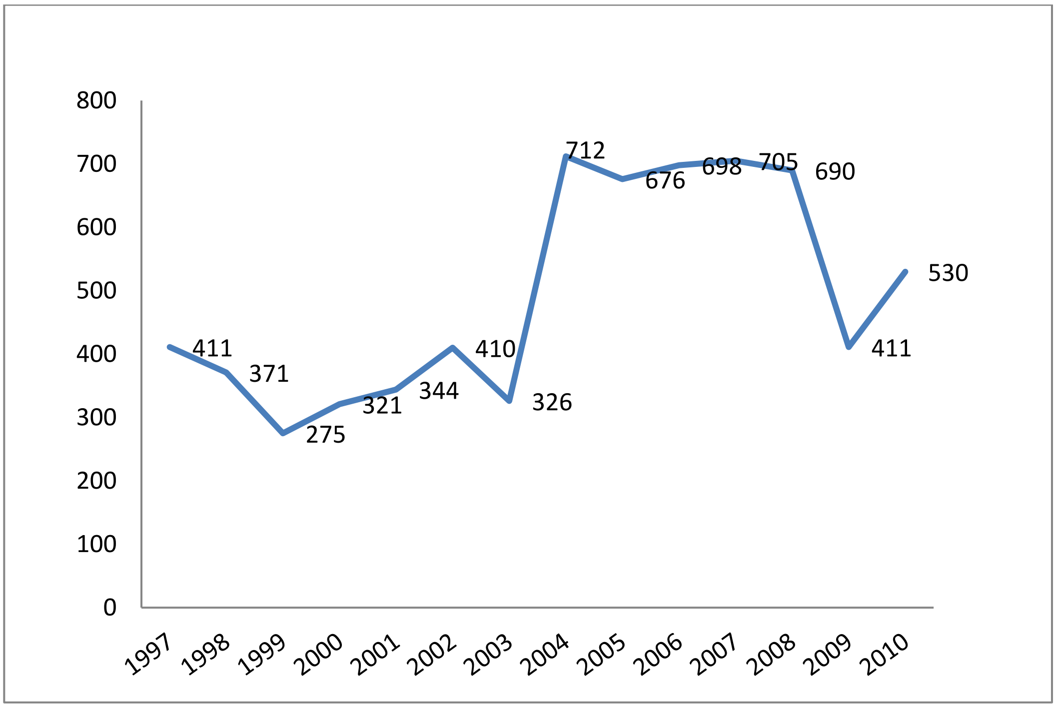
Appendix C: Figures

Appendix Figure 5.1: FDI Projects in the EU-15, 1997-2010



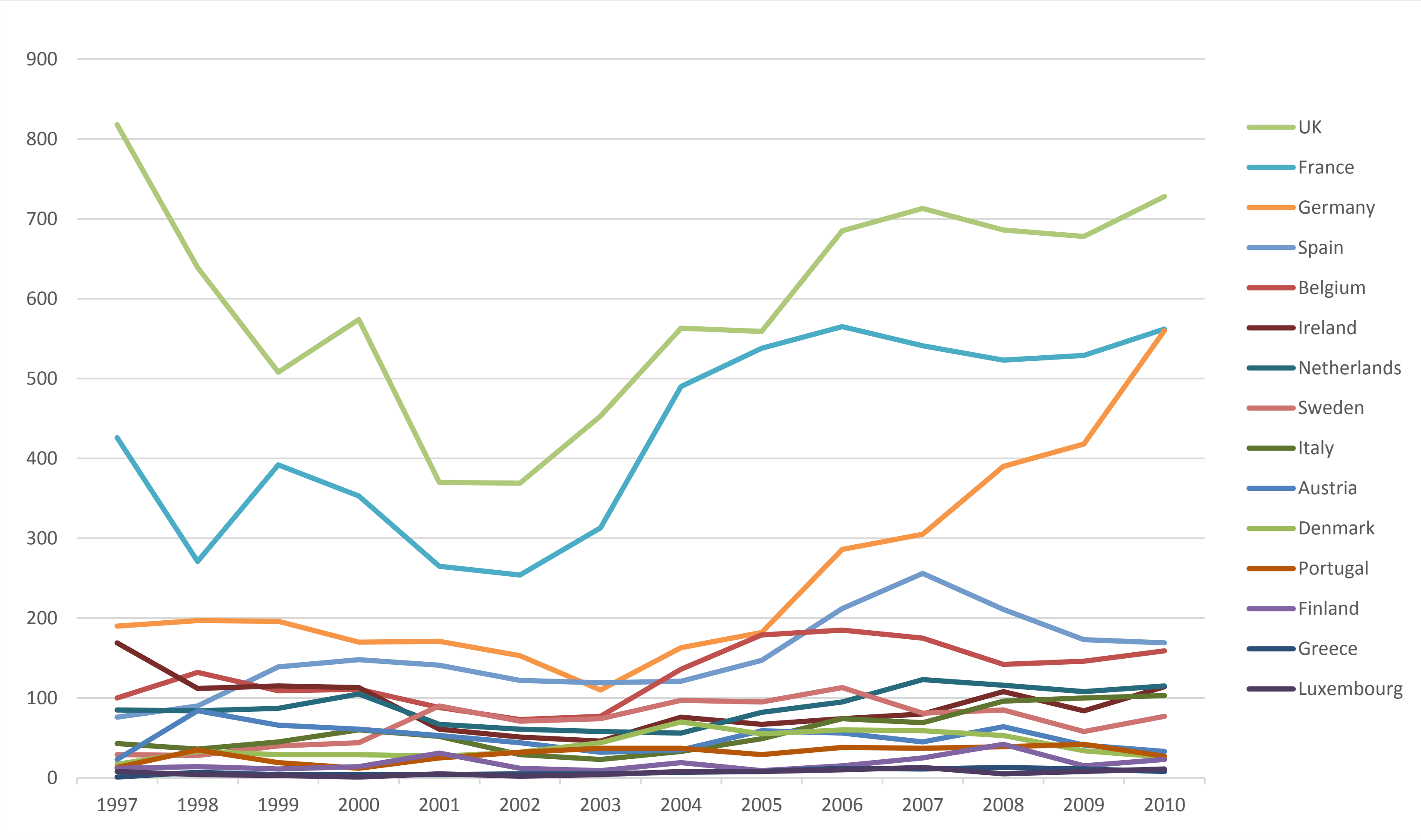
Source: EIM Database.

