Determinants of Foreign Direct Investment and Its relationship to Economic Growth

by

Melissa Chanegriha

A thesis submitted in partial fulfilment of the requirement for the degree of

Doctor of Philosophy

Department of Economics

London Metropolitan University

September 2011

Abstract

Foreign Direct Investment (FDI) has been widely treated in a specific way or as part of strategy theories, in definition and in econometric models and has also been studied in many different aspects and approaches.

This dissertation first embarks on a wide ranging review of theories of variables; it then empirically explores and studies the various economic, political and geographical determinants of FDI in the world economy. It also includes an assessment of the relationship between FDI and economic growth.

To achieve that, this thesis incorporates into the theoretical models more than 56 variables that are standard in the economic literature to capture the economic political and geographical determinants of FDI. Rather than relying on specific theories of FDI determinants, we take an agnostic stance and examine them all simultaneously under a united eclectic framework .This work is based on a new panel data set that covers 168 countries located in different world regions of the world for the period 1970-2006. No previous study covers and analyses such a wide range of fundamentals in such a large dataset.

We first analyse the determinants of FDI using standard panel methods. Then we employ the recent extreme bounds analysis (EBA) approach, of Leamer (1985), Sala-i-Martin (1997) which is imperfect but useful method to deal with model uncertainty. We apply this approach where we account for all possible combinations of explanatory factors to identify "robust" determinants of FDI.

To the best of our knowledge, this approach has not been applied before within such large datasets to examine the robustness of the determinants of FDI. Indeed, the majority of applications of EBA are in the growth literature. The findings significantly outperform existing ones as endogeneity bias and model uncertainty are controlled for in that context.

Among the main conclusions, we show that FDI inflows depends on market size and market growth, established bilateral trade, openness of the host country, bilateral investment treaties, cultural proximity, corporate taxes and the quality of institutions. Our results are consistent with the predictions of the theoretical models.

Based on these results, another empirical chapter tests the causality between FDI and economic growth. We contribute to the literature by applying Granger non causality tests using the Fisher (1948), Hurlin (2004) and Hanck (2008) methods in heterogeneous panel data. The empirical evidence reported in this chapter supports and shows that there is no causality between FDI inflows and economic growth in both directions. Our results suggest that the relationship between the two variables is perhaps too complex to be identified in a bivariate Granger causality framework.

Further to this work we investigate whether FDI can be considered as a new growth determinant. We extend the augmented Solow growth model and its Mankiw-Romer-Weil specification to include FDI to GDP ratio as a variable of interest. Extreme bound analysis growth regressions confirm that FDI, initial income and human capital have a robust positive effect on long-term growth.

Over all, the major contribution of this thesis is to provide a better understanding of the determinants of FDI and to analyse the interrelationship between FDI and economic growth.

Acknowledgements

I have benefited from the help and support of a large number of people to accomplish this thesis. First, I would like to thank my main supervisor Dr Christopher Tsoukis for his invaluable assistance, constant encouragement and time that he kindly offered to me.

I am also thankful to my second supervisor Dr Christopher Stewart for reading the drafts of the thesis. I can never express how much his support, suggestions, profound comments and detailed revisions helped me complete this work and learn more about applied econometrics.

My eternal gratitude goes to my parents, sisters Nadia, Mounira, Meriem, Amina and brother Chafik who taught me to never give up and provide financial and emotional support throughout the years; without them I would not be here. Thanks to my friends who were in the right place at the right time and who stood beside me for so many years and played such vital roles in my everyday life: Leda Neishabourian, Sanam Moghul, Nadeen Alturki, Dr Victor Iego and Nour Mounir.

I would also like to thank the staff at the Department of Economics who provided all the help to facilitate my stay at the university.

Finally, I wish to mention that this thesis was made possible thanks to financial support from Algerian government.

I retain entire responsibility for all remaining errors in this research.

Melissa Chanegriha

DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at any other institutions.

Melissa Chanegriha

Table of Contents

List of Tables and Figures

List of Tables and Figures

List of Abbreviations

BACE: Bayesian Averaging of Classical Estimate

BMA: Bayesian Model Averaging

CDF: Cumulative Distribution Function

EBA: Extreme bound analysis

ECA: Europe and Central Asia

EOS: Economies Of Scale

ESA: East and South Asia

FDI: Foreign Direct Investment

GDP: Gross Domestic Product

GUM: General Unrestricted Model

HC: Homogeneous Causality

HEC: Heterogeneous Causality

HENC: Heterogeneous Non-Causality

HNC: Homogeneous Non-Causality

IBL: International Bank Lending

ICRG: International Country Risk Guide

ICT: Information and Communication Technology

IMF: International Monetary Fund

LAC: Latin America and Caribbean

LDC: Least developed country

LEB: Lower Extreme Bound

List of Abbreviations (Continue)

M&A: Mergers and acquisitions

MENA: Middle East and North Africa

MNCs: Multinational Corporations

OECD Organisation for economic Co- operation and Development

OLS: Ordinary Least Squares

PCI: Portfolio Capital Investment

PWT: Penn World Table

SIC: Schwartz's Information Criteria

SSA: Sub-Saharan AFRICA

UEB: Upper Extreme Bound

UNCTAD: United Nations Conference on Trade and Development

VIF: Variance Inflation Factor

WDI: World Development Indicators

WIR: World Investment Report

Chapter 1
General Introduction

1.1 Introduction

Since the eighties, policymakers began to implement more liberalized trade and investment policies in an effort to attract greater inflows of Foreign Direct Investment (FDI). They come to conclusion that FDI can contribute to boost the growth through creating employment, increase technological development in the host country and improve the economic condition of the country in general.

This thesis sheds new light on various aspects of FDI and growth, reviewing the various existing theories and empirically tests of the various proposed determinants of FDI inflows finally an empirical assessment of the relationship between FDI and economic growth within new large dataset.

1.2 Purpose of the Thesis

The purpose of this thesis is to contribute in a novel way to the existing literature on the determinants of FDI inflows by focusing on large panel of countries. This permits us to identify various economic, political and geographical variables that have been discussed in the different theories of FDI. Additionally, we aim to show its contribution to economic growth.

Three main questions guide this research:

1. What are the main economic, political and geographical determinants of FDI?
2. What is the direction of causality between FDI and economic growth?
3. Is FDI a robust determinant of economic growth?

Answers to such questions are of great importance for policymakers to boost FDI in specific regions. Our work provides evidence of the relationship between FDI and different economic and geopolitical variables using ordinary least squares (OLS) techniques and extreme bound analysis (EBA). We believe that understanding the factors behind the attractiveness of inward FDI is important for policymakers in order to improve the economic situation of a particular country.

1.3 Innovative Features of Thesis:

Most of empirical studies on FDI flows only investigate certain regions or the determinants between certain groups of countries. The first contribution made by this thesis is the construction of large panel dataset that identify more than 5 variables suggested in the literature as determinants of FDI classified into three categories: economic, political and geographical determinants, for 168 countries over the period 1970-2006, is considered. The selection of this sample is based on two main rationales:(i) it represents a heterogeneous group of countries from five geographical regions of the world and (ii) it remains almost unchanged throughout the four empirical chapters of the thesis and consequently enables a comparison between the main findings of the main research questions.
The second contribution of this thesis to the literature is in terms of its methodology as well as its findings and empirical analysis.

In this work, we undertake variety of innovative methods to identify the economic, political and geographical determinants of FDI. Besides, the use of panel OLS estimation in our testing we apply the empirical method of EBA (Leamer 1983,Sala-i-Martin, 1997), this will play a central role because it will be used as a test of the robustness of the determinants of FDI where the findings significantly outperform existing ones as serial correlation, endogeneity bias and model uncertainty are controlled for in that context. To our knowledge, there is no study, which has applied the EBA method to identify the determinants of FDI and to test its influence on economic growth within such large dataset.

Another contribution of this research to the literature is through the application of Granger non-causality test using Fisher (1948), Hurlin (2004) and Hanck (2008) methods in heterogeneous panel data. The empirical evidence reported in this chapter supports and shows that FDI inflows have a negative impact on economic growth. Our results suggest that the relationship between the two variables is perhaps too complex to be identified in a bivariate Granger causality framework. It is believed that by identifying and trying to understand these factors would provide policy makers with better insights as to how future FDI policies must be tailored.

1.4 Outline of the Thesis

The thesis is structured as follows: Chapter 2 begins with a brief definition of FDI and the role of Multinational companies, and then an overview of the environment of FDI is presented, with specific reference to the flow of FDI to different regions.

In chapter 3 the theories, hypotheses and schools of thought that analyse the direction and magnitude of FDI flows are summarised. However, these theories do not provide enough guidance regarding modelling FDI.

Chapter 4 investigates the empirical literature relating to the determinants of FDI flows. It builds on the discussion of the theories in chapter 3 and investigates how these theories have been applied in empirical research. It also guides the expectations of signs. This chapter provides an exposition of the countries and data used.

Chapter 5 provides an empirical investigation using panel data methods and explores more than 40 potential determinants of FDI inflows. The estimation of the FDI models is based on a pooled OLS. The panel property of the data is further explained by estimating the fixed or random effects. The primary estimation results of the OLS estimation are discussed.

In chapter 6, we apply the EBA, as suggested by Leamer (1983) and Sala-I-Martin (1997) to test the robustness of more than 54 variables. In total, we evaluate almost two million regressions. Few variables pass the EBA and thus these can be considered as the most important determinants. After exploring the determinants of FDI, we continue by linking FDI to an economic growth.

In the remainder of the thesis, we turn to the relation between FDI and economic growth.

In Chapter 7, we test the direction of causality between FDI and economic growth. In our methodology, we apply a test statistic based on averaging standard individual Wald statistics of Granger non - causality (GNC) tests for heterogeneous panel data, as suggested by Hurlin (2004) and Hunk (2008) to identify the countries that reject GNC.

In chapter 8, we extend the Mankiw et al. framework by adding the FDI variable to further understand growth using the EBA to test the robustness of FDI on growth and the robustness of the traditional determinants of economic growth.

The study concludes with a summary and set of final remarks provided in chapter 9.

Chapter 2

The International Environment for FDI

2.1 Introduction

Trade and investment across the boundaries of countries has been going on for centuries. The unprecedented growth of FDI during the past two decades has changed, probably irrevocably, the underlying traditional economic relationships in the world economy. The world stock of FDI according to World Bank reached more than $6 trillion in 2008, almost eight times the level of 1980. The sales of foreign affiliates are now greater than world total exports of goods, implying that firms use FDI more than they use exports to service foreign markets. The number of Multinational corporations (MNCs) has also increased significantly, to more than 60,000 parent companies (with 500,000 foreign affiliates). According to the World Trade Organisation (WTO), inflows of FDI were substantial in 2005. They rose by 29% to reach $916 billion having already increased by 27% in 2004. In percentage terms, the share of developed countries increased somewhat, to 59% of global inward FDI. To date, countries are increasingly finding themselves in a global economy where competition for resources and factors of production has become very intense.

FDI contributes to economic growth by providing additional capital and skills, by reducing the share of risks in large projects and by serving as a vehicle for introducing new technology to a country. Since the 1980s, developing countries have begun to implement more liberalised trade and investment policies in an effort to attract greater inflows of FDI.

Many of these countries were successful in attracting considerable amounts of foreign investments. Unfortunately, the bulk of FDI inflows were concentrated in a small group of East Asian and Latin American countries with China emerging as the main beneficiary. Many developing states, however, have failed to benefit from the explosive growth in FDI during this period.

The purpose of this chapter is to explain the international and regional environment for FDI, with specific reference to the role of MNCs and the flow of FDI to different regions in the world. As a starting point, this chapter gives a brief definition and recent trends of FDI. In analysing the inflows of FDI, it is necessary to know the type of investment that qualifies as FDI and to know those that are mostly involved in this type of investment. This section discusses the investments that can be called FDI and those involved in it and their motivations.

2.2 FDI Definition by International Standards

FDI does not concern all cross-border investments. There are some features that make FDI different from international investments and these are discussed below. As illustrated in Figure 2.1 below, international capital flows can be divided into three categories: Foreign Direct Investment (FDI), Portfolio Capital Investment (PCI) and international bank lending (IBL). In contrast, PCI is a type of investment where the investors buy some non-controlling portion of the stock, bond or any other financial security without a lasting and significant management interest (less than 10 per cent of the equity or voting shares).

The internationally accepted definition of FDI is provided in the fifth edition of the IMF's Balance of Payments Manual (1993). The FDI net inflow records the net flow of non-resident direct investment in the recording economy, while the FDI net outflow records the net flow of resident direct investment abroad[1]. Distinguished from other kinds of international investment, FDI is made to establish a lasting interest in or effective management control over an enterprise in another country. As a guideline, the International Monetary Fund (IMF) suggests that investments should account for at least 10% of voting stock to be counted as FDI. In practice, many countries set a higher threshold. In addition, many countries fail to report reinvested earnings, and the definition of long-term loans differs among countries.

[1] In our work, we follow IMF definition were inflows refers to net inward FDI transactions ,i.e , inward investments less disinvestments (FDI in the reporting economy); outflows mean net outward FDI transactions,i,e, outward investments less disinvestments (FDI abroad).

The former definition of FDI makes clear the difference compared with the other two. FDI is the category of international investment that reflects the objective of obtaining a 'lasting interest' by a resident entity in one economy ("direct investor") other than that of the investor ("direct investment enterprise"), according to IMF (1993) and UNCTAD[2] (1996). The two criteria incorporated in the notion of "lasting interest" are:

- The existence of a long-term relationship reflecting lasting interest and the control of a resident entity between the direct investor and the enterprise; and
- The significant degree of influence that gives the direct investor an effective voice in the management of the enterprise.

These two key terms distinguish FDI from portfolio investments, which are short-term activities undertaken by institutional investors through the equity market.

A "lasting interest" in a foreign entity emphasises the difference to other forms of capital flows and occurs in the form of know - how or management skills transfer (Lipsey, 2003). As stated by Salvatore (2007), PCI are purely financial assets such as bonds or purchasing less than 10% of the voting stock of a company that is denominated in another national currency.

The FDI flows comprise three different components: equity investment, reinvested earnings, and short- and long-term inter-company loans between parent firms and foreign affiliates. The components of direct investment capital transactions are recorded on a directional basis (i.e., resident direct investment abroad and non-resident direct investment in the recording economy).

(I) Equity capital: the value of MNCs' investment shares in the foreign country, where 10% or more of the voting stock is considered the threshold of asset control;[3]

(II) Reinvested earnings: consists of the sum of a direct investor's share (in proportion to direct equity participation) of earnings not distributed as dividends by subsidiaries or associates, and earnings of branches not remitted to the direct investor; and

(III) Other capital: covers the short- and long-term borrowing and lending of net loans from the parent firm to subsidiaries or branches.

---

[2] UNCTAD is a department of the United Nations responsible of FDI, which was established in 1964 to integrate the developing countries into the world economy through the encouragement of FDI.

[3] Not all countries use the 10% threshold for defining FDI. Although the 10 % criterion is specified for defining direct investment in the balance of payments, some countries choose other criteria. There are countries that require 50% foreign equity for management control to be exercised, and management control is regarded as a prerequisite to the non-resident managing the asset. Other countries accept management control with 20% foreign equity. From http://www.earthinstitute.Columbia.edu/cgsd/documents/bajpai_fdi_India_China.pdf.

This definition is correct but not complete as it has some shortcomings for several reasons. First, it suggests that FDI involves the international transfer of money ignoring situations where FDI capital could be raised in the host country. Second, the definition of FDI flows is expressed in terms of money capital when it incorporates the transfer of other income-generating assets.

Third, the definition does not take into account the new organisational forms that have appeared in the global economy over the past three decades. Firms today can exercise various forms of control over distant enterprises without direct ownership (Winder, 2006). Fourth, FDI measures are considered sufficiently accurate only in the short run.

Finally, the definitions used by statistical agencies may differ from the legal treatment of MNCs in international treaties such as the World Trade Organisation (WTO), which aims at reducing legal barriers to FDI (Contessi and Weinberger, 2009). Redefining FDI is thus required in order to take into account non-monetary aspects of FDI as well as the new forms of control that have emerged with MNC's changing strategy to cope with globalisation.

2.3 Classification of FDI

FDI can be classified in several ways depending on the perspective of the home country, the host country or the motive. From the perspective of the investing country, FDI can be classified into horizontal FDI, vertical FDI and conglomerate FDI. From the point of view of the host economy, FDI can be import substituting, export increasing or both. FDI to host economies is mainly in the form of Greenfield mergers and acquisitions (M&A) and joint ventures (Moosa, 2002). FDI has been classified further in terms of the motivation underpinning the decision to produce abroad. Based on this classification, FDI can be seen as market seeking, natural resource seeking, strategic asset seeking or efficiency seeking (Buckley et al., 2008).

The mode of entry through which MNCs undertake FDI is a combination of two decisions: the investment mode and ownership mode. The decision on the investment mode is the decision between establishing a new venture (Greenfield investment) and merging with or acquiring an existing firm, while the decision on ownership mode is the decision between establishing a wholly owned affiliate or a joint venture (partially owned affiliate). Another mode of entry is to serve a foreign market where MNCs duplicate the same activities (horizontal FDI) and vertical FDI were MNCs fragment the production process geographically.

2.3.1 Greenfield vs. M&A Investments

Greenfield investments involve new capital investment by MNCs by establishing overseas subsidiaries (or affiliates) that serve as part of the global production/distribution network. A cross-border or M&A is the transfer of the ownership of a local productive activity and assets from a domestic to a foreign country. Owing to differences in the mode of investment, M&A and Greenfield investment are expected to exhibit different impacts on host developing countries. Greenfield investment is more likely to have a strong impact, since the former is a change in ownership structure and affects directly and positively employment and capital stock, while the latter is in essence a new investment, which requires large MNC involvement in the local environment.

Wholly-owned vs. partially –owned subsidiaries

The efficiency of the firm is mainly stressed as an important factor determining the ownership mode. Less efficient firms prefer joint ventures to wholly- owned affiliates for efficiency gains considerations; Raff et al (2009).

2.3.2 Horizontal vs. Vertical:

FDI can also be classified into two other categories: horizontal and vertical FDI. Horizontal FDI refers to the foreign manufacturing of products and services roughly similar to those the firm produces in its home market. This type of FDI is called "horizontal" because MNCs duplicate the same activities in different countries. Horizontal FDI arises because it is too expensive to serve the foreign market by exports because of transportation costs or trade barriers.

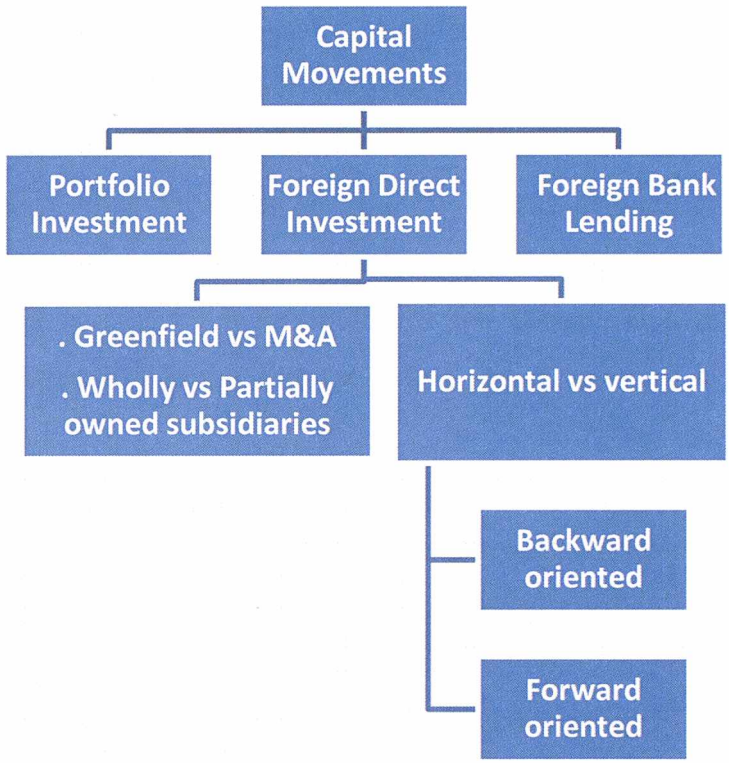
Vertical FDI refers to those MNCs that separate the production chain geographically by outsourcing some production stages abroad. The basic idea behind the analysis of this type of FDI is that a production process consists of multiple stages with different input requirements. If input prices vary across countries, it becomes profitable for the firm to split the production chain.

Indeed, Markusen (1995) argued that there is no clear distinction between horizontal and vertical FDI, because in the former affiliates draw some headquarter services from the parent company, even when the firm duplicates the same production activity in several countries. Thus, each horizontal MNC has some vertical traits.

Furthermore, as shown in Figure 2.1, vertical FDI consists of two groups: backward and forward FDI. Backward FDI is when an MNC establishes its own supplier of input goods, which delivers inputs to the parent company, while forward FDI is when the firm builds up a foreign affiliate that draws inputs from the parent company for its own production, thus staying after the parent in the production chain (Head, 2002). These different types of FDI will not be attached much significance in our empirical work. This distinction is though useful for several discussions led in this thesis. It also illustrates the involvement in the host country economy and politics that FDI indicates.

Figure 2.1 below is a structure of international capital movements and FDI classification, which describes in brief all, which has been, explains in details above.

Figure 2.1: Structure of International Capital Movements and FDI classification



A number of factors go into determining how the firm will enter the market of its choice. The decision is affected primarily by the amount of capital to be employed, other available resources, future mode of operations of the firm, knowledge of the local market where it wants to invest, demand for its products, organisational experience and technological intensity. The efficiency of the firm is mainly stressed as an important factor determining the ownership mode. Less efficient firms prefer joint ventures to wholly owned affiliates for efficiency gains considerations; Raff et al (2009).

2.4 The Role of MNCs

It is necessary to know the types of companies involved in FDI and understand their roles and motivations. According to UNCTAD's (2001) definition, an MNC "is an enterprise that controls assets of other entities in economies other than its home economy, usually by owning a certain capital stake. An equity stake of 10 per cent or more of the ordinary shares or voting power for an incorporated enterprise, or the equivalent for an unincorporated enterprise, is normally considered a threshold for the control of assets". Hence, FDI is conventionally used as a proxy to measure the extent and direction of MNC activity (Jones, 1996).

The main objective of MNCs is to maximise profit and reduce cost. Therefore, consideration is given to regions that are likely to deliver the highest returns on investments. This provides one of the main reasons why there is more FDI in some regions than in others. According to Sethi et al. (2003), MNC investments are higher in regions that provide the best mix of traditional FDI determinants. The challenge for countries receiving FDI is to ensure that the positive impact of FDI is maximised through transfers of technology, managerial skills, improved linkages to the domestic economy, enhanced access to international financial and export markets (UNCTAD, 1996). In the fast changing global economic landscape, virtually every country – developed and developing – has sought FDI to facilitate their development. Developing countries, in particular, have a major role to play because their policies go a long way to determining their inflow of FDI.

In 2001, MNCs accounted for one 10th of world GDP and one third of world exports, and they employed about 54 million people (World Investment Report, 2002). Coca Cola, for example, is the largest private employer in the world economy.

This offers host countries several advantages (OCDE 1999):

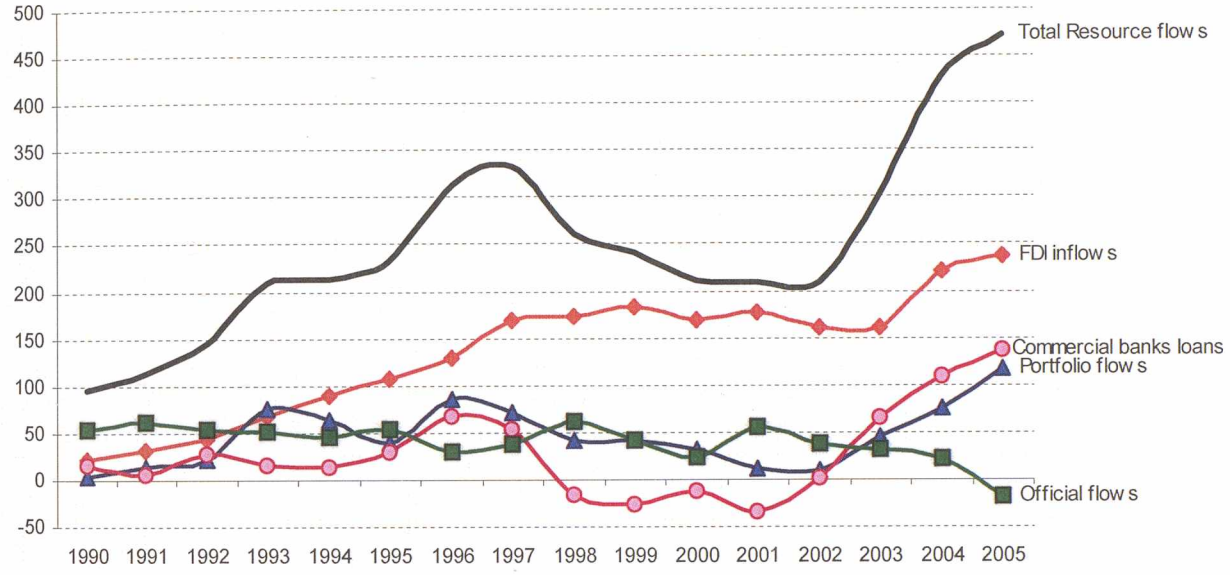
1. The capital brought into a country through FDI is more stable than is commercial debt or portfolio investment.
2. MNCs invest in long-term projects, taking risks and repatriating profits only when the projects yield higher returns.
3. MNCs often possess advanced technologies and can use them in all countries in which they operate, thereby increasing efficiency and productivity.
4. MNCs can bring new expertise and set up training facilities.
5. MNCs can provide market access to export markets, both for existing and new activities.

Hence, FDI can affect the level of output and trade of a country by serving as an engine of growth and development.

2.5 Global inflow of FDI

FDI flows have remained the largest source of foreign private capital reaching developing countries in recent years. Even though FDI inflows can be volatile, they fluctuate less than do portfolio flows and commercial bank loans. This is emphasised in Figure 2.2, which highlights the increasing importance of FDI in the past decade.

Figure 2.2: Total resource flows to developing countries, by type of inflow, 1990 to 2005



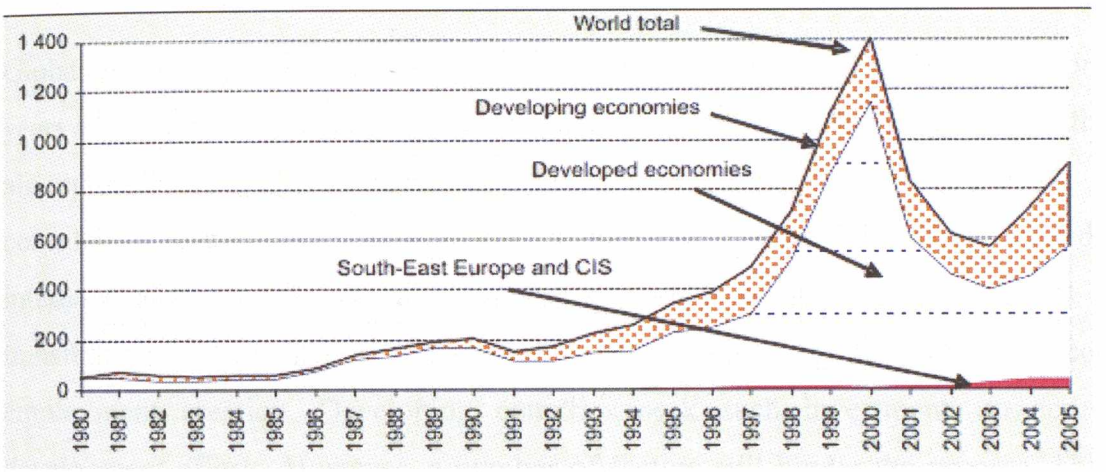
Source: World investment report (2005), Unit; US$ (Billions)

FDI is now the largest source of foreign private capital reaching developing countries (Figure 2.3). Global flows of FDI have grown phenomenally over the past 10 years. Total inflows rose by nearly four times, from US$174 billion in 1992 to US$ 644 billion in 1998. However, total flows to developing economies fell between 1997 and 1998 (UNCTAD, 1999). Regionally, prospects look least good for Africa of the middle to low income countries; Asia has experienced the fastest rate of growth in FDI but also the greatest volatility (World Bank, 1999).

The sudden drop in FDI flows in 2001 was related to depressed stock market sentiments and business cycles, both of which led to a massive drop in M&A investments, especially in developed countries (UNCTAD, 2002a).

Figure 2.3: FDI inflows, global and by group of recipient economies, 1980–2005

Unit: US$(Billions of dollars)



Source: UNCTAD, based on its FDI/MNC database (www.unctad.org/fdi statistics).

The developing world has become more closely integrated with the global financial system, especially over the past two decades. This integration is because of both pulling and pushing factors. Pulling factors include the continuous liberalisation of capital accounts and domestic stock markets as well as large-scale privatisation programmes, while pushing factors include the increasing importance of institutional investors (mutual funds, hedge funds, etc.), the spread of depositary receipts (negotiable receipts that represent a company's publicly traded debt or equity) and cross-listings. Thanks to all these factors, as well as an improvement in emerging market economies, foreign investors have gained confidence in the potential of the developing world, leading to a remarkable surge in cross-border capital flows between developed and developing countries (WDI, 2005). According to Dunning (2002), FDI in developing countries has shifted from market-seeking and resource-seeking to (vertical) efficiency-seeking FDI. Owing to globalisation-induced pressure on prices, MNCs are expected to relocate some of their production facilities to low-cost developing countries. Nevertheless, and in contrast to FDI in industrial countries, FDI in developing countries is still directed predominantly to accessing natural resources and national or regional markets.

2.6 Conclusion

Globalisation has been one of the major driving forces behind world growth in the recent years and has raised the prospects of considerable gains in productivity and wealth creation in all regions. FDI plays an important role as an engine of economic growth. Apart from contributing to domestic investments, it provides capital, and skills needed, promotes international trade and integration, shares risks and assists in innovation and technology transfers that is needed to create stable environments for long – term economic and employment creation. Developing countries seek such investments to accelerate their development efforts. However, a number of factors still hinder the process. This is mainly because of the weak regulatory reform system that is hindering these economies from accomplishing their full FDI potential.

CHAPTER 3

Literature Review

3.1 Introduction

FDI can play a significant role in domestic investments and capital inflows. Attitudes towards FDI inflows have changed considerably over the past couple of decades, as most countries have liberalised their policies to attract investments through MNCs. Economic theory (Dunning 1980) suggests that, in order to understand FDI inflows, it is vital to be familiar with the main motivations for MNCs to invest in particular countries. These motivations usually include the exploitation of economies of scale /scope and the advantages of being based in the host country, rather than exporting products to that country or selling licenses for local firms to run businesses on their behalf. In fact, MNC investment can be beneficial for host countries in many ways. First, FDI inflows stimulate capital accumulation by increasing domestic savings. In addition, it fuels the efficiency of the recipient countries' economies as it improves resource allocation, increases employment and exports, increases competition and enhances human capital, deepening domestic financial markets and reducing local capital costs (Todaro, 2000). By contrast, governments also engage in a policy competition in which they alter key factors of their economic policies, such as domestic labour market conditions, corporate taxes, tariff barriers, privatisation and regulatory regimes in order to enhance FDI activity in their countries.

As a starting point for further analysis, the objective of this chapter is, first, to explore and revisit the existing theories that have contributed to the understanding of the fundamental motivations of FDI flows. A study of these theories will assist in selecting appropriate proxies in order to provide an indication of the expected signs of explanatory variables and to support arguments to be used in empirical estimations and the discussion.

Based on the work of Hymer (1960), Vernon (1966, 1979) and Dunning (1993) an attempt is made to classify theories according to macro and micro approaches, as well as according to theories of industrial organisation, theories of firms, theories of growth, and theories of location. This classification addresses the following questions of why FDI is taking place, where it is destined to go , how is it possible for MNCs to compete successfully in foreign locations?, who are the recipients of FDI?, "on what basis are host countries chosen?" and "what determines the geographic patterns of FDI?". The first section discusses the general motivation and classification of FDI followed by a summary of the theories of FDI in Table 3.2 below.

3.2 General Framework: Motives of FDI

There is an extensive literature on the determinants of FDI and on the welfare impacts on host countries. Before reviewing and discussing the theoretical literature dealing with the determinants of FDI, it seems important to identify the motivations of MNCs. To understand the motivations of FDI we have to consider two interrelated questions: why do firms invest abroad and why are particular destinations chosen? According to Markusen (1995), the decision to invest overseas is the result of a basic comparison between the actual potential benefit and the cost of going abroad. Economic theory states that foreign firms succeed abroad as dominant organisational form (MNCs) if they hold some ownership-specific assets or skills such as knowledge, technology, organisation, management or marketing skills, namely the so-called "market seeking" or "horizontal market" skills. These advantages will increase their degrees of foreign presence abroad and thereby increase their profits. In addition, horizontal FDI can replace exports. Mallampally and Sauvant (1999) argue that the nature and characteristics of FDI are reflected through their motives that can help in identifying their determinants in a host country. An understanding of the motives of FDI provides an insight on the propensity of foreign affiliates to forge local linkages in the host economy (WIR, 2001).

In a broad sense, the literature identifies four factors that determine why MNCs undertake international production in the form of FDI: market seeking, resource seeking, efficiency seeking and strategic asset seeking; their key determinants are summarized in table 3.1 below[4]. Chakrabarti (2001) stated, "Market factors the single most widely used determinant of manufacturing FDI flows.

It is logical to assume that a larger market size, an increased purchasing power and a high growth potential attract greater amounts of FDI. The rationale for the positive relationship is that a reduction in the cost of entry through economies of scale can be exploited in larger market".

Concerning the question of why multinationals invest in specific locations, there was strong consensus in the literature until recently (see Dunning, 1993; Globerman and Shapiro, 2001). The view was that MNCs are mainly attracted by strong economic fundamentals in host economies. Market size, the level of GDP, human capital, infrastructure facilities, political and macroeconomic stability have been traditionally considered as the main determinants. More recently, a new perspective has been raised that can be summarised as providing two distinct explanations for the determinants of FDI: to enlarge the market access network by basing production in low cost locations and to access raw materials. These tend to be correlated with export orientation ("vertical or production cost minimising").

However, these views have begun to change nowadays because of the internalisation of the world economy. In fact, regional integration and lower fiscal rates[5] have reduced the impact of market size and allowed smaller countries to compete for investments that would automatically have been directed to the major markets some decades ago (Taylor, 2000). Furthermore, regional integration has similar effects, thereby allowing MNCs to supply all or several member states from a single location within the region. Mallampally and Sauvant (1999) stated that by understanding the motivation of FDI, the identification of the determinants became easy.

[4] We will discuss in details the implication of each factor further below in section 3.6.
[5] With the exception of export processing zones and industrial estates, where infrastructure and land are subsided.

Moreover, competition between governments to promote FDI may raise some problems (see Oman, 2000) in the sense that constantly giving more and more advantages to foreign investors, such as tax breaks and fiscal advantages, leads to shifting the profits from host countries to MNCs. To avoid this situation, governments should take into account the role of incentive packages in their policies on FDI versus growth. Ireland and Sweden have both succeeded in providing attractive business environments without distinguishing between foreign and domestic investors and, at the same time, having the right fundamentals (Barry et al., 1999).

Table 3.1 Motives of FDI

Reason for FDI	Key Determinants
Nature- resource –seeking FDI	which involves firms seeking advantages such as access to capital and natural resources, stability of supply and control of markets
Market –seeking FDI(national or regional)	which involves firms seeking advantages such as information skills, management expertise, low labor cost, investment incentives, low transaction cost and buyer uncertainty Tradability of product/ service Structure and openness of markets
Efficiency –seeking, export- oriented FDI	which involves firms seeking security advantages such as Quality and cost human resources Physical infrastructure (electricity, transport, ports, roads, telecoms, etc.) Technical infrastructure Trade costs Quality of suppliers, clusters, etc. Economic and political stability
Strategic asset-seeking FDI	Which involves firms seeking advantages such as; market access, product distribution, access to sources of inputs, close proximity to customers and protection of input quality and performance.

Sources UNCTAD 1998

3.3 Development of Theories on FDI

According to Dunning (2002), in the first half of the 20th century, most theories highlighted and tried to elucidate only particular types of FDI in a positive manner (rather than using integrated approaches). Their components of analysis diverged; some schools of thought were concerned with the behaviour of the firm or groups of firms (microanalysis), whereas other schools were focused on the behaviour of countries (macro-oriented).

The second half of the same period revealed the introduction of more holistic theories or paradigms of FDI, but partial explanations continued to be developed by 1980 and 1990 where more consideration was given by trade economists to integrating new variables of foreign-owned production into their models. During this period, the development of theories of MNCs occurred in three stages. The first models of MNCs emerged from the traditional literature on international trade with competitive, constant return models (Caves, 1971); this approach viewed multinational activities as a part of the theory of capital flows. Thus, there was no motive for FDI to occur between identical countries. This was in contrast to empirical observations and lead to the next stage, namely 'new trade theory', which incorporated the ideas of increasing returns to scale and imperfect competition into traditional models. Subsequently, the theory of "vertical" FDI emerged, namely when the firm geographically separates the stages of production. This builds on the theory of capital flows, where direct investment is essentially a foreign production branch.

The other part consists of "horizontal" FDI models, where the firm produces the same goods or services in different locations. In the third stage, new models tried to combine these two branches. The respective theory is called the "knowledge capital model".

3.4 Existing Theoretical Classification of FDI

Two factors dominate the debate in the theoretical literature on FDI. The first one is related to the total absence of theory to explain FDI and all its related facts. Except for Dunning's eclectic theory – which is based on the OLI (Ownership, Location and Internationalisation advantages)[6] paradigm – no theory covered many aspects explaining the international activities of firms (Moon and Roehl, 1993).

The second factor, given the different theories and various approaches, can be classified according to similar tenets. However, the classification of the available theories is inconsistent.

In fact, there have been various ways of categorising economic theories as to their determinants of FDI (Casson, 1987; Dunning, 1993 1990; Hara, 1992; Amano, 1986; Haraguchi, 1992). Hansen (1998) and Razin (2003) stated that FDI theories could essentially be divided into two categories, namely micro (or industrial) and macro theories (finance or cost of capital theories). Kojima and Ozawa (1994) also supported this distinction between micro and macro models of FDI, but placed more emphasis on macro models.

In this thesis, our focus will be mainly on macro theories; however, we also cover micro theories for completeness.
The following section reviews the economic theories on the determinants of FDI, and groups them into three categories: (1) macroeconomic theories; (2) microeconomic theories; and (3) other theoretical contributions. These headings are for the sake of analytical convenience, and there is considerable overlap among these.

[6] The full explanation of the OLI paradigm is explained further below.

3.4.1 Macroeconomic Approach:

Macroeconomic approach on FDI is dominated by the logic of international trade theory. This view concentrates on comparative advantages as well as environmental dimensions and deal mainly with the question of where MNCs will locate their operations. Below are the main theories that represent this approach.

3.4.1.1 Capital Return Theory

Until late 1950s, FDI was seen as a response to differences in the rates of return on capital between countries. This suggestion was reinforced by the empirical observation that American firms (the major source of FDI in the 50s) obtained a higher rate of return from their European investments than at home (Mundell, 1960). However, the differential rate of return hypothesis did not resist the inversion in that relationship registered in the 1960s, which was still accompanied by increases in US investment in Europe (Hufbauer, 1975).

Hymer (1960) was the first to expose the deficiencies of this approach. He claimed that the differential rate of return hypothesis was not consistent with several observed characteristics of international investment. First, the United States combined net outflows of FDI with net inflows of portfolio capital. Second, flows of FDI in both directions between two countries were not rare. Third, many subsidiaries complemented the inflow of direct investment with capital borrowed in local markets. Finally, manufacturing companies were at the time far more important in international direct investment than financial firms were.

Furthermore, an international difference in expected returns is not sufficient to induce FDI (Caves, 1982: p.25). Under perfect markets, an increase in the short run profits of firms in one country would not induce international investment. Instead, it would attract new entrants that would eliminate any excess profits. Perfect markets and MNCs are not compatible (Hymer, 1960; Kindleberger, 1969; Hufbauer, 1975).

Tobin (1969) first introduced the concept of what is often referred to as "Tobin's Q ratio", defined as the ratio of the financial market valuation of reproducible real capital assets to the replacement cost of these assets. According to his approach, if the value that shareholders place on capital assets is higher than the opportunity cost of those assets (meaning Tobin's q is greater than unity), then the decision should be made to invest in these capital assets. In spite of the difficulty actually measuring the level of "q", this can be considered a macroeconomic version of the determinants of FDI, since this is one type of capital investment.

Although Tobin's approach focuses on shareholders' aggregate expectations on the firm's future profitability based on macroeconomic fundamentals, it seems to have similarity with the preceding analysis. Recently, Brainard and Tobin (1992) proposed a model in which FDI is simply one of the alternatives to portfolio investment. The rates of return of the different alternative investments are matched with an element of risk in the choice between (imperfectly) substitutable assets to build an efficient portfolio. However, the introduction of a risk correction element, more than being insufficient to eliminate the theoretical drawbacks of the underlying theory, highlights its deficiencies.
In fact, Hymer's criticisms of the differential rate of return hypothesis previously mentioned fully apply to the portfolio theory as well.

Later, Aliber (1970, 1971, and 1983) stated that MNCs move to another country because of differences in capital endowments and currency risks. In fact, his approach focuses on why MNCs finance their foreign assets in their domestic currencies, and explains the choice of FDI in terms of "monopolistic advantages", namely the ability of MNCs from countries with strong currencies to raise capital more cheaply in foreign markets compared with competitors from countries with weak currencies. He attributes MNCs' motivation for using FDI to the structural failures, or market imperfections, of international financial markets, which allow MNCs to gain a stronger financial position through the acquisition of foreign assets.
Aliber's theory addresses why countries might shift their international investment statuses over time, and adopts the realistic assumption of market imperfection in the international financial market mechanism.

Assuming a perfect market mechanism, it should not matter which currency reflected the costs and future profitability of holding assets in that particular currency at any given moment. Market perfection would, therefore, make any sorts of asset portfolios equally profitable (or unprofitable) through perfect arbitrage. This presumption is at odds with reality. Aliber's theory is useful for explaining US FDI in Europe, in the form of M&A, in the 1950s and 1960s (Buckley and Casson, 1976).

However, in Aliber's theory[7], it is difficult to distinguish FDI from portfolio investment. His theory explains FDI in terms of higher returns on investments, but it cannot explain why the particular form of FDI was preferred to portfolio investment.

Moreover, it does not fully explain the nature of FDI between two countries (host and source countries): FDI flows from country A to country B are empirically observed in parallel with FDI flows from country B to country A, but the approach fails to explain this phenomenon, as only firms from the country with the stronger currency should undertake FDI. Similarly, this approach is unable to explain FDI flows within the same currency areas (Buckley and Casson, 1976). These limitations are primarily because his analysis falls under the theoretical framework of macro-based international finance, which views FDI as an aggregate phenomenon. This could be misleading since it does not highlight the roles of MNCs as the actual players of FDI. In other words, the reality is that MNCs headquartered in country A (B) undertake FDI by establishing their affiliated firms in country B (A).

According to Dunning (1973), the reason why portfolio theory can only partially explain FDI is that it ignores that "direct investment does not involve changes in ownership.

It does, however, involve the transmission of factor inputs other than money capital, entrepreneurship, technology, and management expertise, and is likely to be affected by the relative profitability of the use of these resources in different countries as that of money capital". Also in the capital theory tradition is the risk diversification hypothesis (Rugman, 1979; Lessard, 1976). The argument is that the international diversification of portfolios is a way of reducing the firm's risk. This makes the MNC a vehicle for geographical diversification of investments.

[7] Some studies refer to Aliber's theory as a neoclassical one, such as Faeth (2009).

Another way of stressing the limitation of the macroeconomic approach is that it stays away from non-financial aspects of FDI, namely the transfer of resources specific to respective firms, or "firm-specific assets".

As per the definition of FDI, the MNC transfers its capital in the form of tangible assets, which are unique or specific to the MNC. Furthermore, these assets are directly controlled and utilised by the MNC for its production operations. Although macro conditions are surely one element of consideration, a firm's specific tangible and intangible assets are arguably just as important. In sum, the governing view of macroeconomic theory that FDI is a form of financial flow neglects the transfer of firm-specific assets.

3.4.1.2 International trade approach

International trade economists were among the first to study the FDI phenomenon. This approach considers foreign production as a substitute for exports as it can influence the term of trade and thus, change the whole pattern of specialisation. This approach is mainly represented by Mundell and the Heckscher-Ohlin (1957), Kojima's model (1982) and Veron's Product Cycle Model (1973).

3.4.1.2.1 Mundell and Heckscher-Ohlin Model

Mundell (1957) show that trade and capital movements can be substitutes, namely, that "the introduction of tariffs would induce a flow of FDI towards the country where tariffs are imposed. That is, the same way that restrictions to international movements of factors can be substituted by trade (the original H-O model), restrictions to trade can be replaced by international movements of factors, in particular capital given the intrinsic imperfect mobility of labour". In a way, these hypotheses based on the Heckscher-Ohlin model are not very different from those based on capital movements. As Taveira (1984: p.10) points out, in both cases "FDI was analysed as a re-equilibrium device within a generally perfectly competitive economy", a major limitation of the explanatory potential of both approaches.

3.4.1.2.2 Kojima's Model

Kojima (1982) tried to explain the distinctive character of trade-oriented Japanese FDI, obeying the principle of comparative advantages, vis-à-vis US investment conducted in an oligopolistic market structure, anti-trade oriented and damaging to both home and host countries in the long run (Dunning, 1993a: p.90). The basic theorem is that "Direct Foreign Investment should originate in the investing country's comparatively disadvantaged industry (or activity), which is potentially a comparatively advantaged industry in the host country" (Kojima, 1982: p.2). If this is the case, Kojima argues, (pro-trade oriented, or Japanese) FDI and international trade are complementary and lead to a dynamic reorganisation in the international division of trade and the associated gains for all countries involved.

This approach was the target of many criticisms. Its neo-classical perfect market assumptions are clearly a major limitation, for they ignore economies of scale, product differentiation and other forms of market failure (Dunning, 1993a; Jong and Vos, 1994). It is not that Kojima is not aware of them. However, being unable to distinguish firm level economies of scale from plant level economies (Buckley, 1983b: p.97), he fails to understand that in the presence of market failure hierarchies can improve the international allocation of resources (Dunning, 1993a: p.90). Another limitation of the Kojima (1982) approach is its excessive concern with the distinction between the positive impact of Japanese "pro-trade oriented" FDI and the US" anti-trade oriented" FDI. Kojima's belief is that US FDI in technologically advanced industries was premature and doubly damaging. On the one hand, it did not fit the host country's factor endowments and associated comparative advantages. On the other hand, it prematurely eroded the United States' technology-based competitive advantages.

3.4.1.2.3 The Product Cycle Model

Another work that partially builds upon the factor-endowments tradition is the one that takes into account the role of innovation and the diffusion of knowledge. Posner (1961), Hufbauer (1966), Vernon (1966), Hirsch (1967) and Wells (1972) are probably the most important references, with the product cycle theory, normally associated with Vernon, being the model that better describes the role of MNCs in the interaction between technology, international production and trade.

Their argument is that technological development generates changes in the products' factors intensity, thus changing the comparative advantages of countries.

In a world, with important technological and market barriers to trade (Hufbauer, 1966 Vernon, 1966), MNCs are the most likely institutions to organise the production and distribution of goods with an international demand for which the most efficient production location is changing over time.

This theory offers an explanation for both FDI and international trade and refers to the different stages through which products pass during their lifetime, namely novelty, maturity and standardisation. According to this author, the nature of competition, the location of production and the form of entry into foreign markets depends on the life stage of the traded products.

In the initial or first stage, a new product is developed and produced by the innovating firm in its home country.

The second stage is marked by product maturity and an increase in exports of products to higher-income countries. Increased demand and growing competition in local markets lead eventually to FDI.

The third stage is characterised by a complete standardisation of the product and its production technique, which is no longer in exclusive possession of the innovator (Agarwal, 1980). When the maturity stage is reached the company tends to challenge in domestic and foreign markets, and if overseas production is economically feasible, production abroad may follow.

The product life cycle theory introduces the term of location as part of its theoretical framework, which can be integrated with locational factors to highlight that technological development leads to changes in the comparative advantages of countries engaged in trade. However, this theory does not explain why a certain location is given preference above the others by foreign investors. For this reason, Dunning's OLI paradigm is believed to be more appropriate to use to identify the determinants of FDI.

Clegg (1987: p.24) claims, "[the product cycle] is not, in itself, a complete theory of FDI as it does not explain the ownership of production". Not least because the competitive advantage of firms is frequently associated with country-specific advantages (Dunning, 1993a).

Clegg (1987: p.26) adds, "The product cycle is primarily a theory of new FDI, and it has little to say on the extensions of existing investments by a mature foreign-investing nation".

Vernon (1971: p.108) himself acknowledged, "By 1970, the product cycle model was beginning in some respects to be inadequate as a way of looking at the US-controlled multinational enterprises". The successive revisions of the model - Product Cycle (Vernon, 1974, 1979) - drove it very close to the Hymer-Kindleberger approach (Buckley, 1981) - see section 2.3.2.

Hansen (1998) stated that the theory of FDI is dominated by the international trade theory between nation states. One of the basic concepts in international trade is the principle of comparative advantage, first introduced by classical economist David Ricardo. This concept helps explain geographical differences in production and trade in terms of the differences in productivity[8] between two factor inputs: labour and capital. These theories mainly deal with the question of where MNCs will locate their operations. However, according to him, theorists ignore the question of why MNCs invest in the first place, instead of just exporting their products to these foreign markets. He further indicates that theories ignore the question of how it is possible for MNCs to successfully compete with local firms in foreign locations, in spite of disadvantages such as the knowledge of local market conditions, cultural, institutional and linguistic barriers and communication and transport factors.

[8] Because greater factor productivity in a certain country could lead MNCs to invest in this country to achieve production advantages.

3.4.2. Microeconomic Approach

The early literature that explains FDI in microeconomic settings stresses market imperfections and the desire of MNCs to expand their market powers. Recent literature concentrates on firm-specific advantages, product superiority or cost advantages flowing from economies of scale. This approach involves the work of Hymer and Kindleberger (1969), internalisation theory of Buckley and Casson (1976).

3.4.2.1 The Hymer-Kindleberger Hypothesis

Hymer's (1960) pioneering study on MNCs stressed their role as global industrial organisations. The Hymer-Kindleberger hypothesis suggests that, because foreign firms have necessarily some disadvantages vis-à-vis domestic firms (e.g., knowledge of the market, communication); they must possess some firm-specific advantages if they are to engage in foreign production. Furthermore, he added that FDI is not about the transfer of capital - this could be supplied to local firms using other forms of international financing. It is about the international transfer of proprietary and intangible assets - technology, business techniques, and skilled personnel. The existence of FDI is exclusively due to the imperfection of the international markets for these assets. The firm "internalises or supersedes" these market failures through direct investment (Hymer, 1960: p.48).

Recently, Hymer (1993) stated that MNCs are able to compete because they hold certain additional advantages:

- Better knowledge of the market and environment not possessed by local firms;
- Imperfect competition because of product differentiation;
- Imperfect competition regarding access to capital, or skill advantages;
- Internal or external economies of scale (economies of integration); and
- Government intervention (such as restriction on imports).

A second key element in the Hymer-Kindleberger approach is why firms should choose to exploit their ownership advantages through direct investment rather than exporting, licensing, or other forms of international markets servicing

Hymer (1968: pp. 966-970) seems to believe that FDI is the most efficient internationalisation strategy, in particular when compared with licensing; if the advantage is based on technology or on some intangible asset, FDI was considered the most likely solution to maximise profits. Three reasons were presented: (i) the firm's advantage may be very difficult to price; (ii) FDI eliminates the costs of defining and managing a licensing agreement; (iii) it is simply not possible to sell oligopolistic power. Thus, the work of Hymer was the impetus for the further development of micro-level theories, arguing that technological advantages gave MNCs advantages above local firms. These technological advantages included research and development (R&D) capabilities; organisational advantages such as economies of scale, managerial and entrepreneurial advantages; financial and monetary advantages; and advantages associated with their privileged access to raw materials. Thus, MNCs would logically prefer direct investments instead of (direct) imports as a way to supply the market.

Finally, this approach focuses on the internationalisation process, which states that the greater are the presence of factors encouraging the opportunistic behaviour of trade partners, the higher the transaction costs faced by firm. According to this point of view, MNCs find it cheaper to expand directly into a host country, rather than through trade and engaging in arms-length transactions such as licensing.

3.4.2.2 The internalisation theory

Despite the invaluable contribution of Hymer, Kindleberger and Caves, the credit for transforming internalisation into a full paradigm of international production is usually attributed to Buckley and Casson (1976). These scholars did not simply complement previous work; they re-centred the analysis by building upon the theory of the firm (Coase, 1937). Looking at the firm as an alternative institution to markets, their theory "views the MNC as a special case of the multiplant firm" (Buckley and Casson, 1976: p.36).

Buckley and Casson's (1976) assertion that MNCs are typically both vertically and horizontally integrated led them to a model centred on the relationship between knowledge, market imperfections and the internalisation of markets for intermediate.

The internalisation theory evolves from the concept of market failure. Some transactions are more efficiently performed inside the firm than in the market. Buckley and Casson (1976: pp.37-38) specified five types of market imperfections that call for internalisation:

- When the co-ordination of resources over a long period is needed;
- When the efficient exploitation of market power requires discriminatory pricing;
- When bilateral monopoly produces unstable bargaining situations;
- When the buyer cannot price correctly the (usually intangible) goods on sale, or when public goods are involved;
- When government interventions in international markets create incentives for transfer pricing.

Buckley and Casson (1976: p.39) listed several markets where internalisation is very likely to happen: perishable agricultural products, intermediate products in capital-intensive manufacturing processes, and raw materials geographically concentrated. However, these were secondary in the analysis. As with Hymer, at the centre of the analysis were the imperfections in the markets for knowledge. These were ideal to illustrate why internalisation is the most efficient vehicle to exploit a proprietary advantage without putting at risk the monopoly it represents to the firm.

3.4.3 Micro and Macroeconomic approach (OLI framework)

The two previous approaches discussed above tried mainly to explain why MNCs produce abroad instead of simply servicing the markets via exports. After all, MNCs experience additional costs in producing abroad[9]. A modern approach based on micro and macro perspectives introduced by Dunning (1977, 1981), considers FDI as determined by Ownership, Location and Internalisation advantages which the MNC holds over the foreign producer; when these advantages outweigh the above costs, FDI arises. The possession of such firm-specific advantages must be sufficient to more than offset the disadvantages they may face while competing with local firms which are more familiar with the local situation and do not suffer from the so-called liability of foreignness (Zaheer1995) in the country in which they launch their production activities.

Moon and Roehl (1993) mention that none of the general theories of FDI, except perhaps Dunning's eclectic theory that succeed to explain the international activities of firms. Chakrabarti (2003) states that "Dunning work provides a conceptual framework, to which literature on MNC has converged in recent years".

Dunning explains FDI as an outcome of ownership advantages (O) of the firm combining with locational advantages (L) at a foreign location and internalisation advantages (I) referring to the fact that MNCs prefer direct investment over licensing or selling blueprints to local firms. These three conditions must be satisfied simultaneously for the FDI to take place.

[9] Such as:communication costs , travel expenses for executives or even time costs due to mail delays, language and cultural differences, informational costs on local tax laws and regulations, costs of being outside domestic networks; they also incur higher risks, such as the risks of exchange rate changes or even of expropriation by the host country.

This chapter focuses on the following two aspects of the OLI paradigm: the veracity of traditional L advantages for the country in question and the interaction between locational- and transition-specific factors. A further explanation of the OLI paradigm follows below:

- Ownership-specific advantages (of property rights and intangible assets) arise from the firm's size and access to markets and resources, the firm's ability to coordinate complementary activities, such as manufacturing and distribution, and the ability to exploit differences between countries.[10]
- Location-specific advantages include differences in a country's natural endowments, low-cost and semi-skilled labour, transport costs, cultural factors and government regulations. They determine which countries are preferred as hosts for the foreign production of MNCs.[11]
- Internalisation-specific advantages arise from exploiting imperfections in external markets. These include the reduction of uncertainty and transaction costs in order to generate knowledge more efficiently and the reduction of state-generated imperfections such as tariffs, foreign exchange controls and subsidies.

Although the first and third are firm-specific determinants of FDI, the second is location-specific and it has a crucial influence on a host country's inflows of FDI. If only the first condition is met, firms will rely on exports, licensing or the sale of patents to service a foreign market.

In the presence of internalisation incentives, for example protection from supply interruptions and price instability or the lack of appropriate license, FDI becomes the favoured means of servicing foreign markets, but only if location-specific advantages are present. Within the trinity of conditions for FDI to take place, locational determinants are the only ones that host governments can influence directly.[12]

---

[10] Rugman (1998), p. 6.
[11] ibid.
[12] OECD (1998), pp. 17–20.

Although it has not been possible to arrange MNCs' locational-specific decisions into a uniform theoretical pattern so far, the literature cites a large number of very different incentives for FDI associated with individual locations. These inducements of host country location factors can be broadly classified into two types. First, there are Ricardian-type endowments, which mainly include natural resources, most kinds of labour and proximity to markets. Second, there exists a range of business indicators acting as a function of the political, economic, legal and institutional factors of a host country. Both types of factors play a crucial role in a firm's decision to enter a host country. The sub-themes of host country location factors can be summarised as market size and economic growth, inflation rates, host government policies, level of industry competition in the host country market, state of distribution system and transportation costs.

Depending on whether the final goal of investment is capturing new markets or cheap production to export to the home country, the emphasis will be on different factors. These will drive the empirical search for determinants of FDI in chapter 5.

3.4.4 Other Classifications of FDI Theories

In addition to distinguishing between micro and macro arguments, theories can also be classified according to other sets of criteria. Boddewyn (1985) classified these theories according to the conditions, motivations and precipitating circumstances connected to FDI. In addition, he mentioned that these categories result in possible overlaps and that it is thus necessary to recognise that, despite common characteristics, organisation-specific factors influence investment and disinvestment decisions. Any valid theory must consider factors such as changes in transportation and communication facilities, changes in government policies and the advent of a chief executive officer who is willing to invest or disinvest. According to the same source, many alternative explanations have been offered for foreign investment, rather than accepting the earlier rationale that firms invest abroad, because it is profitable to do so (especially in the post-war period).

Agarwal (1980) classified the theories[13] of FDI into four groups, namely:

(i) The hypotheses that assume full or nearly full competition on factor and/or product markets (these include the theories of differential rate of return, portfolio diversification and output and market size);

(ii) Hypotheses that take market imperfections for granted and assume that the firms investing in foreign countries have one or more comparative advantages over their rivals in the host countries (these include theories of behavioural economics, product cycle, oligopolistic reaction and internalisation);

(iii) The group that includes some selected hypotheses on the propensities of countries, industries or firms to undertake FDI (liquidity and currency area theories); and

(iv) The last group is based on the propensities of countries to attract investments.

Casson (1990) (in Singh and Jun 1995) viewed the theories of FDI as a "logical intersection" of three distinct theories namely:

(i) The theory of international capital markets, which explains financing and risk-sharing arrangements;

(ii) The theory of the firm, which describes the location of headquarters, management and input utilisation; and

(iii) Trade theory, which describes the location of production and destination of sales.[14]

[13] Lizondo (1994) also based the structure of his study on that employed in the comprehensive survey by Agarwal in 1980.

[14] Mentioned as hypotheses because there is not one but a number of competing theories with varying degrees of power in explaining FDI.

Recently, Faeth (2009) classified the determinants of FDI according to nine theories:

(i) Early studies of the determinants of FDI

(ii) Neoclassical trade, which explained international capital trade because of differences in returns on capital;

(iii) Ownership advantages that combine OLI advantages as determinants of FDI;

(iv) Aggregate variables as determinants of FDI that combines OLI, technology and country characteristics;

(v) OLI advantage framework;

(vi) Horizontal and vertical FDI models that combine the proximity concentration hypothesis for horizontal FDI and factor proportions hypothesis for vertical FDI;

(vii) Knowledge capital, which explains FDI forms such as export platform FDI, wholesale FDI and outsourcing;

(viii) Diversified FDI and risk diversification, where MNCs can be seen as risk averse and try to spread = business risk; and

(ix) The policy variables approach that combines fiscal, financial and other investment incentives influencing FDI location.

3.5 Chronicle and Classification of Theories on FDI

Table 3.2 summarises the wide range of divergent theories, including the theory of industrial organisation, product cycle theory, transaction-related FDI theories, the process of internalisation and the theory of the location of FDI by identifying a key set of unambiguous determinants of FDI. The table also provides the names of the authors involved in each theory.

Table 3.2 Classification of the theories

Macro theory		**Micro theory**	
Key view	**Authors**	**Key view**	**Authors**
What are the advantages of being MNCs?			
		Theories of Industrial organisation[15]	Hymer (1960, 1968, 1976) Caves (1971, 1974) Teece (1981, 1992) McCullough (1991)
Why and how do firms expand their territorial boundaries outside their home countries rather than exporting?			
Product cycle	Vernon (1966) Hirsch (1967) Buckley and Casson (1976) Vernon (1979)	**Transaction-related**	Coase (1937) Buckley and Casson (1976) Williamson (1975, 1979) Rugman (1981) Hennart (1982, 2000) Hill and Kim (1988) Prahalad and Doz (1987) Bartlett and Ghoshal (1989) Doz et al. (1997)
Internationalisation Process	Johanson and Vahlne (1977, 1990) Eriksson et al. (1997)	**Resource-based/Raw Materials**	Penrose (1958) Wenerfelt (1984) Nelson and Winter(1982) Cantwell (1989,1994) Teece et al. (1997)
		Strategy-related (and oligopolistic production)	Veron (1966) Knickerbocker (1973) Graham (1975) Flowers (1976) Vernon (1982) Hostman and Markusen (1987) Graham (1990, 1998)
		Option theory	Kogut and Kulatilaka (1994) Rivoli and Solaria (1996) Casson (2000)
		Internalisation	Buckley and Casson (1976)

Source: Based on Jordaan (2005) Continued.

[15] According to Lozondo (1991) and Dunning (2002), these theories are based on imperfect markets.

Table 3.2 Classification of the theories (continue)

Macro theory		Micro theory	
Key view	**Authors**	**Key view**	**Authors**
Why do firms engage in FDI rather than trade? And how does FDI effect existing trade theories?			
Macro (country oriented)	Kojima (1973 to1982) Helpman(1984, 1985) Markusen and Venables (1998)	**Micro (form/industry oriented)**	Vernon (1966) Hirsch (1976) Batra and Ramachandran (1980) Ethier (1986) Gray (1982 and(1999) Markusen (1984,1995, 1998)
What determines where firms locate their value added activities?			
Theory of location (General)	Vernon (1966) Hirsch (1967) Dunning (1972) Vernon (1974) Root and Ahmed(1979) Davidson (1980) Lipsay and Kravis(1982) Krugman (1991,1993)	**Clustering and agglomeration**	Enright (1991, 1998) Porter (1998) Audretsch (1998) Chen (1998) Head, Ries, and Swenson (1995) Markusen and Venables (2000)
Internationalisation	Johanson and Vahlne (1977, 1990) Schneider and Frey (1985) Welch and Luostrainen (1988)	**Knowledge Enhancing**	Cohen and Levinthal(1990), Levinthal (1990), Kogut and Zander (1992, 1994). Nonaka (1994) Porter (1994, 1998) Dunning (1995,1997)
Market size	Stevens (1969) Kwack (1972) Schwartz(1976)	**Output**	Stevens (1969) Kwack (1972) Schwartz(1976)
Exchange rate /currency area	Aliber (1971) Cushman (1986) Culem (1988) Froot and Stein (1991) Rangan (1998)	**Spatial transaction cost**	Florida (1995) Scott (1996) Storper and Scott(1995)
Risk uncertainty	Rugman (1975,1979) Agmon and Lessard(1982) Rivoli and Salorio (1996)	**Taxes ,subsidies and / or tariffs and incentives**	Hines (1996) Devereux and Griffith (1996) Haufler and Wootom (1999) Glass and Saggi (2000)
Exchange rate/ market imperfections	Aliber (1971) Cushman(1985) Frost and Stein(1991) Bloningen (1997) Rangan (1998)	**Cheap labor**	Riedel (1975) Donges(1976,1980) Juhl(1979)

Source: Based on Jordaan (2005)

3.6 Theoretical explanation of the determinants of FDI

The existing literature reviews different location-specific factors in the decision to invest abroad, such as size of market, labour costs, legal and regulatory framework and macroeconomic environment, as reviewed in the work of Estrin et al. (1997) and Horst (1972 cited in Oleksiv (2000)).[16] Protectionist measures such as tariffs and quotas[17] are often used to explain FDI inflows and justify why FDI undertakes cross-border acquisitions both horizontally and vertically.[18] A great number of economists have also considered the issues of taxation and its impact on the flow of investments. For example, Kinoshita and Campos (2001) and Kudina (1999) found that the investment location decisions of MNCs are sensitive to differences in host country tax rates. This was in line with the conclusions of the IMF Report on FDI in Emerging Market Countries (September 2003). Extensive reviews of the key determinants of FDI can be found in Dunning (1993) and Vernon (1966, 1979). By incorporating Hymer's explanations and various other theories of FDI, Dunning's eclectic paradigm provides a general explanation for the determinants of FDI. Dunning's theory will be used in this dissertation as it focuses on the location dimension of FDI determinants.

The relevance of Vernon's product life cycle theory as the main theoretical explanations for the traditional determinants of FDI is to explore economies of scale and scope[19] and to explain the timing and reasons for relocation.

Dunning brought together internalisation theory and traditional trade economics to create the eclectic OLI paradigm of FDI, synthesising the reasons for firms operating internationally (advantages) and the mode of entry (FDI, export and licensing).

The location-specific advantages offered by host countries are further explained according to the motives of foreign investors, which can be local, and regional market seeking or resource and/or efficiency seeking.

---

[16] Each of these factors will be explained in detail under OLI.

[17] For more detail see Mundell and Heckscher-Ohlin model

[18] FDI designed to serve local markets is often called 'horizontal' FDI, since it typically involves duplicating parts of the production process as additional plants are established to supply different locations. By contrast, FDI in search of low-cost inputs is often called 'vertical' FDI, since it involves slicing the vertical chain of production and relocating part of this chain to a low-cost location.

[19] Economies of Scale: a production process exhibits economies of scale over a range of output when Average cost, i.e. cost per unit of output, declines over that range.
Economies of Scope: they emerge if the firm achieves savings as it increases the variety of goods and Services it produces.

First, market-seeking investors will be attracted to a country with a large and fast-growing domestic market. The market size and market growth of the host economy are the main factors that encourage market-seeking FDI since access to a local market can be better reached by local production. The obstacles to serving the market such as tariffs and transport costs also encourage this type of FDI.[20]

Second, resource-seeking investors will look for a country with abundant natural resources. Resources may be natural resources, raw materials or low-cost inputs such as labour. Unlike market-seeking FDI, this type of FDI can serve not only the local market but also the home and third country markets. The availability of raw materials, cheap and skilled labour and physical infrastructure are the main attractions of resource-seeking FDI.[21]

Third, the motivation for efficiency-seeking FDI is to improve the structure of established resource-based or market-seeking investments in such a way that the investing firm can gain from the domination in geographically dispersed activities.

The objective of the efficiency-seeking MNC is to take advantage of different factor endowments, cultures, institutional arrangements, economic systems and policies and market structures by concentrating production in particular locations to supply numerous markets.[22]

For efficiency-seeking foreign production to take place, markets' borders must be well developed and open. This is why this type of investment usually takes place in regionally integrated markets.[23]

Other factors could also encourage FDI inflows in the region. The favourable macroeconomic environment of the host country such as stable prices and exchange rate, low national debt and sustainable budget deficit are attractive to foreign investors. Social and political stability also encourage FDI inflows. The progress of economic reform is particularly important from the transition economy perspective (e.g., privatisation reforms). Other non-economic factors include the level of corruption, legislative framework and administrative efficiency, all of which influence business operations.

---

[20] This is also called 'horizontal FDI' as a firm duplicates the production process in foreign locations. See Markusen and Venables (1998) and Cherry (2001).
[21] This is 'vertical FDI' as a firm relocates part of the vertical chain of production in a low-cost location.
[22] Dunning (1993), p. 59.
[23] ibid.

Gravity model is another way that has emerged for explaining FDI. Geography fundamentally influences how society develops. Some geographic characteristics are important to boost FDI. Sachs (2003) provided explanations for economic prosperity based on geographical characteristics such as whether a country is landlocked. If a country is landlocked, then it does not have access to water trade routes, which are important to any economy. Generally, landlocked countries are quite poor[24] and thus struggle to attract FDI. Ross (2001) deduced that natural resource-rich countries have a tendency to have more FDI inflows compared with countries with poor natural resources.

Quantifying geographical characteristics for social science analysis purposes is rather new. However, the data that Sachs and others assembled have established a rather strong relationship between FDI and geography.

According to the gravity models of international trade, transportation (and informational) costs are approximated by the distance between two countries.[25] In other words, the smaller the distance is, the larger the trade volume between two countries.[26]

3.6.1 Other Considerations

The most important determinants for the location of FDI are economic considerations, which will be examined in this thesis. Historically, the most important host country determinant of FDI has been the availability of natural resources, for example minerals, raw materials and agricultural products, which determines competitive advantage. Up to the end of the Second World War, about 60% of the world stocks of FDI was in natural resources (resource seeking).[27] Even when it was well known as an FDI determinant, the presence of natural resources by itself was not adequate for FDI to take place. Comparative advantage in natural resources usually gave an incentive to trade rather than to FDI. Investment took place when resource-abundant countries either required the large amounts of capital typically needed for resource extraction or did not have the practical and technical skills needed to extract or sell raw materials to other countries.

---

[24] There are 13 landlocked countries in the world, and all of them struggle to attract FDI. The exception to this rule is Switzerland.

[25] The gravity model of international trade predicts bilateral trade flows based on the economic sizes of gravity factors (e.g., GDP, GDP per capita, price, tariffs, etc.) and distance between two trade partners.

[26] Since information on source countries is not presented in this paper, the sample cannot include distances between source and host countries as determinants of FDI.

[27] Dunning (1993), p. 8.

In addition, foreign investors took an interest in developing the infrastructural facilities and distribution channels for getting the raw materials out of the host country and to their final destinations.[28]

Labour-seeking investment is usually carried out by manufacturing and service MNCs from countries with high real labour costs, which set up or acquire subsidiaries in countries with lower real labour costs to supply labour-intensive intermediate or final products to other countries' markets, including the home country. Frequently, to attract such production, host countries have set up free trade or export processing zones[29] (e.g., China). The attractiveness of a country for this type of FDI is approximated by unit labour costs.

Another highly important group of economic determinants of FDI is market factors, which are market size, in absolute terms as well as in relation to market size and the income of its population, and income growth. For firms, new markets provide a chance to remain competitive and grow within the industry as well as achieve economies of scale and scope.

Traditionally, market size and growth as FDI determinants relate to national markets for manufacturing products protected from international competition by high tariffs or quotas that cause "tariff jumping" FDI.[30] In other words, a country with a large or fast-growing market will attract market-seeking investors. For instance, the recent expectation of advanced economic development in China has led to a significant increase in inward FDI. In this case, market potential can be measured by population size.

The counterargument would be that unless the sample presents a homogeneous group of countries in terms of income level, population might be an insufficient proxy for market potential because GDP per capita as well as demand elasticity need to be taken into consideration.[31] High GDP per capita may also be an incentive for foreign investors.

The downside of this indicator is that the number of customers does matter because it is not appealing to invest in a country with very high GDP per capita but with a limited number of consumers. Likewise, the same refers to a country with a large number of residents, but low GDP per capita.

---

[28] UNCTAD (1998), p. 106.
[29] Dunning (1993), p. 57.
[30] UNCTAD (1998) p. 107.
[31] Merlevede and Schoors (2004).

With reference to income, the elasticity of demand, which depends on the types of goods produced and sold in the host country, product life stage and existing competition can affect the decisions of investors to establish themselves in a particular location. Taking into account both GDP per capita and population will lead to considering GDP itself as a determinant of FDI.

The single most important reason for any type of investment remains the position of host governments with regard to methods of attracting FDI into the country. The traditional instrument preferred by governments has been to impose tariffs or other import controls. History implies that the majority of first-time manufacturing and service investments were undertaken to avoid such trade barriers.[32] However, with regards to transitional economies national markets were also important for many MNCs, although the primary reason was not the existence of tariffs, but the fact that most services were not tradable and, therefore, the only way to deliver them to foreign markets was by establishing businesses abroad.[33]

3.6.2 Transition-related Determinants

The core FDI policy is of crucial importance. Without foreign investment legislation, no foreign investment will take place in a particular country. Furthermore, it was found that while investment policy restrictions are important in discouraging foreign investment, investment policy incentives are only one variable attracting such investment.[34] Equally important as FDI policy frameworks in encouraging investment inflows are measures that facilitate business transactions.

These include business promotions, investment inducements, after-investment services, improvements in amenities and measures that reduce the "hassle" cost (related to corruption and administrative efficiency) of doing business. Financial or fiscal incentives are also used to attract investors, even though they typically influence investor location decisions only when economic determinants are in place.[35]

---

[32] Dunning (1993), p. 59.
[33] UNCTAD (1998), p. 107.
[34] OECD (1998) pp. 17–20.
[35] Mallampally and Sauvant (1999), p. 37.

The progress and method of privatisation are both relevant to FDI inflows since they reflect the availability of the production means in the country in transition. The most often used ways to measure progress in privatisation are the European Bank of Reconstruction and Development (EBRD) indices of small- and large-scale privatisation, or private sector share in GDP. With regards to the methods of privatisation, many countries chose to privatise by the free distribution of company shares to employees, so-called insider privatisation.

Another method frequently used in transition countries is voucher privatisation. Nationals receive vouchers free and can trade them for shares of companies.
MNCs then can enter the market by buying these shares from private owners. Yet, the most appealing to foreign investors is so-called direct privatisation, where state-owned companies are sold for cash at auctions. The limited number of bidders encourages FDI.

Another factor influencing FDI inflows in the context of transition is regional integration. Facing a scarcity of domestic capital in relation to the needs of privatisation and growing competition in foreign markets, governments were desperate for a solution. In this regard, the role of FDI is crucial as it facilitates economic growth, technology transfer and institutional restructuring. Hence, soon after the collapse of the Soviet Union, the new independent states tried to establish diplomatic and economic relations with the European Community. The membership of the European Union was anticipated to help countries advance further into the world economy.

According to Bevan and Estrin (2000), the announcement at the Essen European Council in 1994 concerning EU enlargement had a positive impact on FDI in Visegrad countries, which were not only geographically closer to the EU, but also more advanced in economic reforms. There are many requirements concerning the political and economic environment that have to be met by a country in order to join the EU. Thus, such announcements provide guarantees for investors in terms of macroeconomic and political stability. In other words, there are strong incentives for inward FDI.

Theoretical investigations have shown that the institutional, legal, political and macroeconomic environment, namely inflation, transparency and the effectiveness of the legal system influence the decision of foreign investors to locate in a particular country. Studies of FDI in transition countries (which have faced both internal economic and political crises) have placed particular emphasis on country risk assessment.[36] These ratings are provided by specialised firms and usually consist of three main elements: macroeconomic stability (e.g., growth, inflation and exchange rate risk), institutional stability (e.g., policies towards FDI, taxation policies, the transparency of legal regulations and the degree of corruption) and political stability (e.g., indicators of political freedom, measures of revolutions).[37]

Although the theories on FDI present a broad set of FDI determinants including firm-specific, country-specific and transaction-related factors, the consideration of these factors would only be appropriate for highly disaggregated studies using firm-level data. Owing to the objective of this chapter and the availability of data, placing emphasis on the locational determinants of FDI to analyse which of them are significant for Ukraine nowadays is considered more appropriate. The above framework of FDI gives guidance for identifying the set of variables to be tested as determinants of investment locations, which is discussed in detail in the next chapter.

[36] Lucas (1993) and Stoian and Vickerman (2005).
[37] Bevan and Estrin (2000).

3.7 Conclusion

A number of theories attempt to explain FDI, but none succeeds entirely. In this chapter, we classified the theories of FDI according to macro and micro principles. These theories were further classified into theories of industrial organisation, theories of the firm, theories of location and theories of FDI. The FDI literature spans several different disciplines including international economics, economic geography and international business, which makes it difficult to derive appropriate explanatory variables. Therefore, FDI should not be explained by single theories but broadly by a combination of ownership advantages or agglomeration economies, market size and protection and risk factors and policy variables. Varieties of empirical studies have already taken this approach, even when focusing on specific theories or aspects of FDI.

The main ideas represented by these theories will assist in the selection of appropriate explanatory variables and data series to be tested in the empirical section. This idea will further help indicate the expected sign surrounding theoretical foundations. Given the vast range of theories, the challenge now is to identify a set of relevant and empirically significant determinants of FDI as well as their signs.

Chapter 4

Previous Empirical results of FDI studies

4.1 Introduction

An extensive empirical literature has assessed the importance of the different determinants of FDI. The literature however is only extensive, but also confusing and conflicting. Most studies apply a combination of factors from a variety of theoretical models such as ownership advantages or market size characteristics, cost factors, transport costs, protection, risk factors and policy variables to explain the possible determinants of FDI Faeth (2009).
Broadly, these studies can be divided into two groups: (i) studies of the determinants of FDI including studies of the relation between investment climate and FDI and (ii) analyses of the impact of FDI on the economy from both a macroeconomic (growth and trade performance) and a microeconomic perspective (restructuring and enterprise performance).

The aim of this chapter is to build on the theories discussed in chapter 3 and investigates how the variety of theoretical models attempting to explain the determinants of FDI. This will assist in the selection of appropriate variables, data to be tested empirically to determine FDI inflows. It will further assist by providing an indication of the expected signs and magnitudes of the coefficients of variables found in the literature.

The rest of the chapter is structured as follows. The first section highlights the lack of consistency in current empirical studies. The second section discusses selected determinants for explaining FDI. These determinants of FDI are grouped according to economic, social, political and other variables. The empirical results are further categorised by distinguishing between positive and significant, negative and significant and insignificant empirical findings. Lastly, section 4.4, presents the concluding remarks.

4.2 Conflicting and Confusing Empirical Results

The lack of a generally accepted theoretical model that captures all the aspects of FDI (as highlighted in chapter 3) have resulted in a wide range of approaches attempting to answer why MNCs locate their businesses in another country. These approaches vary depending on the methodology, econometric techniques, country characteristics, as well as choices of independent and dependent variables and explanatory variables. As a result, varying conclusions have been reached.

Chakrabarti (2001) states that in addition to the heterogeneity in the approaches, these empirical studies are examples of measurement without theory...this is common in many different fields of economics, where variables are used showing a significant influence, but then the results are then explained".

Most studies on FDI have looked at only a small number of explanatory variables or set of variables of interest, thereby ignoring the fundamentals of theories (for example, Barrell and Pain (1997) for Eastern Europe, Trevino et al (2008) for Latin American Countries (LAC), Asiedu (2006) for Africa and Hattari and Rajan (2009) for Asia). Owing to these contradictory results, Chakrabarti (2001) questioned the reliability of the conclusions and results of cross-country FDI regressions. The absence of a generally accepted and representative theoretical framework to capture FDI is further emphasised by Ioannatos (2003) who mentions that this situation has led researchers to rely on empirical evidence for explaining the emergence of FDI.

When assessing empirical work on FDI another difficulty might rise such as the aggregation of determinants of location on a firm level so that they interact at the national level in order to determine cross- border flows. Bora 2003 mention: "Too much reliance on firm –level determinants ignores the economic significance of national boundaries, but alternatively, too much focus on aggregate variables ignores the contribution and behaviour of affiliates".

Unanimously most studies have suggested the following variables as the main determinants of FDI; market size, gravity factors, availability of natural resources and skills, labour costs, progress in transition reforms and economic and political stability. Domestic market together with the political, economic and legal environment are the main factors that influence MNCs' decisions to locate in countries in transition, while production costs advantages do not seem to be a dominant motivation for investing.[38]

Table 4.1 summarises the most recent empirical studies. It further shows the unit of measurement and the methodology employed as well shows positive significant, negative significant and insignificant findings. The table can be helpful in identifying potential determinants for empirical estimations as it gives an indication of the signs, magnitudes and significance of the variables to be used, and provides a framework for comparing empirical results.

[38] Bevan et al. (2000), Disdier and Mayer (2004).

Table 4.1 determinants of FDI: A review of empirical literature

Determinants of FDI		Effects on FDI					
		positive significant	Unit measure & Methodology	negative significant	Unit measure & methodology	Insignificant	Unit measure & methodology
Market size	Real GDP	Trevino et al (2008) Razin (2002)	Nat/panel Nat/panel			Ahmed (1979) Tuman and Emmert (1999)	Nat/CS Log/panel
	Nominal GDP	Dhakal et al (2007)	Nat/panel				
	Real GDPor GNP per capita	Wheeler and Mody (1992) Tsa i(1994) Van &Walt (1997) Lipsey (1999) Barrell and Pain (1997) Busse &Hefeker(2007) Schneider &Frey(1985)	Nat/panel Nat/CS Log/CS Nat/CS Nat/panel Nat/panel Nat/panel	Edwards (1998) Asiedu(2002) Ancharaz(2003) Chakrabarti2003	Log/panel Log/panel Nat/panel EBA/panel		
	Lagged GNP		Nat/panel				
	Domestic market	Bhasin et al (1994) Morrissey &Rai (1995)	Nat /CS Nat/panel				
GDP or GNP per capita	Growth rates	Gastanaga et al (1998) Barrell &Pain (1998) Razin (2003) Durham(2002) Chakrabarty and Basu (2002)	NAT/CS Nat/panel Nat/panel Nat/panel Nat/panel			Tsai (1994) Asiedu (2002) Razin (2003)	Log/panel Log/panel Nat/panel

	Determinants of FDI	Effects on FDI					
		positive significant	Unit measure & Methodology	negative significant	Unit measure & methodology	Insignificant	Unit measure & methodology
	Growth lag(-1)&(-2)	Ancharaz (2003)	Nat/Panel			Razin(2002)	
Labour	Labour cost or wage	Wheeler &Mody (1992) Van &Walt (1997) Chakrabarti (2003) Love and Lage-Hidalgo (2000)	Log/Cs Nat/panel EBA/panel Nat/panel	Cheng&kwan (2000) Bellak et al (2008) Estrin (2004) Grosse (2001)	Log/panel Nat/panel Nat/panel	Tsai(1994) Loree&Guisinger (1995) Chen (1996) Pain &Lansbury (1997) Lipsey (1999)	Log/panel Log/panel Log/panel Log/panel Log/panel
Labour	Skilled work force	Schneider &Frey (1985)	Log/Cs	Bevan and Estrin (2004)	Nat/panel	Cheng &Zhao (1995) Guntlach (1995)	NAT/CS
Nominal interest rate		Culem (1988)	Nat/panel				
Inflation rate				Schneider &Frey (1985) Chakrabarti (2003) Asiedu(2002)	Log/Cs EBA/panel Nat/panel	Asiedu (2002)	Log/panel
Balance of payments deficits		Dollar (1992)	Nat/panel	Schneider &Frey(1985) Tsai(1994)	Log/Cs Nat/panel		
Per capita trade account balance						Tsai (1994)	Nat/Cs
Δ Exchange rate		Chakrabarti 2003	EBA/panel	Ancharaz (2003) Shapiro (1999)	Log/Cs Nat/panel	Desai et al (2002)	Nat/panel

(Continued)

Determinants of FDI	Effects on FDI					
	positive significant	**Unit measure & Methodology**	**negative significant**	**Unit measure & methodology**	**Insignificant**	**Unit measure & methodology**
Domestic investment	Razin (2002)	Nat/panel				
R&D(research and development)	Ueng and Ojah (1997) Caves (1996) Tomiura (2003)	Nat/panel Nat/panel Nat/panel				
Openness (X+Z)/GDP	Hausman&Arias (2000) Asiedu (2002) Dollar and Kraay (2004) Ancharaz (2003) Kyrkilis (2005)	Nat/panel Nat/panel Nat/panel Nat/panel Nat/panel				
Taxes & tariffs	**Cheng & kwan (2000)**	Nat/panel	Wei(2000) Chakrabarti (2003)	NAT/Panel Log /panel	Wheeler &Mody (1992) Gastanaga et al (1998)	
Government consumption			Ancharaz (2003)	Log/Panel	Asiedu(2002)	Log/panel
Profitability	**Wang &Swain (1995)**	Nat/panel				
Corruption	Mauro (1995) Fosfuri et al(2001) Glass and Saggi (2002) Welsch(2003)	Nat/CS Nat/panel Nat/panel Nat/panel	Smarzynska and Wei(2000)	NAT/panel		

(Continued)

Determinants of FDI		positive sign	Unit measure & Methodology	negative sign	Unit measure & Methodology	Insignificant	Unit measure & methodology
Political instability				Schneider &Frey(1985) Chakrabarti(2003) Ancharaz(2003)		Jasperen et al (2000) Hausman& Arias(2000) Asiedu (2002)	Nat/CS Nat/CS NAT/CS
Institutional quality		Ancharaz(2003)	Nat/panel				
Language(dummy,1if the same language is shared)		Veugelers(1991)	Nat/panel				
Neighbour(Dummy,1if a common borders)		Veugelers(1991) Jordan(2005)	Nat/panel				
Infrastructure quality		Wheeler &Mody(1992 Asiedu (2002) Ancharaz (2003)	Nat/panel				
Natural resources		Asiedu (2006)	Nat/panel				
Location		Barrell & Pain(1997)	Nat/panel				
Democracy	**Minimum levels**			Barro (1996 and 1997)	Nat/panel		
	Higher levels	Barro (1996 and 1997)	Nat/panel				
	Overall	Minier (1998)	Nat/panel	Alesina et al (1996)	Nat/panel		
	Voice			Dollar and Kraay(2004)	Nat/panel		
Ethnicity and language	**Ethno – linguistic fractionalization**			Easterly and Levine(1997) Alesina et al (2003)	Nat/panel		
	Language Diversity			Masters and McMillan(2001)	Nat/panel		

(Continued)

Determinants of FDI		positive sign	Unit measure & Methodology	negative sign	Unit measure	Insignificant	Unit measure & methodology
Education	**College level**			**Barro and lee (1994)**			
	Female (level)	Caselli ,et al(1996)		Barro and lee (1994)and (1997) Forbes(2000)			
	Female (growth)			Barro and lee (1994)			
	Male (level)	Barro and lee (1994) Barro(1996) Forbes(2000)		Caselli ,et al(1996)			
	Male (growth	Barro and lee (1994)					
	Overall (level)$	Azariadis and Drazen(1990) Barro(1991) Easterly and Levine(1997) DE Mello (1997) Krueger and Lindahl (2000)					
	Primary level	Sachs and Warner(1995)		Barro (1997)			
	Second level	Sachs and Warner(1995)					
	Initial income*male schooling	Sachs and Warner(1995)					

Positive- significant and Negative –significant are shown if they are significant between 1 per cent and 10 per cent.
CS: cross section
NAT: natural logarithm
Sources: The table was developed from Chakrabarti (1998) and Jordan2005.

4.3 Measurement Issues and Data Definition

The following section overviews the dependent and independent variables that have been used in various empirical studies on the determinants of FDI. It also includes references to the data sources as well as the signs and significance of the coefficients and their economic interpretations. This should help the selection of appropriate variables, data and proxies to be tested empirically to determine FDI inflows.

4.3.1 Dependent variables

As mentioned in chapter 2, there are a number of definitions of FDI;[39] hence, it is relevant to specify and analyse the sensitivity of the results according to these different definitions. Care was taken to refrain from using other existing definitions because of the higher frequency of missing values versus the selected definitions. Based on the existing literature, FDI can be defined by International Financial Statistics (IFS) as "the net foreign direct investment expressed as a percentage of GDP or the net inflows of investment to acquire a lasting management interest (10% or more of voting stock) in a business enterprise operating in a country other than of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments." The dependent variable in most studies is some measure of the ratio of FDI to GDP. Tsai (1994) in his study of less-developed and developing countries used the 'flow of direct foreign investment' from the Balance of Payment Statistics.

Chakrabarti (2001), Culem (1988), Razin (2003), Asiedu (2002) and Gastanaga (1998) used the total inward flows of FDI as a percentage of GDP for a pooled cross-section and time series for 49 less-developed countries from the Balance of Payment Statistics and IFS.

[39] There are four other definitions of FDI found in the WDI data including (I) net FDI, Balance of Payment Statistics in current US$,(ii) net FDI inflows as a % of gross capital formation, (iii) net inflows BOP in current US$ and (IV) gross FDI as % of GDP in PPP.

Schneider and Frey (1985) used net FDI per capita in US dollars and obtained this data from the United Nations Statistical yearbook and World Development Report. Asiedu (2002) used the ratio of FDI flows to GDP 'as is the standard in the literature' from World Bank data sources. This net flow was also employed by Ancharaz (2003). Gross FDI reflects the sum of the absolute value of inflows and outflows accounted in the Balance of Payment Statistics financial accounts. In our model, we mainly on the inflows to the economy; therefore, we use the net inflow measure.

4.3.2 Independent variables

Among various FDI determinants, existing studies have identified a number of factors that are referred to as "traditional" independent variables of the FDI process.[40]Whether it is possible, we present for each independent variable below the theoretical and empirical finding on FDI.

4.3.2.1 Economic fundamentals for incoming FDI

4.3.2.1.1 Real GDP/GNP per capita or Market size

The market size hypothesis suggests that investment will go primarily to markets large enough to support the scale economies needed for production according to OLI Dunning paradigm (1993). In most studies (see Table 4.1), market size is measured by either real GDP per capita or real GNP per capita (GNP divided by midyear population) which is used as a proxy for the market size of a country or the income within the country.

The theoretical support of this hypothesis is larger economies attract more investment because FDI will shift to countries with larger and growing markets and larger purchasing powers where firms can potentially receive a higher return on their capital, which implies that they receive higher profits from their investments.

---

[40] Comprehensive reviews of the empirical literature on the overall determinants of FDI flows can be found in Dunning (1993) and Caves (1996).

Davidson (1980) argued that market size influences the locational decisions of MNCs for two main reasons: First, the expected sales volume plays a crucial role in the foreign investment decisions. FDI becomes an economically sensible option only when the volume of production exceeds a level at which the average cost of serving the market by means of exports is greater than the average cost of production within the market. Second, market size can be related to economic and strategic motivations behind FDI which occurs primarily in highly concentrated industries".

Schneider and Frey (1985) concluded that the higher the GNP per capita, the better the nation's economic health and the better the prospects for profitable FDI. Empirically, the positive relation between the host country's market size and FDI inflows is the most tested hypothesis (Culem, 1988; Wheeler and Mody, 1992; Barrell and Pain, 1997, 1999; Bevan and Estrin, 2004).

According to a frequently quoted literature survey on FDI determinants by Agarwal (1980), the size of host country markets is the most popular explanation of a country's propensity to attract FDI, especially when FDI flows to developing countries are considered. Subsequent empirical studies have supported this finding.[41] Many studies have come up with results supporting the relevance of market-related variables such as GDP per capita and one period lagged GDP, including Culem (1988), Gastanaga (1998) Wheeler and Mody (1992), Jackson and Markowski (1995), Nunnenkamp (2002), Taylor (2000) and Globerman et al. (2002) and Rasciute (2007).

Asiedu (2002: 110) argued that testing this hypothesis is complex because of the lack of a proper and appropriate measure for return on investment, especially in the case of developing countries. He further mentioned that to overcome the problem of measurement, one must assume that the marginal product of capital is equal to the return on capital. This has the implication that investments in capital-scarce countries (poor countries) tend to have higher returns. He uses the inverse of real GDP per capita to measure return on capital.

This implies ceteris paribus that investments in countries with higher per capita incomes should yield lower returns and, therefore, real GDP per capita should be inversely related to FDI.

[41] Shamsuddin (1994) reiterated Agarwal's finding 15 years later: "Most empirical studies support the market size hypothesis."

The results in the literature are far from unanimous. Edwards (1998) and Jaspersen et al. (2000) used the inverse of income per capita as a proxy for return on capital and concluded that real GDP per capita is inversely related to FDI/GDP. However, Schneider and Fry (1985), Tsai (1994) and Asiedu (2002) found a positive relationship between the two variables. They argued that a higher GDP per capita implies better prospects for FDI in the host country. Chakrabarti (2001) mentioned that there might be some statistical and conceptual problems regarding the market size variable. GDP per capita has served as a proxy of market size in most empirical work on the determinants of FDI. Some studies have used absolute GDP as an alternative measure, but it has been pointed out that this is a relatively poor indicator of market potential for the products of foreign investors; particularly in developing countries since it reflects population size rather than income. By contrast, although reflecting the income level of a country, using GDP per capita data may introduce bias, because a country with a large population will be put into a less attractive category.

Chakrabarti (2001) further indicated that some studies have used GNP or GNP per capita as measures of market size as an alternative to GDP. However, GNP seems to be a less appropriate measure of market size because it captures earnings by nationals in foreign locations and thus overestimates the market for the products of multinationals located in the host country and excludes the earnings of foreigners located in the host country.

He further pointed out in (Chakrabarti, 2003) that an expansion in the market size of a location leads to an increase in the amount of direct investment through increased demand. This is also consistent with the market size hypothesis where foreign investors are likely to be attracted by large markets allowing them to internalise profits from sales within the host country. In our empirical we are interested to test whether market size is among the main FDI determinants. Regardless of the ambiguity regarding this variable in the empirical literature, we also expect the sign of the coefficient to be positive.

Lucas (1993) argued that the importance of local market size is exaggerated in various empirical studies because they exclude export markets as a determinant of FDI. Nonetheless, one can dispute this statement since Lucas did not address changes over time in the importance of FDI determinants. Moreover, it is debatable whether the pattern of FDI for Asian economies examined in his study would be similar in other transition economies.

In our testing we are going to use the GDP per capita measure, despite the mentioned above we are expecting a positive sign of this variable in our testing as it constitutes a major motive for FDI inflows.

4.3.2.1.2 Economic Growth

The growth of real gross domestic product can be used to capture the size of the potential market for foreign investors' products. It serves as an index for measuring the level of development in a country and thus reflects the purchasing power of individual consumers. It is also a proxy for the comparative return on investing in different countries. As the economic growth rate increases, the real return on capital will rise and, therefore, net FDI will increase. Razin (2003) used the annual percentage growth rate of GDP at market prices based on constant local currencies from the WDI. Gastanaga et al. (1998) calculated the growth rate by using the real GDP from the UN's Macroeconomic Data System and the IFS of the IMF. Schneider and Frey (1985) used a one-year lag of the percentage yearly rate of growth of GNP per capita from the World Development Reports. Razin (2003), Gastanaga et al. (1998) and Schneider and Frey (1985) all found positive significant effects of growth on FDI.

Given that most investments are market seeking, economic growth attracts FDI causing investment to move from lower economic growth towards higher economic growth countries, higher economic growth is symbolised by inspiring indicators in supporting FDI inflows[42] (Trevino et al., 2008; Ajami and Barniv, 1984, Dhakal et al., 2007).

[42] If endogeneity is taken into account, market size is no longer significant as found by Campos and Kinoshita (2008).

The growth hypothesis is also not without controversy, but in general, it maintains that a rapidly growing economy provides relatively better profit-making opportunities and acts as an indicator of good development potential (Chakrabarti, 2001; Lim, 1983).

Bandera and White (1968), Lunn (1980), Schneider and Frey (1985), Culem (1988) and Billington (1999) all found a significantly positive effect of growth on FDI, while Root and Ahmed (1979) and Tuman and Emmert (1999) found this variable to be insignificant in explaining FDI in Latin countries.

The findings of Tsai (1994) are surprising in another respect. According to the simultaneous equation model applied in his study, FDI and the growth of the host country's exports were positively correlated in the 1970s but no longer in the 1980s. According to the same source, FDI is widely supposed to have shifted towards more oriented FDI since the 1980s.

By contrast, Nigh (1988) reported a weak positive correlation for less developed economies and a weak negative correlation for developed countries. Ancharaz (2003) found a positive effect with lagged growth for the full sample and for the non-Sub-Saharan African (SSA) countries, but an insignificant effect for the SSA sample. However, Daniels and Quigley (1980) found that economic growth is the most determining variable in explaining FDI inflows. In addition, FDI may be directed away from a country that is either not growing or is not expected to grow. Newly emerging economies' per capita income growth rates are usually high, and often they are expected to continue growing for some time. This attracts market-seeking investors. For this reason, real GDP growth is usually expected to have a positive effect on FDI inflows.

4.3.2.1.3 Human Capital (Costs and Quality of Labour)

Lower wage or cost of labour makes countries with abundant skilled and/or unskilled workers (quality of the labour) more competitive and attractive, and is an important determinant that motivates efficiency-seeking firms, especially those trying to locate manufacturing to affect worldwide markets. This variable can be measured by wages and salaries measured as a percentage of total national expenditure, some authors have used the Consumer Price Index (CPI) as proxy for the wage rate due to lack of data others such as Ionnatos (2001) used labour productivity, measured by real GDP/ Labour force as a proxy for real wage rate variable.

Chakrabarti (2001) used the industrial wage rate, measured in US dollars at current market prices. Schneider and Frey (1985) also used the industrial wage rate (monthly) in US dollars, but with a one-year lag (data from the *United Nations Statistical Yearbook).* Tsai (1994) used the nominal hourly rate of pay in the manufacturing sector, calculated from the *Yearbook of Labour Statistics* (from the International Labour Organisation) and the *Statistical Yearbook* of the United Nations.

Although theoretical considerations suggest low-labour cost is important countries (as one of their comparative advantages) to determine location choices by MNCs and is agreed upon by the proponents of international trade theories, (by both the dependency hypothesis and by those advocating the modernisation hypothesis[43]), there is no clear evidence about the relationship between labour costs and location choice for FDI.

Agarwal (1980) revealed that wage has been the most confusing variable of all the potential determinants of FDI because there is no agreement in studies regarding the role of wages in attracting FDI. Chakrabarti (2002) also cited that Goldsrough (1997), Saunders (1982), Flamm (1994), Schneider and Frey (1985), Culem (1988), Shamsuddin (1994) and Pistoresi (2000) demonstrated that higher wages discourage FDI inflows.

[43] Dependency theorists agree that MNCs create "international division of labour" in a way that "high-paying white collar jobs" are located in the host country. Modernisation theorists do not refute the possibility of such an international division of labour – they argue that all international economic activity creates a division of labour and it is indeed from the resulting specialisation mutual gains from trade are generated (Chakrabarti, 2001).

However Yang et al. (2000), found a positive relationship between increases in wage costs in the host country and FDI inflows. Their given explanation is that increasing wages raise the tendency for labour to be substituted with capital, which results in an increase in FDI. They conclude that low wages are not necessarily crucial for FDI, and that other factors such as natural resources, a large market and so on, also influence inward FDI flows.

The availability of skilled labour and its productivity seem to be important for MNCs as well. Many studies have argued that FDI is attracted by locations with relatively high wages since higher wages represent locations that have a higher productivity and better skills, which are required in fields such as ICT and services. Trevino et al. (2008) found that Latin American Countries (LAC) FDI inflows are related to educational attainment, measured by enrolment in tertiary education. A more educated labour force can learn and adopt new technology faster, and the cost of training local workers would be less for MNCs.

Previous research has used rather basic proxies for labour costs as FDI determinants, without taking into account the difference in productivity and education levels between the source and host country, and thereby often the results have been inconclusive. For instance, Rasciute (2007) used industry-specific average hourly labour costs data as a proxy for labour cost as a determinant of FDI in Central and Eastern European countries. She found that industry-level wages is negatively related to the size of FDI.

Kinoshita and Campos (2002) found a negative but insignificant effect of labour costs. In this work, the nominal wage rate was used as a proxy for labour cost and labour quality was introduced as the general secondary school enrolment rate.[44] Estrin et al. (1997) found an FDI-increasing effect of labour costs while using combined data on average monthly earnings and productivity in manufacturing (data derived from the International Office Yearbook of Labour Statistics). Their conclusion was based on a cross-sectional empirical analysis of information on source and host countries.

Holland and Pain (1998) found a significant negative impact of wage levels in host countries, whether they controlled for productivity levels or not. Azemar and Desbordes (2009) analyze FDI inflows to developing countries and conclude that the relatively low flows into Sub-Saharan Africa are partly explained by poor human capital and illiteracy.

[44] A low wage rate on its own is not a sufficient indicator for labour cost: it was found that investors are attracted to countries that have more educated workers than they were to low-cost labour.

Overall, wage rates and related variables were not constantly statistically significant in FDI models. Partially, this is because labour costs are an incomplete measure of unit costs, and measured levels of basic education may not accurately identify labour productivity differences across countries given different national educational standards and differences in training and education among countries.

Hence, we expect that low labour costs and a more highly educated and skilled workforce should encourage inward FDI. However, the labour cost has to be specified carefully to distinguish between a numbers of different factors. MNCs will not wish to invest abroad, even if wage costs are modest, if the productivity levels attained in their foreign plants are very low. In our tests, we will look to both labour productivity measured by; Compensation of employees (current LCU) over local country GDP and the level of education in the labour force, proxies by primary, secondary and tertiary enrolment to test whether these factors are important determinants of FDI.

4.3.2.1.4 Cost of Capital

Interest rates can be a proxy for the cost of borrowing capital it has also been considered a determining factor influencing investment. Neoclassical theory states that: an increase in interest rates raises the cost of capital and therefore, reduces the incentive to accumulate more capital however; a decrease in interest rates reduces the cost of capital and stimulates investment. Culem (1988) claimed that foreign investors have the possibility of raising funds in a different place than in their home countries. They can benefit from extra advantages such as borrowing (or issue bonds or contract bank loans) where their assets are located if they want to avoid any exchange rate risk. However, they can also borrow in a third market where the interest rate is lower (this would make sense in the case of imperfect capital mobility).

To capture this effect, Culem introduced the nominal interest rate differential between the host country and the rest of the world. Vander Walt (1997) used the user cost of capital, namely the minimum rate of return that would attract investors. The rental price for capital has to be constructed, since no such price exists and because taxes raise the pre-tax rate of return that must be paid to investors.

The user cost of capital r_i *is:*

$$r_i = \text{price of capital} = \frac{i_i + \pi_i + \delta_i + \rho}{1 - \tau_i}$$

Where i_i is the nominal long-term interest rate, π_i is the inflation rate, δ_i is the rate of depreciation, τ_i is a tax ratio (between the pre-tax and the after-tax return) and ρ is a risk premium.

In the case of FDI, two interest rates are vital to the investment decision: the international interest rate (or the source country rate) and the domestic interest rate. The international interest rate represents the cost of funding to foreign investors and this is expected to have a negative effect on foreign investment. The real domestic interest rate, by contrast, serves as an indicator of the rate of return on investment in the host country. This suggests that the higher lending rates in the home country make investment more attractive. Several empirical studies have supported the linkages between FDI inflows and the interest rate (Barrel and Pain, 1997; Farrell et al., 2000; Pan, 2003). However, empirical analysis by Onyeiwu and Shrestha (2004) and Bevan and Estrin (2004) fail to support this hypothesis for FDI inflows to Africa and to East and Central European transition economies.