Appendix Figure 5.2: FDI Projects in the CEEC-10, 1997-2010



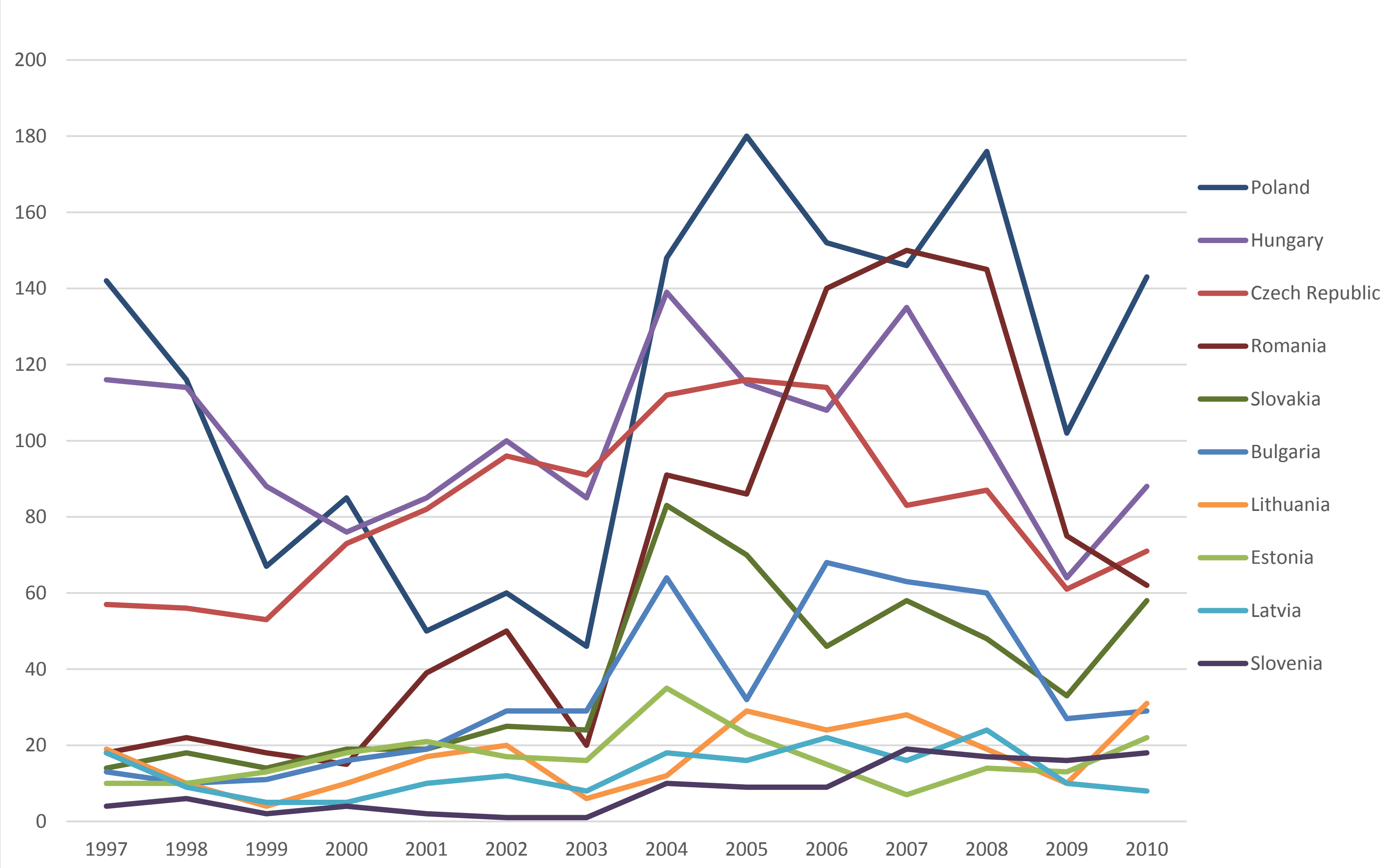
Source: EIM Database.

Appendix Figure 5.3: FDI Projects in Each EU-15 Country, 1997-2010



<u>Source</u>: EIM Database.

Appendix Figure 5.4: FDI Projects in Each CEEC-10 Country, 1997-2010



Source: EIM Database.