4.3.2.1.5 Openness of the Economy to Trade Vs Trade Barriers

Another variable often used in empirical studies is the "openness of the economy" to trade. Convergent evidence exists in the literature regarding the significance of openness, which is normally measured by the ratio of trade expressed as ((imports + exports)/ GDP). This measures the openness of an economy and often interpreted as a measure of trade restriction. However, since it is difficult to find reliable data on trade policies for some countries, many studies, including Dollar and Kraay (2004), have instead simply included trade volumes (exports plus imports as a share of GDP) as a measure of openness. Sachs and Warner (1995) made use of an openness indicator that took into account different ways that governments shut out imports. They classified economies as closed if they displayed any of the following five features: high import tariffs, high non-tariff barriers, a socialist economic system, a state monopoly on important exports or a big gap between official and black market exchange rates.

Several studies find a strong positive effect of openness on FDI inflows. For different regions including Eastern Europe, Asia, LAC and Africa, Kravis and lipsey (1982), Culem (1988) and Edward (1990) find a strong positive effect of openness on FDI and Schmitz and Bieri (1972) obtain a weak positive link. Ancharaz (2003) also finds a strong positive relation for the "all countries" and "non-SSAcountry" samples but an insignificant effect for SSAcountries.

(Asiedu, 2002) argues that openness may have a different effect on the inflows of different kinds of FDI. On the one hand, as usually argued by the "protection or tariff jump" hypothesis, high trade barriers induce some market-oriented FDI. If this were the case, then openness would have a negative effect on the inflows of this kind of FDI. On the other hand, a higher degree of openness of an economy indicates not only more economic linkages and activities with the rest of the world, but also a more open liberalized economic and trade regime. As a result, it is expected to attract more FDI inflows, particularly the inflows of resource-seeking or export-oriented FDI. Schmitz and Bieri (1972) and Lunn (1980) observed a significant positive effect of trade barriers on FDI, but Blonigen, as well as Feenstra (1997), found that trade barriers play an insignificant role in attracting FDI.

The estimation results of Tsai (1994) imply that host countries' openness to trade represents a comparatively traditional determinant of FDI. The study by Lucas (1993) of the determinants of FDI in East and South East Asian countries tended to fortify this view.
Theoretically, trade and FDI can either substitute or complement each other. In particular, on the point that inward FDI is strongly induced by host country trade barriers, the reduction or abolition of those barriers might have the primary effect of discouraging inward FDI flows at the same time as encouraging the repatriation of retained profits from the host country by MNCs established in a different economic environment. On the other hand, to the extent that MNCs progressively more engage in vertical specialisation of production, host countries that are members of many regional agreements and have developed trading ties with neighbouring countries are likely to be more attractive to MNCs as locations for specific value chain activities, and thereby more likely to attract inward FDI.

Assessing openness to trade, Taylor (2000) referred to survey results (from the World Competitiveness Report) on the degree to which government policy discourages imports. This measure of openness to trade was shown to be positively related to FDI in the United States. According to the sensitivity analysis of Chakrabarti (2001), openness to trade (proxies by exports plus imports to GDP) has the highest chance of being positively correlated with FDI among all explanatory variables classified as insubstantial. Similar results were obtained by Asiedu (2002), who used the same proxy for openness when distinguishing Sub-Saharan host countries from host countries in other regions. In comparison, different measures of openness (tariff rates, coverage of non-tariff barriers) have seemed to show an insignificant correlation with FDI. Rasciute (2007) analysed FDI determinants for different MNCs, industries and countries in EU15 countries and other major investors in CEE (Japan, Norway, Russia, Switzerland and US) in 12 CEECs, namely 10 new EU member states (except for Malta and Cyprus) and Bulgaria, Croatia, Romania and Ukraine. The author used a cross-sectional estimation technique where openness of the economy to foreign investment was one of the independent variables.[45] It was measured by country's exports as a percentage of its GDP averaged from 1997 to 2003.

---

[45] Other country-level variables are a financial deal value, GDP, distance, the Corruption Perception index, EU membership (EU dummy), unemployment, the scale-intensive industrial sectors (sector dummy), labour and capital costs, the firm size and firm profitability.

Pantelidis and Kyrkilis (2005) approximated the openness of the economy using the ratio of international trade (exports plus imports) of a home country over the same country's GDP. Data were drawn from a sample of 25 countries, which were divided into three groups depending on their levels of economic development (namely advanced, middle income and developing countries).

The authors estimated a linear form of the equation using OLS to examine each group separately. The results showed that the openness of the economy was a statistically significant variable with the expected sign for all groups of countries.

Nevertheless, many countries have imposed import substitution policies to successfully attract FDI, a fact that helps explain why most FDI historically has been market seeking rather than resource seeking. Under this scenario, one would expect a country's high import restrictions and low levels of trade to correlate with high FDI entry.

4.3.2.1.6 Exchange Rate

A country's exchange rate regime has also constituted an independent variable in FDI models. This can be defined as the measure of the value of currency against a weighted average of several foreign currencies divided by a price deflator or index of cost. A strong exchange rate is often interpreted in the empirical literature as an indicator of the greater "competitiveness" of the host country.

Studies on the macroeconomic effects of exchange rate on FDI have emphasised the positive effects of an exchange rate depreciation of the host country on FDI inflows, because this reduces the cost of production and investment in host countries, raising the profitability of FDI.

The wealth effect is another channel through which a depreciation of the real exchange rate could motivate FDI. By raising the comparative wealth of MNCs, a depreciation of the real exchange rate could make it easier for those firms to extract retained profits to finance investment abroad and to ensure security in borrowing from domestic lenders[46]. The extensive findings of various empirical models constructed by Globerman and Shapiro (2000) showed that volatile exchange rates tend to discourage inward FDI.

[46] Froot (1991) and Razin and Sadka (2003).

Carstensen and Toubal (2004) found that a relatively liquid stock exchange could assist takeovers of domestic firms by foreign investors. This determinant of FDI is likely to be more important as the number of international M&A in the FDI process increases.
The findings presented in Pantelidis and Kyrkilis (2005), whose assumption was that the currency appreciation of the home country is expected to facilitate the FDI involvement of the country's firms, showed mixed results. Only for a group of advanced countries was the exchange rate variable statistically significant with the expected (+) signs; the findings in the other two groups were positive but statistically insignificant.

The model proposed by Chakrabarti (2003) states that an appreciating currency could lead to either a rise or a fall in the level and share of FDI, depending on whether the revenue or the cost effect is larger. When a currency becomes stronger relative to that of the home country, sales become more attractive to MNCs. By contrast, immobile factors in the location with the stronger currency become costlier, leading to a rise in the prices of products produced and making them less competitive at home as well as in foreign markets.

If the revenue effect dominates the cost effect, the level of FDI in a host country will rise with a stronger currency and vice versa. The host share in FDI will also fall with a strong currency since FDI in the other location would increase.
Foreign investors may gain or lose from a depreciating exchange rate. For instance, with a depreciating exchange rate they can export more easily and gain from resource-seeking FDI. Foreign investors, however, may lose because they must incur costs to prevent transaction and translation losses when currencies depreciate. If they believe that depreciation will continue after they enter a country, they may conclude that the costs are too high to justify their investments.
In fact, Grosse and Trevino (1996), Froot and Stein (1991), Klein and Rosengren (1994) and Tuman and Emmert (1999) all found mixed investor reactions to exchange rate depreciation. Leiderman and Thorne (1996) reported that FDI into Mexico changed very little after the Mexican currency crisis and devaluation of 1994.

Further, in spite of the high value of the US dollar during much of the 1980s, the United States was a net recipient of FDI. Therefore, the impact of exchange rate depreciation on FDI inflows is ambiguous. Exchange rate is often cited as a critical determinant of FDI and it is argued by the currency area hypothesis that the weaker the currency of a country, the less likely it is that foreign firms will invest in that location.

A bias in the capital market exists, which is assumed to arise because an income stream from a country with a weak currency is associated with exchange rate risk; therefore, the income stream is capitalised by the market at a higher rate when it is owned by a weak currency firm (Aliber, 1970 in Chakrabarti, 2001). Froot and Stein (1998) developed a more elaborate theory, based on capital market imperfections with similar implications.

Chakrabarti (2001) mentioned that Caves (1988), Froot and Stein (1991) and Blonigen and Feenstra (1997) observed strong negative correlations between a country's exchange rate (foreign currency per domestic currency) and FDI. Edwards (1998) reported a significant positive effect of exchange rate on FDI and Tuman and Emmert (1999) observed that exchange rate has an insignificant effect on FDI in a share regression but a significant negative impact in a per capita regression.

Chakrabarti (2001) used the real exchange rate in terms of US dollars and mentioned that most studies report a positive significant coefficient of real exchange rate combined with openness, domestic investment and government consumption.

Ancharaz (2003) used the change in real exchange rate between year t and $t-1$. The real exchange rate for a country i is defined as:

$$RER_i = E_I * \frac{P_{us}}{P_i}$$

Where E is the exchange rate (local currency per US$), P_{us} is the US wholesale price index and P_i is country i's consumer price index (CPI). Increases in *RER* mean a real depreciation in the currency of country I against the US dollar. Ancharaz (2003) reported a significant negative coefficient for the change in the real exchange rate on FDI. The effect of changes in real exchange rates on FDI flows is also ambiguous. Harrison and Revenga (1995), and Elbadawi and Mwega (1998) used the real exchange rate as an indicator of a country's international competitiveness, hypothesizing that a real depreciation would attract larger FDI flows. However, it may be argued that, unless the purpose of FDI flows to a country is to build an export platform; overvalued exchange rates should not represent a considerable hurdle to foreign investors.

Quite to the contrary, a real depreciation increases the costs of imported inputs and reduces the foreign-currency value of profit remittances, both of which have adverse effects on the profitability of FDI projects. This effect will dominate if FDI is undertaken primarily to serve the domestic market.

Thus, if we assume that the prospective investor uses the previous year's change in the real exchange rate as a guide to its evolution in the near future, we would expect a negative sign on the variable $\Delta (RER)_{it}$ (since an increase in the index represents a real depreciation).

Again, however, this finding is not uniform across all studies. Examining the hypothesis of market liberalisation in transition countries, Bevan et al. (2000) used the EBRD index of price liberalisation and the EBRD index of foreign exchange and trade liberalisation as proxies for market liberalisation (openness). Cross-sectional empirical analysis was employed in this work to avoid the bias related to bilateral aspects of the relationship between host and home countries. The findings confirmed a highly significant positive effect of foreign exchange and trade liberalisation on FDI inflows and positive but insignificant effect of domestic price liberalisation.

The risk of exchange rate fluctuations may be more important for firms investing abroad who are risk-averse (see Caves, 1996; Ancharaz, 2003). Theoretically, exchange rates should be a crucial variable as the depreciation of host country currency attracts FDI, while large volatility in real exchange rates discourages FDI. So, if the currency of one FDI host country appreciates against the home country more than that of its rival, its FDI inflows will decline while the competing country's FDI will rise. However, Dhakal et al. (2007) explained that MNCs might not always gain from the host country's currency depreciation. Currency depreciation encourages exports and FDI but foreign investors may lose, because it increases prevention and translation costs.

Therefore, it can be summarised from most previous studies that a flexible but stable exchange rate system is needed to successfully attract FDI as local currency depreciation assists and promotes incoming FDI, while currency appreciation encourages outgoing FDI.

4.3.2.1.7 Trade Deficit or Balance of Payment Deficit

The notion of the trade deficit being an important determinant of FDI stems from the assertion that trade surplus is indicative of a dynamic and healthy economy with export potential and the country is therefore likely to attract FDI. By contrast, a large deficit in the balance of payments indicates that the country "lives beyond its means" (Schneider and Frey, 1985). Dollar (1992) and Lucas (1993) reported a strong positive correlation between trade surpluses and FDI, while Culen (1988), Tsai (1994) and Shamsuddin (1994) observed a significantly negative effect of a per capita trade account balance on FDI.

Schneider and Frey (1985) used the balance on the current account (a positive balance represents a surplus and a negative balance a deficit) in US dollar per capita with a one-year lag, using data from the IMF's Balance of Payment Statistics. They found a significantly negative effect between the balance on the current account (if in deficit) and FDI.

The current account balance of the host country is an indicator of the strength of its currency. A deteriorating current account balance leads to a depreciation of the host country's currency. It is possible that potential multinational investors view current account deficits negatively, because such deficits may lead to inflation and exchange rate variations. If this is the case, then an increase in the current account deficit may lead to a reduction in FDI inflows. By contrast, if MNCs take advantage of the current account deficits of the host country by negotiating more favourable operative terms, then the current account deficits may increase FDI inflows.

4.3.2.8 Tax (And Tariffs) or Incentives

Chakrabarti (2001) remarked that with respect to taxes and the effects of tax incentives on FDI, the literature remains inconclusive. He commented that Hartman (1984), Hines (1997), Loree and Guisinger (1995), Guisinger (1995), and Billionton (1999) all found that host country corporate taxes (corporate and income) have a significant negative effect on the inflow of FDI. However, Root and Ahmed (1979), Wheeler and Mody (1992), Jackson and Markowski (1995) concluded that taxes do not have a significant effect on FDI. Swenson (1994) reported a positive correlation.

The evidence of the influence of tax incentives on the flow of FDI according to Agarwal (1980) is clearer than is the influence of political stability, but does not support the hypothesis that tax incentives and FDI are necessarily positively correlated with each other. Agarwal indicated that from Aharoni's (1966) survey, evidence exists that firms do not consider incentives during the initial stages of their foreign investment decisions. Income tax exemptions were found to be unimportant.

According to Agarwal (1980), the main reason for the divergence between the targets and the results of incentive schemes is that the incentives provided by developing countries are generally accompanied by a host of disincentives. Restrictions on ownership, size, location, dividends, royalties, fees, entry into certain industries and mandatory provisions for local purchases as well as exports form part of this. The result is that the likely positive effects of tax incentives are cancelled out by the negative effect of disincentives.

Gastanaga et al. (1998) used corporate tax from *Price Waterhouse's Country Books* and the tariff revenue from the IMF's *Governments Financial Statistics* (GFS) yearbook as a fraction of the value of imports in the domestic currency and found negative significant relationships. Benassy- Quere et al (2007) find that FDI inflows have become very sensitive to tax rates in Eastern Europe and EU respectively.

Desbordes and Vicard (2009) investigated the impact of Bilateral Investment Treaties (BITs) and found that this depends on the political relationship between the signatory countries. Only in case of tense relationship, BITs affects FDI inflows.

With respect to tax differences, the conceptually appropriate measure to compare across countries is the marginal effective tax rate. This rate differs among industrial sectors and is extremely difficult to measure (Chen, 2000). Broader measures (such as tax revenues/GDP) do not measure the impact of taxation at the margin. As well, there is considerable intra-country variation in tax rates within large countries, and simple averages may disguise the ability of a particular region to attract FDI. Finally, any aversion to high taxes might be mitigated by their link to the provision of infrastructure that, in turn, is highly valued by international investors.

4.3.2.9 Infrastructure Quality

The infrastructure development of a region is also important, since it indicates how difficult and costly it may be to do business in the country. Well - developed infrastructure increases the productivity potential of investments in a country and, therefore, stimulates the flow of FDI flows towards a country. The more developed the road system in a country, for example, the easier the access to markets and the lower the transportation costs, and, thus, the greater the incentive to invest in that country. The multidimensional nature of infrastructure makes it difficult to measure, however. It comprises roads, telecommunications, railways, and so on. It is difficult to capture the many aspects of infrastructure development, Three measures of physical infrastructure (Internet hosts per 10,000 people, telephone mainlines per 1000 and millions of kilowatt-hours of electricity generated/GDP, roads, total network in Km and railways lines) are usually used. According to Asiedu (2002) and Ancharaz (2003) state that the number of telephones per 1000 of population is a standard measurement in the literature for infrastructural development. However, according to Asiedu (2002), this measure falls short because it only captures the availability and not the reliability of the infrastructure. Furthermore, it only includes fixed line infrastructure and not cellular (mobile) telephones.

Benassy-Quere et al (2007) and Bellak and Leibrecht (2009) found that infrastructure in Eastern Europe promotes FDI. Campos and Kinoshita (2008) showed that telecommunication is important for FDI in Asia and LAC and Bellak et al (2010) conclude that Information Computer Technologies (ICT) and internet network are an essential factor for FDI in the enlarged EU.

4.3.2.10 Other Variables

Apart from the above list of determinants, which emerged from empirical research, a number of other variables[37] that determine FDI are also mentioned:

(i) Inflation rate is used (annual percentage change in CPI) as a measure of the overall economic stability of the country. This hypothesis states that lower inflation fosters FDI (Asiedu, 2002; Chakrabarti, 2001; Jenkins and Thomas, 2002) and a high rate of inflation is a sign of internal economic tension and the inability or unwillingness of the government and the central bank to balance the budget and to restrict money supply (Schneider and Frey, 1985). Schneider and Frey used the percentage change in the GNP deflator with a one-year lag (from the World Development Report). A high return promotes FDI, while a high, rate or variability of inflation indicates macroeconomic instability that induces uncertainty and counteracts the inflow of FDI. It can be argued that a high rate of inflation indicates internal economic instability, which implies that the host government is unable to maintain an expedient monetary policy. Therefore, companies may avoid investments in such countries. Indeed, Schneider and Frey (1998) found that they invest less in emerging economies with high inflation, and Apergis and Katrakilios (1998) found inflation uncertainty in the host country is negatively associated with FDI inflows.

(ii) Financial depth (defined as the ratio of liquid liabilities such as money supply over GDP) and financial development are said to boost FDI. The perception is that there is less cost associated with capital transactions in countries with well-developed financial markets (Asiedu, 2002).

(iii) A larger budget deficit and external debt imply fiscal, balance of payment instability, and may result in higher future tax rates, which may deter FDI.

(iv) Higher rates of domestic investment show a willingness to invest, a culture of investment and confidence in the future of the economy by local people. It may thus reflect potentially higher growth.

(v) Government consumption is expressed as a percentage of GDP. A high consumption rate may indicate high taxation in the corporate sector, with expected negative effects on FDI. A high share of government consumption can also indicate stability in consumption patterns. Part of government consumption is invested infrastructure, which promotes FDI. Ancharaz (2003) expressed government consumption as per capita government consumption in US dollars at current prices. He found a significant positive relationship between government consumption and FDI for a sample of non-SSA and SSA countries, but found the relationship to be insignificant for the SSA sample. Asiedu (2002) used the ratio of government consumption to GDP as a measure of the size of government, with the hypothesis that a smaller government promotes FDI. Nonetheless, he found an insignificant result. We expect a positive impact of government consumption on FDI. Singh and Jun (1995) found that export orientation was the strongest variable for explaining why countries attract FDI.

(vi) Transportation costs, according to Chakrabarti (2003) affect FDI through two channels. First, an increase in internal transportation cost dampens MNC activity by making domestic production relatively more expensive and less competitive. Higher transportation costs reduce recipient countries' shares of FDI.

(vii) Second, a rise in external transportation costs encourages a host country to increase FDI in other countries in order to enter their markets, but discourages FDI with the aim of exporting manufactured products. The net effect remains ambiguous on both the level and share of FDI.

(viii) The effect of neighbouring countries was tested by Veugelers (1991). He found that the proximity of neighbouring countries has a significant impact on the flow of FDI. He further mentioned that an interesting observation from the regression coefficient is the highly significant coefficient of the combination of the size and neighbour. This coefficient indicates that the size of market is an extra stimulus if the market is in a neighbouring economy. If the market is located further away, the size of market is less stimulating.

Overall, as reviewed in works on FDI in transition economies, although the consideration the transition-specific factors are crucial for host governments to create the right impression on potential investors, the veracity of traditional determinants should not be overlooked.

Didier and Mayer (2004) concluded that in the early days of transition the distinction between Eastern and Western European countries is important for the location choices of investors; however, as the transition process progresses, investors become attracted to those particular countries.

4.3.2.2 Political Fundamental for Incoming FDI

4.3.2.2.1 ICRG Country Risk Variables

Country risk is the probability that country-specific governmental measures will adversely alter the value of the international firm (Grosse and Behrman, 1992). The importance of political stability in creating a climate of confidence for investors must not be underestimated. Whether perceived or real, political instability constitutes a serious deterrent to FDI as it creates uncertainties and increases risks and hence costs of doing business in the country.

Institutional political stability and quality are proxies by using data from the International Country Risk Guide (ICRG) a monthly publication of the Fraser Institute and World Bank's World Governance Indicator. This institute reports data on the risk of expropriation, level of corruption, rule of law, democracy level, and bureaucratic quality in an economy and classifying countries into six country risk categories (0 - 7). Schneider and Frey (1985), Edwards (1998) and Wheeler and Mody (1992) all showed the relevance of political variables, but their quantitative impact on FDI was minor compared with economic variables. The quality of institutions and political system are an important determinant of FDI activity, particularly for less developed countries for various reasons. First, political instability reflected by violence, civil war, or weak government, will discourage FDI.

Second, poor legal protection of assets increases the chance of the expropriation of a firm's assets, making investment less likely. Then, poor quality institutions necessary for well-functioning markets (and/or corruption) increase the cost of doing business and, thus, should diminish FDI activity.

Finally, poor institutions increase search, negotiation and enforcement costs thus, hindering the establishment of new business relationships of new transactions (Meyer, 2001).

The importance of these variables to attract FDI has been verified in a number of empirical studies such as Busse and Hefeker 2007, Barrell and Pain (1999) for Eastern Europe.

Greater political stability in a location is reflected in a higher probability of revenues being appropriated by MNCs from sales generated in that location. This lowers the mark-up for the varieties produced in that location, making them more competitive. Political instability is likely to disrupt the economic process and discourage the inflow of FDI; thus, one would expect that these two variables are negatively correlated (Chakrabarti, 2003, Agarwal, 1980; Schneider and Frey, 1985).

Although there is a theoretical negative relationship between the FDI inflows and country risk, the results of empirical studies about this relationship are mixed. In a study about the impact of two classes of political events on U.S. manufacturing FDI, Nigh (1985) finds that the relationship between political events and U.S. manufacturing FDI differs between less developed and developed economies.

The U.S. manufacturing FDI in less developed countries might be affected by both inter-nation and intra-nation conflicts and cooperation while the influence in developed countries appears to be limited to inter-nation conflictual situations and cooperative initiatives. Jaspersen et al. (2000) and Haussmann and Fernandez-Arias (2000) constructed their own risk measures on the basis of country assessments by the *Business International Inc.* and found no relationship between political instability and FDI. Schneider and Frey (1985) concluded that the *Institutional Investor's* country credit ratings have a significant effect on net FDI (inverse relationship). Loree and Guisinger (1995) found that political risk had a negative impact on FDI in 1982 but had no effect in 1977.

Edwards (1998) employed two indices, namely political instability and political violence, to measure political risk. Political instability (which measures the probability of a change of government) was found to be significant, while political violence (the sum of the frequency of political assassinations, violent riots and politically motivated strikes) was found to be insignificant. Asiedu (2002) used the average number of assassinations and revolutions (as in Barro and Lee, 1993) to measure political instability. Harms (2002) argued that the lack of conclusive empirical evidence on the importance of political risk could be attributed to two factors. First, most studies have considered panels that mainly consist of high and middle-income countries and thus neglect countries where political risk is most pronounced.

Second, the normalisation of investment data by dividing by GDP or GNP is innocuous. This is because the expected deterioration of the business climate is likely to affect both aggregate output and FDI and it is thus not surprising that the ratio of the two variables is not affected by indicators of political risk.

Gastanaga (1998), Chakrabarti (2001) and Schneider and Frey (1985) all used the *Nationalisation Risk Index* from Business Environment Risk Intelligence, which ranges from "0" if risk is high to "4" when it is low. Ancharaz (2003), however, used the *Index of Policy Instability,* which is defined as the standard deviation of the share of government consumption in GDP over the previous four years (including the current year). He also used the *Index of Institutional Quality,* which is defined as the product of the *International Country Risk Guides'* "rule of law" and "corruption in government" indices.

Schneider and Frey (1985) also included in their list of 'risk' variables the *World Political Risk Forecast*, the *Political System Stability Index* and the *Institutional Investors Credit Rating*.

Kaufman et al. (2003) applied a governance index constructed from indicators from 199 countries. This included Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption.

Loree and Guisingner (1995) provided some support for a negative relationship between FDI and political risk. Their composite risk variable is statistically significant with the expected sign in 1982, but not in 1977. Using political risk index as a proxy for political risk and workdays lost as a proxy for socio-political instability in the production processes, Jun and Singh (1996) showed that these factors are significant determinants of the FDI inflows into developing countries with relatively low levels of FDI. Thus, political risk has a significant impact on FDI for developing countries that received relatively high levels of FDI inflows.
Tu and Schive (1995) indicated that political stability is no longer considered as a significant determinant of FDI in Taiwan. They argued that it is generally a precondition for FDI, but is less significant in determining the invested amount. Sethi et al. (2003) found that political and economic stability is not significant in determining FDI flows.

In a similar vein, an empirical study by Li and Resnick (2003) showed that political instability, in spite of having an expected negative sign, is not a statistically significant determinant of FDI inflows.

We use the ICRG indicators dataset to assess the effects of political risk on FDI. Therefore, the greater the degree of host- country risk relative to that of the home country, the less attractive the host country will become to FDI inflows.

4.3.2.3 Geographical Fundamental For Incoming FDI

4.3.2.3.1 Natural Resources:

Almost 40 percent of FDI has been directed to the primary sector, such as oil, gas and mineral abundance. Countries such as Algeria, Angola, Namibia, Nigeria and Saudi Arabia have received foreign investment targeted at the oil and mineral sectors of their economies (Basu and Guariglia, 2005) reported a high correlation between FDI inflows and total value of natural resources in a panel of 29 African countries. Moreover, countries such as Lesotho and Swaziland have attracted FDI because they are close to South Africa, and investors wishing to supply the large market in South Africa have located their subsidiaries to these economies (UNCTAD, 1998, Basu and Srinivasan, 2002).

We expect positive effects from the presence of natural resources on the inflow of FDI. Asiedu (2006) concluded that natural resources are a key determinant of FDI in Africa.
A number of dummy variables have been introduced to capture the effects of natural resources in attracting FDI. We include dummy variables to indicate whether or not a country is a crude oil producer or not, whether it speaks English, Spanish, French or Arabic, whether a country is a republic or a parliament and for its predominant religion.

4.3.2.3.2 Landlocked and Common Border

Other variables include geographical location (landlocked, coastal or presence of navigable rivers) and distance from large markets (Sachs and Warner, 1997; Easterly and Levine, 2003). As natural barriers to external trade and knowledge dissemination, geographic isolation and remoteness to some extent determine the scale and structure of external trade in which those countries engage.

Gallup et al (1999) emphasize that geography continues to matter importantly for economic development, alongside the importance of economic and political institutions. They conclude that tropical regions are hindered in development relative to temperate regions and that coastal region and regions linked to coasts by ocean- navigable waterways are strongly favoured in development relative to the hinterlands, with landlocked economies particularly disadvantaged.

4.3.2.3.3 Regional Integration

Regional integration plays an important role in the locational choice of MNCs. The reduction in internal trade costs and economic integration with the rest of the world may affect the volume and pattern of FDI both into and within the integrated region. The ensuing increase in market size because of this integration theoretically makes it more interesting for firms to invest in the area. Blomstrom and Kokko (1997) and Lim (2001) provided good overviews of the issues associated with the effect of regional integration. According to the former, regional economic integration promises economic benefits for integrating countries and stimulates investment in the short run. It is expected, in the long run, that the combined effects of larger market size, stronger competition, more efficient resource allocation and various positive externalities will increase the growth rates of participating countries' economies. Based on the internalisation theory, this implies that regional integration is likely to attract FDI from outside the integration region as it becomes more attractive for foreign investors when the combined market size grows. Regional dummy variables were assigned to East Asia and the Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia, and Sub-Saharan Africa in accordance with the World Bank classification.

4.3.2.3.3 Languages

Language is another dummy variable, which equals to one if the two countries have the same language. A common language is expected to facilitate FDI flows. It is typically positive and statistically significant.

Table 4.2. The expected relation between FDI and the independent variables

Theory/hypothesis	Idea captured in theory	Possible Proxy variable				Expected sign
		Monetary policy	Trade related policy	Fiscal and Government policy	Capital policy[47]	
Internationalisation process	Human capital (HC), knowledge, Marketing, management expertise. Bargaining and buyer uncertainty, minimization of the impact of Government.				Human capital (Schooling primary ,secondary ,tertiary level)	+
Resource based/Raw Materials	Cheaper supply of inputs. Raw materials and energy sources, but also factors of production.				Natural resources Dummy for oil and gas(1=availability of resources)	+
Theory of location (General)	Access to local and regional markets. Comparatively cheap factors of Production. Competitive transportation and Communication cost. Import restrictions and investment incentives.		Openness (export-import)/GDP Where NX ≠ 0		Expenditure on Infrastructure (tel ,roads rail) landlocked or no	+
Knowledge enhancing	Knowledge creation speed and transfer is a fundamental determinant of the firm's rate of growth and competitive position. Shared language, coding schemes, and organizing principles facilitates the firm's ability to create and transfer knowledge.				Human capital (Schooling primary ,secondary ,tertiary level)	+

Source: Adapted from Jordan, J.2005.

[47] Capital policy includes labor, physical capital and natural resources.

Table 4.2: The expected relation between FDI and the independent variables (continued)

Theory/hypothesis	Idea captured in theory	Theory/hypothesis				Idea captured in theory
		Monetary policy	Trade related policy	Fiscal and Government	Capital policy	
Market size/Output	Profit maximization and sales potential in the host country.	GDP, GDP growth rate,				++
Exchange rate variability /currency area	Transaction cost.	Real effective exchange rate , liquidity, real interest rates				- or +
Tariffs and incentives Argument	Tariffs, import substituting.			Tax on income, profit and capital gains in US$(% of current revenue)		- or +
Cheap labor	Inexpensive labor.				Wages ,salaries	or +
Risk uncertainty	Uncertain environments and market volatility		ICRG rating ,	Tax on labor		+

Source: Adapted from Jordan, J.2005.

4.4 Conclusion

This empirical review has identified a large number of variables that seem to be important to explain FDI inflows. The outcome of chapter 3 and this chapter suggest that there is no single theory of FDI[48], but varieties of theoretical models that are compatible with each other imply that all the determinants of the different theoretical models can explain FDI in some aspects. This creates inconsistencies as shown in Table 4.1.

The evaluation of variables used in the previous literature will lead us to construct a model that combines all the possible variables inspired from these theoretical models. The resulting empirical model will fit the needs of this dissertation, extract the maximum from the available dataset and help avoid the bias encountered in previous studies. This table categorises the empirical determinants of FDI into *economic, socio-political* and *other* determinants. It further shows *positive-significant, negative-significant* and *insignificant findings*. The variables identified include market size (GDP or GNP per capita), economic growth, the cost of labour, openness, exchange rates, trade barriers, trade deficits, taxes and tariffs, infrastructure and political risk. Furthermore, a number of less important variables are also identified.These include inflation, domestic investment, financial liquidity, external debt, government consumption, education, transport costs and the effect of neighbouring economies.

Although this analysis shows the inconsistency of the vast range of variables that have been used in the literature, it is mainly helpful in identifying potential determinants for the empirical estimation undertaken in chapters 6 and 7. It also gives an indication of the signs, magnitudes and significance level of the variables to be used and provides a framework for comparing the empirical results. Given the literature on the methods of analysis identified in the current chapter, and the variables identified as determinants of FDI, the next chapter presents a discussion of panel data econometrics, which will be used in the analysis in chapters 6 and 7 as well as of the data and variables that will be used in the analysis.

[48] As presented in chapter 3, Feath's (2009) survey suggests nine theoretical models.

CHAPTER 5

Panel Data Econometric Methodology and Empirical results

5.1 Introduction

A number of the empirical studies of the determinants of FDI discussed in chapter 4 only focused on cross-sectional data for a range of countries for a specific year or only time series data for a specific country. However, a few studies, such as Anchraz (2003), Asiedu (2002), Culem (1988), Gastenaga et al. (1998), Razin (2003) and Chakrabarti (2003) used panel estimations, where they applied panel data econometric techniques for a number of countries over time. This chapter contributes to the literature by analysing the relationship between FDI and its wide economic and geopolitical explanatory variables using OLS techniques. We believe that understanding the factors behind the attractiveness of inward FDI is important for policymakers in order to improve the economic situation of the particular country.

The purpose of this chapter is to present the methodology and advantages of panel data econometric techniques that will be applied in this empirical analysis and in chapters 6, 7 and 8. It further provides a discussion of the data employed in the empirical analysis. Finally, we present the results of the empirical research and discuss the main empirical findings of this research by analysing the estimated and calculated results.

The second section of this chapter discusses the advantages of using panel data as well as the criteria used in selecting data and countries. It is followed by a model specification, number of theoretical models and an attempt to estimate these models empirically.

This also includes the proxies used to capture the ideology of the theory as well as the expected signs of coefficients. In the fourth section, an exposition of the data, variables used and definitions of the data are given. We discuss the empirical results in section five and conclude in section six.

5.2 Panel Models

Earlier researches on the determinants of FDI are dominated by the use of cross-sectional data analysis. Panel data combines cross-sectional data, for example data for 20 countries for one year, with time series data, for example data for one country over 20 years. This then results in data for 20 countries over a time span of 20 years. Panel data econometric techniques are used in chapters 5, 6, 7 and 8 to overcome the problems of endogeneity, heteroscedasticity and non-stationarity in the regression models.

There is a range of advantages that support the use of panel data and panel techniques

(Baltagi, 2001; Hsiao, 2006):

- Panel data give a large number of data points that result in more information available, greater variability, less collinearity among variables, more degrees of freedom and more efficiency.
- Panel data are better able to study the dynamics of adjustment compared with cross-sectional data.
- Panel data are better able to identify and measure effects that are simply not detectable in pure cross-sectional or pure time series data.
- Panel data models allow the construction and testing of more complicated behavioural models than purely cross-sectional or time series data.
- The use of panel data also decreases the effect of unobserved heterogeneity that is a major reason why simple cross-country analysis is problematic in the identification of the determinants of FDI in cross-country studies.
- Panel data allow the identification of certain parameters or questions, without the need to make restrictive assumptions.

5.3 Specification of the Model Estimation

Almost all the empirical literature on the determinants of FDI have generally focused on identifying the location specific factors and relevant government policies that influence FDI and use models that do not have strong micro-foundations (Billington1999, Bevan and Estrin 2000, and Chakrabarti 2001).

A challenge for any econometric checks is to maintain a reasonable degree of parsimony while avoiding the misspecification of the model. Kamaly (2004) argued that since there is no unanimously accepted theory of FDI, empirical studies of FDI should adopt a pragmatic approach in selecting the explanatory variables to be included in the regressions. The specification of the equation and choice of variables should be inspired by the extensive empirical literature on FDI.

The use of panel data makes it possible for meaningful empirical research to be carried out, even in the case of data limitations in terms of timeframe and missing data. Empirical work is applied to our unbalanced panel dataset using Eviews econometric software.

5.3.1 Modeling direct investment inflows

Following the literature in the empirical modelling of FDI, a measure of FDI is regressed on a number of variables identified as determinants of FDI. Thus, the relationship can be written as:

$$FDII_{it} = f(X_j) \qquad (5.1)$$

where $FDII_{it}$ is the FDI inflows from country i (i=1,2,....,N) to region j in period t (t=1,2,.....T).

X_j is a vector of variables that captures the overall attractiveness of region j to FDII.

Following Kamaly (2004) advice, we include in our model all the possible economic, political and geographical variables according to the theories of FDI discussed in chapter 3. Thus, the general form of our model can be written as follows:

$$FDII = f((\text{economic set}) + \beta_2(\text{political set}) + \beta_3(\text{geographical set}) \qquad (5.2)$$ [49]

Since panel data are available, we estimate equations, which take the following form:

$$FDII_i = \beta_{0+}\beta_1 (\text{economic set}) + \beta_2(\text{political set}) + \beta_3(\text{geographical set}) + \varepsilon_{it} \qquad (5.3)$$

Where ε is the error term and β_0 is a scalar parameter β_1, β_2, β_3 are the parameters of interest the subscripts i= 1,2,3...N refer to countries and t=1,2,3...T refers to periods as previously mentioned. The set of the economic, political and geographical variables in the equations is described in Table 5.2. Based on this model, many regressions were carried out to examine the determinants of FDI.

[49] Economic sets consist of various macroeconomic variables from World Bank data, as defined in Table 5.2. Political sets consist of ICRG variables that include law, democracy, ethnicity, international conflict, bureaucracy and corruption. Geopolitical sets are mostly constructed as dummies: common border , landlocked, languages and integration with the WTO, regions, surface and natural ressources.

5.4. Methodology and Data Measurement Approach

The variables and data used to determine FDI must comply with a number of criteria. They must be aligned with the theory or hypotheses of why the variable(s) and proxies may be useful in determining FDI, together with the expected signs and possible magnitudes of coefficients in the empirical literature.

The availability and quality of data and empirical estimation methods are of further importance since they influence the quality of the results.

The following criteria and guidelines are used to select the variables /proxies, data and techniques to be used in each specification of the panel:

(i) Variable selection and model specification were carried out according to theoretical and empirical guidelines (theories used are presented in chapter 3 and models tested empirically and variables are shown in Table 5.2).

(ii) Variables used in the panels were determined according to data availability. It is desirable to use as many periods as possible for as many countries as possible. Although not all data series used were balanced data sets, the estimation software was able to accommodate unbalanced data sets. It was decided in this case that if more than 10% of the data for a specific variable over the panel were not available, the data series was not used.

(iii) A specific data series for all countries was obtained from a single data source to ensure maximum data consistency. For instance, FDI data for all countries were sourced from UNCTAD, and if data for a specific country were not available from this source, the country was excluded from the sample group instead of referring to other data sources, such as the World Bank or IMF.

(iv) A number of variables were used as ratios or indices to increase the probability of the variables being stationary in the end.

(v) Model specification depended on the data, theory and empirical literature.

Another important feature for the data that needs to be addressed here is the stationarity issue. Since empirical studies have so far not offered a clear-cut conclusion regarding the non-stationarity nature of FDI/GDP in this work we recognise that while FDI/GDP may be trended over the sample for some countries it is very unlikely that FDI will grow faster than GDP forever. Hence, the FDI/GDP ratio is likely to converge to a constant. In other words, FDI/GDP is regarded as a stationary process.

5.4.1 An Exposition of the Data

In order to assess the determinants of FDI, we assembled a large dataset. Variables were chosen according to the theories of FDI discussed in chapter 3 and the empirical studies in chapter 4. The definitions of the variables used and their sources are included in Table 5.1 below. Data were constructed from a number of data sources, including the *World Development Indicators(WDI), World Bank African Database, International Financial Statistic(IFS)*, Penn World Tables and UNCTAD, while the political dataset came from a database produced by *Institutional Investor's Country Guide (IRG)* and. Our sample was based on an unbalanced annual panel dataset consisting of 56 economic, political and geographical variables for 168 economies in 1970–2006, resulting in 6048-pooled observations.

The period was selected specifically because this was the period for which data were available for the selected variables. As far as we could verify, no previous studies have covered such a long period with such a huge variety of political, geographical and economic variables.

We refer to Table 5.1 and 5.2 presented below for the list of countries included in our dataset and the list and definition of the variables used, respectively.

The reason for using mainly explanatory variables in relative real terms (as ratio of real GDP) rather than absolute values as is well justified in Cuyvers (2006) is the following. Based on general assumption and beliefs, investors are rational in assessing and choosing foreign countries for the location of FDI activities. When investors in the home country decide to set up production facilities in a particular host country, they normally compare the economic, political and institutional factors between the home and potential host countries.

As a result, home country factors also come into play because they are used as a frame of reference. Thus, the attractiveness of the business environments in the host countries in which the investors may conduct their businesses lies in the differences between the factors of the home and host countries, at least as perceived by the investors. For example, a higher degree of risk in the home country relative to the host country, ceteris paribus, will encourage firms from the former to consider investment in the latter.

Table 5.1 List of countries used in our data

Afghanistan	41 Cyprus	81 Japan	121 Paraguay	161 Uruguay
Albania	42 Czech Republic	82 Jordan	122 Peru	162 Uzbekistan
Algeria	43 Denmark	83 Kazakhstan	123 Philippines	163 Vanuatu
Angola	44 Djibouti	84 Kenya	124 Poland	164 Venezuela, RB
Argentina	45 Dominican Republic	85 Korea, Dem.	125 Portugal	165 Vietnam
Armenia	46 Ecuador	86 Korea, Rep.	126 Puerto Rico	166 Yemen, Rep.
Australia	47 Egypt, Arab Rep.	87 Kuwait	127 Qatar	167 Zambia
Austria	48 El Salvador	88 Kyrgyz Republic	128 Romania	168 Zimbabwe
Azerbaijan	49 Equatorial Guinea	89 Latvia	129 Russian Federation	
Bahrain	50 Eritrea	90 Lebanon	130 Rwanda	
Bangladesh	51 Estonia	91 Lesotho	131 Saudi Arabia	
Barbados	52 Ethiopia	92 Liberia	132 Senegal	
Belarus	53 Fiji	93 Libya	133 Serbia and Montenegro	
Belgium	54 Finland	94 Lithuania	134 Sierra Leone	
Belize	55 France	95 Luxembourg	135 Singapore	
Benin	56 French Polynesia	96 Macao, China	136 Slovak Republic	
Bermuda	57 Gabon	97 Macedonia, FYR	137 Slovenia	
Bhutan	58 Gambia, The	98 Madagascar	138 Somalia	
Bolivia	59 Georgia	99 Malawi	139 South Africa	
Bosnia and Herzegovina	60 Germany	100 Malaysia	140 Spain	
Botswana	61 Ghana	101 Mali	141 Sri Lanka	
Brazil	62 Greece	102 Malta	142 Sudan	
Brunei Darussalam	63 Grenada	103 Mauritania	143 Suriname	
Bulgaria	64 Guatemala	104 Mauritius	144 Swaziland	
Burkina Faso	65 Guinea	105 Mexico	145 Sweden	
Burundi	66 Guinea-Bissau	106 Moldova	146 Switzerland	
Cambodia	67 Guyana	107 Mongolia	147 Syrian Arab Republic	
Cameroon	68 Haiti	108 Morocco	148 Tajikistan	
Canada	69 Honduras	109 Mozambique	149 Tanzania	
Central African Republic	70 Hong Kong, China	110 Namibia	150 Thailand	
Chad	71 Hungary	111 Nepal	151 Togo	
Chile	72 Iceland	112 Netherlands	152 Tonga	
China	73 India	113 New Zealand	153 Tunisia	
Colombia	74 Indonesia	114 Nicaragua	154 Turkey	
Congo, Dem. Rep.	75 Iran, Islamic Rep.	115 Niger	155 Turkmenistan	
Congo, Rep.	76 Iraq	116 Nigeria	156 Uganda	
Costa Rica	77 Ireland	117 Norway	157 Ukraine	
Cote d'Ivoire	78 Israel	118 Oman	158 United Arab Emirates	
Croatia	79 Italy	119 Pakistan	159 United Kingdom	
Cuba	80 Jamaica	120 Panama	160 United States	

TABLE 5.2 Names and definitions of explanatory variables used

Economic determinants of FDI

WDI Code	Variable name	Definition	Own code	Own work	Sources
BX.KLT.DINV.WD.GD.ZS	FDI, net inflows (% of GDP)	FDI is the net inflows of investment to acquire a lasting management interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows in the reporting economy and is divided by GDP.	FDII		IMF, IFS and Balance of Payments databases
BM.KLT.DINV.WD.GD.ZS	FDI, net outflows (% of GDP)	This series shows net outflows of investment from the reporting country to the rest of the world and is divided by GDP	FDIO		WDI estimates
NE.CON.goVT.ZS	General government final consumption expenditure (% of GDP)	General government final consumption expenditure includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditure on national defense and security, but excludes government military expenditures that are part of government capital formation.	GFE		World Bank national accounts data
(NE.RSB.GNFS.ZS)	External balance on goods and services (% of GDP)	External balance on goods and services (formerly resource balance) equals exports of goods and services minus imports of goods and services (previously nonfactor services).	EBP		World Bank national accounts data, and OECD National Accounts data files

Economic determinants of FDI (continue)

WDI Code	Variable name	Definition	Own code	Own work	Sources
BN.CAB.XOKA.CD	Current account balance (% of GDP)	Current account balance is the sum of net exports of goods, services, net income and net current transfers. Data are in current US dollars.	CAB		World Bank national accounts data
NE.GDI.TOTL.ZS	Gross capital formation (% of GDP)	Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains and so on); plant, machinery and equipment purchases; and the construction of roads, railways and the like, including schools, offices, hospitals, private residential dwellings and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and "work in progress." According to the 1993 SNA, net acquisitions of valuables are also considered capital formation.	GCF		World Bank national accounts data
NY.GDS.TOTL.ZS	Gross domestic savings (% of GDP)	Gross domestic savings are calculated as GDP less final consumption expenditure (total consumption).	GS		World Bank national accounts data

Economic determinants of FDI (continue)

WDI Code	Variable	Definition	Own code	Own Work	Sources
(NY.GDP.MKTP.CN)	GDP (current LCU)	GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current local currency.	GDPRL		World Bank national accounts data
(NY.GDP.MKTP.KD.ZG)	GDP growth (annual %)	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2000 US dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.	GDPG		World Bank national accounts data
NE.TRD.GNFS.ZS	Trade (% of GDP)	Trade is the sum of exports and imports of goods and services measured as a share of GDP	Openness		World Bank national accounts data
GB.TAX.CMAR.ZS	Highest marginal tax rate, corporate rate (%)	Highest marginal tax rate (corporate rate) is the highest rate shown on the schedule of tax rates applied to the taxable income of corporations.	Hmtaxcor		World Bank national accounts data

Economic determinants of FDI (continue)

WDI Code	Variable	Definition	Own code	Own Work	Sources
(BX.GSR.TOTL.CD)	Exports of goods, services and income (BoP, current US$)	Exports of goods, services and income is the sum of goods (merchandise) exports, exports of (nonfactor) services and income (factor) receipts. Data are in current U.S. dollars.	EX		International Monetary Fund, Balance of Payments Statistics Yearbook and data files
(NE.IMP.GNFS.CD)	Imports of goods and services (current US$)	Imports of goods and services represent the value of all goods and other market services received from the rest of the world. Data are in current U.S. dollars.	IMP		International Monetary Fund, Balance of Payments Statistics Yearbook and data files
PX.REX.REER	Real effective exchange rate index (2000 = 100)	Real effective exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs.	Rex		World Bank national accounts data
(FP.CPI.TOTL.ZG)	Inflation, consumer prices (annual %)	Inflation as measured by the CPI reflects the annual percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.	infl		World Bank national accounts dataIMF, IFS and data files.
(FR.INR.LEND)	Lending interest rate (%)	Lending interest rate is the rate charged by banks on loans to prime customers	LIR		IMF, IFS
(FP.CPI.TOTL)	Consumer price index (2000 = 100)	Consumer price index reflects changes in the cost to the average consumer of acquiring a fixed basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.	CPI		

Code	Variable	Definition	Own code	Own Work	Sources
(FS.LBL.LIQU.GD.ZS)	Liquid liabilities (M3) as % of GDP	Liquid liabilities are also known as broad money, or M3. They are the sum of currency and deposits in the central bank (M0), plus transferable deposits and electronic currency (M1), plus time and savings deposits, foreign currency transferable deposits, certificates of deposit, and securities repurchase agreements (M2), plus travellers cheques, foreign currency time deposits, commercial paper, and shares of mutual funds or market funds held by residents.	liquid		IMF, IFS and data files, and World Bank and OECD GDP estimates
(FR.INR.LNDP)	Interest rate spread (lending rate minus deposit rate)	Interest rate spread is the interest rate charged by banks on loans to prime customers minus the interest rate paid by commercial or similar banks for demand, time or savings deposits.	intsprd		IMF, IFS
(FR.INR.RINR)	Real interest rate (%)	Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator.	RIR		IMF, IFS and data files using World Bank data on the GDP deflator.
(IS.ROD.TOTL.KM)	Roads, total network (km)	Total road network includes motorways, highways, and main or national roads, secondary or regional roads, and all other roads in a country.	Roads		International Road Federation, World Road Statistics.
(IS.Ril.TOTL.KM)	Rail, total line (Km)	Total Rail network includes total route in a country.	Rail		World Bank, Transportation, Water, and Information and Communications Technologies Department, Transport Division.

Economic determinants of FDI (continue)

WDI Code	Variable	Definition	Own code	Own Work	Sources
(IT.MLT.MAIN.P3)	Telephone mainlines (per 1000 people)	Telephone mainlines are fixed telephone lines connecting a subscriber to the telephone exchange equipment.	tel		International Telecommunication Union, World Telecommunication Development Report database, and World Bank
(IT.NET.USER.P3)	Internet users (per 1000 people)	Internet users are people with access to the worldwide network.	internet		International Telecommunication Union, World Telecommunication Development Report and database, and World Bank estimates.
	School enrolment, primary secondary and tertiary (% gross)	Gross enrolment ratio is the ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Primary, secondary and tertiary education	Schp/LF=Ratiop Schs/LF=Ratios Scht/LF=Ratiot	Constructed as ratio over labour force	United Nations Educational, Scientific and Cultural Organisation (UNESCO) Institute for Statistics.

Code	Variable	Definition	Own code	Own Work	Sources
(GC.TAX.TOTL.ZS)	Tax revenue (% of GDP)	Tax revenue refers to compulsory transfers to the central government for public purposes. Certain compulsory transfers such as fines, penalties, and most social security contributions are excluded. Refunds and corrections of erroneously collected tax revenue are treated as negative revenue.	taxrev		IMF, government Finance Statistics Yearbook and data files and World Bank and OECD GDP estimates.
(GC.TAX.INTT.CN)	Taxes on international trade (current LCU)	Taxes on international trade include import duties, export duties, profits of export or import monopolies, exchange profits and exchange taxes.	ttrade		IMF, government Finance Statistics Yearbook and data files.
(IC.TAX.TOTL.ZS)	Total tax rate (% of profit)	Total tax rate is the total amount of taxes payable by businesses (except for labour taxes) after accounting for deductions and exemptions as a percentage of profit.	taxproft		World Bank, Doing Business project
(IC.TAX.PAYM)	Tax payments (number)	Tax payments by businesses are the total number of taxes paid by businesses, including electronic filing. The tax is counted as paid once a year even if payments are more frequent	taxpay		World Bank, Doing Business project (http://www.doingbusiness.org/).
(SL.UEM.TOTL.ZS)	Unemployment, total (% of total labour force)	Unemployment refers to the share of the labour force that is without work but available for and seeking employment. Definitions of labour force and unemployment differ by country.	unem		International Labour and Labour Market database.

Economic determinants of FDI (continue)

Code	Variable	Definition		Own Work	sources
(GC.DOD.TOTL.ZS)	Central government debt, total (% of GDP)	Debt is the entire stock of direct government fixed-term contractual obligations to others outstanding on a particular date. It includes domestic and foreign liabilities such as currency and money deposits, securities other than shares, and loans. It is the gross amount of government liabilities reduced by the amount of equity and financial derivatives held by the government. Because debt is a stock rather than a flow, it is measured as of a given date, usually the last day of the fiscal year.	cgd		IMF, government Finance Statistics Yearbook and data files and World Bank and OECD GDP estimates.
(NY.GDP.PCAP.ZG)	GDP per capita growth (annual %)	Annual percentage growth rate of GDP per capita based on constant local currency. GDP per capita is GDP divided by midyear population. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.	GDPerg		World Bank national accounts data, and OECD National Accounts data files.

Economic determinants of FDI (continue)

Code	Variable	Definition	Own code	Own Works	Sources
(NY.GDP.PCAP.PP.CD)	GDP per capita, PPP	GDP per capita PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S.	GDPer ppp		World Bank data
(NY.GDP.MKTP.CD)	GDP (current US$)	GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.	GDPru		World Bank data
(GC.XPN.COMP.CN)	Compensation of employees (current LCU)	Compensation of employees consists of all payments in cash, as well as in kind (such as food and housing), to employees in return for services rendered, and government contributions to social insurance schemes such as social security and pensions that provide benefits to employees.	Wgelcl/gdpcl= WGETOGDPL	Constructed as ratio over GDP	IMF, government Finance Statistics Yearbook and data files.

Code	Variable	Definition	Own code	Own Work	Sources
(SL.TLF.TOTL.IN)	Labor force, total	: Total labor force comprises people who meet the International Labour Organization definition of the economically active population: all people who supply labor for the production of goods and services during a specified period. It includes both the employed and the unemployed.	LF		World Bank data
(SP.POP.TOTL)	Population, total	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship--except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin.	poptl		World Bank various sources including the United Nations Population Division's World Population Prospects, national statistical offices,
(NE.RSB.GNFS.ZS)	External balance on goods and services (% of GDP)	External balance on goods and services (formerly resource balance) equals exports of goods and services minus imports of goods and services (previously nonfactor services).	EBP		World Bank national accounts data, and OECD national accounts data files

2-Geographical variables

Code	Variable	Definition	Own code	Own Works	Sources
	dummy of langage	Countries that their official language are ; English ,Arabic, Spanish and French	Arb,Eng,Spn,Frc	Constructed as dummies	Various sources
	Regional dummies	World are divided to 6 regions; East Asia and pacific dummy Europe and Central Asia dummy Latin America and Caribbean dummy Sub-Saharan African dummy South American dummy Middle east and north Africa dummy	 EAP ECA LAC SSA SA MENA	Constructed as dummies	World development indicators
	International business climate 1=low to 6=high).	This variable include Time required to start a business is the number of calendar days needed to complete the procedures to legally operate a business and the rate of administration efficiency and rate of Budget and finance	Timeb Rtead rtebudfin		World development indicators
	Natural ressource dummies	Include oil and gaz dummies	Oildummy,gazdummy	Constructed as dummies	Various sources
	Regional interaction dummy	Countries that are member of World trade organisation	WTO	Constructed as dummies	WTO
	Neighbouring dummies	Total boundaries of the country are higher than 3 Total boundaries of the country are smaller than 3 No boundaries in this country	GTbun Sbun nobund	Constructed as dummies	Various sources
	Geographical dummy	Whether the country is landlocked or no	landlocked	Constructed as dummies	Various sources
(AG.SRF.TOTL.K2)	Surface area (sq. km)	Surface area is a country's total area, including areas under inland bodies of water and some coastal waterways.	surface		Penn World Tables

3-Political variables

Code	Variable	Definition	Own code	Own Works	Sources
	ICRG dummies 0=low to 7=high).	Bureaucracy level International conflict Corruption rates Democracy level Rule of Law and order Ethnic regime	Bureau Conflictint Corr Demo Law Ethnic tension		ICRG
	Political regime dummies	Whether the country is liberal or communist	Repbl commu	Constructed as dummies	Various sources

5-4.2 Hausman specification test: fixed or random effects

As a starting point, we run a simple pooling method that employs a simple OLS estimation applied as analytical technique for investigating the determinants of FDI inflows (equation 5.3). Panel data sets allow to use three estimation procedures: pooled OLS, fixed –effects (FE), or random effects (RE) If the assumption holds the unobservable individual country – specific effects are not very different, pooled OLS estimations are the most simple and efficient method.

The FE estimations allow for the unobservable country heterogeneity as it treated the constant as group (section)-specific and thus allowed different constants for each group. However, the use of a FE model will "kill" the time-invariant variables (such as geopolitical variables in our case) and thereby make FE estimations less efficient than the RE estimation. RE estimations is an alternative method of estimation that handles the constants for each section as random parameters and thus takes into consideration the unobservable country heterogeneity effects, but incorporate these effects into the error terms, which are assumed uncorrelated with the explanatory variables.

To choose the appropriate model for the panel data set from these three competing models, three tests are available (Plasmans, 2006, Wooldridge 2000). To deal with this issue, we carried out the Hausman specification test (Hausman, 1978) that is generally used to test the appropriateness of the FE model compared with the RE model to estimate equation (5.3).

This test statistic is relatively easy to compute using Eviews econometric software.
In our estimation, we started with a simple pooling method that employed the OLS estimation technique (equation 5.1). In this model, we did not take into consideration unobservable country-specific effects, which are time-invariant and account for any country-specific effects not included in X (equation 5.2 and 5.3). A small value for F would lead to the rejection of the null hypothesis in favour of the FE model.

The F test was used to carry out a test for the FE model against the pooled OLS. A rejection of the pool ability test (F test)[50] would imply a preference for the FE method. In Table 5.3, we present the estimated regression models explaining the economic determinants of FDI that were estimated from the panel data, in line with what was outlined above. The results of Hausman test clearly favour the application of the FE model for economic variables. For completeness and visual comparison, the estimates were generated with the RE panel and FE panel models. Thus, the more accurate models are those appearing in specification 3 and 4.

Since our model contains both time-variant and time-invariant variables, the use of FE estimation was deemed inappropriate for the complete economic and geopolitical variables because it drops the time-invariant variables. Therefore, we opted for the estimation within FE models for the economic variables and RE for the geopolitical variables. However, this option did not discourage us from comparing the results of RE and FE within the same set.

[50] $F = \frac{(R^2_{FE} - R^2_{CC})/(N-1)}{(1-R^2FE)/(NT-N-k)} \sim F(N\text{-}1, NT\text{-}N\text{-}k)$,
The R^2_{FE} is the coefficient of determination of the FE model and R^2_{cc} is the coefficient of determination of the Common constant model, if F-statistical is bigger the F-critical, then we reject the null hypothesis.

5.5 Estimation Results

In this section, the effect of different variables on FDI inflows will be tested by using panel regression. Based on the discussion above, we run numerous regressions. Many of the hypotheses (variables) we tested were found to be determinants of FDI when tested in isolation. Combining these factors into a single model allowed us to isolate the most significant variables in determining FDI inflows. We present some of these estimations in the following subsection. The results of the estimated regressions model within FE for the economic variables are reported in Table 5.3 under section 5.5.1. We discuss geopolitical country-specific characteristics after that as presented in Table 5.4 in section 5.5.2.

5.5.1 Economic Determinants of FDI

We regressed the FDI ratio over GDP against our various economic variables as a first step. Table 5.3 presents the estimated regression models explaining the economic determinants of FDI from panel data, according to the outline above.

Since we did not know what the 'true' model of determinants of FDI looked like, it was reasonable to experiment with several different specifications. Both FE and RE estimations were applied for estimation purposes; however, as specified earlier, we used the FE model for economic variables to identify the economic determinants of FDI. Variables were included in the model gradually, which allowed us to select variables potentially capturing similar affects and thus avoid potential multicollinearity problems.

The first specification in Table 5.3 column 1 presents the results of our basic model that included only four variables: openness, inflation, GDP in US dollars, GDP growth.

The estimated model showed that the coefficients of all variables were highly significant (varying levels) with the expected correct sign. Thus, countries with openness towards trade, lower inflation and high GDP are more likely to be successful in attracting FDI. Strong economic growth attracts MNCs as it implies this particular economy offers greater opportunities for strong returns. To confirm the correct Hausman test result, a quick comparison between FE and RE suggested that the FE column leads to less inconsistent estimations.

The second specification introduced current account balance (CAB) as measure of financial health. The result was in line with earlier empirical studies that showed that a negative current account balance would increase FDI. The coefficient of this variable had expected sign (negative) and significant as a deficit current account is financed through FDI. The coefficients of the remaining variables within this specification are significant at 1% level (unless inflation) and with the expected sign.

Better results were obtained in Specification (3) where we added tax on trade (TTRADE) to take into account tax advantages in the host country. The estimated model showed that the effect of this variable was significant and had the correct sign. Specification (4) added wages. The estimated coefficient had a negative sign as expected and was statistically significant at 10%. This indicated that countries with low wages tend to attract FDI especially for the type of FDI focussed on manufacturing goods for export to higher income markets.This variable captured the relative cost effect on FDI instead of productivity effect. As predicted, our results confirmed and corroborated with many previous empirical results. The finding that unit labour costs (measured by wages) are negatively associated with FDI supports the consensus idea that MNCs are attracted by low labour costs.

Table 5.3: OLS estimation results of Economic determinants of FDI

Conditioning information set	fixed	random	Fixed	random	fixed	random	fixed	random
	01OLS		02 OLS		03 OLS		04 OLS	
Constant	5.4996 (0.000)***	7.589 (0.000)***	-7.7432 (0.000)***	-2.798 (0.005))***	0.813 (0.416)	-0.162 (0.871)	-0.716 (0.474)	0.773 (0.439)
Openness	4.6358 (0.000)***	8.409 (0.000) ***	9.8102 (0.000)***	12.043 (0.000)***	2.7844 (0.005)***	8.0268 (0.000)***	4.700 (0.000)***	8.669 (0.000)***
Inflation	-2.0491 (0.040)**	1.486 (0.137)	-2.509 (0.012)**	-2.233 (0.025)**	-2.3272 (0.020)**	-2.489 (0.013)**	-2.509 (0.012)**	-2.233 (0.025)**
GDP PPP	1.7516 (0.080)*	1.187 (0.235)	5.4996 (0.000)***	7.589 (0.000)***	2.5942 (0.000)***	1.475 (0.140)	1.633 (0.102)	2.482 (0.013)**
GDP growth	2.5707 (0.010)**	2.226 (0.026)	3.6636 (0.000)***	3.444 (0.000)***	2.8722 (0.004)***	2.654 (0.008)***	2.016 (0.044)**	2.262 (0.023)**
Current account balance			-15.492 (0.000)***	-15.648 (0.000)***	-10.240 (0.000)***	-9.879 (0.000)	-10.399 (0.000)***	-11.998 (0.000)***
Tax trade					-2.8484 (0.004)***	-1.9471 (0.051)*	-3.029 (0.002)***	-2.825 (0.004)***
Wage to GDP							1.770 (0.077)*	-0.586 (0.557)
Number of obs.	891	891	867	867	671	671	123	123
Number of obs	891	867	671	671	123	123	102	102
R^2	0.62	0.24	0.63	024	0.57	0.33	0.63	0.23
Adj R^2	0.57	0.24	0.57	0.23	0.54	0.33	0.53	0.23
Hausman specification test	0.61		0.52		0.34		0.19	

Note p-ratios are reported in parentheses

*** significant at 1% level, ** significant at 5% level, * significant at 10% level

Hausman specification criteria : If p-value < 0.05 then we use fixed effect (in our case all the values are greater than 0.05), otherwise we use random effect.

Please note we do not take in account R^2 values as it does not indicate the goodness of fit since it decrease every time we added additional regressors.

5.5.2 Geopolitical determinants of FDI

Table 5.4 show the results regarding the geopolitical variables, namely time and country effects. In the first specification (model 1, Table 5.4), we included democratic accountability as an indicator of the better respect of civil liberties, common Arabic language, low bureaucracy The estimated model showed that the coefficients of all variables were significant with the expected correct sign.

In model 2, we added great common border dummy variable (GTBUN) with the purpose of capturing neighbouring influence. However, equation (2) shows that GTBUN does not add high explanatory power to the previous specification (R^2 from 0.30 to 0.34), even though it had the expected sign and was highly significant. The estimated coefficients of the other variables remained almost unchanged. With the purpose of obtaining another specification with greater explanatory power, we also added the South American region dummy variable (SA), which showed the expected sign, had high significance.

Better results were obtained by including the Europe and Central Asia (ECA) regional dummy variables. The estimated coefficient had the expected positive sign and was statistically significant at 1%. Finally, in model 5, we included the rule of law variable.

Our findings were broadly consistent with the empirical results mentioned in chapter 4. Our result regarding the geopolitical variables supported the gravity model theory were language, great common border contribute positively in attracting FDI.

Our OLS approach presents some limit. For example, the multiplicity of possible regressors is one of the major difficulties in trying to make sense of the empirical evidence on FDI. The sign and size of coefficients differ between different sample groups and different estimation methods, which can create inconsistency in the empirical results. The relatively poor fit of the models shown in this chapter support this. Sala-i-Martin (1997) criticised this method in the sense that the number of observations becomes large; all variables that do not belong in the regression will have coefficients that converge to zero. A huge number of potential explanatory variables, in many cases, can exceed the number of sample countries, rendering the all-inclusive regression computationally impossible.

He added that in reporting the preferred specification, such data mining could lead to spurious inference. Thus, the results of these models should be interpreted with caution.

Table 5.4: OLS estimation results of political and geographical determinants of FDI (within random effects)

Conditioning information set	RE	RE	RE	RE	RE
	01	02	03	04	05
Constant	2.012 (0.044)	0.247 (0.804)	-0.988 (0.322)	-2.378 (0.017)	-2.987 (0.002)
ARB	7.240 (0.000)***	7.191 (0.000) ***	6.862 (0.000)***	7.175 (0.000)***	7.126 (0.000)***
Burau.	-5.256 (0.000)***	-5.268 (0.000)	-5.363 (0.020)**	-5.553 (0.000)**	-5.963 (0.000)
Democracy	4.059 (0.000)***	4.019 (0.000)	4.010 (0.000)***	3.723 (0.000)	2.752 (0.006)***
GTBOUN		2.681 (0.007)	2.727 (0.000)***	2.105 (0.035)**	2.752 (0.041)***
SA			7.559 (0.000)***	7.731 (0.000)	7.744 (0.000)***
ECA				3.948 (0.000)*	3.698 0.000
Law					3.406 0.000
R^2	0.31	0.34	0.55	0.60	0.64
Adj R^2	0.30	0.32	0.53	0.58	0.61
D.W Stat	1.100	1.10	1.125	1.131	1.137

Note t-ratios are reported in parentheses
*** significant at 1% level
** significant at 5% level
* significant at 10% level

5.6 Conclusion

In this chapter, we analysed the economic, political and geographical determinants of FDI inflows and focused on two aspects that have been given insufficient attention in previous studies, namely the various selection of variables that covers all FDI theories and a large dataset of 168 countries for the 1970–2006 period. This analysis enabled us to identify several determinants of FDI. In order to estimate the FDI models we performed an econometric model based on pooled OLS methods.

We found that the sizes and signs of coefficients differ between the different estimation techniques used for the FE model, which is the best fit for the economic variables; however, the RE model is favoured for the political and geographical variables.

The preliminary estimation results support many of the findings of previous research in this area. We were able to determine that the size of the economy, as measured by GDP, low inflation rate, low tax on trade, deficit current account, openness towards trade and low wages, are the main economic determinant of FDI as they constitute a sustainable platform for a particular country. However, the results within the selected variables indicated that there was a probability of endogeneity and correlation. We will deal with these issues in our robustness check in the next chapter.

The main geopolitical determinants of FDI for the same set of countries and time periods according to our results are Arab language, democracy accountability, sharing a common border, South American region dummy, Europe and Central Asia regional dummy and low rate of bureaucracy.

The next chapter will robustly test the selected determinants of FDI using recent EBA techniques to check for the robustness of the explanatory variables when constructing econometric models.

Chapter 6

Extreme Bounds Analysis: Identifying robust determinant of FDI

6.1 Introduction

Economic theory in general, and in particular for the determinants of FDI, does not provide enough guidance regarding the complete specification of which variables are to be kept in a model. Even when statistical tests are carried out on the relation between dependent and independent variables it may be unclear which specification to favour. Thus several different models may all seem reasonable given the data (they have equal theoretical status) but generate different conclusions about the parameters of interest [51](please see our results in chapter 4). Various methods have been proposed to deal with this problem, including the use of Extreme Bounds Analysis (EBA) to determine which coefficients of the explanatory variables are robust and which are fragile.

In fact, EBA is a procedure theoretically developed by Leamer (1983) and applied by Levine and Renelt (1992) and Sala -I- Martin (1997) to provide robustness and sensitivity tests of explanatory variables when constructing econometric models[52].

This enables us to examine which explanatory variables are robust determinants of (in our case FDI). It is a relatively neutral way of coping with the problem of selecting variables for an empirical model in situations where there are conflicting or inconclusive suggestions, as mentioned in our panel estimation chapter (Chapter 5).

Formally, model uncertainty addresses the question of what variables to include in a regression. Usually one relies on past research and theory as a guide to selecting such variables.

---

[51] Presenting only the results of a single preferred model can be misleading Temple (2000).

[52] Studies that have examined the robustness of coefficient estimates in the context of cross-country growth regressions include Levine and Renelt (1992), Sala-i-Martin (1997), Fernández et al. (2001), Hendry and Krolzig (2004), Sala-i-Martin et al. (2004), and Hoover and Perez (2004).

The EBA procedure allows the researcher to run a reasonable regression and then check for robustness by varying the subset of control variables included in the regression to find the widest range of coefficient estimates on the variables of interest that standard hypothesis tests do not reject. If the coefficients of interest remain statistically significant, the variables are considered robust[53]. An early application of this robustness checking procedure applied to growth theory was conducted by Leamer (1983).

The aim of this chapter is to conduct a sensitivity analysis on our sample and to determine which among the long list of potential economic, geographical and political variables suggested in the literature review (and identified in many studies as determinants of FDI, see chapter 4) are robust or fragile determinants of FDI.

EBA constitutes a relatively neutral way of coping with the problem of selecting variables for an empirical model in a situation where there are conflicting or inconclusive suggestions in the literature. We employ two methods that have been proposed as appropriate for isolating robust relationships (Leamer1983, Sala -I- Martin1997)[54]. For this purpose, we first explain the EBA methodology and second we estimate panel data models using EBA to examine to what extent the potential explanatory variables are robust determinants of FDI.
This study attempts to advance the literature on model uncertainty and empirical results in several ways.

First, through considering a larger sample and investigating many more variables than in previous work on FDI. In fact, we tried in our selection of variables to represent all the theories of FDI that we group into two categories "economic" and "geopolitical country characteristics" variables (We have data on 168 countries for 56 variables[55], over the period 1970-2006).

---

[53] As pointed out by Temple (2000), robustness of a variable (in the sense that its significance is not depending on the choice of conditioning variables) is neither a necessary nor a sufficient condition for an interesting finding. Especially if causality is indirect (e.g. a variable affects investment or human capital), a finding that a variable is fragile in a growth model should be interpreted extremely carefully. Furthermore, a robust variable may not be very interesting as robustness is defined in terms of significance of coefficients. A robust variable may therefore be of little quantitative importance. However Temple (2000) in another context gives a counter argument to justify why finding a robust variable might be useful. Being that it provides certainty and tells us how sensitive the results are to alternative models.

[54] Sala-i-Martin's article has been very influential and has 240 citations in the Social Sciences Citation Index. Recent applications are in e.g. Sturm and de Haan (2005), de Haan (2007), Dreher, Sturm and Vreeland (2009).

[55] We have identified through a review of the literature on FDI, 56 variables that are theoretically significant in explaining FDI.

Second, and most importantly, we use panel data (previous applications of EBA are applied in a cross section context), by applying two versions of EBA (Leamer and Sala –I- Martin test). To the best of our knowledge, this approach to check the robustness of the determinants of FDI using panel data has not been applied before. Indeed, the majority of applications of EBA are in the growth literature.

Third, this study explores possible developments in the application of EBA; such as considering the endogeneity between variables in our testing, performing extensive three different specification tests within fixed and random effects to check the robustness of our results, the use of unweighted normal and non-normal cumulative distribution function (CDF) rather than weighted CDF to fit our purpose.

Fourthly justify why the form of EBA to be used is appropriate in our case compared to other methods that deal with model uncertainty.

The remainder of the chapter is structured as follows. The next section reviews the relevant literature and outlines the methodology of the EBA approach. It is followed by a discussion of the data design and identification of the variables used for each EBA test. The results of the EBA tests are then reported and interpreted. Finally, we summarise and conclude.

6.2 Theoretical Considerations

6.2.1 Motivating Extreme Bounds Analysis

Cross-sectional studies of the inwards determinants of FDI are usually based on a regression that takes the following form:

$$FDII_i/Y_i = \alpha_0 + \sum_{K=1}^{N} \alpha_K X_{ki} + \varepsilon_i \qquad (6.1)$$

Where $FDII_i/Y_i$ is inward foreign direct investment inflows as a percentage of GDP into country i and X_{ki} denotes the k^{th} explanatory variable of country i. Many studies report a sample of regressions, using a certain set of explanatory variables[56].

The problem is that theory (particularly the theory of FDI) is not adequately explicit about the variables that should appear in the "true" model, rather there is a long list of potential explanatory variables. The main difficulty that usually occurs, according to Sturm and Haan (2002), is that numerous different models may all seem reasonable given the data, but yield different conclusions about the parameters of interest. As we saw in the previous chapter, X_1 may be significant when the regression includes X_2 and X_3, but not when X_4 is included. So, which combination of all available X_k's do we choose? Studies often restrict their analysis to certain subsets of these variables and often ignore the effects of any omitted variable bias when other variables are not included.

[56] "Economists are notorious for estimating 1000 regressions, throwing 999in the bin and reporting the 'best' estimated model" (Moosa 2006). This is typically the procedure used in the empirical studies of FDI due to the lack of a comprehensive theoretical model. True scientific research should be based on a quest for the truth. As a result of current practice, readers are left uninformed about the sensitivity of the results to sensible changes in estimation strategy. Gilbert (986, p 288) casts significant doubt on the validity of the practice of assigning 999 regressions to the waste bin because they do not produce the anticipated results. Because of this problem, Leamer (1983) suggested, "econometricians confine themselves to publishing mappings from prior to posterior distributions rather than actually making statements about the economy".

Others report the most "appealing" or convenient regression or regressions after extensive search and data mining and those that possibly confirm a preconceived idea. Indeed, a glance at the studies summarized in Table A-2 in the previous chapter illustrates this point. In addition to any model uncertainty, the limited number of observations often restricts the power of statistical tests that rule out irrelevant explanatory variables.

The results of these studies sometimes differ substantially. At the same time, most studies do not offer a careful sensitivity analysis to double check how robust their conclusions are with respect to model specification. As pointed out by Temple (2000), presenting only the results of the model preferred by the author can be misleading. Hussain and Brookins (2001) argue that : " the standard practice of reporting a preferred model with its diagnostic tests, which is what was invariably done in previous studies of FDI, need not be sufficient to convey the level of reliability of the determinants (the explanatory variables). However, EBA enables the investigator to find upper and lower bounds for the parameter of interest from all possible combinations of potential explanatory variables".

Among the advantages of EBA is that it provides a useful method for assessing and reporting the sensitivity of estimated results to specification changes. As argued by Temple (2000), in empirical research it is rare that we can say with certainty that some model dominates all other possibilities in all dimensions. In these circumstances, it makes sense to provide information about how sensitive the findings are to alternative modelling choices. EBA provides a relatively simple means of doing exactly this. Previous applications of this method in the literature have mainly been related to economic growth[57]. To estimate our model and test the importance of various explanatory variables in determining FDI; we propose to use the fixed effects and random effects[58] estimators in a panel data context and apply (variants) of the so-called EBA as suggested by Leamer (1983) and developed later by Levine and Renelt (1992) and Sala -I-Martin (1997).

---

[57] See Sturm and de Haan (2005) for a further discussion.

[58] Based on the outcome of the Hausman test in the previous chapter we should apply fixed effects when considering only economic variables and random effects when political and geographical variables are included We apply the random effects estimator because the fixed effects estimator cannot be used since many of the geographical and political variables are perfectly multicollinear with the fixed effects. The result of the Hausman test for each of the models estimated always suggests that it is more appropriate to use fixed effects for the economic variables and random effects for geopolitical variables.

The aim of the EBA procedure is to run many regressions, continuously permuting explanatory variables, and to test how the variable of interest "behaves" (e.g., how often it is significant) with respect to the conditioning set, to ascertain the robustness of the determinants across various specifications. The basic idea of this method is to ascertain which explanatory variables are robustly related to our dependent variable across various specifications. In other words, we test the consequences of changing the set of conditioning variables Z for the estimated effect of our variable of interest I on FDI.

6.2.2 Modeling Approach:

The standard way of conducting the EBA test is by dividing the variables into four groups as expressed in equation (2) below. The first is the dependent variable (which is FDI as a percentage of GDP), and the second is the n standard core explanatory variables[59] that are included in every single regression (including a constant) denoted X_{it}. The third is *I*, is the variable of interest whose robustness we are testing, and the fourth is Z, a vector of exactly three possible additional control variables chosen from a pool of explanatory variables. We choose exactly three variables partly in order to hew as closely as possible to Sala-i-Martin's original methodology. (Sala - I -Martin, 1997)[60]. This is because we want to tie our hands as tightly as possible in the regression specification process in order to avoid the perception of data mining or selective reporting of results. Z is identified from a wide range of past studies as potentially important candidates (beyond X) that need to be controlled for in FDI regressions. The subscript k indexes the variable of interest and j the different combinations of conditioning variables (the different models).

[59] These variables are chosen because they were identified as the main factors determining FDI in our previous chapter(chapter 5,table 5.3 equation3)

[60] Levine and Renelt allow the Z variables to be combined in sets of up to three variables.

We investigate the effects on the statistical significance of γ when varying Z. This is done by including the three combination variables, Z, at all times and ε is an error term.

$$\left(FDI/Y\right)_{it} = \alpha_i + \beta_j X_{it} + \gamma_{jk} I_{kit} + \delta_j Z_{jit} + \varepsilon_{jit} \qquad (6.2)$$

Where, there are n core variables, thus,

$$X_{it} = \begin{bmatrix} X_{1it} \\ X_{2it} \\ X_{3it} \\ \vdots \\ x_{nit} \end{bmatrix} \quad \beta = \begin{bmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \\ \vdots \\ \beta_n \end{bmatrix}$$

n x 1 n x1

and I_{kit} is the k^{th} variable of interest and is one variable selected from Z_{it} .

Z_{jit} is a 3x1 vector of control variables selected from the K x1 vector (excluding I_{Kit}) of Z_{it} which contains all K possible explanatory variables not included in X_{it}. δ_j is a 3x1 vector of coefficients on Z_{jit}.

Further j= 1,2,....M where j denotes the j^{th} estimated combination of the variables: the j^{th} model. There are M possible combinations for each of the K variables of interest were k =1,2,.....K. (K is the total number of (non-core) variables in Z giving a total of M*K possible regressions).

Assuming that all models are of the same size, p, the total possible number of regressions for the j is:

$$\frac{k!}{(k-p)! \times p!} \qquad (6.3)$$

Using this setup, we follow Levine and Zervos's (1993) EBA application. This consists, at the first stage, of running a whole series of regressions (which we did in chapter 4) that will yield a set of common accepted variables that are always kept in the equation (the core variables) which is our X (as previously mentioned in chapter 4 there does not exist a clear best practice for prior construction.

The starting point of this chapter is the outcome of chapter 4, where we found that the main economic determinants of FDI/GDP were openness, inflation, GDP growth, the current account balance, GDP per capita (measured in purchasing power parities units) and tax on trade. These variables will be considered as our core model (in X) in our first application of EBA. Following Leamer we consider all of the remaining variables (one at a time) as I. Each variable considered as I is then tested while controlling for X and all the combinations of three variables in Z that are sampled from a predetermined pool of variables.

The variables included in the Z set change for each regression as all possible M combinations of the remaining control variables are considered. EBA consists of estimating regression (2) for all the M regressions to give the widest range of coefficient estimates on the variable of interest, I_k (being γ_k).

The corresponding standard error and cumulative distribution of γ_k is recorded. (The same may be done for the coefficients of the variables in X, which is what we do in our second application of EBA). This procedure is repeated for each variable of interest I.

The process continues until the complete set of candidate variables, I, have been tested (where each regression contains the same core variables (*X*), the same variable of interest (I) and changing combinations of the subset of variables in Z[61]). By running an exhaustive number of regressions for each variable of interest, we find the coefficient estimates $\hat{\gamma}_{kj}$ and standard deviations of these estimates, denoted $\hat{\sigma}_k$.

[61] A large number of regressions are required because of the large number of possible combinations of the Z variables used with each variable of interest. This means that the number of regressions increases with the number of variables.

Next, we identify the highest and lowest values of γ_{kj}, which are denoted $\hat{\gamma}_k^{max}$ and $\hat{\gamma}_k^{min}$, respectively.

We compute the "extreme bounds" as suggested in the original work of Leamer (1983) for I_k. The lower extreme bound is the minimum estimate of $\hat{\gamma}_k$ minus two times its standard deviation, $\hat{\sigma}_k$ that is:

$$LEB = \hat{\gamma}_k^{min} - 2\,\hat{\sigma}_k \qquad (6.4)$$

The upper extreme bound is the maximum estimate of $\hat{\gamma}_k$ plus two times its standard deviation, thus:

$$UEB = \hat{\gamma}_k^{max} + 2\,\hat{\sigma}_k \qquad (6.5)$$

The size of these "extreme bounds" depends on the number of models that can be estimated (i;e variations in model specifications) within the limits of the dataset.

According to Leamer (1985), a variable is "robust" if the extreme bounds (LEB and UEB) are of the same sign then the I_k variable will be considered as robustly related to FDI/GDP. Otherwise, the I_K variable is described as having a "fragile" correlation with the dependent variable. That is, if the lower extreme bound for the I_k variable is negative and the upper extreme bound is positive, then the I_k variable is considered fragile and not a robust determinant of FDI/GDP because alternations in the conditioning information set change the statistical inferences that can be drawn regarding the I_k and FDI/GDP relationship. Thus, the notion of robust variable according to Leamer criteria is not conditional on the choice of information set, that is on whether other variables are added to (or excluded from) the regression equation.

EBA is arguably a procedure that provides sensitivity analysis, thus producing robust results. As explained earlier Leamer and Leonard (1983) argue strongly against the conventional reporting of empirical results (reporting the best estimated model or models out of tens or hundreds), which is typically the procedure used in empirical studies of FDI, mainly because of the lack of a comprehensive theoretical model. They assert, referring to the conventional procedure, that "the reported results are widely regarded to overstate the precision of the estimates and probably to distort them as well". Therefore, they argue, "statistical analyses are either greatly discounted or completely ignored".

They further argue that the conventional econometric methodology (or "technology" as they call it) "generates inference only if a precisely defined model were available, and which can be used to explore the sensitivity of inferences only to discrete changes in assumptions".

In order to identify and estimate the impacts of determinants of FDI most of the past empirical literature take some measure of FDI and regress it on a number of variables identified as determinants of FDI.

The main problem with the conventional reporting of econometric results on the determinants of FDI (which arguably can be circumvented by using EBA) is that the availability of many potential explanatory variables that are unrelated by a cohesive theoretical model effectively means the availability of many models that can serve as a basis for data analysis.

Consequently, this means that many conflicting inferences can be drawn from a given data set. According to Leamer and Leonard (1983), this "deflects econometric theory from the traditional task of identifying the unique inferences implied by a specific model to the task of determining the range of inferences generated by a range of models".
To circumvent this problem they suggest that researchers should indulge in identifying "interesting families of alternative models", and summarising the range of inferences implied by each of the families. Whether or not the results produce useful conclusions depends on the range of inferences relative to that of the corresponding family of models. If the former is narrow while the latter is wide, the conclusions will be useful, and vice versa. EBA facilitates the task proposed by Learner and Leonard, who argue that the extreme values $\hat{\gamma}_k^{\max}$ and $\hat{\gamma}_k^{\min}$ delineate the ambiguity in the inferences about γ_k induced by the ambiguity in choice of model.

If the difference between $\hat{\gamma}_k^{\max}$ and $\hat{\gamma}_k^{\min}$ is small in comparison to the sampling uncertainty, the ambiguity in the model may be considered irrelevant since all models lead to essentially the same inferences (see, for example, Leamer and Leonard, 1983, p. 307).
For Leamer's variant of the EBA we will not only report the extreme bounds but also the percentage of regressions in which the coefficient of the variable I_K is statistically different from zero at the five percent level of significance level.

Nevertheless, an important problem with this literature is that usually authors do not properly establish that their choice of regressors is rich enough to avoid the criticism that reported findings result from omitted variables that causally affect growth and are correlated with the variable of interest. We refer to Durlauf (2002b) for an elaboration of this point. This problem highlights the need for a properly conducted robustness analysis.

Likewise McAleer et al. (1985), argue, "Unless extreme bounds are presented for all possible classifications of variables as doubtful and free, an observer cannot be certain that the selection does not constitute a con job". EBA, the argument goes, provides a reporting style that is not better than the conventional procedure because it replaces (arbitrary) regression selection with (arbitrary) variable partition. They conclude, "EBA cannot de-con econometrics", while suggesting another procedure for "de-conning": econometrics comprising "a clear and full disclosure of the process whereby a preferred model was selected, and the requirement that a thorough evaluation has been made of the prospects of such a specification".

Levine and Renelt (1992, p.945) show that a recognition of the McAleer et al. (1985) problem may be accommodated by showing that changes in the X variables do not alter the overall conclusions. In our second application of the EBA procedure we test all possible variables considered in both X and Z for robustness. Further, we do consider two different sets of X variables in our EBA applications.

Sala-I- Martin (1997) argues that the testing criterion applied in Leamer's EBA is too restrictive for any variable to really pass it. If the distribution of the parameter of interest has some positive and some negative values, then a researcher is bound to find at least one regression for which the estimated coefficient changes sign if enough regressions are run.

In other words, under this test a variable is considered "fragile" if only one regression out of many thousands causes a change in the sign of a coefficient. He noted that if one keeps trying different combinations of control variables included in the samples drawn within some error from the true population, then one is virtually guaranteed to find a model for which the coefficient of interest becomes insignificant or even changes sign. As a result, one may conclude either that no variables are robust or that the test of robustness is extremely difficult to pass.

Sala –I- Martin proposes an alternative form of EBA to determine a variable's robustness. It is derived from Leamer's (1983) EBA methodology and uses the same regression, as specified in model (2). However, Sala –I- Martin's approach differs in the way the extreme bounds of the variable of interest are calculated.

His estimation of robustness is based on the fraction of the density function of the estimated coefficient of I_k that is lying to the right of zero (using the entire distribution of the estimated coefficients). Provided that this fraction is sufficiently large (small) for a positive (negative) relationship, the relationship can be labelled robust. In his application, Sala-i-Martin uses a 'critical fraction' of 95%, (a full explanation of the CDF method is given below). Obviously, his relaxation of the robustness criterion leads to a higher likelihood that a variable is robust. This discussion illustrates that there is no uniform definition of robustness[62].

Moreover, we follow Sala-I- Martin's (1997) recommended suggestion and analyse the entire distribution of γ_k. He proposes using the (integrated) likelihood to construct a weighted cumulative distribution function, denoted CDF (0). For reasons to be discussed below, we report the unweighted parameter estimate of γ_k and its corresponding standard deviation[63], as well as the unweighted CDF (0).

---

[62] This is explicitly recognised in Florax *et al.* (2002), who consider a range of definitions of robustness. They analyse the sign, size, and significance of regression results. This analysis extends Levine and Renelt and Sala-I-Martin's work by not only considering a wide range of robustness definitions but also explicitly analysing the robustness of the sizes of the estimated effects. The robustness criteria adopted by Levine and Renelt and Sala-I-Martin focus mainly on statistical significance. Whether the estimated effect sizes are robust to changes in the conditioning set of variables is hardly addressed. We refer here to McCloskey (1985), and McCloskey and Ziliak (1996), for a pervasive critique on this practice in economics. To assess robustness along this dimension, Florax et al. (2002) extend the definition of robustness by requiring that the average estimated effect sizes conditional upon the inclusion of a particular variable are within predetermined bounds from the overall average estimated effect size.

[63] We are careful to exclude regressions where the regressions do not estimate and the values are reported as zero.

The CDF statistic is based on the fraction of the cumulative distribution function lying on each side of zero. CDF (0) indicates the larger of the areas under the density function either side of zero: in other words, the larger of CDF (0) and 1-CDF (0). So the CDF (0) statistics would always lie in a [0.5 ;1] interval.

A variable is regarded as robust if it passes the Leamer's EBA test or if it is CDF (0) is not lower than 90percent. Sala-I- Martin argues that if at least 90% of the density function for γ_k lies on either side of zero, it is probably safe to conclude that I_k is robust.

Several attempts have been made to refine the robustness criteria check and to introduce improvements to Leamer's original idea. One criticism of Leamer's method was that it weights all model specifications equally, so that divergent coefficient estimates from a poorly specified equation can be sufficient to disqualify a variable as "robust'. An alternative method is to relax the strictness of EBA and construct reasonable extreme bounds, as proposed by Clive W.J Granger and Harald Uhlig (1990). This method stipulates that the range of coefficient values to be used is restricted to the set of specifications that produce R^2 values that are not too far from the maximum R^2 achieved across all specifications. In other words, this method uses estimates derived from "sufficiently reliable" regressions only. The assessment of reliability is made on the basis of the goodness of fit of a specific regression relative to all other estimated regressions as measured by R^2 (see Doppelhofer, 2000, for an application) .

The motivation behind this method is that the particular models that produce the extreme bounds in the traditional criterion of Leamer (the upper and lower bounds) might be inferior or flawed in some way compared to other specifications among all the possible M regressions.

Granger and Uhling's (1990) criterion is given in (6) below:

$$R_j^2 \geq \left[(1-\varphi)\times R^2_{\max} + R^2_{\min}\right] \qquad (6.6)$$

Where R^2_{max} is the highest R^2 value among all M regressions, and $0 < \varphi < 1$, such that if $\varphi = 0$ then the extreme bounds will be drawn from one model only, the one with the highest R^2, while if $\varphi = 1$, then all models are relevant for the determination of the extreme bounds. Any other value means that the extreme bounds are determined by only a proportion of the models within the top φ x 100 percent of the $(R^2_{max} - R^2_{min})$ range.

This modification results in the so-called restricted extreme bounds analysis (REBA).
Granger and Uhlig suggested this refinement of EBA by imposing a condition on the level of goodness of fit such that all models with a very low R^2 are irrelevant for the calculation of extreme bounds. (They set φ equal to 0.1 and calculate the extreme bounds only from the subset of models that satisfy (6)). This should rule out the poorest models, which are likely to have omitted variable problems and may narrow the bounds. However, this method does not provide guidance for the choice of φ (which seems to be arbitrary). Another problem with narrowing the bounds based on overall fit measures concerns multicollinearity. Failure to consider multicollinearity, which inflates σ in the Leamer criteria and therefore widens the extreme bounds, increases the risk that EBA will erroneously classify a variable as fragile[64]. To address this issue, one can examine a modification of EBA that excludes regressions that exhibit a degree of multicollinearity based on the Variance Inflation Factor (VIF)[65] .

Sala-i-Martin (1997) uses a different weighting procedure (that does not require the arbitrary specification of φ). As discussed above, he proposed to average estimates of mean and standard deviations for variables across regressions, using weights proportional to the likelihoods of each of the models. (The procedure is discussed in the next section).

Another related objection to EBA is that the models generating the bounds might be inconsistent or flawed. Hence, the EBA will tend to overstate the degree of uncertainty about parameters, because it does not take into account the information that, for example, certain models are poor and should almost certainly be dismissed. A good example of this is if we are convinced that some variables selected in our data, such as natural resources or non-landlocked countries, should be part of our model. However, in applying EBA some models might omit those variables and it may be the omission of these key variables that generate the wide intervals of the parameters. (Temple 2000).

[64] Following Goldberger (1991), multicollinearity ultimately reflects the fact that there are insufficient data to produce statistically significant relations among a set of imperfectly collinear variables. The problem is secondary to satisfactory specification – multicollinearity is not a sufficient excuse for ignoring competing factors.

[65] The VIF is equal to $\frac{1}{1-R^2}$

A further objection to EBA is that the initial partition of variables in to X and Z is likely to be rather arbitrary. However, as pointed out by Temple (2000), there is no reason why standard model selection procedures (such as testing down from a general specification) cannot be used in advance to identify variables that seem to be particularly relevant. Furthermore, some variables may be included in the majority of studies and are by now common in this branch of the literature (Growth literature). To address this problem we established a favoured model (in chapter 4) that we will use to guide our choice of the core variables, X.

As discussed above EBA may suffer from multicollinearity, which inflates standard errors. Leamer (1983) points out that the multicollinearity problem really reflects a weak-data problem. Levine and Renelt (1992, p.944) support this view by arguing that "multicollinearity is not a procedural problem but it rather represents an inability to identify a statistical relationship that is insensitive to the conditioning set of information". To give the results more credibility, Levine and Renelt (1992) restrict their EBA in three ways. First, they use three *Z* variables only, hence restricting the number of explanatory variables in each equation. Second, they choose a small pool of variables from which the three *Z* variables are chosen. Third, for every variable of interest, they restrict the pool of variables from which the Z variables are chosen by excluding variables that, a priori, might measure the same phenomenon (ensuring that there are no close substitutes). They argue that these restrictions make it more difficult to endogenously obtain fragile results.

In our work, we consider multicollinearity in our second and third applications of EBA by eliminating variables with similar definitions from the Z set of variables.

In our empirical analysis we apply Sala-I- Martin's (1997) variant of EBA using both the normal unweighted and non-normal unweighted CDF methods. We consider both methods in the next sections.

6.2.2.1: Case 1 the distribution of the estimates of γ_k across models is normal

Following the Sala-I-Martin methodology, we calculate the cumulative distribution function (CDF). To this end, we need to know the mean and the standard deviation of the distribution of γ_{kj}. For each of the j= 1, 2,..M models (reflecting the different combination of variables), it is possible to compute the integrated likelihood L_{kj}, the point estimate of γ_{kj}, and the standard deviations of γ_{kj}, denoted $\hat{\sigma}_{jk}$. With these values, one can construct the mean estimate of $\bar{\gamma}_k$, as the weighted average of each of the M point estimates of γ_{kj}, that is:

$$\bar{\gamma}_k = \sum_{j=1}^{M} W_{kj}\hat{\gamma}_{kj} \qquad (6.7)$$

Where the weights W_{kj} are proportional to the (integrated) likelihoods, thus:

$$W_{kj} = {}^{L_{kj}}\Big/_{\sum_{j=1}^{M} L_{kj}} \qquad (6.8)$$

The main reason for using this weighting scheme, according to Sala -I- Martin (1997), is to give more weight to the models that are most likely to be considered the true model.

Similarly, one can also compute the average variance $\bar{\sigma}_k^2$ as the weighted average of the M estimated variances $\hat{\sigma}^2_{kj}$, where the weights are given by equation (8), thus:

$$\bar{\sigma}^2_k = \sum_{j=1}^{M} W_{kj}\hat{\sigma}^2_{kj} \qquad (6.9)$$

Given the mean and the variance of γ_{kj} we can calculate the cumulative distribution function CDF(0) using the standard normal distribution to measure the larger area under the density function either side of zero of the t-ratio, $\bar{t}_k = \frac{\bar{\gamma}_k}{\bar{\sigma}_k}$. The CDF is calculated as $\Phi(\bar{t}_k)$, where Φ denotes the cumulative density based on the normal distribution.

Finally, CDF (0) = $\Phi(\bar{t}_k)$ if $\Phi(\bar{t}_k) \geq 0.5$ or CDF (0) =1- $\Phi(\bar{t}_k)$ if $\Phi(\bar{t}_k) < 0.5$. Note that in our application, because we cannot estimate the M models over the same sample period we do not attach different weights to different models' parameters using L_{kj} .That is, we effectively set $W_{kj} = \frac{1}{M}$.

We use the unweighted, instead of weighted, CDF (0) mainly because of a missing data problem. The number of observations used to estimate each equation changes depending on which variables are included in each regression. Thus, the dataset is not identical over all combinations of variables (our data set is an unbalanced panel), and the integrated likelihood will not simply reflect the model's fit but also the sample size making it inappropriate to use as a weight in our application. Another reason for using the unweighted CDF can be found in Sala –I-Martin's (1997) notes where he noted that the integrated likelihood might not be a good indicator of the probability that a model is the true model.

According to Sala -I- Martin the main problem with this procedure is that it involves the goodness of fit of model j, measured by $L_{jk,}$ which may not be a good indicator of the probability that model j is the true model. He argues that this might happen in the case when some explanatory variables in the data set are endogenous: models with endogenous variables may have a spuriously better fit. Thus, the weights corresponding to these models will tend to be larger and may very well dominate the estimates. It may, for example, be found that only two of the models have all of the weight in the estimated weighted average, and these two models may suffer from endogeneity bias. It can be argued that when this is a serious problem the unweighted average of all the models may be superior to the weighted averages[66].

In addition, Sturm and De Haan (2005) show that this goodness of fit measure may not be a good indicator of the probability that a model is the true model and the weights constructed in this way are not equivariant for linear transformations in the dependent variable. Hence, changing scales will result in rather different outcomes and conclusions.

[66] We consider the endogeneity issue in our second application of the EBA method (please see Table 6.4 for further details).

6.2.2.2: Case 2 the distribution of the estimates of γ_k across models is non normal

According to Sala I Martin (1997) if the distribution is not normal we can still calculate CDF(0) by computing the individual CDF for each of the M regressions, designated by $F_j = (0/\gamma_{kj}, \sigma_{kj}^2)$

Where $\Phi_{kj}(0/\hat{\gamma}_{kj}, \hat{\sigma}_{kj}^2) = F_{kj}(0/\hat{\gamma}_{kj}, \hat{\sigma}_{kj}^2)$ if $F_{kj}(0/\hat{\gamma}_{kj}, \hat{\sigma}_{kj}^2) \geq 0.5$

And $\Phi_{kj}(0/\hat{\gamma}_{kj}, \hat{\sigma}_{kj}^2) = 1 - F_{kj}(0/\hat{\gamma}_{kj}, \hat{\sigma}_{kj}^2)$ if $F_{kj}(0/\hat{\gamma}_{kj}, \hat{\sigma}_{kj}^2) < 0.5$.

The aggregate CDF (0) of γ_{kj}, (denoted $\Phi_k(0)$) is calculated as the weighted average of all of the individual CDF (0)s, where the weights are, again, the integrated likelihoods given by (6.8).This can be written as :

$$\Phi_k(0) = \sum_{j=1}^{M} W_{kj}\Phi_{kj}(0/\hat{\gamma}_{kj}, \hat{\sigma}_{kj}^2) \qquad (6.10)$$

Once again we use unweighted statistics, that is, we set $W_{kj} = \frac{1}{M}$.

Following notational conventions, we assign the degree of robustness to variables as:

*** Robust at the 1%level when the unweighted CDF (0) is $\geq$ 99%

** Robust at the 5%level when the unweighted CDF (0) is $\geq$ 95%

* Robust at the 10%level when the unweighted CDF (0) is $\geq$ 90%[67]

Being a Possible determinant when the unweighted CDF (0) is 80%-0.89%

Being a Fragile determinant when the unweighted CDF (0) is 0.50% -79%.

[67] We took 0.90 as the posterior probability threshold following Fernandez et al (2001b) who label a regressor that obtains a posterior probability that is equal to or greater than 0.90 as robust.

6.2.3: Other Approaches Dealing With Model Uncertainty:

In our application we will use the EBA procedures as discussed above however, for completeness we will highlight alternative methods of dealing with model uncertainty. For example, the Bayesian Averaging of Classical Estimate (BACE) method combines "Bayesian Model Averaging" with classical estimation techniques, as proposed by Doppelhofer et al (2004).

This provides a formal way of measuring the importance of variables under model uncertainty. It allows the right–hand–side variables to vary over all possible combinations of regressors. This approach has been used to check the robustness of different explanatory variables in growth regressions in the sense that different specifications are estimated (by OLS) to check the sensitivity of the coefficient estimate of the variable of interest. A major advantage compared to the Sala-I-Martin approach is that there is no need to specify the set of variables in the core model (X). In other words, all of the variables are tested for their significance rather than the core variables being assumed the main determinants[68]. This is done employing a certain goodness of fit statistic related to the Schwarz criterion.

The second advantage of the BACE technique is that there is no set of fixed variables included and the number of explanatory variables in the specifications is flexible. However, a major disadvantage, and this is the primary reason why we are not going to apply the BACE approach, is that this approach requires a balanced data set and our data is an unbalanced panel.

That is, an equal number of observations for all regressions are required due to using a weighting scheme based on Schwartz's Information Criteria (SIC)[69].

---

[68] In our second application of EBA we test both the X and I variables for robustness. Hence, our analysis addresses this criticism.

[69] The SIC is one of the main, competing schools of thought regarding how to conceptualize the task of selecting the "best" model. If the researcher believes that the true model is included within the set of candidate models, then a desirable property of a model selection procedure is that it is "consistent." That is, that it selects the true model with probability converging to one as the sample size becomes infinitely large. The SIC is by far the most commonly used of the several model selection criteria that possess this property. However SIC varies with the sample size so does not simply reflect a fit or parsimony trade off but also the sample size.

Another approach called the general to specific method, is adopted by Hendry and Krolzig (2004) and is implemented in their PcGets model-selection computer package (see Hendry and Krolzig, 2000)[70]. In their work, they argue that there is no need to run such vast numbers of regressions using the EBA technique as a robustness check. They suggest running only one regression called the General Unrestricted Model (GUM) appropriately reduced to a parsimonious encompassing congruent representation[71]. The algorithm distinguishes relevant from irrelevant variables by performing a series of econometric tests. It tests the significance of individual variables and their groups, as well as the correct specification of the resulting models. This technique leads to a different and smaller set of significant (robust) variables as compared to others approach when applied to economic growth.

The problem with the GUM method is that it cannot be applied to an unbalanced data set such as ours where the inclusion of different variables alters the sample. Indeed including all variables simultaneously is not possible in our dataset. Hence, we do not employ this method.

Bayesian Model Averaging (BMA) methods have also become a popular means of identifying the robust set of growth determinants. Examples where BMA has been applied to cross country growth data include Brock and Dulauf (2001), Brock, Durlauf and Sala –I-Martin (2003), Doppelhofer and Miller (2004), Fernandez et al (2001) and Masanjala and Papageorgiou (2005 and 2008). The fundamental principle of this method is to estimate the distribution of unknown parameters of interest across different models by treating models and related parameters as unobservable, and to estimate their distributions based on the observable data. In contrast to classical estimation, model averaging copes with model uncertainty by allowing all possible models to be considered, which consequently reduces the biases of parameters.

---

[70] Hendry and Krolzig's (2003, 2004) program selects econometric models through an automatic general to specific procedure. Instead of millions of regressions, the authors just run one regression (choose one model) to identify the determinants of growth based on a set of statistical tests. According to the general-to- specific methodology, the 'true' equation should be characterised by a general regression that includes all information about the effective sources of, in their case growth. However, this general unrestricted model should be appropriately reduced to a more congruent representation (specific regression) which encompasses every other restricted regression of the general specification.

[71] This GUM would need to be applied by imputing missing data (as Hendry and Krolzig apply it in their methodology where they do it in a cross-sectional context) so that the general model could be estimated. This is possible with panel data; however, it is not a widely employed method in economics. (This is outside of the scope of this PHD but is an interesting topic for future research).

Another advantage of this method is that it does not require fixing the number of regressors that must appear in each regression as this has a direct effect on the size of the estimated coefficients (see Leon –Gonzalez and Montolio, 2003) and it limits the number of models that are explored. The main disadvantage of this method is that it involves intensive calculations and this can become quickly infeasible as 30 candidate variables imply 1 billion candidate models. The vast majority of BMA analyses these methods have been applied on growth regressions using cross sectional data as it is less complicated than using panel data.

In our case, we used unbalanced panel data that covers 168 countries over 36 years and includes over 30 economic, political and geographical variables (yielding a maximum sample of 6048 observations)[72]. Hence, it is not feasible to apply this method to our data.

Reed (2006) pointed out some problems with using the BMA approach that are summarized as follows. First, the results are sensitive to assumptions about the prior parameter distribution. For example, in order to implement their version of BMA Sala-I-Martin et al. (2004) must first specify an "expected model size." While they claim that their results are "robust" across different assumptions about this parameter, they acknowledge that this is not true in all cases. That is, some of the variables that are "significant" under a given assumed "expected model size" become "insignificant" under a different assumed "expected model size" and vice versa.

Lenkoski (2001) argue that BMA approach applied to unbalanced panel involves the imputation of the missing observations (see eg chapter 14 of Koop et al (1997)) such an approach is appealing, since the imputation requirement in each step may lead to considerable autocorrelation thereby causing convergence to be extremely slow, if not practically impossible.

Second, there are important computational issues. BMA does not actually estimate all possible specifications. Instead, it uses sampling procedures (e.g., Markov chain Monte Carlo procedures, of which the Gibbs sampler is the best known) to estimate the "probability" that a given specification is the true one.

---

[72] Please note that the number of right hand side variables used in each of the three EBA analyses that we apply vary as specified further, in the first test we restrict ourselves to six economic variables in the core model, one variable of interest and 41 economic control variables. In the second test, we use three economic variables in the core model, one variable of interest and 27 economic control variables. In the third EBA test, we use 3economic variables in the core model, variable of interest that can be either economic, political or geographical variable and 55ecnomic and geopolitical control variables. We used the random effect just in the third test while for first and second test we applied the fixed effect.

There is no standard sampling algorithm, which raises the possibility that the results will be idiosyncratic to the program used by the individual researcher. Finally, the weighting probabilities are derived from Bayesian statistical foundations and are closely related to the SIC criterion defined above. However, alternative criteria, such as the AIC, produce different results.

It is worth noting that the BMA and general-to specific model selection procedures used to assess the robustness of growth determinants are very sensitive to the international data sets used, see Ciccone and Jarocinski (2010). Thus, in our testing we are going to use the EBA method due to the nature of our dataset (unbalanced panel), rather than the mentioned procedures; as those one require either balanced panel (BACE) or involve intensive calculations and become infeasible within large explanatory variables (GUM). Table 6.1 below summaries the alternatives approach of measuring model uncertainty (advantages and disadvantages of each method).

Table 6.1 summaries the alternatives approach of measuring model uncertainty

Methods	Main idea	Application	Advantages	Disadvantages
Bayesian Model Averaging (BMA)	Average the variety of alternative models. Use frequents parameter estimates and combine them with probabilities of unknowns (a standard Bayesian object) Distributions for the parameters can be calculated by averaging the posterior model probability.	Pioneered by Ley and Steel (1999), Sala –I- Martin and Doppelhofer and Miller (2004) applied the methods in growth context	The use of BMA to average over growth models leads to better out of sample predictions than a null model with entirely random variation. This is quite helpful considering the claim that growth Regressions turn to be entirely spurious.	Implemented by Hoeting et al (1999). This method involves convergence issues in the use of Markov-chain to average across models with many predictors. -it does not lead to a simple model which can make the interpretation of the results harder BMA does not actually estimate all possible specifications. As it uses sampling procedures.
General Unrestricted Model (GUM)	Based on only one regression appropriately reduced to a parsimonious encompassing congruent representation	Ley (1999) ,Hendry and Krolzig 2004	Easy to run as it is one automatic regression, this will eliminate many intolerable computational burdens. It reduces the subjectivity of the selection.	The validity of the selected model depend on many considerations such as homogeneity of the sample, constancy of the parameters across observations which is hard to achieve This method can be applied to all data types. It relies on a relatively constant sample and in this instance; this was achieved by imputing the data. Data can be implemented with panel It has been implemented just on cross sectional context; within panel data it is more complex.

Table 6.1 summaries the alternatives approach of measuring model uncertainty (Continue)

Methods	Main idea	Application	Advantages	Disadvantages
Bayesian Averaging of Classical Estimate (BACE)	Determine the posterior probability attributed to each single model that includes the variable of interest and conditioned on the underlying dataset	Doppelhofer et al. (2004)	No need to specify the set of the core model, and the number of explanatory variables in the specification is flexible.	The approach requires a balanced data set.
Bayesian Averaging of Thresholds (BAT)	The approach examines non-linearity's tests explicitly whether the linear variant of the model can be rejected in favor of the nonlinear variant. This can be done by selecting the variables that pass the inclusion test from the linear model averaging, estimates the OLS model, and analyses nonlinearity within this model.	Crespo and Doppelhofer (2006):	Only a single linear model is selected for a given set of explanatory variables.	It does not test whether the nonlinear variant of the model is superior to the linear version.

Source: own research

6.2.4 Previous Applications of EBA on FDI:

As far as we are aware, only Chakrabarti (2001) and Imad Moosa (2006) have used EBA to identify the robust determinants of FDI.

Moosa (2006) considered eight possible determining variables of FDI in his EBA analysis using a cross sectional sample of 136 countries between 1998 and 2000. With GDP serving as the only core variable, each of the remaining seven variables is considered (in turn) as the variable of interest (I), and combinations of three other variables are selected from the remaining six (The Z set), which leads to a total of 140 regressions (20 regressions for each variable of interest).The results reveal three robust variables: exports as a percentage of GDP, telephone lines per 1000 of the population and country risk. In contrast, the variables GDP growth rate, commercial energy use, domestic investment and tertiary enrolments are found to be fragile. Moosa (2006) concludes that developed countries with large economies, a high degree of openness and low country risk tend to be more successful than others in attracting FDI.

Chakrabarti's (2001) EBA analysis of the determinants of FDI used data involving 135 countries for the year 1994 and found that the 7 variables tested (namely, tax, wage, openness, exchange rate, tariff on imports, growth rate of GDP and the trade balance) appear to be fragile and highly sensitive to small alterations in the conditioning information set. Only the openness variable could possibly be regarded as robust as its CDF is 0.91. Chakrabarti attributes the lack of consensus upon determinants in the FDI literature to "the wide differences in perspectives, methodologies, sample-selection and analytical tools" used.
This argument may explain the contradiction in results of previous applications of EBA on FDI (Chakrabarti and Moosa) and our results. In our work we use a substantially larger panel data set and consider far more variables (168 countries, over 56 various variables running from 1970-2006) previous applications of EBA (mentioned above) use cross sectional data and smaller sample.

This provides a major development of previous work that should produce superior inference. We apply two versions of EBA (Leamer and Sala –I- Martin) Further 3 different EBA applications to take in account fixed and random effects and provide estimators as well as economic, social and political variables. To the best of our knowledge our EBA analysis, of the determinants of FDI is the first to use panel data and considers the largest number of determinants.

6 - 3 Estimation Methodology

6.3.1 The Data

The database constructed for the EBA robustness analysis consists of the same data used and described in chapter 4. The data is an unbalanced panel with annual frequency that covers the time period 1970-2006 for 168 countries (yielding a maximum sample of 6048 observations) and includes 48 economic variables[73]and 28 geopolitical variables. In addition, we construct dummy variables to examine how FDI varies across five different regions (our geographical and political variable) which make it fifty-six variables in total[74].

The sample size varies for the different regressions run using EBA, depending on the availability of data on the specific variables included in a particular regression. Table 5.2 in chapter 5 provides a summary of the economic, political and geographical variables used including details of the variables and their sources.

To apply EBA we used a semi program procedure that was implemented in Eviews 6 and Excel. Note that even with a program, this work is still intensive and time consuming because it involved the estimation of almost 2 million regressions in our three applications of EBA to produce the results reported here.

[73] Please note that 48 economic variables were used in the first EBA test (6 core varables+ 42 variables of interest) .We reduced this to 28 economic variables for second and third EBA tests

[74] For a list of countries included in the sample and variable definitions please see table 5.2 and 5.3 in chapter 5.

6.3.2 Model Specification

6.3.2.1 Fixed effects versus random effects estimations in the panel regressions

Application of the Hausman test and F- test in the modelling of FDI in the previous chapter indicated that the fixed – effects estimator was preferred to the random effects and pooled OLS estimators. Therefore, we will use the fixed effects estimator model when only economic variables are included as determinants of FDI in the application of EBA. However, when political and geographical variables are added to the analysis, we can only estimate the models using the random effects estimator. This is due to the nature of these political and geographical variables which will be perfectly collinear with the (cross-sectional) fixed effects because many of the former variables only vary across sections and not through time.

That is, because our data contains both time –variant (economic) variables and time-invariant (geographical and political) variables the fixed effects estimator cannot be used with time invariant variables. An effective way to deal with this problem is to apply EBA in two separate groupings.

The first group only includes economic variables and is estimated using the Fixed Effects estimator. The second group contains economic, geographical and political variables and is estimated using the Random effects estimator. For the models including only economic variables, we perform two applications of EBA.

The first uses six variables in the core model being those identified in the previous chapter as the significant determinants of FDI.

The second includes three variables in the core model following Sala-I-Martin (1997) recommendation to use this number of factors[75].

In a third and final robustness application, we apply EBA including economic, political and geographical variables using the random effects estimator.

[75] Fixing the number of regressors that must appear in each regression has a direct effect on the size of the estimated coefficients (see Leon Gonzalez and Montolio, 2003) and it limits the number of the models that are explored

6.3.2.2 The First EBA application with six economic core variables using the fixed effect estimator

An extensive analysis of the data based on a standard model selection procedure, in the previous chapter, suggested six significant economic determinants of FDI (inflation, GDP at Purchasing Power Parity $ per capita, GDP growth, the current account balance, tax on trade and openness). This was out of 48 variables that are routinely considered in such regressions, either individually or in groups, and are characterised by a general acceptance in past studies for both theoretical plausibility and empirical support. (See table 6.2 for the list of variables included in the first EBA application (under first test column)). We will use these six significant determinants as variables in our core model and examine whether the non–core variables are robustly related to FDI. In order to check for robustness, EBA was conducted by including I_k and Z variables selected from the remaining 42 variables. The procedure is discussed below.

Each of the 42 non-core variables is individually added as an additional explanatory variable to the core model to take the function of the I_k variable in equation (6.2). Each combination of three of the other 41 non-core variables are then included in Z in equation (6.2) to check the robustness of the coefficient estimates for each particular variable, I_k. This follows the convention of Sala-I-Martin (1997), who recommends three variables to be used in Z.

Our empirical strategy is the following. We calculate the upper and lower extreme bound as developed by Leamer (1983) (see equation (6.4) and (6.5)). In addition, we also apply Sala-I-Martin's (1997) variant of the EBA by calculating normal and non –normal CDF.

In contrast to Sala - I - Martin, we restrict our test by applying the unweighted (instead of the weighted) version of CDF (0).

This shows the fraction of the cumulative distribution lying on each side of zero. CDF (0) indicates the larger of the areas under the density function either above or below zero, in other worlds, regardless of whether this is CDF (0) or 1- CDF (0), it will always be a number between 0.5 and 1.0. We also report the average unweigted parameter estimate of γ_k and its standard deviation. The proportion of regressions in which the coefficient of the variable I_k is statistically different from zero at the 5% level is given in the column headed % sig.

6.3.2.3 The Second EBA application with three economic core variables using the fixed effect estimator

To further, test the robustness of our results, we apply EBA by reducing the core model to three variables in all regressions following Levine and Renelt (1992) and Sala-I-Martin (1997). The reason for keeping three core variables in all regressions and allowing the Z variables to come in combinations of up to three is that; by fixing the number of regressors that must appear in each regression has a direct effect on the size of the estimated coefficients (see Leon-Gonzalez and Montolio,2003) and it limits the number of models that are explored. Therefore, it has been suggested that around seven variables will tend to fit the data. Hence, it has become standard to apply EBA with seven variables in each model. Given that we found six significant determinants of FDI in the previous chapter, including seven variables in an EBA analysis of FDI also seems appropriate. As we mentioned earlier reducing the number of variables in the core model from 6 to 3 will have a direct effect on the size of the estimated coefficients as it increases the number of models that are explored.

However, the number of models estimated may not increase (substantially) because we reduce the number of variables to be considered. The three core variables (X) were chosen because they have been shown to be robustly linked to FDI either in previous empirical work or in our previous chapter and because we do not strongly expect them to be endogenous (openness, infl and ttrade). For the combination set of (Z) variables, we implemented some changes on the following grounds. We removed some variables to be considered in Z for the following reasons: poor availability of data for a particular variable, some variables may be substitutes of others (potentially causing collinearity) and suspicion of endogeneity with the FDI variable (see the discussion further below). From the 48 variables in our original dataset, to 28 (listed in Table 6.2 further below (under second test column)) were chosen to be included in Z in this second application of EBA. These variables have correlation coefficients (with each other) that are (in all cases) lower than 0.5 in magnitude and are therefore not regarded as close substitutes. (Beugels Dijket al, pp123 - 124). Hence, this should limit the problem of multicollinearity, which can adversely affect our conclusions regarding robustness.

6.3.1.4 The Third EBA application with economic Political and geographical variables using the random effects estimator

In our final EBA robustness analysis, we consider economic, political and geographical variables by using the random effects estimator. The three main economic variables included in the core model in addition are those that were found in the first and second dimension to be robust (openness, GFE, ratios). We use the same set of the economic variables applied in the second EBA application and we add 28 geographical and political variables. This will allow us to test the robustness of an extended set of variables (Table 6.2 lists the variables included in the third EBA test (under third test column)). the set of geopolitical variables are mainly institutional variables obtained from International country risk guide (ICRG) that covers mainly the country's corruption, Bureaucratic efficiency, Democratic accountability, Ethnic tension, Internal and external conflict, political regime, rule of law added to this set few dummies related to country characteristics such as common boundaries , languages.

Table 6.2 list of the variables used in the First, Second and Third test

	Definition of variables	variable code			
	Dependent variable	FDII	First test	Second test	Third test
1	Trade	Openness	√	√	√
2	Inflation	Infl	√	√	√
3	GDP per capita, PPP	Gdpppp	√	√	√
4	GDP growth	Gdpg	√	√	√
5	Current account balance	Cab	√	√	√
6	Taxes on international trade	Ttrade	√	√	√
7	Central government debt	Cgd	√	√	√
8	Consumer price index	Cpi	√	X	X
9	External balance of payments	Ebp	√	X	X
10	Exports	Ex	√	X	X
11	Foreign direct investment, net outflows	Fdio	√	√	√
12	Gross fixed capital formation	Gcf	√	√	√
13	GDP (constant LCU)	Gdpcl	√	X	X
14	GDP per capita growth	Gdperg	√	X	X
15	GDP (real LCU)	Gdprl	√	X	X
16	GDP (current US$)	Gdpru	√	X	X
17	government final expenditure	Gfe	√	√	√
18	Gross National Incomes in PPP	Gnipppu	√	X	X
19	Gross National Incomes in (LCU)	Gniru	√	X	X
20	Gross savings (current US$)	Gs	√	√	√
21	Highest marginal tax corporate rate	Hmtaxcor	√	√	√
22	Imports of goods and services	Imp	√	X	X
23	Inflation, GDP deflator	Infld	√	X	X
24	Internet users	Internet	√	√	√
25	Interest rate spread	Intsprd	√	√	√
26	Labor force, total	Lf	√	X	X
27	Liquid liabilities	Liquid	√	√	√
28	Lending interest rate	Lir	√	√	√
29	Total reserves	Nreserve	√	√	√
30	total population	Poptl	√	√	√
31	Rail lines	Rail	√	√	√
32	Primary school enrolment/labour force	Ratiop	√	√	√
33	secondary school enrolment /labor force	Ratios	√	√	√
34	Tertiary school enrolment/labor force	Ratiot	√	√	√
35	Real exchange rate	Rex	√	√	√
36	Real interest rate	Rir	√	√	√
37	Roads, total network	Roads	√	√	√
38	Primary school enrolment	Schp	√	X	X
39	secondary school enrolment	Schs	√	X	X

Table 6.2 list of the variables used in the First, Second and Third test(Continue)

	Definition of variables	variable code			
	Dependent variable	FDII	First test	Second test	Third test
40	Tertiary school enrolment	Scht	√	X	X
41	Taxes on income, profits	Taxprofr	√	√	√
42	Taxes payments	Taxpay	√	√	√
43	Tax revenue	Taxrev	√	√	√
44	Telephone mainlines	Tel	√	√	√
45	Time required to start a business	Timeb	√	√	√
46	Unemployment, total	Unem	√	√	√
47	Total wage	Wgelcl	√	X	X
48	Wage to GDP ratio	Wgetogdpl	√	√	√
49	Arabic language dummy	ARB	X	X	√
50	Bureaucracy	bureau	X	X	√
51	International conflict	conflictint	X	X	√
52	Corruption rates	corr	X	X	√
53	Democracy	demo	X	X	√
54	Rule of law	law	X	X	√
55	Ethnic tension	ethnic	X	X	√
56	communist regime	commu	X	X	√
57	Republic regime	repb	X	X	√
58	total surface of the country	surface	X	X	√
59	Countries that their language is English	Eng	X	X	√
60	Countries that their language is Spanish	Spn	X	X	√
61	Countries that their language is French	frc	X	X	√
62	rate of administration efficiency	rtead	X	X	√
63	rate of budget and finance	Rtebudfin	X	X	√
64	East Asia and pacific regional dummy	EAP	X	X	√
65	Europe and central Asia regional Dummy	ECA	X	X	√
66	Latin America and Carabbean regional Dummy	lac	X	X	√
67	Sub –Saharan African regional Dummy	ssa	X	X	√
68	South American regional dummy	sa	X	X	√
69	Middle east and north Africa dummy	mena	X	X	√
70	Countries that are member of WTO	wto	X	X	√
71	gas dummy variables	gasdummy	X	X	√
72	country is landlocked	landlocked	X	X	√
73	oïl dummy variable	oildummy	X	X	√
74	total boundaries of the country are higher than 3	gtbun	X	X	√
75	total boundaries of the country are lower than 3	sbun	X	X	√
76	no boundaries in this country	nobund	X	X	√

Please not that the sign √ refers to included variables
The sign X refers to omitted variables.

6.4 Econometric Results

6.4.1 Robustness Analysis of FDI Determinants

This section presents and discusses the results of our robustness analyses using EBA for each variable of interest I_k. One of our concerns was whether the variables of interest and core variables were robust in determining FDI. The empirical results are presented in different subsections that correspond to the three dimensions along which we explore the robustness of the determinants of FDI. In section 6.4.2 we report the results of EBA robustness tests applied only to economic variables with 6 covariates included in X (as mentioned earlier, this specification is built on the results of the previous chapter) and 42 in Z. Section 6.4.1.2 examines the exogeneity issue and applies EBA with only economic factors, 3 core variables and 25 Z variables. In section 6.4.1.3 EBA is applied to economic, political and geographical variables using the random effects estimator although only three economic variables are included in the core model.

6.4.1.1: Dimension 1: EBA applied with six core economic variables

We shall undertake our analysis on the basis of the following set of regressors. Firstly we take the 6 variables that were presented as being significant determinants of FDI in chapter 4 as our core variable. The results of the first EBA application are summarized in Table 6.4 This table shows which methods lead to findings of robustness for specific variables. The table is organized as follows:

N of Obs in column (1) in Table 6.3 states that 10662 is the maximum number of possible regressions run for each I_K. The second value gives the number of regressions that produced results from each I_K. The difference between the two values is mainly due to insufficient observations preventing the estimation of some models. The total maximum number of regressions run for this dimension (for all 42 variables) is 447804, (= (42)! / (3! (42-3)!)), with over half of these yielding usable results.

Column 5 **(%sign)** reports the percentage of the regressions in which the coefficient of the variable of interest differs significantly from zero. That is, when the t-statistic for I_k has an absolute value larger than approximately two. Column 2 **(AVG γ_k)** and column 3 **(AVG SE (γ_k))** give, respectively, the unweighted averages over all regressions of the estimated coefficients, and their respective standard errors Column 4 **(AVG T)** reports the average absolute value of the T-ratio averaging across all regressions.

The results in columns 6 **(Lbound)** and 7 ((**Ubound**)), give Leamer's lower and upper bounds, respectively. The first result to notice from Table 6.3 is that Leamer's strong EBA-test is only 'passed' by one variable, ratiot, as it has the same sign for both upper and lower bounds. Hence ratiot is robust according to Leamer's criteria. For the remaining 41 I_K variables the lower extreme bound is negative and the upper extreme bound is positive. Therefore, according to Leamer's criteria these 41 variables should not be considered as robust.

In contrast the unweighted CDF approach of Sala- I- Martin calculated with the normal approach is given in column 9 (denoted CDF normal), and using the non normal method in column 9 (CDF non-normal) identifies four variables that appear to be robust as their CDF value is above 0.9.[76]

Our finding within this first dimension states that 4 out of 42 economic variables are robust determinants of FDI according to the Sala -I- Martin criterion (beyond the variables in the core model). The robust variables are, telephone (TEL) as a measure of infrastructure, the tertiary enrolment ratio (RATIOT) as a measure of high quality labor and human capital, FDI outgoing (FDIO) and Government final expenditure (GFE)[77]. As we state in our literature review these variables were found to be determinants of FDI as they were significant with the correct sign within OLS regressions in many empirical studies. (Please see chapter 3 and 4). Finally, it is worth mentioning that three of the four variables that were robust according to the CDF criteria, telephone variable (tel) as measure of infrastructure, Foreign direct investment outflows (FDIO) and tertiary school enrolment (ratiot) are positively related to foreign direct investment (See the column headed AVG γ_k) and statically significant at 5 % level (AVGT). Finally, the coefficient sign on government final expenditure (GFE) in the economy is negative and significant. These results are all in line with the theory.

Other variables such as Central Capital Debit (CCD), Capital Price Index (CPI), GDP per Capita Growth (GDPERG) and Tax on profit (Taxproft) are possible determinants of FDI as their CDF is at least 0.80. One possible explanation of finding just a few robust determinants is that in our conditioning set we included variables that are close substitutes such as CPI and inflation, labor force and total population and even primary, secondary and tertiary schooling ratios. This may indicate that we should look deeper, and think carefully about our selection of the conditioning set of information to avoid any possible multicollinearity.

---

[76] This illustrates how stringent Leamer's criterion is. It seems quite possible that a variable found not to be robust using Leamer's test is a determinant of FDI.

[77] These four variables also feature the highest percentage of models in which I_k was significant (column % sign). These percentages range from 67%-91%. They are also four out of the five variables with an average absolute T- ratio (Avg T) greater than two.

Another interpretation points the existence of a particular specification error or data problem. Although it is virtually impossible to pinpoint the exact source of such problems, there is a problem with two variables where the EBA results could not be obtained, as all their values are zero. The two variables where EBA was not running were the case of exports (ex) and the external balance of payments (EBP). Finally the only variable that passes both the Leamer and Sala-I-Martin test is ratiot. No other variable passes the Leamer criterion even though some are robust according to Sala –I- Martin's criteria.

In this test, we carry out robustness check however; our result presented here may be subject to simultaneity problems. Thus, we test the sensitivity of our results by taking into account endogeneity. This can be addressed by using the instrumental variables (IV) techniques as presented in the following section.

It is worth noting that the BMA and general-to specific model selection procedures used to assess the robustness of growth determinants are very sensitive to the international data sets used, see Ciccone and Jarocinski (2010). Thus, in our testing we are going to use the EBA method due to the nature of our dataset (unbalanced panel) rather than the mentioned procedures; as those one require either balanced panel (BACE) or involve intensive calculations and become infeasible within large explanatory variables (GUM).Table 6.1 below summaries the alternatives approach of measuring model uncertainty (advantages and disadvantages of each method).

Tables 6.3: First test: **Sensitivity results for the I variables (Dependent variable FDI/G)**

total regression:447804	1	2	3	4	5	6	7	8	9	10
						Leamer EBA test		Sala -I-Martin EBA		
	Variables	N of obs	AVG βeta	AVG S.E	t	% sign	L_bound	U_bound	CDFnon normal	CDF normal	robustness
x1	CGD	10662/5828	0.00	0.00	1.05	0.00	-0.004	0.007	0.85	0.80	possible
x2	CPI	10662/6448	0.01	0.01	5.13	0.13	-0.10	0.33	0.81	0.80	possible
x3	EBP	10662/6447	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	not running
x4	EX	10662/6447	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	not running
x5	FDIO	10662/6447	0.34	0.08	5.13	0.91	-1.46	0.54	**0.98**	**1.00**	**robust *****
x6	GCF	10662/6447	0.00	0.04	0.94	0.08	-2.31	0.03	0.79	0.52	fragile
x7	GDPCL	10662/6447	0.00	0.00	0.44	0.00	-0.002	0.006	0.66	0.70	fragile
x8	GDPERG	10662/6448	0.38	0.34	1.68	0.41	-13.19	8.49	0.89	0.87	possible
x9	GDPRL	10662/6447	0.00	0.00	0.50	0.00	-0.005	0.007	0.67	0.75	fragile
x10	GDPRU	10662/6448	0.00	0.00	0.99	0.12	-0.004	0.006	0.78	0.72	fragile
x11	GNIPPPU	10662/6448	0.00	0.00	0.77	0.04	-0.00 3	0.009	0.74	0.54	fragile
x12	GFE	10662/6422	-0.19	0.10	2.24	0.67	-4.22	3.44	**0.92**	**0.97**	**robust****
X13	GNIRU	10662/6448	0.00	0.00	0.97	0.11	0.002	0.007	0.78	0.56	fragile
x14	GS	10662/6447	0.00	0.00	0.71	0.05	-0.004	0.008	0.72	0.55	fragile
x15	HMTAXCOR	10662/6448	0.06	0.09	0.79	0.00	-4.32	1.62	0.77	0.76	fragile
x16	IMP	10662/5454	-0.38	0.91	1.32	0.00	-1.61	1.03	0.90	0.66	fragile
x17	INFLD	10662/6448	0.20	0.24	1.56	0.39	-4.14	7.83	0.87	0.80	fragile
x18	INTERNET	10662/6430	0.00	0.00	1.42	0.15	-0.05	0.04	0.87	0.62	fragile
x19	INTERESPRD	10662/6448	0.01	0.04	0.52	0.00	-1.33	1.87	0.69	0.59	fragile

Tables 6.3 (continue) *First test: Sensitivity results for the I variables(Dependent variable FDI/G)*

total regression:447804	1	2	3	4	5	6	7	8	9	10
						Leamer EBA test		Sala -I-Martin EBA		
	Variables	**N of obs**	**AVG βeta**	**AVG S.E**	**t**	**% sign**	**L_bound**	**U_bound**	**CDFnon normal**	**CDF normal**	**robustness**
x20	**LF**	10662/5890	-6E-10	7E-08	0.54	0.00	-0.001	0.003	0.69	0.50	fragile
x21	**LIQUID**	10662/6448	-0.01	0.02	1.50	0.23	-0.16	0.29	0.89	0.73	fragile
x22	**LIR**	10662/6448	0.00	0.02	0.55	0.00	-0.96	0.63	0.69	0.52	fragile
x23	**NRESERVE**	10662/6448	0.00	0.00	0.73	0.07	0.00	0.00	0.76	0.54	fragile
x24	**POPTL**	10662/6328	0.49	0.69	1.65	0.00	-0.54	0.80	0.87	0.76	fragile
x25	**RAIL**	10662/6446	0.00	0.00	0.47	0.00	-0.09	0.01	0.67	0.57	fragile
x26	**RATIOP**	10662/6390	0.00	0.05	0.92	0.01	-0.59	0.53	0.80	0.52	fragile
x27	**RATIOS**	10662/6391	-0.02	0.05	0.81	0.05	-0.76	0.90	0.77	0.66	fragile
x28	**RATIOT**	10662/10398	0.02	0.01	3.07	0.77	**0.02**	**0.02**	**0.93**	**0.99**	**robust****
x29	**REX**	10662/10660	0.00	0.03	1.01	0.06	-0.71	0.58	0.79	0.56	fragile
x30	**RIR**	10662/10662	-0.02	0.03	0.99	0.01	-0.01	0.30	0.81	0.75	fragile
x31	**ROADS**	10662/10545	0.00	0.00	0.48	0.01	-0.006	0.09	0.66	0.52	fragile
x32	**SCHP**	10662/10662	-0.32	3.44	0.51	0.02	-67.25	52.85	0.67	0.54	fragile
x33	**SCHS**	10662/10480	-0.11	4.16	0.84	0.01	0.00	15.98	0.78	0.51	fragile
x34	**SCHT**	10662/10661	-3.08	6.10	0.78	0.04	-4.02	15.98	0.75	0.69	fragile
x35	**TAXPROFT**	10662/6077	-0.03	0.04	1.63	0.40	-0.07	0.12	0.88	0.80	possible
x36	**TAXPROFR**	10662/6447	-0.02	0.05	1.25	0.19	-0.28	0.95	0.84	0.68	fragile
x37	**TAXREV**	10662/6242	-0.03	0.10	0.69	0.01	-3.87	2.13	0.72	0.64	fragile
x38	**TELEPHONE**	10662/10426	0.02	0.01	3.07	0.77	-0.07	0.11	**0.93**	**0.99**	**robust****
x39	**TIMEB**	10662/10506	0.00	0.04	0.46	0.00	-1.30	0.68	0.65	0.55	fragile
x40	**UNEM**	10662/10590	-0.14	0.21	1.22	0.14	-2.19	2.20	0.85	0.76	fragile
x41	**WGELCL**	10662/10490	0.00	0.00	0.44	0.01	-0.002	0.005	0.65	0.50	fragile
x42	**WGETOGDPL**	10662/10662	0.49	0.69	1.65	0.00	-0.54	0.80	0.76	0.68	Fragile

Notes: 'Avg. Beta' and 'Avg. S.E.' give the unweighted averages over all regressions of the coefficient and the standard error, respectively. '%Sign.' gives the percentage of regressions in which the respective coefficient is statistically significant at the five percent level. 'CDF(0)' yields the result of the CDF criterion as described in the previous section. All variables are sorted according to this criterion. The cut-off value for a variable to be considered robustly linked to our dependent variable is 0.9. Finally, 'Regres.' and 'Avg. Obs.' report the number of regressions run for testing each variable and the average number of observations for each regression. please note that *,**and *** refers to the significances level at 10%,5%and 1% respectively

6.4.1.1.2 The Potential Endogeneity of the Regressors

To obtain a satisfactory econometric model we have to consider the issue of endogeneity as mentioned above. When explanatory variables are endogenous, ordinary least squares (OLS) gives biased and inconsistent estimates of the causal effect of an explanatory variable on the dependent variable. Temple (1999) argues that there exists a robust correlation between investment and growth. Empirically, a number of studies have shown that causality runs from growth to investment and vice versa. We hypothesize that an increase in CAB, GDPG and GDPPPP leads to an increase in FDII and so FDII is positively influenced by CAB, GDPG, and GDPPPP. For example, higher GDPPPP indicates greater aggregate income and or more companies, and therefore a higher ability to invest abroad, while smaller GDPPPP in host country implies limited market size and a consequent desire by companies to expand their operations overseas in order to gain market share.

On the other hand, FDI may affect economic growth directly because it contributes to capital accumulation, and the transfer of new technologies to the recipient country. In addition, FDI enhances economic growth indirectly where the direct transfer of technology augments the stock of knowledge in the recipient country through labor training and skill acquisition, new management practices and organizational arrangements. (Blomstrom, Lipsey, and Zejan, 1996 and Barro and Sala-I- Martin, 1995).

We consider that CAB should be treated like GDP as this variable indicates the financial health of a host country. Hence, we consider possibility of bi-directional causality between CAB and FDI.

Schneider and Frey (1985) found that the current account deficit would contribute to a negative effect on FDI on the balance of payments. Meanwhile, Hassan (2003) demonstrated that a current surplus giving positive impact on FDI inflows.

We use the six core variable used in the first EBA application as our starting point for assessing endogeneity.This can be expressed as follows:

$$FDII/Y = \beta_0 + \beta_1 CAB + \beta_2 OPEN + \beta_3 GDPPPP + \beta_4 GDPG + \beta_5 INFL + \beta_6 TTRADE + \mu_t \ldots \quad (6.11)$$

A common strategy for dealing with endogeneity is to use an instrumental variable estimator. An instrument is an exogenous variable (that is uncorrelated with the error term) that is correlated with a right hand side endogenous variable. We will assess whether the 3 variables CAB, GDPG and GDPPPP, are weakly exogenous or not in equation (6.11).

We first need to consider the issue of Identification refers to the ability to retrieve structural from reduced form parameters. The order condition is a counting rule that is necessary but not sufficient for identification. To over identify a model there should be at least as many instruments as regressors. The next step is to express the potential endogenous variables in terms of exogenous variables, giving the reduced form equations.

The idea is that these equations are free of any reverse causation. Further, because there are more instruments in (6.12) – (6.14) than variables in (6.11) the model satisfies the order condition of over identification

To make this more explicit, consider the following reduced form equations:

$$CAB = \pi_1 + H_1\ OPEN + \Lambda_1\ INFL + \Delta_1\ TTRADE + \Phi_1\ CGD + \Gamma_1\ RATIOT + A_1\ GS + \Sigma_1 GCF + \mu_{1T} \quad (6.12)$$

$$GDPG = \pi_2 + H_2\ OPEN + \Lambda_2\ INFL + \Delta_2\ TTRADE + \Phi_2 CGD + \Gamma_2\ RATIOT + A_2\ GS + \Sigma_2 GCF + \mu_{2T} \quad (6.13)$$

$$GDPPPP = \pi_3 + H_3\ OPEN + \Lambda_3\ INFL + \Delta_3\ TTRADE + \Phi_3 CGD + \Gamma_3\ RATIOT + A_3\ GS + \Sigma_3 GCF + \mu_{3T} \quad (6.14)$$

Where CAB, GDPG, GDPPPP are the potential endogenous variables, and OPEN, INFL, TTRADE, CGD, RATIOT, GS, and GCF are the exogenous instrument variables.[78]

These variables are chosen, as they might be correlated with the endogenous variable but exogenous to FDI. The standard test for instrument relevance (non-weakness) is built on the partial R^2 of the instruments in the estimated reduced form regressions (see Table 6.4 below). The rule of thumb given by Staiger and Stock (1997) is that the F statistic in the reduced form equation should be greater than 10 for a valid instrument equation.Stock and Yogo (2005) provide more precise critical values, ranging from 9.08 (for the three instruments) to 11.52 (for 12 to 14 instruments).

[78] Notice that the vector of variables is the same in each equation. These equations can be estimated using ordinary least squares (OLS) under the assumptions that the instruments are valid.

Table 6.4: Reduced form instrument equations

		FIXED EFFECT									Pooled OLS								
		Potential endogenous variables																	
		CAB			GDPPPP			GDPG			CAB			GDPPPP			GDPG		
		coeff	p-value	t-stat	Coeff	p-value	t-stat	Coeff	p-value	t-stat	Coeff	p-value	t-stat	Coeff	p-value	t-stat	Coeff	p-value	t-stat
Assumed exogenous	C	9.863	(0.000)***	5.597	6403.38	(0.000)***	8.649	-3.546	(0.025)**	-2.238	0.566	0.582*	0.549	11307.85	0.000***	8.092	0.281	(0.661)*	0.438
	OPEN	0.037	(0.021)***	2.300	45.439	(0.000)***	5.929	0.046	(0.005)***	2.81	0.008	0.218*	1.232	63.243	0.000***	6.787	-0.000	(0.896)*	-0.129
	INFL	-0.098	(0.000)***	-3.913	-0.666	(0.724)*	-0.352	-0.026	(0.000)***	-6.343	0.001	0.963*	0.045	-13.686	0.0813**	-1.746	-0.029	(0.000)***	-7.570
	TTRADE	-0.068	(0.071)**	-1.805	-77.939	(0.000)***	-4.668	0.071	(0.054)**	1.926	-0.044	0.016**	-2.409	-367.95	0.000***	-14.243	0.022	(0.08)**	1.743
	CGD	-0.026	(0.006)**	-2.759	-0.152	(0.969)*	-0.038	-0.020	(0.020)**	-2.323	-0.023	0.000***	-4.596	-4.550	0.498*	-0.678	-0.011	(0.000)***	-3.630
	RATIOT	0.118	(0.000)***	4.094	0.632	(0.705)*	0.377	0.023	(0.000)***	6.326	-0.003	0.942*	-0.072	12.276	0.080**	1.751	0.025	(0.000)***	7.465
	GS	1.10E-11	(0.054)**	1.928	2.08E-08	(0.000)***	7.693	-1.75E-12	(0.771)*	-0.290	3.60E-12	0.011**	2.543	1.95E-08	0.000***	9.907	-8,74E-13	(0.360)*	-0.915
	GCF	-0.640	(0.000)***	-9.747	-42.351	(0.128)*	-1.521	0.186	(0.000)***	3.683	-0.087	0.039**	-2.061	-134.56	0.018**	-2.373	0.183	(0.000)***	8.233
	$R^2$0.90	0.738			0.981			0.480			0.085			0.455			0.264		
	F STAT10	14.418			279.07			5.125			6.678			63.199			27.929		
	Prob(f.Stat)	0.000			0.000			0.000			0.000			0.000			0.000		
	N OBS	508			537			552			508			537			552		

*p < 0.1,**p < 0.05,***p < 0.01

The results of the regressions indicate that the instruments are broadly appropriate using the fixed effects estimator as the R^2 of the regression is 73% for CAB, 98% for GDPPPP, and 48 % for GDPG. The F-statistics for testing that the joint significance of the coefficients in the instrument equations is highly significant ($p < 0.001$) in all cases.

Hence, the null hypothesis that the coefficients on the instruments are equal to zero can be rejected (Wooldridge, 2000). Finally, the F-statistic exceeds 10 for both the CAB and GDPPPP instrument equations using the fixed effects estimator, although this is not the case for GDPG.

However, the F-statistic exceeds 10 for the GDPG instrument equation using pooled OLS. We use the instrument equations for all three variables based on the fixed effects estimator because these models exhibit better fit. We bear in mind that the F-test for GDPG is not quite 10 when interpreting the results for GDPG.

We introduced four further (assumed) exogenous variables, CGD, RATIOT, GS and GCF to the three variables assumed exogenous in (6.11), OPEN, INFL and TTRADE to over identify the system. The exogenous instruments allow us to partition the variance of the endogenous explanatory variable into exogenous and endogenous components. The exogenous component is then used in instrumental variable estimation. More specifically, the estimator uses one or more instruments to predict the exogenous component of the potentially endogenous regressor. The predicted values are then used as regressors in the original model, (called the structural equation), which is equation (6.11).

Substituting the fitted reduced –form equations from equation (6.12) - (6.14), into equation (6.11) give:

$$FDII/Y = \beta_0 + \beta_1 Infl + \beta_2 Open + \beta_3 Ttrade + \beta_4 \widehat{Cab} + \beta_5 \widehat{Gdpg} + \beta_6 \widehat{Gdpppp} + \mu_t \quad (6.15)$$

This is a model containing three explanatory variables from (11) that are not being instrumented, followed by the three variables being instrumented($\widehat{Cab}$,$\widehat{Gdpg}$, $\widehat{Gdpppp}$).

The Wu –Hausman test can easily be conducted by adding the residuals of the instrument equations,(12)-(14) to the original model,(11) that is:

$FDII/Y = \beta_0 + \beta_1 Cab + \beta_2 Open + \beta_3 Gdpppp + \beta_4 Gdpg + \beta_5 Infl + \beta_6 Ttrade + \theta_1 resid01cab + \theta_2 residg01 + \theta_3 resid02gdpppp + \mu_t$.....(6.16)

Where resid01cab, residg01, resid02gdpppp are, respectively, the residuals from the instruments equations for Cab, Gdpg and Gdppp (equations (6.12)-(6.14)) using the fixed effects estimator.

The F-test for weak exogeneity is:

$H_0: \theta_1 = \theta_2 = \theta_3 = 0$ the variables are jointly weak exogenous (OLS applied to equation (11) is valid)

$H_0: \theta_1 \neq 0 \cup \theta_2 \neq 0 \cup \theta_3 \neq 0$ the variables are not weakly exogenous (OLS applied to equation (11) is not valid).

The hypotheses for the t-tests for each individual variable are summarised by:

$H_0: \theta_i = 0$, i=1, 2, 3 (weak exogeneity)

$H_0: \theta_i \neq 0$, (weak exogeneity is violated)

Summary of the Wu Hausman test for weak exogeneity

$\widehat{FDI/Y}$=	**-1.450** +	**0.042 OPEN** +	**0.008CAB** +	**0.207GDPG** +	**0.000GDPPPP** +
	(-0.800)	(2.148)	(0.103)	(0.965)	(0.252)
	0.000INFL+	**-0.030TTRADE**+	**-0.202 RESID01CAB** +	**-0.089 RESID02GDPG**+	**0.000RESID03GDPPP**
	(0.029)	(-0.843)	(-2.253)	(-0.413)	(-0.604)
	R^2=0.661	**Adj R^2=0.595**	**Stderror=2.238**	**F-Stat=2.247**	**Prob F= 0.082**

In the equation summarised above the probability value for the F statistic for testing the joint exclusion of resid01cab, resid02gdpg and resid03gdpppp is equal to 0.0822. This means that the three variables are jointly weakly exogenous at the 5% level but not jointly weakly exogenous at the 10 % level.

The result from the t-tests (given in parentheses) on these three residual series indicates that CAB is not weakly exogenous while GDPG and GDPPPP are weakly exogenous. There is some evidence of violated weak exogeneity for all three variables jointly (at the 10% level) and CAB individually. We are also concerned that our instrument equation for GDPG may be weak which may affect the results from the Wu- Hausman test. Further, there are reasons to believe that these three variables are potentially endogenous. We therefore treat them as if they may be endogenous in our subsequent EBA applications because the costs of incorrectly treating exogenous variables as endogenous are much lower than incorrectly assuming endogenous variables as exogenous.

6.4.1.2 Dimension 2: EBA using only economic variables with 3 core covariates using fixed effects estimation

In this dimension of EBA analysis we conduct further tests of the robustness of economic variables by restricting the core model to exactly three variables. This follows Sala - I – Martin's methodology of having regressions with exactly seven independent variables, excluding the constant term. This means one variable of interest (I_k), three core model variables (X) and three other control variables (Z). We select the following three variables to be included in the core model in this application of EBA: OPEN, INFL, and TTRADE. These are three of the variables used in the core model in our previous application of EBA (see section 6.4.1.2). The other three variables included in the core model of our previous EBA application were excluded because they are regarded as potentially endogenous. These excluded variables are: GDPG, CAB, and GDPPPP per capita. In contrast to our previous application of EBA we produce EBA statistics (eg. Leamer's upper and lower bounds and CDF (0)) for these 3 core variables. In addition to those statistics produced forI_k.

The second change that we implement regards the pool of remaining variables, Z. In particular, we reduce the dataset by excluding variables that are close substitutes (the pool of variables drops from 42 to 25 economic variables (plus three potentially endogenous variables that will not be included in the Z set). Limiting the set of the explanatory variables helps avoid potential multicollinearity, which is a problem that invariably arises in EBA analysis. The variables were mainly excluded because they constitute close substitutes: the correlation matrix reveals high correlations (above 0.80) between many variable pairings. (See Table 6.5: Bilateral economic variable correlation matrix).

The potential I_k variables that we focus on are those identified in Table 6.2. They are the 25 Z variables plus the three potentially endogenous variables (GDPG, CAB and GDPPP). We investigate their robustness using a modified program that produces statistics for the core variables as well as the I_k variable. Hence for each I_k variable we will have four sets of EBA results (I_k and the three variables in X). Furthermore in this dimension we test whether GDPG, CAB and GDPPP are endogenous to help ensure that our EBA results are valid obtain a satisfactory econometric models used in EBA valid.

Table 6.4 summarizes the results of this second phase of EBA testing; where for each I_k variable four sets of statistics are reported. These are for the I_k variable and the 3 core model variables (ttrade, open and infl). Several key results are worth mentioning.
The first noticeable result is the number of regressions used to calculate the EBA statistics fluctuates across the I_k variables due to missing data problems. Column (1) shows that for all of the variables about 561 out of 2288 regression results are produced except for the REX variable (where substantially more regressions results are obtained, 1904 out of 2288) and CGD (where slightly fewer results are often obtained).

Table 6.4 indicates that more variables are robust according to Sala -I- Martin's CDF criteria compared to the EBA tests discussed in section 6.3.2 Table 6.4 reveals that normal CDF non normal CDF criteria yield the same inference. Some of the economic variables that we found to be robust before (FDIO and GFE) in the first test (section 6.3.2.2) remain robust as well in this test. However, others are no longer robust determinants of FDI, such as RATIOT and TEL. The openness core variable is robust in 27 out of 28 sets of EBA results. (The exception is for the timeb variable where CDF n is 0.760 and CDF non-n is 0.74).

Overall we regard this as evidence supporting the robustness of open as one of the main determinants of FDI.

The Ttrade core variable is only robust in three (UNEM, CGD, TEL) out of 28 sets of EBA. The last core variable named INFL is robust according to the CDF criteria for one (RATIOT) out of the 28 EBA sets. Hence, we do not consider this as strong evidence that ttrade or infl are robust determinants of FDI.

Four noncore variables are robust determinants of FDI according to Sala –I-Martin criteria being HMTAXCOR, RATIOS, FDIO and GFE as their CDFs (see CDF normal in column 9 and CDF non normal in column 8) exceed 0.90. Two variables can be considered as possible determinants because their normal CDF is between 0.80% and 0.89%, being WGETOGDPL, and *TAXPROFT*. This later variable was previously found to be a possible determinant of FDI as well. (See Table 6.4). These robust variables are in line with the theoretical expectation as previous studies found them significant with the correct sign. All of the other variables seem to be fragile. Finally, none of the variables in this EBA analysis are robust according to the Leamer test.

Looking to the sign of average γ_k (column 2) and the average t– ratio (column 4) for the robust variables revels that OPEN, GDPG,TTRADE, FDIO, GFE exhibit the expected sign and are found to be significant (avgT> 2) while the variables HMTAXCOR and Ratios are significant (according to avgT) however with a theoretically unexpected sign .

Concerning the three variables that we regard as potentially endogenous only GDPG whereas Cab is fragile determinant of FDI according to Sala -I-Martin CDF criterion. However the result regarding GDPPPP per capita IN PPP variable is unambiguously as we found it robust according to CDF non normal in column 8 and possible within normal distribution in column 9. Given the possible endogeneity of these three variables we treat the EBA results regarding these three variables with cautions.

Table 6.5: Bilateral economic variable correlation Matrix (1970-2006)

Balanced sample (listwise missing value deletion)

Correlation	CPI	EBP	EX	GDPCL	GDPERG	GDPRL	GDPRU	GNIPPP	GNIRU	IMP	INFLD	LF	TXPROFR	TXPROFT	INFL	WGELCL	WGE/GDPL	RATIOP	RATIOS	RATIOT	SCHT	SCHS	SCHP	OPPENESS	POPACT
CPI	1																								
EBP	0.03	1																							
EX	0.10	0.38	1																						
GDPCL	0.06	0.10	-0.09	1																					
GDPERG	0.24	-0.06	0.13	**0.87**	1																				
GDPRL	0.07	0.02	-0.02	**0.79**	**0.88**	1																			
GDPRU	0.00	0.03	-0.19	**0.95**	**0.96**	**0.87**	1																		
GNIPPPU	0.01	0.04	-0.24	**0.85**	**0.72**	**0.97**	**0.97**	1																	
GNIRU	0.00	0.02	-0.19	**0.72**	**0.64**	**1.00**	**1.00**	**0.97**	1																
IMP	0.09	-0.17	**0.85**	-0.16	0.18	-0.04	-0.22	-0.27	-0.22	1															
INFLD	**0.72**	0.33	0.35	0.11	0.27	0.01	0.10	0.10	0.10	0.18	1														
LF	0.00	0.04	-0.26	0.16	0.01	0.01	0.31	0.52	0.31	-0.30	-0.06	1													
TAXPROFR	-0.14	0.23	0.00	0.07	-0.13	0.05	0.31	0.32	0.30	-0.13	0.02	0.15	1												
TAXPROFT	-0.13	0.33	0.05	0.10	-0.14	0.02	0.42	0.42	0.42	-0.14	0.11	0.14	**0.87**	1											
INFL	-0.18	-0.10	-0.07	-0.01	-0.11	0.01	-0.02	-0.03	-0.02	-0.01	**0.85**	-0.01	-0.07	-0.08	1										
WGELCL	0.07	0.02	-0.02	0.03	-0.15	**1.00**	-0.01	0.00	-0.01	-0.04	0.01	0.01	0.04	0.02	0.01	1									
WGE/GDPL	-0.03	-0.26	0.13	-0.14	-0.17	0.01	-0.13	-0.18	-0.13	0.28	-0.17	-0.24	-0.14	-0.09	0.04	**0.87**	1								
RATIOP	0.14	0.32	0.22	-0.06	0.07	-0.01	0.12	0.08	0.12	0.05	**0.72**	-0.17	0.24	0.31	-0.11	-0.01	-0.12	1							
RATIOS	0.17	0.24	0.02	0.02	0.11	-0.03	0.28	0.24	0.28	-0.11	**0.64**	-0.10	0.19	0.26	-0.09	-0.03	-0.24	**0.79**	1						
RATIOT	-0.15	-0.10	-0.06	-0.01	-0.10	0.01	-0.02	-0.02	-0.02	-0.01	-0.14	-0.02	-0.07	-0.08	0.02	0.01	0.05	-0.10	-0.08	1					
SCHT	0.16	0.24	0.01	0.00	0.09	-0.03	0.28	0.24	0.28	-0.12	0.60	-0.10	0.20	0.27	-0.08	-0.03	-0.23	**0.79**	**1.00**	**0.97**	1				
SCHS	0.12	0.30	0.18	-0.09	0.02	-0.01	0.12	0.08	0.12	0.03	0.62	-0.17	0.26	0.32	-0.09	-0.01	-0.08	**0.99**	**0.76**	-0.08	**0.77**	1			
SCHP	-0.06	-0.27	-0.20	0.00	-0.15	-0.02	-0.07	-0.06	-0.07	-0.06	-0.53	0.04	-0.02	-0.10	0.05	-0.02	0.13	**0.99**	-0.31	0.04	-0.28	-0.24	1		
OPPENESS	0.10	**0.85**	**0.96**	-0.13	0.16	-0.03	-0.22	-0.26	-0.22	**0.96**	0.28	-0.29	-0.06	-0.04	-0.04	-0.03	0.21	0.15	-0.04	-0.03	-0.06	0.11	-0.13	1	
POPACT	0.10	-0.05	0.02	0.08	0.01	-0.02	0.00	0.01	0.00	0.05	0.12	**0.99**	0.01	-0.02	-0.06	-0.02	0.05	0.18	0.11	-0.06	0.12	0.20	**0.76**	0.04	1

*Bold figures indicates highly correlation coefficients

Table 6.6 : **Second test :Sensitivity results for the I variables (Dependent variable FDI/G)**

	total regression:256256	1	2	3	4	5	6	7	8	9	10
							Leamer EBA test		Sala -I-Martin EBA		
	variables	control variable	N of obs	AVG βeta	AVG S.E	T	% sign	lower bound	upper bound	CDFnon normal	CDF normal	robustness
x1	**gdppppp**	Ttrade	2288/561	-0.002	0.059	0.000	0.073	-1.20	1.30	0.736	0.512	fragile
		Open	2288/561	0.059	0.019	3.116	0.907	-0.03	0.31	**0.986**	**0.999**	**robust** ***
		gdppppp	2288/561	0.000	0.000	2.052	0.618	0.00	0.00	**0.939**	0.881	possible
		Infl	2288/561	-0.003	0.010	1.034	0.098	-0.51	0.70	0.806	0.623	fragile
x2	**gdpg**	Ttrade	2288/561	0.000	0.059	0.000	0.111	-1.26	1.27	0.754	0.503	fragile
		Open	2288/561	0.053	0.019	2.816	0.832	-0.06	0.33	**0.983**	**0.997**	**robust****
		Gdpg	2288/561	0.078	0.052	1.896	0.395	-0.60	0.81	0.717	0.931	robust*
		Infl	2288/561	-0.001	0.011	0.847	0.057	-0.52	0.72	0.764	0.524	fragile
x3	**cab**	Ttrade	2288/561	-0.008	0.061	0.000	0.173	-1.37	1.19	0.747	0.554	fragile
		Open	2288/561	-0.124	0.052	3.587	0.646	-1.11	0.38	**0.920**	**0.992**	**robust****
		Cab	2288/561	-0.001	0.011	0.847	0.057	-0.52	0.72	0.764	0.524	fragile
		Infl	2288/561	-0.003	0.013	1.107	0.138	-0.52	0.75	0.813	0.605	fragile
x4	**cgd**	Ttrade	2288/560	0.696	0.110	0.565	0.011	-2.92	1.99	**0.756**	**1.000**	**robust****
		Open	2288/558	0.914	0.028	3.191	0.927	-0.09	0.46	**0.994**	**1.000**	**robust****
		Cgd	2288/564	-0.005	0.024	0.620	0.020	-0.43	0.25	0.700	0.585	fragile
		Infl	2288/341	-0.011	0.021	0.418	0.021	-0.80	1.27	0.442	0.705	fragile
x5	**fdio**	Ttrade	2288/560	0.002	0.061	0.903	0.098	-1.24	1.23	0.756	0.516	fragile
		Open	2288/560	0.056	0.019	3.092	0.936	-0.08	0.29	**0.993**	**0.998**	**robust****
		Fdio	2288/560	0.355	0.096	4.077	0.948	-0.77	1.10	**0.995**	**1.000**	**robust****
		Infl	2288/560	-0.003	0.013	1.060	0.093	-0.50	0.77	0.813	0.574	fragile
x6	**gcf**	Ttrade	2288/560	0.003	0.059	0.945	0.113	-1.13	1.20	0.764	0.518	Fragile
		Open	2288/560	0.057	0.019	3.074	0.913	-0.04	0.31	**0.990**	**0.999**	**robust****
		Gcf	2288/560	0.057	0.073	1.499	0.304	-0.59	1.52	0.835	0.781	fragile
		Infl	2288/560	-0.002	0.010	0.993	0.082	-0.41	0.87	0.797	0.571	Fragile

See Table 6.3 for the explanation of the abbreviations used

Tables 6.6 (continue)

Second test :Sensitivity results for the I variables(Dependent variable FDI/G)

total regression:256256		1	2	3	4	5	6	7	8	9	10
							Leamer EBA test		Sala -I-Martin EBA		
	Variables	control variable	N of obs	AVG βeta	AVG S.E	t	% sign	lower bound	upper bounc	CDFnon normal	CDF normal	Robustness
X7	**GFE**	Ttrade	2288/561	0.009	0.059	0.907	0.096	-0.783	1.278	0.758	0.560	**Fragile**
		Open	2288/561	0.006	0.002	3.22	0.931	-0.03	0.28	**0.93**	**1.00**	**robust*** **
		Gfe	2288/561	-0.174	0.112	1.496	0.261	-3.57	0.40	1.096	0.940	**robust***
		Infl	2288/561	-0.003	0.010	0.854	0.059	-0.44	0.70	0.487	0.608	Fragile
x8	**Gs**	Ttrade	2288/561	0.002	0.065	0.879	0.091	-1.37	1.22	0.750	0.510	Fragile
		Open	2288/561	0.060	0.020	3.154	0.934	0.01	0.33	**0.992**	**0.999**	**robust*** **
		Gs	2288/561	0.000	0.000	0.707	0.011	0.00	0.00	0.733	0.718	Fragile
		Infl	2288/561	-0.002	0.011	0.963	0.082	-0.63	0.65	0.789	0.568	Fragile
x9	**Hmtaxcor**	Ttrade	2288/561	0.034	0.099	0.441	0.000	-2.92	1.99	0.665	0.636	Fragile
		Open	2288/561	0.108	0.037	3.002	0.863	-0.17	0.46	**0.984**	**0.998**	**robust*** **
		hmtaxcor	2288/561	0.157	0.076	2.039	0.645	-0.56	0.00	**0.940**	**0.981**	**robust*** **
		Infl	2288/561	-0.013	0.065	0.592	0.000	-0.98	1.68	0.699	0.579	Fragile
x10	**Internet**	Ttrade	2288/561	0.046	0.071	0.910	0.080	-1.23	1.40	0.764	0.739	Fragile
		Open	2288/561	0.073	0.021	3.450	0.957	-0.03	0.32	**0.994**	**1.000**	**robust*** **
		internet	2288/561	-0.001	0.002	1.098	0.039	-0.02	0.01	0.764	0.636	Fragile
		Infl	2288/561	0.001	0.013	1.246	0.204	-0.53	0.69	0.837	0.527	Fragile
x11	**Intresprd**	Ttrade	2288/562	0.014	0.070	0.898	0.071	-2.92	1.99	0.770	0.581	Fragile
		Open	2288/562	0.064	0.021	3.147	0.934	-0.09	0.39	**0.991**	**0.999**	**robust*** **
		interesprd	2288/562	0.019	0.041	0.781	0.036	-0.65	1.72	0.753	0.679	Fragile
		Infl	2288/562	-0.005	0.016	0.850	0.025	-0.71	1.68	0.770	0.624	Fragile
x12	**Liquid**	Ttrade	2288/561	-0.010	0.064	1.074	0.196	-1.55	1.80	0.775	0.563	Fragile
		Open	2288/566	0.031	0.019	2.033	0.500	-0.11	14.00	**0.906**	**0.951**	**robust***
		Liquid	2288/561	0.010	0.026	1.517	0.273	-0.30	0.62	0.880	0.648	Fragile
		Infl	2288/561	0.007	0.021	1.143	0.068	-0.80	0.80	0.832	0.627	Fragile

See Table 6.3 for the explanation of the abbreviations used

Table 6.6 (continue)
Second test :Sensitivity results for the I variables (Dependent variable FDI/G)
total regression:256256

			1	2	3	4	5	6	7	8	9	10
								Leamer EBA test		Sala -I-Martin EBA		
	Variables	control variable	N of obs	AVG βeta	AVG S.E	t	% sign	lower bound	upper bound	CDFnon normal	CDF normal	Robustness
x13	**Lir**	Ttrade	2288/561	0.013	0.065	0.797	0.057	-1.65	1.27	0.750	0.577	Fragile
		Open	2288/561	0.062	0.020	3.148	0.934	-0.03	0.39	**0.993**	**0.999**	**robust*** **
		Lir	2288/561	-0.004	0.020	0.803	0.048	-0.37	0.74	0.751	0.579	Fragile
		Infl	2288/561	-0.003	0.013	0.853	0.045	-0.61	0.98	0.768	0.606	Fragile
x14	**Nreserve**	Ttrade	2288/561	-0.006	0.102	0.820	0.071	-4.38	3.43	0.744	0.522	Fragile
		Open	2288/561	0.053	0.028	2.659	0.745	-0.33	0.40	**0.929**	**0.972**	**robust** **
		nreserve	2288/561	0.000	0.000	0.519	0.002	0.00	0.00	0.682	0.544	Fragile
		Infl	2288/561	0.015	0.034	0.947	0.052	-0.76	2.04	0.793	0.665	Fragile
x15	**Poptl**	Ttrade	2288/561	0.040	0.080	0.670	0.018	-1.42	1.36	0.670	0.694	Fragile
		Open	2288/561	0.069	0.024	2.734	0.848	-0.06	0.37	**0.985**	**0.998**	**robust*** **
		Poptl	2288/561	0.008	0.052	0.759	0.005	-0.82	0.48	0.749	0.558	Fragile
		Infl	2288/561	-0.004	0.023	0.995	0.095	-0.63	0.79	0.793	0.570	Fragile
x17	**Rail**	Ttrade	2288/562	0.005	0.101	0.868	0.071	-2.92	1.99	0.759	0.520	Fragile
		Open	2288/562	0.072	0.027	2.725	0.834	-0.09	0.46	**0.981**	**0.996**	**robust*** **
		Rail	2288/562	0.000	0.000	0.522	0.013	-0.01	0.00	0.679	0.600	Fragile
		Infl	2288/562	-0.002	0.023	0.756	0.018	0.00	0.00	0.749	0.526	Fragile
x18	**Ratiop**	Ttrade	2288/562	0.034	0.084	0.613	0.004	-1.68	1.15	0.715	0.659	Fragile
		Open	2288/562	0.069	0.025	2.660	0.823	-0.04	0.41	**0.982**	**0.997**	**robust*** **
		Ratiop	2288/562	-0.019	0.047	0.759	0.018	-0.71	0.41	0.742	0.660	Fragile
		Infl	2288/562	0.001	0.016	0.823	0.007	-0.53	0.66	0.770	0.524	Fragile
x19	**Ratios**	Ttrade	2288/561	0.047	0.108	0.667	0.020	-2.16	1.94	0.723	0.668	Fragile
		Open	2288/561	0.068	0.027	2.525	0.843	-0.14	0.40	**0.980**	**0.995**	**robust*** **
		Ratios	2288/561	-0.055	0.039	1.473	0.116	-0.39	0.31	**0.905**	**0.922**	**robust***
		Infl	2288/561	0.005	0.023	0.750	0.011	-0.80	1.27	0.748	0.577	Fragile

See Table 6.3 for the explanation of the abbreviations used

Table 6.6 (Continue)

Second test :Sensitivity results for the I variables (Dependent variable FDI/G)

	total regression:256256		1	2	3	4	5	6	7	8	9	10
								Leamer EBA test		Sala -I-Martin EBA		
	Variables	control variable	N of obs	AVG βeta	AVG S.E	t	% sign	lower bound	upper bound	CDFnon normal	CDF normal	Robustness
X20	**Ratiot**	Ttrade	2288/1904	0.007	0.059	0.893	0.093	-1.261	1.342	0.752	0.744	**Fragile**
		Open	2288/561	0.057	0.019	3.118	0.902	-0.03	0.32	0.987	0.999	**robust****
		Ratiot	2288/561	0.018	0.026	1.153	0.196	-0.61	0.88	0.987	0.750	Fragile
		Infl	2288/561	-0.020	0.029	1.187	0.216	-0.76	0.76	0.809	0.962	**robust****
x21	**Rex**	Ttrade	2288/1904	0.155	0.189	0.128	0.296	-8.08	1.08	0.824	0.794	Fragile
		Open	2288/1904	0.155	0.039	0.625	0.702	-0.74	0.29	0.952	1.000	robust**
		Rex	2288/1904	-0.015	0.027	0.242	0.005	-0.56	0.12	0.720	0.715	Fragile
		Infl	2288/1788	0.058	0.075	0.134	0.045	-1.43	1.93	0.766	0.779	Fragile
x22	**Rir**	Ttrade	2288/561	0.013	0.064	0.817	0.064	-1.64	1.22	0.753	0.579	Fragile
		Open	2288/561	0.062	0.020	3.141	0.921	-0.04	0.38	0.992	0.999	**robust****
		Rir	2288/561	-0.007	0.028	0.649	0.014	-0.73	0.64	0.713	0.596	Fragile
		Infl	2288/561	0.002	0.005	0.551	0.048	-0.69	1.02	0.518	0.656	Fragile
x23	**Roads**	Ttrade	2288/561	0.058	0.075	0.134	0.045	-1.43	1.93	0.766	0.779	Fragile
		Open	2288/561	0.044	0.022	2.112	0.561	-0.12	0.28	0.951	0.980	**robust****
		Roads	2288/561	0.000	0.000	0.402	0.005	0.00	0.00	0.645	0.563	Fragile
		Infl	2288/561	-0.004	0.020	1.094	0.086	-0.64	1.13	0.812	0.570	Fragile
x24	**Taxprofr**	Ttrade	2288/561	-0.007	0.060	0.056	0.118	-1.38	1.22	0.757	0.544	Fragile
		Open	2288/561	0.061	0.019	3.314	0.916	-0.03	0.33	0.991	0.999	**robust****
		Taxprofr	2288/561	-0.041	0.040	1.248	0.154	-0.53	0.44	0.840	0.842	Possible
		Infl	2288/561	-0.002	0.011	0.953	0.088	-0.64	0.75	0.784	0.586	Fragile

See Table 6.3 for the explanation of the abbreviations used

Table 6.6(Continue)

Second test :Sensitivity results for the I variables(Dependent variable FDI/G)

total regression:256256	1	2	3	4	5	6	7	8	9	10
						Leamer EBA test		Sala -I-Martin EBA		
	Variables	control variable	N of obs	AVG βeta	AVG S.E	t	% sign	lower bound	upper bound	CDFnon normal	CDF normal	robustness
X25	**Tel**	Ttrade	2288/561	0.063	0.060	1.173	0.109	-1.12	1.15	0.845	0.854	possible
		Open	2288/561	0.057	0.017	2.519	0.734	-0.02	0.30	**0.958**	**1.000**	**robust****
		Tel	2288/561	-0.004	0.019	1.048	0.104	-0.98	0.58	0.805	0.583	fragile
		Infl	2288/561	-0.004	0.019	1.048	0.104	-0.98	0.58	0.805	0.583	fragile
x26	**Timeb**	Ttrade	2288/561	-0.088	0.353	0.530	0.000	-12.10	4.33	0.675	0.598	fragile
		Open	2288/561	0.020	0.072	0.500	0.020	-0.61	0.60	0.672	0.607	fragile
		Timeb	2288/561	-0.025	0.039	0.810	0.045	-0.24	0.28	0.760	0.741	fragile
		Infl	2288/561	0.141	0.177	0.949	0.007	-1.58	5.24	0.808	0.807	possible
x27	**Unem**	Ttrade	2288/561	0.078	0.089	0.996	0.023	-2.04	1.33	0.807	0.812	possible
		Open	2288/561	0.091	0.023	3.974	0.988	-0.02	0.38	**0.999**	**1.000**	**robust*****
		Unem	2288/561	-0.104	0.140	0.781	0.054	-3.51	0.50	0.744	0.771	fragile
		Infl	2288/561	-0.010	0.022	1.098	0.123	-0.63	1.18	0.814	0.684	fragile
x28	**Wgetogdl**	Ttrade	2288/561	0.028	0.070	0.793	0.059	-1.29	1.28	0.740	0.653	fragile
		Open	2288/561	0.061	0.020	3.142	0.911	-0.03	0.32	**0.988**	**0.999**	**robust****
		Wgetogdl	2288/561	24.180	27.735	1.274	0.186	-516.57	338.46	0.836	0.808	possible
		Infl	2288/561	-0.005	0.010	1.142	0.154	-0.54	0.71	0.811	0.682	fragile

See Table 6.3 for the explanation of the abbreviations used

6.4.1.3 Dimension 3 EBA for economic, geographical and political indicators using random effects estimation

So far, in our EBA robustness analysis we have used only economic variables and employed the fixed effects estimation procedure. In this subsection, we extend our analysis in two ways. First, we add 28 geographical and political variables to the existing 28 economic variables used in the EBA analysis applied in section 6.4.3 (second test, Table 6.2). This will allow us to test the robustness of an extended set of variables. We apply the random effects estimator because the fixed effects estimator cannot be used since many of the geographical and political variables are perfectly multicollinear with the fixed effects. However the geopolitical variables are not included in the core model (only three economic variables are). Neither are included in z set (this to ensure that perfect multicollinearity does not arise). This means that all the geopolitical variables are considered (in turn) as the variable of interest (I_k) only and the remaining 25 economic variables are considered in turn as the variable of interest and in the combinations of the three variables used in Z. This means that all of the remaining economic and geopolitical variables are considered (in turn) as the variable of interest (I_k) and the combinations of the three variables used in Z.

Concerning the three potentially endogenous economic variables (CAB, GDPG, GDPPPP per capita PPP), we consider them as we did in our second EBA analysis and (section 6.4.1.2) by allowing them to be used one by one as variables of interest (I_k) and to exclude them from (Z). As mentioned previously in the second test the reason for this restriction is to limit the problem of multicollinearity affecting the conclusion regarding robustness.

Second, we change the set of variables in the core model by using variables that we found to be robust determinants of FDI from our analysis in section 6.4.3. We still use three variables in the core model however we change the composition of our core model. That is, we replace inflation with the secondary enrolment ratio because the former was not robust while the latter was in the second EBA conducted in section 6.4.1.2.

The second change made to the core model set is that we replace tax on trade (TTRADE) with government final expenditure (GFE).

The reason behind this is because GFE is robust in both the first and second EBA analyses at the 1% level according to the Sala -I-Martin criteria However TTRADE was robust in only the second EBA application (see Table 6.2 (second test) and 6.4). Further, the GFE variable seems to be less controversial and problematic from our discussion in the literature review compared to TTRADE. We keep the openness variable in the core model as we found this variable to be robust in all of our earlier results. Within this dimension only the I_k variables are tested for robustness and the core variables are not. This is due to the larger number of variables (compared to the previous section) which made it infeasible to apply to program.

The results of our EBA analysis including both economic and geopolitical variables are summarized in Table 6.10 below. A quick look at column (8 and 9), reveal that according to Sala -I-Martin's criteria (CDF normal and non normal) only 11 out of 56 variables (not included in the core model) can be considered as robust determinants of FDI as their CDF are above 0.90. As expected those variables are mainly geopolitical, (8 geopolitical and 3 economic variables) South American regional dummy (SA), GTBUN, country landlocked dummy (land locked), English language dummy (ENG), Arabic language (arb),Democratic accountability dummy (demo), international and internal conflict(conflictint) , East Asia and pacific regional dummy (eap), telephone (TEL) as a measure of infrastructure, the tertiary enrolment ratio (RATIOT) as a measure of high quality labor and human capital , Gross Capital formation (GCF) as measure of investment; the result suggest that FDI is influenced by country characteristics such as and English languages, absence of international conflict in host country as well as better democracy, the table indicates as well that the highest CDF criterion is the Arab dummy followed by south American regional dummy. The result regarding the last mentioned variable (SA) is consistent with the empirical evidence that South American country received the largest share of FDI.

Vial (2002) pointed many reasons behind the increase of FDI justify the high inflow of FDI to this particular region such as the change in the political climate and the receptivity towards foreign capital. Second, the process of reforms through which these countries have gone through. A third explanation is the new business climate in natural Resource sectors. Arabic is common to all Arab countries. This variable is used to take into account the level of proximity of source and host countries sharing the same colonial history, which leads to common business and legislation language.

Concerning the three variables that we regard as potentially endogenous CAB and GDP per PPP are found to be robust according to according to Sala -I-Martin CDF criterion (For both CDF normal and non normal) whereas Cab is found to be fragile .

Finally it is worth mentioning that in our testing we find no evidence that trade agreements measured by WTO dummy neither countries with lower wages exert robust effects on FDI.

In this test as well, none of the 56 variables in this EBA analysis are robust according to the Leamer test.

Table 6.10: Third test :Sensitivity results for the I variables (Dependent variable FDI/G)

total regression =1312024	1	2	3	4	5	6	7	8	9	10
						Leamer EBA test		Sala -I-Martin EBA		
	variables	N of obs	AVG βeta	AVG S.E	t	% sign	L_bound	U_bound	CDFnon normal	CDF normal	Robustness
x1	**Arb**	23429/9081	11.9602	1.1798	1.9590	0.3176	-4.2451	1.0000	**0.99**	**1.00**	**robust *** **
x2	Sa	23429/9083	16.6242	4.2531	2.5315	0.4046	-3.2221	28.6038	**0.97**	**1.00**	**robust *** **
x3	Gdpppp	23429/10543	0.0003	0.0001	2.0663	0.4252	-0.0003	0.0007	**0.95**	**0.99**	**robust *** **
x4	Tel	23429/16049	0.0120	0.0064	1.6330	0.4124	-0.0108	0.0064	**0.96**	**0.97**	**robust ** **
x5	Gcf	23429/9102	0.2132	0.1104	4.1021	0.6658	-1.1928	1.8089	**0.91**	**0.97**	**robust ** **
X6	Gtbun	23429/159999	16.6242	4.2531	2.5315	0.4046	-1.1928	1.8089	**0.91**	**0.97**	**robust ** **
X7	Cab	23429/9804	-0.1433	0.0809	4.5251	1.078	-0.4716	1.3036	**0.93**	**0.96**	**robust ** **
X8	Ratiot	23429/17804	-6.0035	3.3854	1.7566	0.386	-51.900	21.4039	**0.91**	**0.96**	**robust ** **
X9	landunlock	23429/16728	0.0812	0.0506	1.6974	0.4153	-6.8580	5.3526	**0.91**	**0.94**	**robust * **
X10	Eng	23429/14986	0.0930	0.0569	1.7180	0.3477	-6.8580	5.3526	**0.90**	**0.94**	**robust * **
X11	Demo	23429/16001	0.3388	0.2247	1.5373	0.255	-0.4587	0.5184	**0.90**	**0.93**	**robust * **
X12	conflictint	23429/10730	-0.2300	0.2962	2.0416	0.618	-8.3266	0.000	**0.91**	**0.92**	**robust * **
X13	Eap	23429/9103	-4.536	3.374	1.7298	0.369	-27.229	32.1338	**0.92**	**0.91**	**robust * **
X14	Sbun	23429/9102	2.0084	2.2390	0.8524	0.037	-2.4458	13.9399	0.86	0.89	Possible
X15	oildummy	23429/17832	1.2340	1.0323	0.1950	0.0089	-0.5118	0.8173	0.86	0.88	Possible
X16	Taxrev	23429/16024	0.2480	0.2057	1.2881	0.1467	-0.3450	1.7139	0.86	0.88	Possible
X17	Repb	23429/15071	-0.0703	0.0589	1.2331	0.0782	-0.1846	0.0791	0.85	0.88	Possible
X18	Eca	23429/23429	2.7221	2.3560	0.4275	0.231	-8.87	14.12	0.87	0.87	Possible
X19	Liquid	23429/16015	-0.0097	0.0083	1.1977	0.2097	-0.0612	0.0220	0.81	0.87	Possible
X20	gasdummy	23429/9102	2.5577	2.1858	0.7729	0.01395	-2.0378	16.8772	0.74	0.87	Possible
X21	Surface	23429/18745	0.000	0.000	0.171	0.0001	-0.000003	0.045132	0.84	0.86	Possible
x22	hmtxcor	23429/15568	1.35E-05	1.27E-05	5.33E-03	5.14E-04	-4.30E-16	4.51E-02	0.85	0.85	Possible
X23	Rir	23429/14719	1.43E-05	1.35E-05	2.82E-03	7.35E-01	-1.52E-15	4.51E-02	0.85	0.85	Possible
X24	Frc	23429/15012	0.0521	0.0487	1.0880	0.02411	-0.0572	0.0523	0.84	0.85	Possible
X25	Unem	23429/16008	-0.2024	0.1951	0.9367	0.0424	-2.5418	1.5523	0.80	0.85	Possible
X26	Timeb	23429/14965	0.0090	0.0129	1.1011	0.022	-0.0330	0.0250	0.84	0.84	Possible

See Table 6.3 for the explanation of the abbreviations used

Table 6.10 (continue)
Third test :Sensitivity results for the I variables(Dependent variable FDI/G)

total regressior = 1312024	1	2	3	4	5	6	7	8	9	10	
							Leamer EBA test		Sala -I-Martin EBA		
	variables	N of obs	AVG βeta	AVG S.E	t	% sign	L_bound	U_bound	CDFnon normal	CDF normal	robustness
x27	**parl**	23429/8864	-0.9174	2.5970	1.1759	0.15456	-43.1622	21.2696	0.83	0.83	possible
x28	poptl	23429/9102	-0.1417	0.1974	0.9650	0.1098	-2.0254	1.6401	0.78	0.78	fragile
X29	gdpg	23429/9804	0.0240	0.1169	0.9515	0.12699	-1.2354	1.4391	0.71	0.77	fragile
x30	Law	23429/13617	0.1106	0.1928	1.0281	0.044	-1.0614	0.5079	0.71	0.77	fragile
X31	mena	23429/16005	-1.9662	3.6284	0.7198	0.0053	-27.5371	26.5445	0.70	0.74	fragile
x32	**ssa**	23429/9102	-1.47	2.39	0.70	0.03	-17.62	15.57	0.73	0.73	fragile
x33	Lac	23429/16007	0.1463	2.7471	0.7145	0.0486	-7.0586	21.1493	0.72	0.72	fragile
X34	wgetogdpl	23429/15014	-10.307	37.2500	0.6203	0.0162	-125.129	247.177	0.60	0.71	fragile
X35	spn	23429/9102	-1.4336	3.0052	0.5519	0.00066	-15.7321	18.8872	0.70	0.70	fragile
X36	ttrade	23429/15999	-0.0058	0.0385	0.5760	0.0301	-0.2422	0.1091	0.68	0.69	fragile
X37	REX	23429/15974	-0.0096	0.0459	-0.1042	0.0105	-0.9148	0.0459	0.68	0.68	fragile
X38	Wto	23429/9189	-0.2713	4.1316	0.7054	0.0922	0.0000	53.2002	0.67	0.67	fragile
X39	roads	23429/14997	8.08E-07	2.21E-06	3.63E-01	0.00E+00	-5.41E-06	8.88E-06	0.63	0.64	fragile
X40	Rail	23429/15014	0.000	0.000	0.402	0.0001	-0.0003	0.0002	0.64	0.57	fragile
X41	nobund	23429/9102	-0.8505	3.0892	0.4733	0.00110	-13.0093	18.9804	0.60	0.60	fragile
X42	bureau	23429/16656	3.47E-18	1.24E-11	1.64E-03	6.64E-05	-6.78E-15	2.77E-09	0.56	0.56	fragile
X43	cgd	23429/15952	1.56E-19	3.03E-16	1.16E-02	3.76E-04	-9.00E-17	9.04E-16	0.540	0.540	fragile

See Table 6.3 for the explanation of the abbreviations used

See Table 6.3 for the explanation of the abbreviations used

Table 6.10 (continue)

Third test :Sensitivity results for the I variables (Dependent variable FDI/G)

total regression =1312024	1	2	3	4	5	6	7	8	9	10	
							Leamer EBA test		Sala -I-Martin EBA		
	variables	N of obs	AVG βeta	AVG S.E	t	% sign	L_bound	U_bound	CDFnon normal	CDF normal	robustness
x44	corr	23429/16740	-3.43E-19	8.76E-13	5.30E-03	8.68E-04	-5.40E-16	4.35E-10	0.570	0.583	fragile
X45	ethnic	23429/16724	4.58E-18	7.65E-12	2.12E-03	0.00E+00	-9.95E-16	3.43E-15	0.527	0.529	fragile
X46	fdio	23429/13991	2.05E-19	2.14E-12	7.85E-04	0.00E+00	-3.93E-16	1.52E-15	0.593	0.601	fragile
X47	gs	23429/15009	-1.32E-28	1.54E-22	5.53E-04	0.00E+00	-3.88E-25	1.21E-19	0.559	0.559	fragile
X48	internet	23429/15929	-2.02E-20	3.27E-12	9.76E-04	6.28E-05	-6.78E-16	1.19E-09	0.581	0.592	fragile
X49	infl	23429/17823	9.35E-20	6.02E-13	4.74E-04	0.00E+00	-2.59E-16	1.15E-15	0.824	0.831	fragile
X50	intsprd	23429/17803	3.00E-19	7.06E-13	8.58E-04	0.00E+00	-2.94E-16	7.98E-16	0.507	0.512	fragile
X51	lir	23429/14935	1.74E-20	1.08E-13	6.73E-04	0.00E+00	-1.46E-17	3.50E-17	0.564	0.558	fragile
X52	nreserve	23429/12504	-2.03E-19	6.06E-12	1.18E-02	0.00E+00	-6.21E-17	9.03E-11	0.511	0.521	fragile
X53	ratiop	23429/15950	-5.31E-21	1.06E-14	3.52E-04	0.00E+00	-9.16E-18	7.35E-12	0.541	0.583	fragile
X54	rtead	23429/15950	-5.31E-21	1.06E-14	3.52E-04	0.00E+00	-9.16E-18	7.35E-12	0.545	0.546	Fragile
x55	rtebudfin	23429/19227	4.57E-18	7.50E-12	0.3733	0.0002	-0.0004	0.0003	0.526	0.526	fragile
X56	TAXPROFR	23429/15952	1.56E-19	3.03E-16	1.16E-02	3.76E-04	-9.00E-17	1.21E-19	0.516	0.516	fragile

please note that *,**and *** refers to the significances level at 10%,5%and 1% respectively

6.5 Conclusion:

The uncertainty surrounding FDI theories and empirical approaches has created much ambiguity regarding the determinants of FDI. When model uncertainty is not addressed traditional empirical results based on OLS regressions, would lead to biased and inconsistent estimates seems to be subjective.

In this chapter we advanced several previous arguments, and it may be useful to recap at this point. In our methodology we tried to find adequate ways of addressing model uncertainty, and extreme bounds analysis remains a potentially useful approach.

We investigate 56 economic, geographical and political variables that have been previously proposed as determinants of FDI using the recent EBA econometric method. We use a large unbalanced panel of data containing 168 countries covering the period that cover 1970 to 2006.

Our results seems to be more convincing as we run three extensive program to recheck the robustness of our primarily results and to deal with fixed and random effects. As far as we are aware, this approach has not yet been applied for such large data set to identify the robust determinants of FDI. Our extensive robustness analysis advances previous work in this field as it uses a large unbalanced panel data set rather than simply cross sectional data, we also consider a larger number of economic, political and geographical indicators than previously. In this respect, we believe our work is a major improvement over the existing literature that seeks to understand the determinants of FDI. Our study has important implications for economic development and is designed to test the robustness of the determinants of FDI across various specifications.

We apply EBA method to three distinct groupings variables using the Leamer (1983, 1985) and Sala-I-Martin (1997) approaches to assess the robustness of determinants of FDI. We find that the Sala -I- Martin (1997) method is more 'permissive' than the Leamer method. In general, the Leamer test is considered the most restrictive of the robustness tests, so we are interested to learn how our results change when we consider Sala -I-Martin approach.

The Sala - I- Martin approach suggests that out of the 56 proxies examined only a few appear to be robust determinants of FDI.

According to our first EBA application on economic variables we found that (in addition to our six core variables) FDIO, GFE, TEL and RATIOT are robust determinants of FDI.

In our second EBA application we reduced the number economic variables of considered to 28 and this indicated that TTRADE, OPENNESS, FDIO, HMTAXCOR, ratios and GFE are robust determinants of FDI.

In the third EBA application we added political and geographical variables to the economic covariates and found that SA, gtbun, landlocked, eng, arb.demo, conflictint, EAP, TEL, RATIOT, GCF, CAB and GDPPPP are robust determinants of FDI. Rapid comparisons between the three EBA applications see table 6.8 indicates that openness is a common robust variable and that there is a positive impact from openness to inward FDI. There is some evidence to suggest that economies with high trade levels have relatively higher FDI.

Another noticeable conclusion regarding Ratiot and tel variables were they appear to be robust in first and third test this indicates that tel and ratiot are among the determinants of FDI.

Our results show as well that more than half of the previously suggested FDI determinants are no longer robust once the econometric EBA procedure is applied .Our finding highlights, the main theories that receive support from data (gravity FDI theory represented by high number of border, languages landlocked, (EAP) and (SA) region vertical FDI theory represented by higher level of development (GDPPPP) higher education (ratiot) and low trade restriction (open)).

It is important to point out some limitations of our study. First, measurement errors may occur in data sources such as UNCTAD or World Bank where it is acknowledged that there is "imperfect reporting and non inclusion of certain items in the data by some countries". Second, a problem that could affect our results is the heterogeneity of the countries comprising the sample, as the results may differ between groups of relatively homogenous countries. The literature reveals some differences between developed and developing countries with respect to the determining factors on FDI inflows. Most of the existing studies (Cleeve,(2000), Culem (1988), Nguyen (2007)) either deal with a group of developed countries as opposed to developing countries or they produce separate group regressions that are separated by high and low FDI flows. The results might be different if the models were estimated separately for country groups.

In our work we tried to address this issue to some extent by using fixed effects and random effects estimators) to capture these cross-country differences.

Our most striking finding is that most of the variables suggested in the literature do not survive the rigorous EBA robustness test. While many of the factors that we test have been shown in previous work to produce significant effects in plausible and well-specified models, when put to the rigors of being tested along with many other plausible variables, the significance of their effects does not hold.We do not suggest that this implies these factors are unimportant. Many of the findings we build off are valid within the confines of the original statistical model proposed in the literature. Moreover, to the extent that some variables fail our test, this could be because they are poor proxies for otherwise strong theories of FDI.

The standard of surviving the test of EBA is just a very a high one, and only the strongest of relationships survive it. Nevertheless, we are able to identify a small number of variables that appear to be robust determinants of FDI on which we can base policy, since we can be most certain of their effects.

Finally, to conclude it can be said that countries need to reinforce its infrastructure facilities, liberalise its local and global investment policy and maintain macroeconomic and political stability to improve its inward FDI performance and potential index and to become an attractive destination for foreign investors.

Table 6.8 Summary of the results of three tests

1st test		2nd test		3rd test		
	Oppeness	√	√	**robust** ***	√	robust
	Infl	√	√	mild	X	
	Ttrade	√	√	**robust*** **	X	
	Gdpg	√	X	**robust***	X	fragile
	Cab	√	X	fragile	X	**robust** **
6 Core variables	Gdpppp	√	X	mild	X	**robust** ***
	RATIOS	X	X		√	**robust**
	GFE	X	X		√	**robust**
Tested variables	Tested variables				Tested variables	
Ttrade	X	used in core model	X	used in core model	√	fragile
Infl	X	used in core model	X	used in core model	√	**robust** ***
Cgd	√	Mild	√	fragile	√	fragile
Cpi	√	Mild	X	deleted	X	deleted
Ebp	√	not running	X	deleted	X	deleted
Ex	√	not running	X	deleted	X	deleted
Fdio	√	**robust** ***	√	**robust*** **	√	fragile
Gcf	√	Fragile	√	fragile	√	**robust****
Gdpcl	√	Fragile	X	deleted	X	deleted
Gdperg	√	Fragile	X	deleted	X	deleted
Gdprl	√	Fragile	X	deleted	X	deleted
Gdpru	√	Fragile	X	deleted	X	deleted
Gnipppu	√	Fragile	X	deleted	X	deleted
GFE	√	**robust****	√	**robust***	X	used in core model
Gniru	√	Fragile	X	deleted	X	deleted
Gs	√	Fragile	√	fragile	√	fragile
Hmtaxcor	√	Fragile	√	**robust*** **	√	fragile
Imp	√	Fragile	X	deleted	X	deleted
Infld	√	Fragile	X	deleted	X	deleted
Internet	√	Fragile	√	fragile	√	fragile
Intsprd	√	Fragile	√	fragile	√	fragile
Lf	√	Mild	X	deleted	X	deleted
Liquid	√	Fragile	√	fragile	√	fragile
Lir	√	fragile	√	fragile	√	fragile
Nreserve	√	fragile	√	fragile	√	fragile
Poptl	√	fragile	√	fragile	√	fragile
Rail	√	fragile	√	fragile	√	fragile
Ratiop	√	fragile	√	fragile	√	fragile

Table 6.8 Summary of the results of three tests (cont)

1st test		2nd test		3rd test		
ratios	√	fragile	√	robust*	X	used in core mod e
Ratiot	√	robust**	√	fragile	√	robust**
Rex	√	fr gile	√	fragile	√	fragile
Rir	√	fragi e	√	fragile	√	fragile
Roads	√	fragile	√	fragile	√	fragile
Schp	√	f agile	X	deleted	X	deleted
Schs	√	fragile	X	deleted	X	deleted
Scht	√	fragile	X	deleted	X	deleted
Taxproft	√	mild	√	mild	√	fragile
Taxpay	√	fragile	X	deleted	X	deleted
Taxrev	√	fragile	√	fragile	√	fragile
Tel	√	ro ust**	√	fragile	√	robust***
Timeb	√	fragile	√	fragile	√	fragile
unem	√	fragile	√	fragile	√	robust ***
Wgelcl	√	fragil e	X	deleted	X	deleted
wgetogdpl	√	fragile	√	mild	√	robust ***
ARB	X	not tested	X	not test d	√	robust ***
bureau	X	no tested	X	not tested	√	fragile
conflictint	X	not tested	X	not tested	√	fragile
corr	X	not tested	X	not tested	√	fragil
demo	X	not tes ed	X	not tested	√	ro ust *
law	X	not tested	X	not tested	√	fragile
ethnic	X	not tested		not tested	√	fragile
parl	X	not tested	X	not tested	√	fragile
repb	X	not tested	X	not tested	√	fragile
surface	X	not tested	X	not tested	√	fragi e
Eng	X	not tes ed	X	not tested	√	ro ust *
spn	X	not tested	X	not tested	√	robust *
frc	X	not tested	X	ot tested	√	fragile
rtead		not tested	X	not tested	√	fragile
Rtebudfin	X	not tested	X	not tested	√	fragile
EAP	X	not tested	X	not tested	√	fragil
eca	X	not tes ed	X	not tested	√	po sible
landlock	X	not tested	X	not tested	√	robust *
	X	not tested	X	not tested	√	
number of variable	42		28		56	
number of regressions	447804		256256		1312024	
nature of the variables	economic		economic		economic ,political and geographical	
nature of the test	fixed effect		fixed effect		random effect	
number of robust variables	4+ core model		5+ core model		5+ core model	

Chapter 7
Causality testing between FDI and economic growth in heterogeneous panel data

7.1 Introduction

Globalisation offers an unprecedented opportunity for developing countries to reach sustainable economic growth through trade and investment. During the 1970s, international trade grew more rapidly than did FDI, and thus international trade was the most important international economic activity. This situation changed dramatically during the 1990s when FDI flows started to increase sharply. FDI was the main source of flows to developing countries because it is less volatile compared with other alternatives[79] and it enables the transfer of technologies, skills and knowledge between regions and countries.

FDI contributes to economic growth in a number of ways. It can influence productivity and serve as a catalyst for economic development through productivity enhancement, employment creation (poverty alleviation) and trade growth (Pacheco-Lopez, 2005; OECD, 2002). In addition to this range of prospective benefits suggested by the literature, FDI has two other crucial roles for economic development. First, as FDI inflows bring new capital investment, adding to a country's capital stock, it promotes both forward and backward linkages within the domestic economy, thereby stimulating future economic growth (Ikiara, 2003).

Second, the greatest contribution of FDI may also come through technology transfer that can stimulate growth, improve total factor productivity (TFP), help a country integrate into global economic networks, reduce dependence on debt accumulation as a source of development and strengthen the competitive environment in a host country (Ancharaz, 2003).

[79] As mentioned in chapter 2, FDI is more stable compared with other capital flows such as capital portfolios and bank loans and provides a stable source of finance to meet capital requirements in developing contexts (Reisen and Soto, 2001).

Thus, Understanding the direction of causality between the two variables is crucial for formulating policies that encourage private investors in developing countries attracting FDI has become crucial for most countries because of its perceived positive impact on economic growth and development. According to the World Bank, developing countries should endeavour to attract more FDI because it encourages production improvements, contributes to the advancement of technology, boosts employment opportunities, bolsters business sector competition and creates exports.[80]

The most efficient way to attract FDI is to focus on reducing the deficiencies in the following areas: free trade zones, trade regimes, tax incentives, and the human capital base in the host country, financial market regulations, banking system (financial system), infrastructure quality, tax incentives and market size.
Currently, there is a pool of both theoretical and empirical literature regarding the relationship between FDI and economic growth. Recently, renewed interest in growth determinants and the considerable research on externality-led growth, with the advent of endogenous growth theories (Barro, 1991; Barro and Sala-i-Martin, 1995), made it more plausible to include FDI as one of the determinants of long run economic growth.

The interest in the subject has also grown out of the substantial increase in FDI flows that started in the late 1990s, which led to a wave of research on its determinants. Conventionally, economic theories indicate that FDI has a positive impact on a country's economic growth. Although some empirical studies have shown that the direction of causality is from FDI to economic growth, other studies have found either the reverse causation or no causation at all. Caves (1996) thus ,suggests that "the causal relationship between FDI and economic growth is a matter on which we totally lack trustworthy conclusions"[81]. To our knowledge, many studies have tested the direction of causality between growth and FDI; however, the results are mixed.

[80] World Bank Development brief number 14, April 1993.
[81] Quotation obtained from UNCTAD report vol. 13 number 3.

This chapter tests the direction of causality between FDI and economic growth. Our work contributes significantly to the literature in the following ways. First, by applying the tests to a larger panel of countries than previously considered in the literature. Second, in addition to applying standard time series Granger non causality (GNC) tests we also apply panel GNC tests using the Fisher (1932, 1948) method and the recently developed Hurlin (2004,) test. We are not aware of any previous application of Hurlin's (2004) method to the causality between FDI and growth in the literature. Third, we adapt a method applied by Hanck (2008) within the context of unit root testing to test for GNC. We are not aware of any previous application of this method to GNC testing.

Our panel analysis uses pooled data from 136 developed and developing countries for the 1970–2006 period. Existing studies that test GNC between GDP and FDI apply this test on time series data for a single or small group of countries. By contrast, this chapter analyses pooled data for a large number of countries over a relatively long period to exploit both cross-sectional and time series data.
If we find that FDI has a positive impact on growth, policymakers can stress on school attainment, openness to international trade, lower taxes and inflation (These are the main determinants of FDI according to our previous chapter) to influence growth. This means that the study is vital to some extent.

The rest of the chapter is organised as follows: section 7.2 highlight the causal relationship between FDI and economic growth. Section 7.3 reviews the theories and empirical literature on the relationship between FDI and economic growth. Section 7.4 presents a survey of empirical studies. Section 7.5 presents the econometric methodology and data. Section 7.6 presents and comments on the empirical results and we conclude in section 7.7.

7.2 Causal Relationship between FDI and Economic Growth

The relationship between FDI and economic growth has motivated a voluminous empirical literature focusing on both developed and developing countries. Several studies have found a clear positive association between FDI and growth, although others have not. Research using data from less developed countries has tended to find a clear positive relationship, while studies that have ignored this distinction or have focused on data from only developed countries have found no growth benefit for the country in receipt of FDI.

An OECD (2002) survey underpinned these observations and confirmed that 11 out of 14 studies found FDI to contribute positively to income growth and factor productivity. According to De Mello (1997) and OECD (2002), the effect of FDI on growth is likely to depend on the economic and technological conditions in the host country.

In particular, it seems that developing countries have to reach a certain level of development in education and/or infrastructure before they are able to capture the potential benefits associated with FDI. Therefore, FDI seems to have a more limited growth impact in technologically less advanced countries[82].
The main result of the OECD survey (2002) suggested that there might be a strong relationship between FDI and growth especially for OCDE countries. Although the survey concluded that this relationship is highly heterogeneous across countries, it argues that, in general, FDI has an impact on growth in the Granger-causality sense.

Although FDI's contribution to growth may come through its direct increase of capital formation in the recipient economy, FDI may also help increase growth by introducing new technologies, such as new production processes and techniques, managerial skills, ideas and new varieties of capital goods. In the new growth literature, the importance of technological change for economic growth has been emphasised (Grossman and Helpman, 1991; Barro and Sala-i-Martin, 1995).

[82] Please note that in our estimation we do not distinguish between a group of developed and a group of underdeveloped countries because Hanck's (2008) method allows us to identify whether Granger causality exists for each individual country.

Thus, FDI provides better access to technologies for the local economy and it leads to indirect productivity gains through spillovers. In addition, MNCs may increase the degree of competition in host country markets, forcing inefficient firms to invest more in capability, physical or human capital and to promote trade. MNCs can also provide training for labour and management, enhancing their productivity, as well as training for the local suppliers of intermediate products to meet the higher standards of production and managerial standards. Although FDI may bring substantial gains through the channels described above, there are some drawbacks of FDI for the host country. These include the possible deterioration of the balance of payments position of the host economy through increased imports and a possible crowding out of domestic investments. Since different locations compete for scarce funds, outward FDI inevitably implies a substitution of domestic output by foreign output (Herzer, 2008; Ghosh and Wang, 2009).

However, there is evidence that economic growth is a crucial determinant of attracting FDI (Cheng and Kwan, 2000; Dee, 1998; Coughlin and Segev, 2000; Fung et al., 2002). The outcomes of rapid economic growth are the emergence of huge domestic markets, increased per capita income and the emergence of a large middle class in urban areas. This could attract foreign investment.

7.3 Review of the Theoretical Literature

Neoclassical models of growth as well as endogenous growth models provide the basis for most empirical work on the FDI– growth relationship. The relationship has been studied by explaining four main channels: (i) determinants of growth, (ii) determinants of FDI, (iii) the role of MNCs in host countries and (iv) the direction of causality between FDI and growth (Chowdhury and Mavrotas, 2005).

7.3.1 Neoclassical Growth Theory

According to neoclassical growth theory based on Solow's growth model, economic growth generally comes from two sources: factor accumulation and TFP growth (Felipe, 1997). Of these two sources, the empirical literature usually focuses on studying the growth of factor inputs than the growth in TFP. This is because factor growth is easier to quantify and analyse while difficulties abound in the measurement of TFP growth and there is a lack of appropriate econometric modelling techniques as well as an unavailability of appropriate data.
Within this theory, technological progress and labour growth are exogenous to the economic system and, therefore, this model does not adequately examine them. Furthermore, inward FDI merely increases the investment rate, leading to a transitional increase in per capita income growth but has no long run growth effect (Hsiao, 2006).

The extent to which FDI affects output growth is limited by the assumptions of the model, namely constant economies of scale, decreasing marginal products of inputs, a positive elasticity of the substitution of inputs and perfect competition (Sass, 2003). The potential impact of FDI on growth would only be in the short run, the magnitude and duration of which depends on the transitional dynamics to the steady-state growth path. According to this theory (Solow, 1956), the impact of FDI on the growth rate of output is constrained by the existence of diminishing returns of physical capital. Therefore, FDI can only exert an effect on the level of per capita output, but not on the growth rate. In other words, it is unable to alter the growth of output in the long run (Calvo and Robles, 2003).

The only vehicle for growth-enhancing FDI would be through permanent technological shocks, which is the main idea of the new growth theory developed in the 1980s. This new growth theory states that technological progress and FDI has a permanent effect on growth in the host country through technology transfer and spillover.

7.3.2 Endogenous Growth Theory

In the framework of endogenous growth models, three main channels can be detected through which FDI affects growth. First, FDI increases capital accumulation in the receiving country by introducing new inputs and technologies (Dunning, 1993; Blomstrom et al., 1996; Borensztein et al., 1998). In the case of new technologies, FDI is expected to be a potential source of productivity gains via spillover to domestic firms. Empirically, Blomstrom et al. (1996) found that positive growth effects are caused by increasing FDI using FDI inflows in a developing country as a measure of its interchange with other countries. They also found that FDI has a significant effect on promoting growth in exporting countries rather than in importing countries. This implies that the impact of FDI varies across countries and trade policy can affect the role of FDI in economic growth.

Second, FDI raises the level of knowledge and skills in the host country through labour and manager training (De Mello, 1996, 1999). Influenced by Mankiew et al.'s (1992) pioneering research, most recent empirical models have added education to the standard growth equation as a proxy for human capital. Borensztein et al. (1998) suggested that the level of human capital determines the ability to adopt foreign technology. Thus, larger endowments of human capital are assumed to induce higher growth rates given the amount of FDI. They suggested further that countries might need a minimum threshold stock of human capital in order to experience the positive effects of FDI.

Bengoa and Sanchez-Robles (2003) showed that FDI is positively correlated with economic growth, but host countries require human capital, economic stability and liberalised markets in order to benefit from long-term FDI inflows. Developed countries are expected to have a higher level of human capital and thereby to benefit more from FDI than are developing countries. This seems to be confirmed by Xu (2000) who looked into US MNCs as a channel of international technology diffusion in 40 countries from 1966 to 1994. His main results suggested that the technology transfer provided by US multinationals contributes to productivity growth in developed but not in developing countries. As most less developed countries do not meet the threshold requirement of human capital, they may find it difficult to benefit from inward FDI.

Third, FDI increases competition in the host country's industry by overcoming entry barriers and reducing the market power of existing firms. As a consequence of endogenous growth theory, FDI has a newly perceived potential role in the growth process (Bende-Nabende and Ford, 1998). In the context of the new theory of economic growth, however, FDI may affect not only the level of output per capita but also its rate of growth. This literature has developed various hypotheses to explain why FDI may enhance the growth rate of per capita income in the host country (Calvo and Robles, 2003). However, the endogenous growth theory, which dispenses with the assumption of perfect competition, leaves more scope for the impact of FDI on growth.

Recently, consensus has been reached among academia and practitioners that FDI tends to have a significant effect in promoting economic growth through multiple channels such as capital formation, technology transfer and spillover and human capital (knowledge and skill) enhancement. Technology spillover to the host country is normally through imitation and forward and backward linkages with domestic enterprises and suppliers. The spillovers linkage enables domestic firms to improve their efficiency and productivity levels (Johnson, 2005). Econometric models of endogenous growth have been combined with studies of the diffusion of technology in an attempt to show the effect of FDI on the economic growth of several economies (Lucas, 1988; Barro,1999). In these models, technology plays an important role in economic development. As a result, and in contrast to the neoclassical theory, monetary and fiscal policies are deemed to play a substantive role in advancing growth in the long run.

Factors contributing to the mobility of capital and technology have been the single most important reason for low-income countries to grow at a higher rate. Macroeconomic requirements and financial adjustments have been identified as contributing factors for economic development.

Borensztein et al. (1995) developed an endogenous growth model in which long run growth increases through the effect of the rate of technological diffusion from the industrialised world to the host country. They conducted a cross-country analysis of 69 developing countries using panel data averaged over two separate time periods, where the dependent variable is per capita GDP growth rate over each decade.

They concluded that FDI, by itself, has a positive but insignificant effect on economic growth. In addition, the authors stated that FDI is an important determinant of economic growth only when a country has a minimum threshold stock of human capital because this actually contributes to growth more than domestic investment does.

Micro studies at the firm level have suggested that the impact of FDI on growth may depend on many factors. Atkins and Harrison's (1999) study on Venezuelan plants revealed that foreign equity participation is positively correlated with plant productivity, but that this relationship is strong only for small enterprises. Harrison (1994) found that firms with foreign equity are more productive and have higher productivity growth compared with domestic firms. However, she noted that in Venezuela the productivity of domestic competitors was damaged because the presence of MNCs decreased their market shares.

Most macro empirical analyses of the effects of FDI on growth are largely based on the single equation time averaged cross-section estimation approach, with or without instrumental variables. A good example of this statement is Balasubramanyam et al. (1999, 1996) who used cross-sectional annual data averaged over the period 1970–1985 for a sample of 46 developing countries. They found that the size of the domestic market, the competitive climate in relation to local producers and interactions between FDI and human capital exert an important influence on growth performance. Their analysis indicated that FDI is more productive in countries that have pursued export promotion rather than import substitution policies.

Chowdhury and Mavrotas (2005) argue that, a large amount of empirical research on the role of FDI in host countries suggested that FDI is an important source of capital, complements domestic private investment, is usually associated with new job opportunities and the enhancement of technology transfer and spillovers, enhances human capital and boosts overall economic growth in host countries[83].

[83] See de Mello (1997, 1999) for a comprehensive survey of FDI and growth relationship. See Mody and Murshid (2002) for an assessment of the relationship between domestic investment and FDI.
See Asiedu (2002), Chakrabarti (2001) and Tsai (1994) on the determinants of FDI, Blomstrom and Kokko (1998) for a critical review of the role of FDI in technology transfer and Asiedu (2003) for an excellent discussion of the relationship between policy reforms and FDI in the case of Africa.

By contrast, a number of firm-level studies have not supported the view that FDI promotes economic growth[84]. Concerning developing countries, macro empirical work on the FDI–growth relationship has shown that subject to a number of crucial factors, such as the trade regime, the human capital base in the host country, financial market regulations and the degree of openness in the economy, FDI has a positive impact on overall economic growth[85].

Many studies, such as Hermes and Lensink (2003), Durham (2004) and Alfaro (2003) have examined the linkages between the effectiveness and regulations of financial markets, FDI and growth. All found that countries with better financial systems and financial market regulations could exploit FDI more efficiently and achieve a higher growth rate.

These studies argued that countries need not only a sound banking system, but also a functioning financial market to allow entrepreneurs to obtain credit to start a new business or expand an existing one. The emerging literature on FDI stipulates that its positive impact on growth depend on local conditions and absorptive capacities. Essential among these capacities is financial development. These results imply that countries should reform their domestic financial systems before working on attracting FDI.

The vast literature on the determinants of FDI in developing countries has clearly indicated the importance of infrastructure, skills, macroeconomic stability and sound institutions for attracting FDI flows[86].

There have been a number of interesting studies of the role of FDI in stimulating economic growth (Barro and Sala -i- Martin1995). Of particular interest is the survey of de Mello (1997) that highlighted two main channels through which FDI may be growth enhancing. First, FDI can encourage the adoption of new technology in the production process through capital spillovers. Second, FDI may stimulate knowledge transfers, both in terms of labour training and skill acquisition and by introducing alternative management practices and better organisational arrangements.

---

[84] See Carkovic and Levine (2003) and the references therein. Hanson (2001) found weak evidence that FDI generates positive spillovers for host countries. See Gorg and Greenaway (2004) for a comprehensive discussion at the firm level.

[85] See Balasubramanyam et al. (1996, 1999), Borensztein et al. (1998) and Nair-Reichert and Weinhold (2001) for a critical assessment of the empirical literature. See Aitken and Harrison (1999) and Harrison (1994) regarding recent assessments for micro studies at the firm level that examine the impact of FDI on growth in developing countries.

[86] See Borghesi and Giovannetti (2003) for the role of institutions in attracting FDI.

Hence, the flow of FDI is argued to be a potential growth-enhancing player in the receiving country. The growth rates of less developed countries is perceived to be highly dependent on the extent to which these countries can adopt and implement the new technologies available in developed countries. By adapting new technologies and ideas (i.e., technological diffusion), they may catch up to the levels of technology in developed countries. One important channel through which the adoption and implementation of new technologies and ideas by less developed countries may take place is FDI.

The new technologies they introduce in these countries may spill over from subsidiaries of multinationals to domestic firms (Findlay, 1978). The use of new technologies may be important for contributing to a higher productivity of capital and labour in the host country. The spillover may take place through; demonstration and/or imitation (domestic firms imitate the new technologies of foreign firms), competition (entrance of foreign firms leads to pressure on domestic firms to adjust their activities and to introduce new technologies), linkages (spillovers through transactions between multinationals and domestic firms) and/or training (domestic firms upgrade the skills of their employees to enable them to work with the new technologies) (Kinoshita, 1998; Sjöholm, 1999a).

This view is challenged by many authors for instance Carkovic and Levine (2002) show that there is no robust impact from FDI on growth if country-specific level differences, endogeneity of FDI inflows and convergence effects are taken into account. In addition Akinlo (2004) shows that, both private capital and lagged foreign capital have no statistically significant effect on economic growth. He concluded that the results seem to support the argument that extractive FDI might not be growth enhancing as much as manufacturing FDI.

While the literature has heeded the importance of FDI to growth and development, it has also recognised economic growth as an important determinant of FDI inflows into host countries. Rapid growth in an economy might attract more FDI from MNCs, as they locate new profit opportunities (Hansen and Rand, 2006). This suggests a possible dual causality of FDI to growth and vice versa.

As indicated in several empirical studies[87], according to the market size hypothesis, markets with a large population size and/or rapid economic growth (as measured by real GDP per capita) tend to give MNCs more opportunities to generate greater sales and profits and thus become more attractive investments. Wheeler and Mody (1992) tried to determine the relative importance of these two explanatory variables and found that market size is more important for developed countries, while per capita GDP is more important for developing countries. Therefore, two strands of research have emerged one that discusses the effects of FDI on economic growth and the other that recognises these effects and subsequently tries to identify the determinants of FDI flows to receiving countries. The possibility of a two-way causality between FDI and a host country's economic growth identifies a third line of research in the FDI literature, but of a lesser magnitude (Choe, 2003). Countries with fast economic growth generate more demand for FDI and offer opportunities for making profits. By contrast, inward FDI flows may enhance growth through positive direct and indirect effects on variables that affect growth. Thus, the study expects bidirectional causality between FDI and growth. Despite the considerable volume of research on the subject, there is conflicting evidence on the (dual) direction of causality between FDI and economic growth.

7.4 Survey of empirical studies

Many empirical contributions have tried to explain the relationship between FDI and growth (see Table 7.1). A summary of the literature on the effects of FDI on growth is outlined in this section to provide a more detailed review of their main findings. We group the studies into three categories according to their results. First, studies those find a positive unconditional effect for FDI on growth. Second, studies that find an ambiguous role for FDI alone on economic growth, but find that FDI when combined with other conditions – such as a minimum level of human development or financial market development – contributes positively to growth. Finally, studies that do not find any positive effect for FDI on growth, even when associated with the previously mentioned conditions.

[87] Wang and Swain (1995); Moore (1993); Schneider and Frey (1985); Bajorubio and Rivero (1994); Frey (1984); Billet (1991); Horisaka (1993); and Eaton and Tamamura (1994).

7.4.1 Empirical Findings: Positive Effect of FDI on Economic Growth

Pioneering work was conducted by Blomstrom et al. (1994) when they analysed the influence of FDI on growth in 78 developing countries for the period 1960–1985 using an endogenous growth equation. The study found a significant robust positive impact for FDI on per capita income growth in the host country (Blomstrom et al., 1994).

Gao (2001) tested the effect of FDI on income growth using data from all countries in the PWT, while excluding oil-producing countries, for 1980, 1985 and 1990. This study used a simple log linear equation following a cross-country technique to examine the relation between FDI and income: once for FDI inflows and once for FDI as stock. In all cases, FDI showed a positive statistically significant coefficient at the 5% level.

Lensink and Morrissey (2001) contributed to the literature on FDI and growth by introducing measures of the volatility of FDI inflows. They found that although FDI has a positive effect on growth, the volatility of FDI has a negative impact. Another important finding of the study was that the evidence on the positive effect of FDI on output growth in the recipient country is not conditional on any other explanatory variable. In particular, the positive effect is not conditional on the level of human capital accumulation, which is a significant finding that deviates from the mainstream literature. The study utilised a standard model using cross-sectional panel data and the instrumental variables estimation for the period 1975–1997 to derive the results (Lensink and Morrissey, 2001).

7.4.2 Empirical Findings: Conditional Positive Effect of FDI on Economic Growth

Many explanations have been given regarding the effect of FDI on growth. This group of studies has suggested that the effect of FDI on growth depends on the stock of human capital, degree of development of the financial sector, openness of the trade regime and the size of the economy. In addition, some studies have argued that different modes of FDI have different effects on growth and that the sectorial distribution of FDI affects its impact on growth.

Brensztein et al. (1998) consider the effect of FDI on economic growth in a framework of cross-country regressions using yearly data on FDI inflows from industrial countries to 69 developing countries in the 1970s and 1980s. All regressions use panel data and are estimated using the seemingly unrelated regressions technique. They concluded that FDI has a positive overall effect on economic growth, with the magnitude of this effect depending on the stock of human capital available in the recipient economy. These results were echoed by Campos and Kinoshita (2002), who tested the effects of FDI on growth in transitional economies during the transitional period 1990–1998. They used OLS panel data estimates and found that FDI has a direct and positive impact on growth that is not conditional on a minimum level of human capital.

However, the study argued that the insignificance of the human capital variable in transition economies is because most of these countries have a labour force that is above the threshold level of human capital. Such an argument according to them reinforces the importance of human capital.

Alfaro et al. (2006) linked the positive effect of FDI on growth to the degree of development of the financial sector and they conclude that countries with well-developed financial markets gain significantly from FDI. The results were robust to different measures of financial market development, the inclusion of other determinants of economic growth, and consideration of endogeneity. They reach this conclusion after examining the link between FDI and growth using cross-country data for the period 1975-1995.

Agrawal (2001) tested the economic impact of FDI in South Asia from 1965–1996 and found the impact of FDI inflows on GDP growth rate to be negative. He concludes that for a country to benefit from the positive effect FDI can potentially have on output growth, it has to have an open economy.

Busse and Groizard (2008) applied an Arellano and Bond (1991) Generalised Method of Moments (GMM) estimator, to data for 84 developed and developing countries and found that the impact of FDI on economic growth depends on the level of financial development. In addition, their results suggested that the growth effect of FDI is negatively related to the level of regulation in the host country. The authors explained this finding by arguing that "restrictive or costly regulations impede both the allocation of foreign capital to the most productive sectors and the creation of linkages with (and spillovers to) local firms".

7.4.3 Empirical Findings: Negative Effect of FDI on Economic Growth

Other recent empirical studies have found a negative relation between FDI and growth. Such as the work of Carkovic and Levine (2005) , they construct a panel dataset with data averaged over each of the seven five-year periods between 1960to 1995.Using the using GMM panel estimator to extract consistent and efficient estimates of the impact of FDI flows on economic growth. Using several specifications estimated for a sample of 65 developed and developing countries, the authors found that there is no effect between FDI and growth and vice versa. They showed that although sound economic policies may encourage output growth and FDI, FDI does not have a positive impact on output growth that is independent of other growth determinants.

Saltz (1992) examined the effect of FDI on economic growth for 75 third world countries. His empirical tests revealed a negative correlation between FDI and growth. He argued that this might be rationalised as follows. The level of output of a host country receiving FDI will stagnate if monopolisation and pricing transfers occurs. This will cause the under-utilisation of labour. This, in turn, will cause a lag in the level of domestic consumption demand and eventually will lead growth to stagnate. The overall short and long run effects of FDI on the current account balance can vary through time and may differ from country to country; they depend on the effects that FDI has on domestic savings and economic growth.

Indeed Mencinger (2003) confirms this view and states that: foreign ownership of the assets deteriorates current account balance through the investment account and improves it through the trade account; positive effects of the latter might outweigh or not the negative effects of the former. However, even in the trade balance, positive effects of foreign ownership on trade balance may not prevail over "structural patterns" created by transition, effects of growth, and availability of credits. This implies deterioration in the trade balance and additional deterioration of the current account balance.

Hence, a large share of the financial means obtained by selling the existing capital stock to foreigners was used to increase consumption and imports rather than capital formation. This explains why there is no positive relationship between the share of FDI and the share of gross fixed investments in GDP, why there is a strong contemporaneous negative relationship between FDI and the current account balance, and, at least partly, why there is a negative relationship between FDI and growth.

Fry (1993) estimated a macro-econometric model with three-stage least squares for pooled data containing 16 developing countries for the period 1966–1988 using the IMF's data. He concluded that FDI neither increases domestic investment nor provides additional balance of payments financing; thus, it appears that FDI was used as a substitute for other types of foreign flows. Fry also observed that any increase in FDI reduces national savings, and that FDI does not exert a significantly different effect on the rate of economic growth compared to domestically financed investments. His study concluded that FDI exerts both direct and indirect effects on the current account; FDI's effect on the latter was found to be significantly negative.

However, these were the broad conclusions for the whole sample, while the integration of the countries into similar subgroups revealed differences in the results, especially with regard to Pacific countries, where FDI was not a substitute for other types of foreign capital flows.

Ericsson and Irandoust (2001) examined the causal effects between FDI growth and output for four OECD countries applying a multi-country framework to Denmark, Finland, Norway and Sweden. The authors failed to detect any causal relationship between FDI and growth for Denmark and Finland. They suggested that the specific dynamics and nature of FDI entering these countries could be responsible for these non-causality results.

Lipsey (2002) surveyed the most important economic empirical literature on the effects of FDI and determined that the studies of the effects of FDI inflows on national economic growth are inconclusive. Almost all studies found positive effects in some periods or among some groups of countries, but these effects were not universal as there are circumstances, periods and countries where FDI has an insignificant relation with output growth.

7.4.4 Empirical Findings: Positive Effect of Economic Growth on FDI

This group of studies believe that growth is a positive determinant of FDI, arguing that foreign investors invariably prefer to invest in large markets and in economies that experience high rates of economic growth. A large inflow of FDI can add to foreign exchange and investment resources in a host economy but may deter the development of local firms or create exchange rate problems.

Chakraborty and Basu (2002) explored the causality between FDI and growth in India from 1974 to 1996. They found that real GDP in India is not Granger caused by FDI and that causality runs more from real GDP to FDI.

Kumar and Pradhan (2002) investigated the relationships among FDI, economic growth and domestic investment for a sample of 107 developing countries between 1980 and 1999. The causality tests showed that causality runs from economic growth to FDI in a considerable number of countries.

Abdus Samad (2009) analysed the relationship between FDI and growth for 19 developing countries in South East Asia and Latin America. The author employed the co-integration and, Granger causality tests as well as error correction modelling. He found unidirectional causality that runs from growth to FDI for five countries in Latin America and one country in South East Asia.

Table 7. 1. Empirical studies of FDI and Economic Growth

Author (year)	Econometric method	Sample	Period	Direction of causality
Blomström (1986)	Cross-section, OLS	Mexico	1970 and 1975	Positive and significant effects of FDI on economic growth
Saltz (1992)	Cross-section	75 developing countries	1970–1980	Negative effect of FDIon growth. Countries with a large presence of FDI had generally slower rates of growth than those expected.
De Gregorio (1992)	Panel	12 Latin American countries	1950–1985	Positive and significant correlation between FDI and growth.
Fry (1993)	Cross-section OLS	16 developing countries (five East Asian economies)	1966–1988	FDI does not exert a significant effect on growth.
Kokko (1994)	Cross-section, OLS	Mexico	1975	Positive and significant impact on growth when there exist skilled labour and local competition.
Blomström et al. (1994)	Cross-section, OLS	Uruguay	1988	FDI has a Positive effect on growth; however, it depends on technological gap.
Blomström et al. (1994)	Cross-section, OLS	78 developing countries	1960–1985	Positive impact of FDI on growth, which is larger in those countries that exhibit higher levels of per capita income.
Borenztein et al. (1995, 1998)	Cross-section, Endogenous growth model and SUR	69 developing countries	1970–1989	FDI exerts a positive effect on growth only when a minimum level of human capital exists.
Zhao (1995)	VAR	China	1960–1991	Positive effect on growth as it is affected by imported technology.
Balasubramany am et al. (1996, 1999)	Cross-section, OLS	46 developing countries	1970–1985	Positive effect on growth but only for export-promoting host countries rather than countries with import-substituting trade policies.
Mody and Wang (1997)	Cross-section, OLS	7 Chinese coastal regions	1985–1989	Positive effect on growth.
Oloffsdotter (1998)	Cross-section OLS	50 developing countries	1980–1990	Positive and strong for host countries with a higher level of institutional capabilities.
Nyatepe-Coo (1998)	Cross-section, OLS	South East (4) Latin America (4) SA (4)	1963–1992	Positive effect on growth holds only when a host country has crossed a minimum threshold level of human capital.
Bosworth and Collins (1999)	Cross-section, OLS	58 developing countries (18 emerging markets)	1978–1995	Positive through impact on TFP.
De Mello (1997)	Annual Panel FE, pooled group VAR, co-integration	32 countries (15 OECD and 17 non-OECD)	1970–1990	Not strong: positive for OECD, but negative effect for non-OECD.
Sjoholmn (1999)	Cross-section, OLS	Indonesia	1980–1991	Positive effect on growth.
Agrawal (1980)	Cross-section, OLS	Mexico, India, China	1965–1996	Negative effect of FDI and growth; it has to have on open economy.
Bende-Nabende et al. (2000)	Panel data, co-integration	Asia-Pacific Region (five countries)	1970–1994	FDI has a positive effect for three out of five countries. FDI has a negative effect on growth for Singapore and Thailand.
UNCTAD (2000)	Panel	100 less developed countries	1970–1995	Positive effect on growth.

Table 7. 1. Empirical studies of FDI and Economic Growth (continued)

Author (year)	Econometric method	Sample	Period	Direction of causality
Chan (2000)	Time series panel data, Granger causality, Bivariate and multivariate models	Taiwan	1973–1994	Positive as FDI promotes economic growth through technological improvement instead of capital accumulation and export growth.
Bengoa (2000)	Panel, fixed and RE	18 Latin American countries	1972–1997	Positive and significant correlation from FDI to growth, if there exists a minimum threshold of development associated with "social capability".
Alfaro et al. (2003)	Cross-section, IV OLS	129 developed and developing countries	1981–1997, 1977–1997 and 1970–1995	FDI in the primary sector tended to have a negative effect on growth, the relationship was positive for the manufacturing sector and ambiguous in the service sector.
Duttaray (2001)	Granger causality test, non-Stationarity	66 developing countries	1970–1996	In less than 50% of selected countries, FDI affects economic growth.
Nair - Reichert and Weinhold (2001)	Panel, MFR approach causality test	24 developing countries	1971–1995	Emphasise heterogeneity as a serious issue and, therefore, use the mixed fixed and random (MFR)[88] coefficient approach. They found a positive and significant effect on growth, although the relationship is highly heterogeneous across countries.
Ericsson and Irandoust (2001)	Toda and Yamamoto (1995) specification	Sweden, Denmark, Finland Norway,	1998–2001	No causal relationship from FDI to growth except for Sweden.
Lensink and Morrissey (2001)	Cross-sectionals, decade panel FE	115 countries	1975–1998	Mixed FDI has a positive impact on growth, but evidence is weak in developing countries. FDI volatility has a negative growth effect.
Zang (2001)	Time series, Granger causality tests	11 developing countries in East Asia Latin America	1957–1997	Evidence of growth enhancement from FDI, but magnitude depends on host country condition.
Reisen and Soto (2001)	Panel data	44 countries	1986–1997	Positive and significant effect on growth.
Chakrabort y and Basu (2002)	Panel data, structural co-integration model	India	1974–1996	Causality runs from real GDP to FDI. FDI in India is labour displacing.
Campos and Kinoshita (2002)	Panel data	25 transitional economies	1990–1998	Positive and significant effect on growth.
Carkovic and Levine (2005)	Cross-section OLS and dynamic panel data using GMM	65 countries	1960–1995	FDI inflows do not exert a robust independent influence on economic growth
Hoeffler (2002)	Panel, GMM	85 countries	1960–1989	Causality runs from FDI to growth

[88] Nair et al. (2001) suggested the MFR approach to allow for heterogeneity of the long run coefficients, thereby avoiding the biases emerging from homogeneity on the coefficients of lagged dependent variables. Hurlin (2004) contended that even through heterogeneity may exist in the data-generating process, Granger causality may be tested through the derivation of average Wald statistic over a given time span for all units in the panel.

Table 7.1. Empirical studies of FDI and Economic Growth (continued)

Author (year)	Econometric method	Sample	Period	Direction of causality
Wang (2003)	Cross-section OLS	12 Asian economies	1987–1997	Positive FDI in the manufacturing sector has a significant and positive impact on economic growth and attributes this positive contribution to FDI spillover effects.
Bazzoni et al. (2002)	Panel	11 MED countries	1970–1999	Positive and significant effect on growth.
Liu et al. (2002)	Panel co-integration	China	1981–1997	Bidirectional causal relationship among FDI, growth and exports.
Kumar and Pradhan (2002)	Panel	107 developing countries	1980–1999	Panel data estimations in a production function framework suggest a positive effect of FDI on growth. However, tests of causality found that in a majority of cases the direction of causation is not pronounced and in a substantial number of cases the direction of causation actually runs from growth to FDI.
Choe (2003)	Panel, Granger causality test	80 countries	1971-1995	FDI Granger causes economic growth and vice versa but the effects are more apparent from growth to FDI.
Hermes and Lensink (2003)	Cross-section, panel FE, RE, five-yearly	67 developing countries	1970–1995	Positive for 37 countries (Latin America and Asia region); for all others no effect The financial system matters.
Omran and Bolbol (2003)	Cross-country	17 Arab countries	1975–1999	Domestic financial reforms should precede policies promoting FDI.
Bengoa and Sanchez-Robles (2003)	Panel data, regression comparing fixed and RE	18 Latin American countries	1970–1999	FDI has a positive effect on economic growth. Magnitude depends on host country condition.
Alfaro (2003)	OLS, cross-section	47 countries	1981–1999	FDI exerts an ambiguous effect on growth. FDI in the primary sector, however, tends to have a negative effect on growth, while investment in manufacturing a positive one. Evidence from the service sector is ambiguous.
Mencinger (2003)	Granger causality test	8 transition countries	1994–2001	Negative effect of FDI on GDP.
Alfaro et al. (2006)	Cross-section, OLS	Different samples 71 countries	1975–1995	Positive effect of FDI on growth, but the level of development in the local financial market is crucial for these positive effects to be realised.

Table 7.1. Empirical studies of FDI and Economic Growth (continued)

Author (year)	Econometric method	Sample	Period	Direction of causality
Nath (2005)	Panel data	13 economies of CEE and CEEB	1990–2003	In the presence of trade, FDI does not have any significant effect on growth.
Kang and Du (2005)	Panel, GMM	20 OECD countries	1981–2000	No significant effect in both direction.
Chowdhury (2005)	Toda and Yamamoto (1995) specification	Chile, Malaysia, Thailand	1969–2000	GDP causes FDI in Chile and not vice versa. There is a bidirectional causality between GDP and FDI in Malaysia and Thailand.
Li and Liu (2005)	Unit root tests, Durbin –Wu-Hausman test, OLS	84 countries	1970–1999	Positive impact of FDI on economic growth through its integration with human capital in developing countries, but a negative impact through its interaction with the technology gap.
Busse and Groizaisard (2008)	Panel, GMM	82 countries	1975–2003	Effect of FDI on growth depends on regulations and institutional framework.
Darrat et al. (2005)	OLS, Pooled time series, cross-section	6 MENA and 17 CEE countries	1979–2002	The effect of FDI inflows on economic growth is generally negative in MENA and non-EU accession CEE countries. However, it is positive in the case of EU accession countries of the CEE region. The magnitude of FDI effect depends on host country conditions.
Bacic et al. (2005)	OLS, Pooled time series, cross-section	11 transition economies	1994–2002	Insignificant in both direction.
Karbasi et al. (2005)	GMM, panel	42 countries	1971–2000	Positive effect. The contribution of FDI on economic growth is enhanced by its positive interaction with human capital and sound macroeconomic policies and institutional stability.
Hansen and Rand (2006)	Panel co-integration	31 countries, 10 from Africa, 11 from Latin America	1970–2000	FDI has a lasting impact on GDP, whereas GDP has no long run impact on FDI.
Johnson (2005)	Cross section, OLS	90 countries	1980–2002	FDI enhances economic growth in developing economies but not in developed ones.
Lensink and Morrissey (2006)		87 countries	1975–1997	Positive and significant effect of FDI on growth.
Basu and Guariglia (2007)	GMM, panel	119 developing countries	1979–1999	FDI enhances both educational inequalities and economic growth in developing countries. However, it reduces the share of the agriculture sector in GDP.
Herzer (2010)	Heterogeneous panel co-integration,	44 countries	1970–2003	FDI has, on average, a negative effect on growth in developing countries.

Sources: Own construction

The main message to take from this selective survey is that the empirical evidence is mixed and inconclusive. Despite the large number of studies of the relationship between FDI and growth (Vu and Noy, 2009), and it varies from country to country and even within a country over different periods.

The results of previous studies can be categorised into three different forms; unidirectional causality (either from FDI to economic growth or from economic growth to FDI) other studies find such evidence elusive, while the third group of studies finds the effects of FDI on growth dependent on other factors such stock of human capital, the size of the economy, the degree of financial development and openness of the trade regime. The result varies across countries and periods. These findings prove that the nexus between FDI and economic growth is far from straightforward.

This previous finding will give an indication of the bi- direction of causality between FDI and growth and it will support arguments to be used in empirical estimation.

There are several criticisms of the empirical approaches adopted by most papers. First, as mentioned by Guo and Suliman (2009), models estimated with time averaged data lose dynamic information and degrees of freedom and thereby run the risk of serious omitted variable bias. Ericsson et al. (2001), for example, showed that the use of growth rates (first differences) could lead to highly misleading conclusions regarding the long run relationship between the variables, even in cross-country analysis. Several studies have used co-integration and causality analysis to investigate the long run relationship between FDI and GDP and to overcome Ericsson et al.'s criticisms. Herzer et al. (2008) investigate the long run (co-integration relationship) between FDI and GDP; however, they do not find a long run relationship. This could be due to the low power inherent in individual co-integration tests.

Second, the connection between the dependent variable and independent variables in a regression could be misspecified because of reverse causality and the insufficient control of important determinants of the dependent variable and thus, these models may suffer endogeneity biases.

In addition, these problems are hard to address satisfactorily because of the difficulty finding instruments. Parsons and Titman (2007) argued that endogeneity is often far easier to recognise than it is to adequately treat. Without good instrumentation, simultaneous equation analysis is unable to capture the feedback relationship between capital structure and other variables.

To address endogeneity we test for causality using heterogeneous FE panel methods (see for example Hurlin, 2004). Further, we do not average our data to the the above mentioned reasons.

The analysis of causality between FDI and GDP is generally based on standard Granger-causality test. Prior to testing for causality, unit root tests are implemented to determine the order of the integration of the individual series and co-integration tests[89] are used to identify any long run relationships.

Regarding the non-stationarity issue, we assume that FDI/GDP and GDP growth are stationary. In the former case, we do not expect FDI and GDP to diverge without bound. Owing to the relatively short time series for many countries, we cannot consider error correction models and so limit the analysis to two stationary series. Finally, the use of the panel data will help increase the power of the tests.

Our methodology applies panel GNC tests to exploit the enhanced power of panel data methods. The methods used are based on Fisher (1948), Hurlin (2004), and Hanck (2008).

[89] These tests are sensitive to the values of nuisance parameters in finite samples and, therefore, it is possible that misleading inferences could be made about the issue of causality (Cheung and Lai, 1993; Toda and Yamamoto, 1995; Zapata and Rambaldi, 1997).

7.5 Econometric Methodology

Based upon the review in the previous section, we assess the GNC hypothesis between the two variables only: the FDI to income ratio and economic growth using heterogeneous panel data (we will investigate the links with third variables in the next chapter). The literature suggests, however, two approaches to GNC testing in panel data models. The first pioneered by Holtz-Eakin et al. (1985), estimates vector autoregression (VAR) coefficients using panel data and letting the autoregressive coefficients and regression coefficients slopes as variable. This approach was applied in the work of Hsiao (1986), Holtz-Eakin et al. (1988), Weinhold (1996, 1999), Nair-Reichart and Weinhold (2001) and Choe (2003). The second approach proposed by Hurlin and Venet (2001) and Hurlin (2004) treats the autoregressive parameter $\gamma_i^{(H)}$ as constant as explained below in equation (7.1).

It is based upon pooling time series results to exploit the panel properties of data and allows coefficients to vary across countries. Within this broad framework, we apply three panel GNC tests that are based upon the Hurlin (2004), Fisher (1948) and Hanck (2008). In our methodology, we employ the second approach because of its suitability to our data sets, in which we have a relatively short time span and comparatively large number of cross-sectional units. Following Hurlin's (2004) methodology, all of our panel tests are based on a GNC time series test.

The approach of Hurlin and Venet's (2001) and Hurlin (2004,2008) approach is essentially an improvement of Holtz-Eakin et al's (1988) method , which does not allow the coefficient to be different across sections. Hurlin's approach enables researchers to control for country-specific, time-invariant FE models and includes dynamic, lagged dependent variables. We focus on testing the homogeneous non-causality (HNC) null hypothesis rather than the homogeneous causality (HC), heterogeneous non-causality (HENC) or heterogeneous causality (HEC) hypotheses.

The use of a panel data methodology in this context can be justified by the same arguments used in the contemporary panel testing literature (as mentioned in chapter 5). First, panel data offer more flexibility in the modelling of the behaviour of cross-sectional units compared with conventional time series analysis (Greene, 2000). Second, the panel incorporates significantly larger numbers of observations, which will increase the degrees of freedom. Third, it reduces collinearity among explanatory variables. Finally, and most importantly for our purposes, it considers a heterogeneous model (in the sense that coefficients can vary across the sections) to test the non-causality hypothesis. In sum, it improves the efficiency of Granger causality tests (Hurlin and Venet, 2001).

In testing causality with panel data, the researcher should pay attention to the question of heterogeneity between cross-sectional units. One source of heterogeneity is caused by permanent cross-sectional disparities. A pooled estimation without heterogeneous intercepts leads to a bias of the slope estimates and this could lead to a fallacious inference in causality tests (Hurlin, 2004a). Further, if the slope coefficients were different across sections imposing a homogeneous slope coefficient would be inappropriate.

The second potential flaw is the risk of the inappropriate assumption of causal homogeneity[90] (Hood and Irwin, 2006). In sum, the analysis of causality for panel data sets should consider the different sources of heterogeneity of the data-generating process. We consider the most general (and least restrictive) case of heterogeneous slopes and intercepts across sections[91].

[90] This assumption is often ignored within panel data; however, the failure to analyse it correctly could lead to faulty substantive conclusions such as inferring a causal relationship in all cross-sections when it is only present in a subset of cross-sections or rejecting the presence of a causal relationship for a group of observations when a subset of the sample does actually manifest the hypothesized causal relationship.

[91] It is clearly beyond the scope of the present work to review in detail the four distinct scenarios to describe the causal process: HNC, HC, HEC and HENC for detailed and sample properties, see Hurlin and Venet (2001).

7.5.1 Model specification

To test our hypothesis we employ panel data versions of the time series Granger (1969, 1980 and 2003) causality test. Granger (1969) posited that for each individual country the variable x causes y if we are able to better predict y using all available information than if we exclude x. Hurlin (2008) thus contended that if x and y are observed on N countries, we should be able to determine the optimal information set used to forecast y. The basic idea is to assume that there exists a minimal statistical representation common to x and y of at least a subgroup of countries. Granger (1969) causality applies to homogeneous time series when N causality relationships exist and when the individual predictors of y obtained conditionally on the past values of y and x are identical. Heterogeneity exists when individual predictors of y are not the same, such as might be the case with different countries in a panel.

Hurlin (2004) and Hurlin and Venet (2001) incorporated Granger causality tests between individuals y and x, taking into account cross-sectional heterogeneity in panel data (unbalanced or balanced). This is achieved by distinguishing between the heterogeneity of the causal relationship, between two variables. (x and y) and the heterogeneity of the data generating process. Hence, they distinguished between the HENC and HNC hypotheses[92].The latter was adopted by Holtz-Eakin et al. (1988).

[92] Please note in our estimation our focus is on HENC.

7.5.1.1 GNC within the Hurlin and Venet Methods

We propose using an approximated standardised average Wald statistic to test the HENC hypothesis where all coefficients potentially vary across individual units in a sample with small T and N units. Hurlin's (2004) model considers two covariance stationary variables, denoted x and y observed on T periods and on N individuals that takes the following form:

$$x_{i,t} = \alpha_i + \sum_{H=1}^{Hi} \gamma_i^{(H)} x_{i,t-H} + \sum_{H=1}^{Hi} \beta_i^{(H)} y_{i,t-H} + \varepsilon_{i,t} \quad i = 1,2,\ldots.,N, t = 1,2,\ldots,T \qquad (7.1)$$

With $H \in N$ and $\beta_i = (\beta_i^{(1)} \ldots . \beta_i^{(H)})$. Individual effects α_i are considered fixed. Initial conditions $(x_{i-H}, \ldots \ldots x_{i-0})$ *and* $(y_{i-H}, \ldots \ldots y_{i-0})$ *of* both individual processes $x_{i,t}$ and y_i,t are given .The lag-order H_i are identical for all cross section units of the panel and so the panel is balanced . Autoregressive parameters $\gamma_i^{(H)}$ of the lagged dependent variables and regression coefficients slopes $\beta_i^{(H)}$ are different across countries. Importantly, unlike Weinhold (1999) and Nair-Reichert and Weinhold (2001) the parameters $\gamma_i^{(H)}$ and $\beta_i^{(H)}$ are constant with fixed coefficients model.

Hurlin (2004) made three assumptions in the case of a balanced panel within common lag order H

A1 : For each cross sectional unit i=1,....N, individual residuals $\varepsilon_{i,t}$, $\forall t = 1, \ldots., T$ are independently and normally distributed with $E(\varepsilon_{i,t}) = 0$ and finite heterogeneous variances $E(\varepsilon_{i,t}^2) = \sigma_{i,t}^2$.

A2: individual residuals $\varepsilon_i = (\varepsilon i,1,\ldots ,\varepsilon_{i,T})'$ are independently distributed across groups. Consequently $E = (\varepsilon i,t\ \varepsilon_{j,s}) = 0, \forall i \neq j$ and $\forall (t, s)$.

A3: Both individual variables $y_i = (y_{i,1},\ldots ,y_{i,T})'$ and $x_i = (x_{i,1},\ldots x_{i,T})'$, are covariance stationary with $E(x_{i,t}^2) < \infty$, $E (y_{i,t}^2) < \infty$, $E (y_{i,t}\ y_{j,z})$, $E (x_{i,t}\ x_{j,z})$ and $E (x_{i,t}\ y_{j,z})$ are only functions of the difference t- z, whereas $E (y_{i,t})$ and $E (x_{i,t})$ are independent of t.

In this heterogeneous panel model, the homogeneous non causality (HNC) hypothesis (H_0) is:

$$H_0: \quad \beta_i = 0 \quad \forall i = 1,.....N \tag{7.2}$$

Under the alternative hypothesis (H_1), we allow for β_i to differ across groups. We also allow for some, but not all, of the individual vectors to be equal to 0 (There is some Granger non causality). We assume that under H_1, there are $N_1 < N$ individual processes with no causality from y to x, and N-N_1 individuals where y Granger causes x, thus:

$$H_1: \quad \beta_i = 0 \quad \forall i = 1,.....N_1 \tag{7.3}$$
$$\beta_i \neq 0 \quad \forall i = N_1+1, N_1+2,....,N$$

N_1 is denoted as unknown but satisfies the condition $0 \leq N_1/N<1$ where the fraction N_1/N should be inferior to one, since if $N_1 = N$ there is no causality for all individuals of the panel, and then we have the null hypothesis HNC.

The opposite case of $N_1 = 0$, implies that the results are homogenous and y Granger causes x for all of the countries in the panel. Whereas if $0 < N_1 < 1$, then the causality relationship is heterogeneous: the data generating process and the causality relations are different for the different individuals of the sample.

In this context, Hurlin and Venet (2004) [93] proposed using the average of individual (country) GNC Wald statistics $W_{i,T}$ to test the homogeneous non causality hypothesis (HNC) for a panel of countries i=1,...N, such that:

$$W_{NT}^{HNC} = \frac{1}{N}\sum_{i=1}^{N} W_{i,T} \tag{7.4}$$

Where $W_{N,T}^{HNC}$ is the average statistic of the Wald[94], GNC tests applied to each country individually.

[93] For extensive and full derivations of asymptotic and semi-asymptotic distributions, please see Hurlin (2008).

[94] The Wald test, described by Polit (1996) and Agresti (1990), is one of a number of ways of testing the significance of particular explanatory variables in a statistical model. If for a particular explanatory variable, or group of explanatory variables, the Wald test is significant, then the parameters associated with these variables are not zero, so that the variables should be included in the model (in our context this means that there is Granger causality). If the Wald test is not significant then these explanatory variables can be omitted from the model.

$W_{i,T}$ are generated as a function of the F-statistic for the time hypothesis,

$$W_{i,T} = \frac{H}{N}\sum_{i=1}^{w} F_I \text{, where:}$$

$$F_I = \frac{(RSS_{r,i} - RSS_{u,i})/H}{RSS_{u,i}/df_u - df_r} \qquad (7.5)$$

where RSS_r= restricted sum of squared residual (taken from equation (7.1) with (7.2) imposed) and RSS_u = unrestricted sum of squared residuals (computed from equation (7.1)); H= number of lags or number of parameters $\beta_i^{(H)}$; df_u and df_r are the degrees of freedom of unrestricted and restricted regressions, respectively:

$df_u - df_r$ = T- 2H-1; and T = number of years.

Hurlin and Venet (2003) specified the relation between the Wald test for country i and the F-statistic defined in equation (7.5) as follows:

$$W_i = H_i F_i \;\; F_{i\,T\tilde{\iota}\to\tilde{\alpha}}\, X^2(H_i) \qquad (7.6)$$

For a large N and large T sample under A2, the individual $W_{i,T}$ statistics for i= 1,…,N are identically and independently distributed with finite second-order moments as T→∞ and, therefore, under the HNC hypothesis the following standardised average W_{NT}^{HNC} statistic sequentially converges to a standard normal in distribution. (See Hurlin (2008)).

$$Z_{N,T}^{HNC} = \sqrt{\frac{N}{2K}}(W_{N,T}^{HNC} - H) \underset{T;N\to 1}{\overset{d}{\to}} N(0,1) \qquad (7.7)$$

If the realisation of the standardised statistic $Z_{N,T}^{HNC}$ is larger than the (one-tailed, right hand side) critical value from the standard normal distribution for a given level of significance, the HNC hypothesis is rejected. This asymptotic result can be extended to the case next equation where T is fixed (finite).

For a small T sample, Hurlin (2008) proposes to compute an approximated standardized statistic $(\widetilde{Z}_{N;T}^{HNC})$ of the average Wald statistic $W_{N,T}^{HNC}$ for the HNC hypothesis. Where under A2, if T>5+ 2H the individual $W_{i,T}$ statistics $\forall i = 1,.....N$ are independently but not identically distributed with finite second order moments.

$$\tilde{Z}_{N;T}^{HNC} = \frac{\sqrt{N}[\, W_{N,T}^{HNC} - N^{-1} \sum_{I=1}^{N} E(W_{i,T})]}{\sqrt{N^{-1} \sum_{I=1}^{N} var(w_{i,T})}} \tag{7.8}$$

This statistic can be rationalised under A1 and A2, when the panel is balanced for a fixed T dimension with T>5+ 2H [95] the standardised average statistic $\tilde{Z}_{N;T}^{HNC}$ converges in distribution (For large N) to the standard normal, Thus:

$$\tilde{Z}_{N;T}^{HNC}(\varphi) = \sqrt{\frac{N}{2\times H} \times \frac{(T-2H-5)}{(T-2H-3)}} \times \left[\frac{(T-2H-3)}{(T-2H-1)} W_{N,T}^{HNC} - H\right] \underset{N \to \infty}{\overset{d}{\to}} N(0,1) \tag{7.9}$$

Once we compute equation (7.9) if the value of $\tilde{Z}_{N;T}^{HNC}$ is superior to the right tail of the standard normal distribution corresponding critical value for a given level of significance, the HNC null is rejected. When the panel is unbalanced or when the lag order H_i is specific to each cross-sectional unit, the standardized statistic $\tilde{Z}_{N;T}^{HNC}$ must be adapted as follows:

$$\tilde{Z}_{N;T}^{HNC} = \sqrt{N}\left[W_{N,T}^{HNC}(\varphi) - N^{-1} \sum_{i=1}^{N} H_i \times \frac{(T_i - 2H_i - 1)}{(T_i - 2H_i - 3)}\right] \times \left[N^{-1} \sum_{i=1}^{N} 2H_i \times \frac{(T_i - 2H_i - 1)^2 \times (T_i - 2H_i - 3)}{(T_i - 2H_i - 3)^2 \times (T_i - 2H_i - 5)}\right]^{-1/2} \tag{7.10}$$

Where $T_i > 5 + 2H_i$ denotes the minimum time dimension for the i^{th} cross-section of unit.

[95] Please note when T is fixed (small) the panel test statistic is not always positive, even though it is based on individual Wald statistics that are all positive, because the expected value of these statistics is subtracted in constructing the normalised Z statistics. However, the test is one-tailed as only very small values of Wald statistics will fall in the extreme left hand tail and these will indicate non-rejection of the null. Hence, the rejection region only occurs in the right hand tail (Stewart, 2010).

If N and T are fixed, the standardized statistic $\tilde{Z}_{N;T}^{HNC}$ and the average statistic $W_{N,T}^{HNC}$ do not converge to standard distributions under the HNC hypothesis. Two solutions are then possible: the first consists of using the mean Wald statistic $W_{N,T}^{HNC}$ and computing the exact sample critical value, denoted $c_{N,\,T}\,(\alpha)$, for the corresponding sizes N and T via stochastic simulations.

The second solution consists of using the approximated standardized statistic $\tilde{Z}_{N;T}^{HNC}$ and to compute an approximation of the corresponding critical value for a fixed N regarding the latter Hurlin (2008) shows that:

$$Pr\left[\tilde{Z}_{N;T}^{HNC} < \tilde{z}_{N,T}(\propto)\right] = Pr\left[W_{N,T}^{HNC} < C_{N,T}(\propto)\right] \qquad (7.11)$$

Where $\tilde{z}_{N,T}(\propto)$ is the$\propto$ percent level of the one tailed right hand critical value of the standard normal distribution of the standardized statistic under the HNC hypothesis. The critical value $C_{N,T}(\propto)$ of $W_{N,T}^{HNC}$ is defined as:

$$C_{N,T}(\propto) = \tilde{z}_{N,T}(\propto)\sqrt{N^{-1}Var(\widetilde{W}_{I,T}) + E(\widetilde{W}_{I,T})} \qquad (7.12)$$

Where $E(\widetilde{W}_{I,T})$ and respectively denote the mean and the variance of the individual Wald statistic.

The critical value $\tilde{z}_{N,T}$ (α) corresponds to the α percent critical value of the standard normal distribution, denoted Z_{α}, if N tends to infinity whatever the size T. For a fixed N, Hurlin (2008) proposes an approximation $\tilde{C}_{N,T}(\alpha)$ based on this value:

$$\tilde{C}_{N,T}(\alpha) = Z_{\alpha}\sqrt{N^{-1}Var(\widetilde{W}_{I,T}) + E(\widetilde{W}_{I,T})} \qquad (7.13)$$

These yields:

$$\tilde{C}_{N,T}(\alpha) = Z_{\alpha} \times \frac{(T-2H-1)}{(T-2H-1)} \times \sqrt{\frac{2H}{N} \times \frac{(T-2H-1)}{(T-2H-5)}} + \frac{H\times(T-2H-1)}{(T-2H-3)} \qquad (7.14)$$

Where equation (7.14) is suggested for use with the semi-asymptotic balanced panel statistic (fixed T and large N) (Hurlin, 2008)[96].

[96] Stewart (2010) suggested the following formula to calculate the critical values when the panel is unbalanced as Hurlin (2008) did not provide this. The formula can be as follows:

$$\tilde{c}_{N,T}(\alpha) = z_{\alpha}\sqrt{N^{-2}\sum_{i=1}^{N}\left[2H_i \times \frac{(T_i-2H_i-1)^2\times(T_i-2H_i-1)}{(T_i-2H_i-3)^2\times(T_i-2H_i-3)}\right] + N^{-1}\sum_{i=1}^{N}\left[H_i \times \frac{(T_i-2H_i-1)}{(T_i-2H_i-3)}\right]}$$

7.5.2.2 GNC Within Fisher's Method

In our testing, we also use the Fisher test (1932, 1948) in order to test the GNC hypothesis, which is based on the sum of the log p-values from each individual cross-section's GNC test. This can be written as follows:

$$\lambda = -2 \sum_{i=1}^{N} Log\pi_i \; \lambda u \; X^2 \qquad (7.15)$$

where π_i is the P-value for the F or Wald test for the GNC null for the i^{th} cross-sectional unit. Fisher's test tests the null hypothesis of GNC for all N cross-sections against the alternative that there is Granger-causality for at least one individual unit.

Hurlin (2008) pointed out the main drawback of his panel GNC test (which is also relevant for the Fisher test):

"Firstly, the rejection of the null of Homogeneous Non Causality does not provide any guidance to the number or the identity of the particular members for which the null of non causality is rejected. Secondly, the asymptotic distribution of our statistics is established under the assumption of cross-section al independence. As for panel unit root tests, it is now necessary to develop second generation panel non causality tests that allow for general or specific cross-section dependencies. This is precisely our objective future researches." The Fisher method suffers as well from the same shortcoming. Thus, to overcome this problem we follow Stewart's (2010) suggestion of using the intersection test discussed by Hanck (2008) based on the earlier work of Simes (1986) and Hommel (1988).

7.5.3.3 Hanck's (2008) Method

Hanck (2008) proposed an intersection panel unit root test, making use of Simes (1986) and Hommel's (1988) earlier work. The test is robust to general patterns of cross-sectional dependence, is straightforward to implement and can identify which cross-sectional units in the panel reject the null and which do not. However, in contrast to Hanck, we follow Stewart's (2010) suggestion by applying this intersection test within the context of GNC (rather than unit roots). This can be justified because the procedure is based on probability values from time series tests and is not restricted to any specific class of tests[97].

The Simes-type panel GNC test is based upon the panel data model see equations (7.20) and (7.21).

$$\mathrm{FDII}_{i,t} = \alpha_{i,1} \sum_{H=1}^{Hi} \gamma_i^{(H)} \mathrm{FDII}_{i,t-H} + \sum_{H=1}^{Hi} \beta_i^{(H)} \mathrm{GDPG}_{i,t-H} + \varepsilon_{i,t} \quad i = 1,2,\dots,N, t = 1,2,\dots T \tag{7.16}$$

$$\mathrm{GDPG}_{i,t} = \alpha_{i,1} \sum_{H=1}^{Hi} \gamma_i^{(H)} \mathrm{GDPG}_{i,t-H} + \sum_{H=1}^{Hi} \beta_i^{(H)} \mathrm{FDII}_{i,t-H} + \varepsilon_{i,t} \quad i = 1,2,\dots,N, t = 1,2,\dots T \tag{7.17}$$

We focus on the null hypothesis that GDPG does not Granger – cause FDII for the whole panel (homogeneous GNC).

[97] The procedure is appropriate for probability values based on test statistics that are multivariate totally positive of order two. This contains a large class of distributions including the absolute valued multivariate normal, absolute valued central multivariate t and central multivariate F, see Hanck (2008) and Stewart (2010). Given that GNC tests can be based on t,F and chi-squared distributions this would make this an appropriate test for use with Hanck's (2008) procedure.

This can be re-expressed as follow:

$$H_0 = \bigcap_{I=1\epsilon N} H_{i,0} \qquad (7.18)$$

Where,

$\cap_{I=1\epsilon N}$ denotes the intersection over the individual cross –sectional units for i = 1, 2,..., N and $H_{i,0}: \beta_i^{(1)} = \beta_i^{(2)} \ldots = \beta_i^{(H)} = 0$ for one particular i.

Otherwise, there is at least one cross – section that exhibits Granger Causality (GC) defined as follows:

$$H_1 = \bigcup_{i=1\epsilon N} H_{i,1} \qquad (7.19)$$

Where$\cup_{i=1\epsilon N}$ denotes the union over the individual cross –sectional units for i = 1, 2,..., N and

$H_{i,1}: \beta_i^{(1)} \neq 0 \cup \beta_i^{(2)} \neq 0 \cup \ldots \cup \beta_i^{(H)} \neq 0$ for one particular i.

The test is based upon the probability values, which we generically denote p_i, of time series F or Wald GNC tests, $F_i^{(\theta)}$ and $W_i^{(\theta)}$ respectively, for the null $H_{i,0}$ obtained from the estimation of equations (7.16) and (7.17) for each of the i cross- sectional units. These N probability values are arranged in ascending order, thus, $p_1 \leq p_2 \leq \ldots\ldots \leq p_N$. Therefore, p_1 is associated with the cross-sectional unit that is most likely to reject the GNC null, $H_{i,0}$.

The intersection test rejects the null for any individual cross-section in the panel at the α level of significance only if the following condition holds:

$P_j \leq \frac{J\propto}{N}$ for some j =1,2,.....,N (7.20)

The N ordered probability values are compared with ever increasing critical points, defined by, $\frac{J\propto}{N}$ and if at least one p_j exceeds its critical point the null is rejected for the whole panel (hence, at least one cross-section exhibits Granger causality otherwise one infers that there is GNC for all individual units.

To identify which individual cross-sections in the panel reject, or fail to reject, the GNC null we follow Hanck (2008) in applying Hommel's (1988) procedure. The first step is to calculate r such that the following condition holds (for all q for a given i):

$$r = \max\left\{P_{(N-i+q)} > \frac{q\alpha}{i}\right\} \text{ for } q = 1,2,....,i \quad \text{where} \quad i=1,2,....,N \qquad (7.21)$$

The second step is to use r to determine which cross-sections reject the GNC null and which do not. In particular, if r = 0 the GNC null is rejected for all cross- sectional units – $H_{i,0}$ is rejected for all i. Whereas if r > 0, we reject the GNC null for all cross-sectional units where $P_j \leq \frac{\alpha}{r}$ and do not reject the null for all units where this condition is not satisfied.

We implement our panel GNC testing approach, as follows:

Step 1: The data for the two variables FDI and GDPG are collected separately for each country in the panel.

Step 2: Bivariate VARs are estimated for each individual cross-section (country) with 1, 2 and 3 lags on the variables. The lag length for each equation in the VAR is selected using Schwarz's information criteria.

Step 3: We use a program supplied by Chris Stewart to produce the results of the time series F and Wald statistics, Hurlin and Fisher's panel statistics, and the Simes–Hommel–Hanck (SHH)-type intersection GNC statistics. It should be noted that the ability of the SHH procedure to deal with cross-sectional units should make its inference superior to that obtained from the Hurlin and Fisher tests in addition to its ability to identify which countries exhibit GNC and which do not. The panel nature of the SHH procedure should make its influence superior to that of time series tests, too.

7.5.2 Data Description and Sources

This section describes the data used to test the bidirectional causality between FDI and economic growth. To be coherent with the previous chapters, we stuck to the same panel of countries covering the period 1970–2005. We had to exclude 32 countries because of a shortage of data (for a list of countries included and excluded from our used sample, see table 7.2). The data were extracted from the WDI 2006 edition. For this study, annual unbalanced panel data were considered to test for causality between GDP and FDI. The use of panel data allowed us to gain more observations by pooling the time series cross sections data, leading to higher power for the Granger-type causality tests. The two variables used were the FDI variable, which is defined as net inflows of FDI as a percentage of GDP, and GDP growth, which is the growth of real per capita GDP of country i at time t. The unit of measurement for both variables (prior to transformation) were US dollars.

7.2 List of countries used in our Data[98]

1	Afghanistan	41	Cyprus	81	Japan	121	Paraguay	161	Uruguay
2	Albania	42	Czech Republic	82	Jordan	122	Peru	162	Uzbekistan
3	Algeria	43	Denmark	83	Kazakhstan	123	Philippines	163	Vanuatu
4	Angola	44	Djibouti	84	Kenya	124	Poland	164	Venezuela, RB
5	Argentina	45	Dominican Republic	85	Korea, Dem.	125	Portugal	165	Vietnam
6	Armenia	46	Ecuador	86	Korea, Rep.	126	Puerto Rico	166	Yemen, Rep.
7	Australia	47	Egypt, Arab Rep.	87	Kuwait	127	Qatar	167	Zambia
8	Austria	48	El Salvador	88	Kyrgyz Republic	128	Romania	168	Zimbabwe
9	Azerbaijan	49	Equatorial Guinea	89	Latvia	129	Russian Federation		
10	Bahrain	50	Eritrea	90	Lebanon	130	Rwanda		
11	Bangladesh	51	Estonia	91	Lesotho	131	Saudi Arabia		
12	Barbados	52	Ethiopia	92	Liberia	132	Senegal		
13	Belarus	53	Fiji	93	Libya	133	Serbia and Montenegro		
14	Belgium	54	Finland	94	Lithuania	134	Sierra Leone		
15	Belize	55	France	95	Luxembourg	135	Singapore		
16	Benin	56	French Polynesia	96	Macao, China	136	Slovak Republic		
17	Bermuda	57	Gabon	97	Macedonia, FYR	137	Slovenia		
18	Bhutan	58	Gambia, The	98	Madagascar	138	Somalia		
19	Bolivia	59	Georgia	99	Malawi	139	South Africa		
20	Bosnia and Herzegovina	60	Germany	100	Malaysia	140	Spain		
21	Botswana	61	Ghana	101	Mali	141	Sri Lanka		
22	Brazil	62	Greece	102	Malta	142	Sudan		
23	Brunei Darussalam	63	Grenada	103	Mauritania	143	Suriname		
24	Bulgaria	64	Guatemala	104	Mauritius	144	Swaziland		
25	Burkina Faso	65	Guinea	105	Mexico	145	Sweden		
26	Burundi	66	Guinea-Bissau	106	Moldova	146	Switzerland		
27	Cambodia	67	Guyana	107	Mongolia	147	Syrian Arab Republic		
28	Cameroon	68	Haiti	108	Morocco	148	Tajikistan		
29	Canada	69	Honduras	109	Mozambique	149	Tanzania		
30	Central African Republic	70	Hong Kong, China	110	Namibia	150	Thailand		
31	Chad	71	Hungary	111	Nepal	151	Togo		
32	Chile	72	Iceland	112	Netherlands	152	Tonga		
33	China	73	India	113	New Zealand	153	Tunisia		
34	Colombia	74	Indonesia	114	Nicaragua	154	Turkey		
35	Congo, Dem. Rep.	75	Iran, Islamic Rep.	115	Niger	155	Turkmenistan		
36	Congo, Rep.	76	Iraq	116	Nigeria	156	Uganda		
37	Costa Rica	77	Ireland	117	Norway	157	Ukraine		
38	Cote d'Ivoire	78	Israel	118	Oman	158	United Arab Emirates		
39	Croatia	79	Italy	119	Pakistan	159	United Kingdom		
40	Cuba	80	Jamaica	120	Panama	160	United States		

[98] Please note that the countries excluded from the sample are indicated with on underline will included countries are not underlined.

7.6 Empirical Results

For the entire sample considered (with 136 countries over the period 1970–2006), we test for the HNC from FDI to growth and the reverse causality relationship. In each case, we apply three panel GNC tests that are based upon the Fisher (1948), Hurlin (2004) and Hanck (2008).

The panel results for Hurlin's and Fisher's models for the HNC hypothesis are presented in Table 7.3 along with the time series GNC test statistics. Table 7.4 and Table 7.5 present the result of the SHH method based upon the GNC for F test and Wald test respectively.

7.6.1 The Time Series Results of the GNC Tests

In column 1, we identify the 136 countries used in the GNC test between FDI and GDPG. Then, the lag lengths of the VAR chosen for both variables in each country according to Schwartz's Information criteria are given in column 2 and the length used for the time series GNC tests are given in column 3. The lag lengths used in the tests for the selected countries vary between 1, 2 and 3. Columns 4 and 6 denote the time series GNC F; when the Schwartz's criterion favoured a zero lag length, we applied the test with a lag length equal to one for FDI to GDPG and GDPG to FDI, respectively. Column 5, 7, 9 and 11 are the probability values for GDPG to FDI and vice versa for the F and Wald tests.

Finally, columns 8 and 10 denote the time series Wald statistics for GDPG to FDI and FDI to GDPG, respectively. The rows at the bottom of the table labelled Hurlin and Fisher give Hurlin and Fisher panel test statistics and probability values corresponding to the time series tests given in the associated columns.

7.6.1.1 Fisher panel causality test

The Fisher test statistic (defined in equation 7.15) is distributed as X^2 (2N). The last part of Table 7.3 presents a series of tests where the value of the F test for GDPG to FDI is 303.867 and from FDI to GDPG is 348.541. The Fisher test based upon time series Wald statistics GDPG to FDI is 335.918 and from FDI to GDPG is 432.065.

The critical values are 329.181 at the 1%, 311.467 at the 5% and 302.286 at the 10% significance level. The test results cause us to reject the null hypotheses at the 1%, 5% and 10% levels of significance since their critical values at all levels are lower than the panel test statistic, except for the F-test for GDPG causing FDIG where rejection is only at the 10% level. Overall, these results suggest that for at least one country in the panel there is evidence that GDPG Granger-causes FDI and for at least one country FDI Granger-causes GDPG.

7.6.1.2 Hurlin's panel causality test

The results of the standardised statistic for the average Wald test proposed by Hurlin (2008) given by equation (7.10) are presented at the bottom of Table 7.3. The average Wald statistic for $\tilde{Z}_{N;T}^{HNC}$ from GDPG to FDI is equal to 1.369 and for FDI to GDPG is 4.502. Our inference depends on which of the following two assumptions we make:

- Under the asymptotic one-tailed normal distribution of the panel (where both T and N tend to infinity), the critical values are 2.326 at the 1%, 1.645 at the 5% and 1.282 at the 10% significance level. These suggest rejecting the null hypothesis of HNC between FDI and GDPG at all significance levels. This means that there is at least one country in our panel for which FDI Granger-causes GDPG. However, for causality from GDPG to FDI the results suggest accepting the null hypothesis except at the 10% level.

- Under the semi-asymptotic one-tailed normal distribution of the panel (with fixed T and large N), the critical values are 1.664 at the 1%, 1.550 at the 5% and 1.489 at the 10% significance level. This indicates rejecting the null hypothesis of HNC between FDI and GDPG since the panel GNC statistic exceed its critical value at all significance levels. However, we accept the null hypothesis at all significance levels for causality from GDPG to FDI. Given that our data features small T, the influence based on semi-symptotic critical values is appropriate. Hence, Hurlin's test suggests that FDI Granger-causes GDPG for at least one country while GDPG does not Granger-cause FDI for any country.

Table7.3: Time Series GNC Tests

Country	Lag SIC	Lag used (K)	F-test GDPG to FDIG	PF GDPG to FDIG	F-test FDIG to GDPG	PF FDIG to GDPG	W GDPG to FDIG	PW GDPG to FDIG	W FDIG to GDPG	PW FDIG to GDPG
1 Albania	0	1	0.181	0.680	0.398	0.542	0.181	0.671	0.398	0.528
2 Algeria	2	2	5.726	0.008	5.891	0.007	11.451	0.003	11.783	0.003
3 Angola	0	1	0.517	0.482	0.642	0.434	0.517	0.472	0.642	0.423
4 Argentina	0	1	1.327	0.260	0.098	0.757	1.327	0.249	0.098	0.754
5 Armenia	0	1	0.095	0.764	0.000	0.993	0.095	0.758	0.000	0.993
6 Australia	0	1	0.857	0.362	0.366	0.550	0.857	0.355	0.366	0.545
7 Austria	0	1	0.029	0.865	0.870	0.358	0.029	0.864	0.870	0.351
8 Bangladesh	3	3	5.984	0.041	0.675	0.604	17.953	0.000	2.025	0.567
9 Barbados	1	1	0.016	0.901	4.333	0.053	0.016	0.899	4.333	0.037
10 Belarus	0	1	0.035	0.853	0.222	0.641	0.035	0.851	0.222	0.637
11 Belgium	1	1	3.638	0.086	0.024	0.881	3.638	0.057	0.024	0.878
12 Belize	1	1	0.031	0.863	0.000	1.000	0.031	0.861	0.000	1.000
13 Benin	0	1	0.576	0.457	0.205	0.656	0.576	0.448	0.205	0.651
14 Bolivia	1	1	0.023	0.882	0.595	0.446	0.023	0.881	0.595	0.441
15 Botswana	1	1	0.466	0.500	0.418	0.523	0.466	0.495	0.418	0.518
16 Brazil	1	1	1.515	0.229	0.710	0.407	1.515	0.218	0.710	0.400
17 Bulgaria	1	1	0.230	0.635	0.212	0.649	0.230	0.632	0.212	0.645
18 Burkina Faso	3	3	0.154	0.924	5.137	0.043	0.461	0.927	15.410	0.002
19 Burundi	0	1	1.848	0.184	0.939	0.340	1.848	0.174	0.939	0.333
20 Cambodia	0	1	0.180	0.674	0.001	0.980	0.180	0.671	0.001	0.980
21 Canada	0	1	3.268	0.081	0.972	0.332	3.268	0.071	0.972	0.324
22 Central Africa	1	1	1.957	0.172	0.007	0.933	1.957	0.162	0.007	0.933
23 Chad	0	1	3.009	0.092	0.710	0.406	3.009	0.083	0.710	0.400
24 Chile	1	1	0.000	0.990	5.717	0.023	0.000	0.990	5.717	0.017
25 China	1	1	1.617	0.213	0.373	0.546	1.617	0.204	0.373	0.541
26 Columbia	1	1	2.182	0.153	0.199	0.660	2.182	0.140	0.199	0.656
27 Congo Dem	1	1	0.184	0.671	2.215	0.146	0.184	0.668	2.215	0.137
28 Congo Rep	1	1	0.714	0.404	0.200	0.658	0.714	0.398	0.200	0.655
29 Costa Rica	0	1	0.185	0.670	0.790	0.381	0.185	0.667	0.790	0.374
30 Ivory Cost	1	1	0.020	0.888	0.709	0.406	0.020	0.887	0.709	0.400
31 Croatia	1	1	0.110	0.742	0.051	0.823	0.110	0.740	0.051	0.822
32 Cyprus	0	1	0.358	0.564	1.530	0.247	0.358	0.550	1.530	0.216
33 Czech Rep	1	1	0.009	0.926	1.068	0.311	0.009	0.925	1.068	0.302
34 Denmark	0	1	0.038	0.850	0.531	0.483	0.038	0.846	0.531	0.466

PF and PW denote probability values for F and Wald time-series tests of GNC. Note that Wald = K * F.
Lag SIC denotes the VAR lag length chosen according to Scwartz's criterion.
Lag used (K) denotes the lag length used in the VAR for the time-series GNC tests.
Hurlin denotes Hurlin's panel GNC test allowing for heterogeneous T and K which is appropriate for finite T and large N.
Hurlin's Z panel statistics are given below columns headed W and corresponding (one-tail) asymptotic (normal) p-values beneath PW.
Asymptotic (one-tail normal distribution) 1%, 5% and 10% critical values for Hurlin's test are, respectively: 2.326, 1.645 and 1.282.
Semi-asymptotic (one-tail) 1%, 5% and 10% critical values for Hurlin's test are, respectively: 1.664, 1.550 and 1.489.
Fisher denotes Fisher's panel test applied to GNC individual units' probability values.
Fisher-type panel GNC statistics are given below columns headed F-test and W with corresponding chi-squared (2N) p-values beneath PF and PW
The 1%, 5% and 10% critical values for the Fisher-type panel GNC test are: 329.181, 311.467 and 302.286.
Countries have numbers that run from 1 to 136.0000 consecutively down the columns. Hence, country 1 is Albania, country 2 is Algeria and country 136 is Zimbabwe.

Table7.3: Time Series GNC Tests (continued)

Country	Lag SIC	Lag used (K)	F-test GDPG to FDIG	PF GDPG to FDIG	F-test FDIG to GDPG	PF FDIG to GDPG	W GDPG to FDIG	PW GDPG to FDIG	W FDIG to GDPG	PW FDIG to GDPG
35 Djibouti	0	1	0.116	0.736	0.134	0.717	0.116	0.733	0.134	0.714
36 Dominican	2	2	2.321	0.169	0.371	0.703	4.642	0.098	0.742	0.690
37 Ecuador	1	1	0.015	0.904	0.761	0.390	0.015	0.903	0.761	0.383
38 Egypt	1	1	0.136	0.715	1.313	0.260	0.136	0.712	1.313	0.252
39 El Salvador	1	1	1.547	0.223	5.760	0.023	1.547	0.214	5.760	0.016
40 Equatorial	1	1	0.252	0.619	0.001	0.977	0.252	0.616	0.001	0.977
41 Estonia	1	1	0.521	0.482	66.424	0.000	0.521	0.471	66.424	0.000
42 Ethiopia	0	1	0.987	0.344	0.441	0.522	0.987	0.321	0.441	0.507
43 Fiji	1	1	0.317	0.580	0.436	0.517	0.317	0.573	0.436	0.509
44 Finland	0	1	0.161	0.692	3.619	0.067	0.161	0.689	3.619	0.057
45 France	2	2	0.485	0.622	1.245	0.306	0.969	0.616	2.489	0.288
46 Gabon	1	1	5.370	0.028	1.865	0.183	5.370	0.021	1.865	0.172
47 Germany	1	1	0.144	0.707	1.343	0.255	0.144	0.705	1.343	0.247
48 Ghana	0	1	0.078	0.782	0.583	0.451	0.078	0.780	0.583	0.445
49 Greece	1	1	4.205	0.049	0.159	0.693	4.205	0.040	0.159	0.690
50 Grenada	0	1	0.686	0.416	1.511	0.231	0.686	0.407	1.511	0.219
51 Guatemala	1	1	0.016	0.900	0.746	0.397	0.016	0.899	0.746	0.388
52 Guinea	1	1	0.182	0.673	1.994	0.168	0.182	0.670	1.994	0.158
53 Guinea Bissau	1	1	0.182	0.676	5.359	0.035	0.182	0.670	5.359	0.021
54 Guyana	1	1	1.447	0.245	20.201	0.000	1.447	0.229	20.201	0.000
55 Haiti	1	1	2.120	0.155	3.450	0.073	2.120	0.145	3.450	0.063
56 Honduras	1	1	0.666	0.421	11.874	0.002	0.666	0.415	11.874	0.001
57 Hungary	1	1	0.665	0.421	0.014	0.907	0.665	0.415	0.014	0.906
58 Iceland	1	1	0.115	0.739	1.790	0.199	0.115	0.734	1.790	0.181
59 India	1	1	0.675	0.419	0.060	0.809	0.675	0.411	0.060	0.807
60 Indonesia	1	1	1.600	0.215	3.198	0.083	1.600	0.206	3.198	0.074
61 Iran	1	1	5.656	0.024	0.053	0.820	5.656	0.017	0.053	0.819
62 Ireland	1	1	6.465	0.017	0.955	0.337	6.465	0.011	0.955	0.329
63 Israel	1	1	4.234	0.049	0.000	0.984	4.234	0.040	0.000	0.984
64 Italy	1	1	0.012	0.914	1.462	0.235	0.012	0.914	1.462	0.227
65 Jamaica	1	1	0.127	0.724	1.407	0.244	0.127	0.721	1.407	0.236
66 Japan	1	1	0.800	0.378	2.961	0.095	0.800	0.371	2.961	0.085
67.00000	1	1	4.970	0.035	0.046	0.832	4.970	0.026	0.046	0.830
68 Kazakhstan	0	1	0.022	0.883	0.002	0.966	0.022	0.882	0.002	0.966
69 Kenya	1	1	4.559	0.059	0.420	0.532	4.559	0.033	0.420	0.517

PF and PW denote probability values for F and Wald time-series tests of GNC. Note that Wald = K * F.
Lag SIC denotes the VAR lag length chosen according to Scwartz's criterion.
Lag used (K) denotes the lag length used in the VAR for the time-series GNC tests.
Hurlin denotes Hurlin's panel GNC test allowing for heterogeneous T and K which is appropriate for finite T and large N.
Hurlin's Z panel statistics are given below columns headed W and corresponding (one-tail) asymptotic (normal) p-values beneath PW.
Asymptotic (one-tail normal distribution) 1%, 5% and 10% critical values for Hurlin's test are, respectively: 2.326, 1.645 and 1.282.
Semi-asymptotic (one-tail) 1%, 5% and 10% critical values for Hurlin's test are, respectively: 1.664, 1.550 and 1.489.
Fisher denotes Fisher's panel test applied to GNC individual units' probability values.
Fisher-type panel GNC statistics are given below columns headed F-test and W with corresponding chi-squared (2N) p-values beneath PF and PW
The 1%, 5% and 10% critical values for the Fisher-type panel GNC test are: 329.181, 311.467 and 302.286.
Countries have numbers that run from 1 to 136.0000 consecutively down the columns. Hence, country 1 is Albania, country 2 is Algeria and country 136 is Zimbabwe.

Table7.3: Time Series GNC Tests (continued)

Country	Lag SIC	Lag used (K)	F-test GDPG to FDIG	PF GDPG to FDIG	F-test FDIG to GDPG	PF FDIG to GDPG	W GDPG to FDIG	PW GDPG to FDIG	W FDIG to GDPG	PW FDIG to GDPG
70 Korea	1	1	0.444	0.510	4.931	0.034	0.444	0.505	4.931	0.026
71 Kuwait	1	1	6.324	0.018	0.024	0.879	6.324	0.012	0.024	0.878
72 Kyrgyz Rep	0	1	0.046	0.832	0.020	0.888	0.046	0.830	0.020	0.887
73 Lesotho	0	1	0.015	0.903	2.727	0.123	0.015	0.901	2.727	0.099
74 Liberia	1	1	0.024	0.877	0.024	0.878	0.024	0.876	0.024	0.877
75 Lithuania	1	1	1.922	0.175	6.507	0.016	1.922	0.166	6.507	0.011
76 Macedonia	0	1	4.066	0.071	1.566	0.239	4.066	0.044	1.566	0.211
77Madagascar	2	2	1.889	0.213	0.511	0.619	3.777	0.151	1.021	0.600
78 Malawi	1	1	0.506	0.482	0.524	0.474	0.506	0.477	0.524	0.469
79 Malaysia	0	1	0.508	0.482	4.256	0.049	0.508	0.476	4.256	0.039
80 Mali	1	1	0.153	0.698	0.009	0.924	0.153	0.696	0.009	0.924
81 Mauritania	1	1	0.501	0.484	1.714	0.200	0.501	0.479	1.714	0.190
82 Mauritius	2	2	0.926	0.414	4.441	0.027	1.852	0.396	8.882	0.012
83 Mexico	1	1	2.737	0.108	1.069	0.309	2.737	0.098	1.069	0.301
84 Moldova	0	1	1.423	0.260	2.285	0.162	1.423	0.233	2.285	0.131
85 Mongolia	3	3	1.430	0.338	0.193	0.897	4.291	0.232	0.578	0.901
86Morocco	1	1	0.744	0.395	0.798	0.378	0.744	0.388	0.798	0.372
87Mozambic	1	1	1.456	0.241	0.552	0.466	1.456	0.228	0.552	0.457
88 Nepal	0	1	0.002	0.968	0.002	0.962	0.002	0.968	0.002	0.961
89 Netherland	1	1	2.684	0.111	1.099	0.302	2.684	0.101	1.099	0.294
90 New Zealand	0	1	0.385	0.540	0.094	0.761	0.385	0.535	0.094	0.759
91 Nicaragua	1	1	0.088	0.770	1.672	0.207	0.088	0.767	1.672	0.196
92 Niger	0	1	6.578	0.015	0.178	0.676	6.578	0.010	0.178	0.673
93 Nigeria	0	1	0.718	0.404	2.363	0.136	0.718	0.397	2.363	0.124
94 Norway	2	2	3.543	0.045	0.887	0.425	7.087	0.029	1.773	0.412
95 Oman	0	1	9.628	0.004	0.438	0.513	9.628	0.002	0.438	0.508
96 Pakistan	1	1	0.002	0.966	0.797	0.379	0.002	0.966	0.797	0.372
97 Panama	0	1	0.005	0.944	0.793	0.380	0.005	0.944	0.793	0.373
98 Paraguay	1	1	0.161	0.691	0.403	0.530	0.161	0.689	0.403	0.525
99 Peru	1	1	0.236	0.630	0.868	0.359	0.236	0.627	0.868	0.352
100 Philipines	1	1	0.003	0.958	0.030	0.863	0.003	0.958	0.030	0.862
101Poland	1	1	2.415	0.148	15.103	0.003	2.415	0.120	15.103	0.000
102 Portugal	1	1	1.118	0.300	1.331	0.259	1.118	0.290	1.331	0.249
103 Romania	1	1	0.899	0.362	0.135	0.720	0.899	0.343	0.135	0.714
104 Rwanda	1	1	0.193	0.663	0.035	0.852	0.193	0.660	0.035	0.851

PF and PW denote probability values for F and Wald time-series tests of GNC. Note that Wald = K * F.
Lag SIC denotes the VAR lag length chosen according to Scwartz's criterion.
Lag used (K) denotes the lag length used in the VAR for the time-series GNC tests.
Hurlin denotes Hurlin's panel GNC test allowing for heterogeneous T and K which is appropriate for finite T and large N.
Hurlin's Z panel statistics are given below columns headed W and corresponding (one-tail) asymptotic (normal) p-values beneath PW.
Asymptotic (one-tail normal distribution) 1%, 5% and 10% critical values for Hurlin's test are, respectively: 2.326, 1.645 and 1.282.
Semi-asymptotic (one-tail) 1%, 5% and 10% critical values for Hurlin's test are, respectively: 1.664, 1.550 and 1.489.
Fisher denotes Fisher's panel test applied to GNC individual units' probability values.
Fisher-type panel GNC statistics are given below columns headed F-test and W with corresponding chi-squared (2N) p-values beneath PF and PW
The 1%, 5% and 10% critical values for the Fisher-type panel GNC test are: 329.181, 311.467 and 302.286.
Countries have numbers that run from 1 to 136.0000 consecutively down the columns. Hence, country 1 is Albania, country 2 is Algeria and country 136 is Zimbabwe.

Table7.3: Time Series GNC Tests (continued)

Country	Lag SIC	Lag used (K)	F-test GDPG to FDIG	PF GDPG to FDIG	F-test FDIG to GDPG	PF FDIG to GDPG	W GDPG to FDIG	PW GDPG to FDIG	W FDIG to GDPG	PW FDIG to GDPG
105 Senegal	0	1	0.046	0.831	1.241	0.274	0.046	0.830	1.241	0.265
106Siera Leon	0	1	0.733	0.398	0.114	0.738	0.733	0.392	0.114	0.736
107 Singapore	1	1	0.082	0.777	1.207	0.281	0.082	0.775	1.207	0.272
108 Slovak Rep	3	3	0.178	0.907	0.850	0.515	0.534	0.911	2.550	0.466
109 Slovania	1	1	0.020	0.891	2.520	0.144	0.020	0.888	2.520	0.112
110 Somalia	0	1	0.002	0.967	0.227	0.640	0.002	0.967	0.227	0.634
111 South Africa	0	1	2.254	0.143	0.036	0.851	2.254	0.133	0.036	0.850
112 Spain	1	1	5.082	0.033	0.046	0.831	5.082	0.024	0.046	0.830
113 Sri Lanka	0	1	0.006	0.941	0.620	0.437	0.006	0.941	0.620	0.431
114 Sudan	1	1	0.200	0.658	0.262	0.613	0.200	0.655	0.262	0.609
115 Swaziland	0	1	0.453	0.506	0.200	0.658	0.453	0.501	0.200	0.655
116 Sweden	1	1	0.158	0.693	1.028	0.318	0.158	0.691	1.028	0.311
117 Switzerland	0	1	0.222	0.643	0.509	0.484	0.222	0.637	0.509	0.476
118 Syrian	0	1	0.204	0.655	1.119	0.299	0.204	0.651	1.119	0.290
119 Tajikistan	1	1	2.100	0.178	0.030	0.866	2.100	0.147	0.030	0.862
120 Tanzania	1	1	0.165	0.692	6.215	0.027	0.165	0.685	6.215	0.013
121 Thailand	1	1	0.745	0.395	0.303	0.586	0.745	0.388	0.303	0.582
122 Togo	0	1	0.151	0.701	1.311	0.261	0.151	0.698	1.311	0.252
123 Tonga	0	1	0.023	0.882	0.003	0.954	0.023	0.880	0.003	0.953
124 Tunisia	1	1	3.396	0.075	2.301	0.139	3.396	0.065	2.301	0.129
125 Turkey	1	1	5.364	0.027	0.962	0.334	5.364	0.021	0.962	0.327
126 Uganda	1	1	0.277	0.607	0.047	0.832	0.277	0.599	0.047	0.828
127UK	1	1	2.519	0.122	0.694	0.411	2.519	0.113	0.694	0.405
128 USA	1	1	1.714	0.200	1.149	0.292	1.714	0.191	1.149	0.284
129 Uruguay	1	1	0.270	0.607	1.299	0.263	0.270	0.603	1.299	0.254
130 Uzbekistan	2	2	1.566	0.274	2.016	0.203	3.132	0.209	4.033	0.133
131 Vanuatu	1	1	1.945	0.177	0.094	0.763	1.945	0.163	0.094	0.760
132 Venezuela	1	1	0.124	0.727	0.058	0.811	0.124	0.725	0.058	0.809
133 Vietnam	1	1	5.047	0.038	0.438	0.517	5.047	0.025	0.438	0.508
134 Yemen	0	1	0.316	0.586	0.549	0.474	0.316	0.574	0.549	0.459
135 Zambia	0	1	0.325	0.573	0.415	0.524	0.325	0.569	0.415	0.520
136 Zimbabwe	0	1	0.082	0.777	0.900	0.350	0.082	0.775	0.900	0.343
Hurlin							1.369	0.086	4.502	0.000
Fisher			303.867	0.089	348.541	0.001	335.918	0.005	432.065	0.000

PF and PW denote probability values for F and Wald time-series tests of GNC. Note that Wald = K * F.
Lag SIC denotes the VAR lag length chosen according to Scwartz's criterion.
Lag used (K) denotes the lag length used in the VAR for the time-series GNC tests.
Hurlin denotes Hurlin's panel GNC test allowing for heterogeneous T and K which is appropriate for finite T and large N.
Hurlin's Z panel statistics are given below columns headed W and corresponding (one-tail) asymptotic (normal) p-values beneath PW.
Asymptotic (one-tail normal distribution) 1%, 5% and 10% critical values for Hurlin's test are, respectively: 2.326, 1.645 and 1.282.
Semi-asymptotic (one-tail) 1%, 5% and 10% critical values for Hurlin's test are, respectively: 1.664, 1.550 and 1.489.
Fisher denotes Fisher's panel test applied to GNC individual units' probability values.
Fisher-type panel GNC statistics are given below columns headed F-test and W with corresponding chi-squared (2N) p-values beneath PF and PW
The 1%, 5% and 10% critical values for the Fisher-type panel GNC test are: 329.181, 311.467 and 302.286.
Countries have numbers that run from 1 to 136 consecutively down the columns. Hence, country 1 is Albania, country 2 is Algeria and country 136 is Zimbabwe.

7.6.1.3 Results from the SHH procedure

In this section, we consider the results from using the SHH panel method. This allows us to identify the countries for which there is causality from FDI to GDPG and from GDPG to FDI. We consider the results of this method based upon probability values of the F-test (reported in Table 7.4) first. Then, we discuss the SHH method's results based upon the Wald test's probability values (Table7.5).

7.6.1.3.1 The SHH method based upon the GNC F-test

Table 7.4 (footnotes) indicates that there are r = 136 (column 3) because the probability value is greater than 0.00037 for all 136 countries. We accept the null hypothesis that GDPG does not Granger-cause FDI for all countries. Furthermore, r =134 in column 7 because the probability value is lower than 0.00037 for two countries. We calculate r for the GNC tests as specified earlier in equation (19).

Then, we use r to determine which cross-sections reject the GNC null and which do not. The first four rows of the table show that GNC from GDPG to FDI cannot be rejected for all 136 countries. Because P_j (column 2) is greater than $\frac{\propto}{r}$, where $\alpha = 0.05$. Columns 4 to 8 of Table 2 show that we reject the GNC null hypothesis for FDI to GDPG in two (Estonia and Guyana) out of 136 countries. Thus, FDI Granger-causes GDPG in Estonia and Guyana as their probability values are less than 0.00037 ($\frac{\propto}{r}$). However, FDI does not Granger-cause GDP for the remaining 134 countries.

Table 7.4: The SHH GNC test (final result) applied to (ascending) ordered p-values from the F statistic

GDPG to FDIG				FDIG to GDPG			
Country number	Probability value	Alpha / r	Accept or reject null	Country number	Probability value	Alpha / r	Accept or reject null
Oman	0.00407	0.00037	Accept	Estonia	0.00000	0.00037	**Reject**
Algeria	0.00802	0.00037	Accept	Guyana	0.00028	0.00037	**Reject**
Niger	0.01522	0.00037	Accept	Honduras	0.00161	0.00037	Accept
Ireland	0.01660	0.00037	Accept	Poland	0.00254	0.00037	Accept
Kuwait	0.01843	0.00037	Accept	Algeria	0.00713	0.00037	Accept
Iran	0.02353	0.00037	Accept	Lithuania	0.01573	0.00037	Accept
Turkey	0.02712	0.00037	Accept	El Salvador	0.02281	0.00037	Accept
Gabon	0.02831	0.00037	Accept	Chile	0.02285	0.00037	Accept
Spain	0.03250	0.00037	Accept	Tanzania	0.02694	0.00037	Accept
Jordan	0.03501	0.00037	Accept	Mauritius	0.02706	0.00037	Accept
Vietnam	0.03824	0.00037	Accept	Korea	0.03358	0.00037	Accept
Bangladesh	0.04144	0.00037	Accept	Guinea Bissau	0.03519	0.00037	Accept
Norway	0.04484	0.00037	Accept	Burkina Faso	0.04276	0.00037	Accept
Greece	0.04857	0.00037	Accept	Malaysia	0.04850	0.00037	Accept
Israel	0.04904	0.00037	Accept	Barbados	0.05280	0.00037	Accept
Kenya	0.05850	0.00037	Accept	Finland	0.06744	0.00037	Accept
Macedonia	0.07140	0.00037	Accept	Haiti	0.07249	0.00037	Accept
Tunisia	0.07464	0.00037	Accept	Indonesia	0.08319	0.00037	Accept
Canada	0.08068	0.00037	Accept	Japan	0.09495	0.00037	Accept
Belgium	0.08558	0.00037	Accept	Lesotho	0.12259	0.00037	Accept
Chad	0.09241	0.00037	Accept	Nigeria	0.13545	0.00037	Accept
Mexico	0.10784	0.00037	Accept	Tunisia	0.13915	0.00037	Accept
Netherland	0.11117	0.00037	Accept	Slovenia	0.14347	0.00037	Accept
UK	0.12233	0.00037	Accept	Congo Dem	0.14643	0.00037	Accept
South Africa	0.14309	0.00037	Accept	Moldova	0.16158	0.00037	Accept
Poland	0.14844	0.00037	Accept	Guinea	0.16759	0.00037	Accept
Colombia	0.15317	0.00037	Accept	Gabon	0.18329	0.00037	Accept
Haiti	0.15513	0.00037	Accept	Iceland	0.19860	0.00037	Accept
Dominican Rep	0.16857	0.00037	Accept	Mauritania	0.20005	0.00037	Accept
Central Africa	0.17150	0.00037	Accept	Uzbekistan	0.20344	0.00037	Accept
Lithuania	0.17522	0.00037	Accept	Nicaragua	0.20662	0.00037	Accept
Vanuatu	0.17710	0.00037	Accept	Grenada	0.23086	0.00037	Accept
Tajikistan	0.17788	0.00037	Accept	Italy	0.23539	0.00037	Accept
Burundi	0.18354	0.00037	Accept	Macedonia	0.23926	0.00037	Accept

The column headed Country Number identifies the country (see TBL_TSeries for the key to country numbers) to which the row refers to.
The column headed Probability Value gives the probability value for each individual country's GNC test arranged in ascending order of magnitude.
The column headed Alpha / r gives the nominal level of significance (alpha) divided by r calculated in TBL_SHH_F, where alpha = 0.050, r = 136 (column 3) and r = 134 (column 7).
The column headed Accept or Reject Null indicates whether the GNC null is accepted or not for each cross-sectional unit in the panel.
NOTE: if r = 0 the GNC null is rejected for ALL cross-sectional units. If r > 0 the null is rejected when p(i) <= (alpha / r).

Table 7.4: The SHH GNC test (final result) applied to (ascending) ordered p-values from the F statistic (continued)

GDPG to FDIG				FDIG to GDPG			
Country number	Probability value	Alpha / r	Accept or reject null	Country number	Probability value	Alpha / r	Accept or reject null
USA	0.19981	0.00037	Accept	Jamaica	0.24437	0.00037	Accept
China	0.21266	0.00037	Accept	Cyprus	0.24742	0.00037	Accept
Madagascar	0.21290	0.00037	Accept	Germany	0.25516	0.00037	Accept
Indonesia	0.21506	0.00037	Accept	Portugal	0.25871	0.00037	Accept
El Salvador	0.22315	0.00037	Accept	Egypt	0.26035	0.00037	Accept
Brazil	0.22858	0.00037	Accept	Togo	0.26067	0.00037	Accept
Mozambique	0.24091	0.00037	Accept	Uruguay	0.26287	0.00037	Accept
Guyana	0.24464	0.00037	Accept	Senegal	0.27362	0.00037	Accept
Argentina	0.26016	0.00037	Accept	Singapore	0.28075	0.00037	Accept
Moldova	0.26038	0.00037	Accept	USA	0.29176	0.00037	Accept
Uzbekistan	0.27409	0.00037	Accept	Syrian	0.29852	0.00037	Accept
Portugal	0.29978	0.00037	Accept	Netherland	0.30226	0.00037	Accept
Mongolia	0.33817	0.00037	Accept	France	0.30602	0.00037	Accept
Ethiopia	0.34389	0.00037	Accept	Mexico	0.30893	0.00037	Accept
Australia	0.36163	0.00037	Accept	Czech Rep	0.31139	0.00037	Accept
Romania	0.36166	0.00037	Accept	Sweden	0.31832	0.00037	Accept
Japan	0.37770	0.00037	Accept	Canada	0.33207	0.00037	Accept
Thailand	0.39462	0.00037	Accept	Turkey	0.33396	0.00037	Accept
Morocco	0.39467	0.00037	Accept	Ireland	0.33662	0.00037	Accept
Sierra leon	0.39829	0.00037	Accept	Burundi	0.33992	0.00037	Accept
Nigeria	0.40402	0.00037	Accept	Zimbabwe	0.34977	0.00037	Accept
Congo Dem	0.40428	0.00037	Accept	Austria	0.35797	0.00037	Accept
Mauritius	0.41412	0.00037	Accept	Peru	0.35853	0.00037	Accept
Grenada	0.41555	0.00037	Accept	Morocco	0.37840	0.00037	Accept
India	0.41885	0.00037	Accept	Pakistan	0.37870	0.00037	Accept
Honduras	0.42053	0.00037	Accept	Panama	0.37991	0.00037	Accept
Hungary	0.42097	0.00037	Accept	Costa Rica	0.38082	0.00037	Accept
Benin	0.45678	0.00037	Accept	Ecuador	0.38961	0.00037	Accept
Estonia	0.48167	0.00037	Accept	Guatemala	0.39679	0.00037	Accept
Malaysia	0.48170	0.00037	Accept	Chad	0.40585	0.00037	Accept
Angola	0.48204	0.00037	Accept	Ivory cost	0.40617	0.00037	Accept
Malawi	0.48223	0.00037	Accept	Brazil	0.40674	0.00037	Accept
Mauritania	0.48418	0.00037	Accept	UK	0.41084	0.00037	Accept
Botswana	0.49965	0.00037	Accept	Norway	0.42515	0.00037	Accept

The column headed Country Number identifies the country (see TBL_TSeries for the key to country numbers) to which the row refers to.
The column headed Probability Value gives the probability value for each individual country's GNC test arranged in ascending order of magnitude.
The column headed Alpha / r gives the nominal level of significance (alpha) divided by r calculated in TBL_SHH_F, where alpha = 0.050, r = 136 (column 3) and r = 134 (column 7).
The column headed Accept or Reject Null indicates whether the GNC null is accepted or not for each cross-sectional unit in the panel.
NOTE: if r = 0 the GNC null is rejected for ALL cross-sectional units. If r > 0 the null is rejected when p(i) <= (alpha / r).

Table 7.4: The SHH GNC test (final result) applied to (ascending) ordered p-values from the F statistic (continued)

GDPG to FDIG				FDIG to GDPG			
Country number	Probability value	Alpha / r	Accept or reject null	Country number	Probability value	Alpha / r	Accept or reject null
Swaziland	0.50615	0.00037	Accept	Angola	0.43401	0.00037	Accept
Korea	0.51001	0.00037	Accept	Sri Lanka	0.43696	0.00037	Accept
New Zealand	0.53996	0.00037	Accept	Bolivia	0.44615	0.00037	Accept
Cyprus	0.56445	0.00037	Accept	Ghana	0.45092	0.00037	Accept
Zambia	0.57261	0.00037	Accept	Mozambique	0.46557	0.00037	Accept
Fiji	0.57957	0.00037	Accept	Yemen	0.47407	0.00037	Accept
Yemen	0.58545	0.00037	Accept	Malawi	0.47421	0.00037	Accept
Uruguay	0.60697	0.00037	Accept	Denmark	0.48289	0.00037	Accept
Uganda	0.60700	0.00037	Accept	Switzerland	0.48440	0.00037	Accept
Equatorial	0.61902	0.00037	Accept	Oman	0.51308	0.00037	Accept
France	0.62188	0.00037	Accept	Slovak Rep	0.51523	0.00037	Accept
Peru	0.63007	0.00037	Accept	Fiji	0.51651	0.00037	Accept
Bulgaria	0.63497	0.00037	Accept	Vietnam	0.51695	0.00037	Accept
Switzerland	0.64267	0.00037	Accept	Ethiopia	0.52185	0.00037	Accept
Syrian	0.65463	0.00037	Accept	Botswana	0.52256	0.00037	Accept
Sudan	0.65807	0.00037	Accept	Zambia	0.52422	0.00037	Accept
Rwanda	0.66332	0.00037	Accept	Paraguay	0.52994	0.00037	Accept
Costa Rica	0.66981	0.00037	Accept	Kenya	0.53162	0.00037	Accept
Congo Rep	0.67120	0.00037	Accept	Albania	0.54220	0.00037	Accept
Guinea	0.67264	0.00037	Accept	China	0.54548	0.00037	Accept
Cambodia	0.67401	0.00037	Accept	Australia	0.54954	0.00037	Accept
Guinea Bissau	0.67554	0.00037	Accept	Thailand	0.58584	0.00037	Accept
Albania	0.67974	0.00037	Accept	Bangladesh	0.60362	0.00037	Accept
Paraguay	0.69126	0.00037	Accept	Sudan	0.61283	0.00037	Accept
Tanzania	0.69150	0.00037	Accept	Madagascar	0.61849	0.00037	Accept
Finland	0.69169	0.00037	Accept	Somalia	0.63957	0.00037	Accept
Sweden	0.69342	0.00037	Accept	Belarus	0.64134	0.00037	Accept
Mali	0.69820	0.00037	Accept	Bulgaria	0.64851	0.00037	Accept
Togo	0.70062	0.00037	Accept	Benin	0.65577	0.00037	Accept
Germany	0.70707	0.00037	Accept	Congo Rep	0.65777	0.00037	Accept
Egypt	0.71466	0.00037	Accept	Swaziland	0.65821	0.00037	Accept
Jamaica	0.72368	0.00037	Accept	Colombia	0.65966	0.00037	Accept
Venezuela	0.72702	0.00037	Accept	Niger	0.67626	0.00037	Accept
Djibouti	0.73561	0.00037	Accept	Greece	0.69267	0.00037	Accept
Iceland	0.73854	0.00037	Accept	Dominican	0.70277	0.00037	Accept

The column headed Country Number identifies the country (see TBL_TSeries for the key to country numbers) to which the row refers to.
The column headed Probability Value gives the probability value for each individual country's GNC test arranged in ascending order of magnitude.
The column headed Alpha / r gives the nominal level of significance (alpha) divided by r calculated in TBL_SHH_F, where alpha = 0.050, r = 136 (column 3) and r = 134 (column 7).
The column headed Accept or Reject Null indicates whether the GNC null is accepted or not for each cross-sectional unit in the panel.
NOTE: if r = 0 the GNC null is rejected for ALL cross-sectional units. If r > 0 the null is rejected when p(i) <= (alpha / r).

Table 7.4: The SHH GNC test (final result) applied to (ascending) ordered p-values from the F statistic (continued)

GDPG to FDIG				FDIG to GDPG			
Country number	Probability value	Alpha / r	Accept or reject null	Country number	Probability value	Alpha / r	Accept or reject null
Croatia	0.74221	0.00037	Accept	Djibouti	0.71720	0.00037	Accept
Armenia	0.76413	0.00037	Accept	Romania	0.72008	0.00037	Accept
Nicaragua	0.76947	0.00037	Accept	Sierra Leon	0.73788	0.00037	Accept
Singapore	0.77647	0.00037	Accept	Argentina	0.75688	0.00037	Accept
Zimbabwe	0.77677	0.00037	Accept	New Zealand	0.76084	0.00037	Accept
Ghana	0.78207	0.00037	Accept	Vanuatu	0.76264	0.00037	Accept
Senegal	0.83143	0.00037	Accept	India	0.80901	0.00037	Accept
Kyrgyz Rep	0.83208	0.00037	Accept	Venezuela	0.81089	0.00037	Accept
Denmark	0.84976	0.00037	Accept	Iran	0.81999	0.00037	Accept
Belarus	0.85270	0.00037	Accept	Croatia	0.82296	0.00037	Accept
Belize	0.86255	0.00037	Accept	Spain	0.83109	0.00037	Accept
Austria	0.86480	0.00037	Accept	Uganda	0.83150	0.00037	Accept
Liberia	0.87705	0.00037	Accept	Jordan	0.83199	0.00037	Accept
Bolivia	0.88163	0.00037	Accept	South Africa	0.85139	0.00037	Accept
Tonga	0.88176	0.00037	Accept	Rwanda	0.85199	0.00037	Accept
Kazakhstan	0.88276	0.00037	Accept	Philippines	0.86277	0.00037	Accept
Ivory Cost	0.88793	0.00037	Accept	Tajikistan	0.86570	0.00037	Accept
Slovenia	0.89119	0.00037	Accept	Liberia	0.87773	0.00037	Accept
Guatemala	0.90013	0.00037	Accept	Kuwait	0.87907	0.00037	Accept
Barbados	0.90073	0.00037	Accept	Belgium	0.88109	0.00037	Accept
Lesotho	0.90329	0.00037	Accept	Kyrgyz Rep	0.88844	0.00037	Accept
Ecuador	0.90380	0.00037	Accept	Mongolia	0.89703	0.00037	Accept
Slovak Rep	0.90741	0.00037	Accept	Hungary	0.90669	0.00037	Accept
Italy	0.91439	0.00037	Accept	Mali	0.92423	0.00037	Accept
Burkina Faso	0.92351	0.00037	Accept	Central Africa	0.93305	0.00037	Accept
Czech Rep	0.92572	0.00037	Accept	Tonga	0.95354	0.00037	Accept
Sri Lanka	0.94118	0.00037	Accept	Nepal	0.96147	0.00037	Accept
Panama	0.94401	0.00037	Accept	Kazakhstan	0.96584	0.00037	Accept
Philippines	0.95820	0.00037	Accept	Equatorial	0.97720	0.00037	Accept
Pakistan	0.96614	0.00037	Accept	Cambodia	0.97998	0.00037	Accept
Somalia	0.96712	0.00037	Accept	Israel	0.98438	0.00037	Accept
Nepal	0.96837	0.00037	Accept	Armenia	0.99268	0.00037	Accept
Chile	0.99030	0.00037	Accept	Belize	0.99968	0.00037	Accept

The column headed Country Number identifies the country (see TBL_TSeries for the key to country numbers) to which the row refers to.
The column headed Probability Value gives the probability value for each individual country's GNC test arranged in ascending order of magnitude.
The column headed Alpha / r gives the nominal level of significance (alpha) divided by r calculated in TBL_SHH_F, where alpha = 0.050, r = 136 (column 3) and r = 134 (column 7).
The column headed Accept or Reject Null indicates whether the GNC null is accepted or not for each cross-sectional unit in the panel.
NOTE: if r = 0 the GNC null is rejected for ALL cross-sectional units. If r > 0 the null is rejected when p(i) <= (alpha / r).

7.6.1.3.2 The SHH method based upon the GNC Wald test

The results reported in Table 7.5 refer to the Wald test results. From the results in the first four columns, we find that r is equal to 136 as the probability value is greater than 0.00037 for all 136 countries. Thus, we accept the null hypothesis that GDPG does not Granger-cause FDI for all countries. This result is consistent with those from the SHH test on the F-statistic.

The application of the SHH test based on the Wald test for GNC FDI to GDPG is reported in columns 5 to 8 of Table 7.5. In this case, r = 133 and $\frac{\propto}{r}$ = 0.00038, which shows that there is causality in Estonia, Guyana and Poland only. For the other 133 countries, FDI does not Granger-cause GDPG because $P_J < \frac{\propto}{r}$. These results are consistent with those obtained from the SHH test based on the F-test except causality is found for Poland as well as Estonia and Guyana.

Table 7.5: The SHH GNC test (final result) applied to (ascending) ordered p-values from the Wald statistic

GDPG to FDIG				FDIG to GDPG			
Country number	Probability value	Alpha / r	Accept or reject null	Country number	Probability value	Alpha / r	Accept or reject null
Bangladesh	0.00045	0.00037	Accept	Estonia	0.00000	0.00038	**Reject**
Oman	0.00192	0.00037	Accept	Guyana	0.00001	0.00038	**Reject**
Algeria	0.00326	0.00037	Accept	Poland	0.00010	0.00038	**Reject**
Niger	0.01032	0.00037	Accept	Honduras	0.00057	0.00038	Accept
Ireland	0.01100	0.00037	Accept	Burkina Faso	0.00150	0.00038	Accept
Kuwait	0.01191	0.00037	Accept	Algeria	0.00276	0.00038	Accept
Iran	0.01739	0.00037	Accept	Lithuania	0.01074	0.00038	Accept
Gabon	0.02049	0.00037	Accept	Mauritius	0.01179	0.00038	Accept
Turkey	0.02056	0.00037	Accept	Tanzania	0.01267	0.00038	Accept
Spain	0.02418	0.00037	Accept	El Salvador	0.01640	0.00038	Accept
Vietnam	0.02466	0.00037	Accept	Chile	0.01680	0.00038	Accept
Jordan	0.02579	0.00037	Accept	Guinea Bissau	0.02061	0.00038	Accept
Norway	0.02891	0.00037	Accept	Korea Rep	0.02638	0.00038	Accept
Kenya	0.03274	0.00037	Accept	Barbados	0.03738	0.00038	Accept
Israel	0.03962	0.00037	Accept	Malaysia	0.03911	0.00038	Accept
Greece	0.04031	0.00037	Accept	Finland	0.05711	0.00038	Accept
Macedonia	0.04375	0.00037	Accept	Haiti	0.06326	0.00038	Accept
Belgium	0.05648	0.00037	Accept	Indonesia	0.07372	0.00038	Accept
Tunisia	0.06536	0.00037	Accept	Japan	0.08529	0.00038	Accept
Canada	0.07064	0.00037	Accept	Lesotho	0.09866	0.00038	Accept
Chad	0.08279	0.00037	Accept	Slovak Rep	0.11238	0.00038	Accept
Mexico	0.09806	0.00037	Accept	Nigeria	0.12423	0.00038	Accept
Dominican	0.09819	0.00037	Accept	Tunisia	0.12933	0.00038	Accept
Netherland	0.10137	0.00037	Accept	Moldova	0.13065	0.00038	Accept
UK	0.11250	0.00037	Accept	Uzbekistan	0.13313	0.00038	Accept
Poland	0.12016	0.00037	Accept	Congo Dem	0.13664	0.00038	Accept
South Africa	0.13329	0.00037	Accept	Guinea	0.15794	0.00038	Accept
Colombia	0.13960	0.00037	Accept	Gabon	0.17202	0.00038	Accept
Haiti	0.14539	0.00037	Accept	Iceland	0.18098	0.00038	Accept
Tajikistan	0.14726	0.00037	Accept	Mauritania	0.19042	0.00038	Accept
Madagascar	0.15128	0.00037	Accept	Nicaragua	0.19605	0.00038	Accept
Central Africa	0.16188	0.00037	Accept	Macedonia	0.21077	0.00038	Accept
Vanuatu	0.16317	0.00037	Accept	Cyprus	0.21612	0.00038	Accept

The column headed Country Number identifies the country (see TBL_TSeries for the key to country numbers) to which the row refers to.
The column headed Probability Value gives the probability value for each individual country's GNC test arranged in ascending order of magnitude.

The column headed Alpha / r gives the nominal level of significance (alpha) divided by r calculated in TBL_SHH_W, where alpha = 0.050, r = 135 (column 3) and r = 133 (column 7).
The column headed Accept or Reject Null indicates whether the GNC null is accepted or not for each cross-sectional unit in the panel.
NOTE: if r = 0 the GNC null is rejected for ALL cross-sectional units. If r > 0 the null is rejected when p(i) <= (alpha / r).

Table7.5: The SHH GNC test (final result) applied to (ascending) ordered p-values from the Wald statistic (continued)

GDPG to FDIG				FDIG to GDPG			
Country number	Probability value	Alpha / r	Accept or reject null	Country number	Probability value	Alpha / r	Accept or reject null
Lithuania	0.16564	0.00037	Accept	Grenada	0.21894	0.00038	Accept
Burundi	0.17403	0.00037	Accept	Italy	0.22653	0.00038	Accept
USA	0.19048	0.00037	Accept	Jamaica	0.23564	0.00038	Accept
China	0.20349	0.00037	Accept	Germany	0.24658	0.00038	Accept
Indonesia	0.20593	0.00037	Accept	Portugal	0.24860	0.00038	Accept
Venezuela	0.20887	0.00037	Accept	Egypt	0.25185	0.00038	Accept
El Salvador	0.21352	0.00037	Accept	Togo	0.25218	0.00038	Accept
Brazil	0.21834	0.00037	Accept	Uruguay	0.25441	0.00038	Accept
Mozambique	0.22750	0.00037	Accept	Senegal	0.26532	0.00038	Accept
Guyana	0.22905	0.00037	Accept	Singapore	0.27201	0.00038	Accept
Mongolia	0.23170	0.00037	Accept	USA	0.28374	0.00038	Accept
Moldova	0.23284	0.00037	Accept	France	0.28809	0.00038	Accept
Argentina	0.24926	0.00037	Accept	Syria	0.29008	0.00038	Accept
Portugal	0.29042	0.00037	Accept	Netherland	0.29440	0.00038	Accept
Ethiopia	0.32046	0.00037	Accept	Mexico	0.30118	0.00038	Accept
Romania	0.34295	0.00037	Accept	Czech Rep	0.30150	0.00038	Accept
Australia	0.35470	0.00037	Accept	Sweden	0.31071	0.00038	Accept
Japan	0.37102	0.00037	Accept	Canada	0.32418	0.00038	Accept
Thailand	0.38820	0.00037	Accept	Turkey	0.32661	0.00038	Accept
Morocco	0.38825	0.00037	Accept	Ireland	0.32854	0.00038	Accept
Sierra Leon	0.39193	0.00037	Accept	Burundi	0.33265	0.00038	Accept
Mauritius	0.39605	0.00037	Accept	Zimbabwe	0.34266	0.00038	Accept
Nigeria	0.39684	0.00037	Accept	Austria	0.35098	0.00038	Accept
Congo Rep	0.39801	0.00037	Accept	Peru	0.35156	0.00038	Accept
Guatemala	0.40738	0.00037	Accept	Morocco	0.37173	0.00038	Accept
India	0.41138	0.00037	Accept	Pakistan	0.37204	0.00038	Accept
Honduras	0.41450	0.00037	Accept	Panama	0.37327	0.00038	Accept
Hungary	0.41495	0.00037	Accept	Costa Rica	0.37419	0.00038	Accept
Benin	0.44793	0.00037	Accept	Ecuador	0.38312	0.00038	Accept
Estonia	0.47058	0.00037	Accept	Guatemala	0.38788	0.00038	Accept
Angola	0.47228	0.00037	Accept	Brazil	0.39960	0.00038	Accept
Malaysia	0.47580	0.00037	Accept	Chad	0.39960	0.00038	Accept
Malawi	0.47708	0.00037	Accept	Ivory Cost	0.39993	0.00038	Accept
Mauritania	0.47889	0.00037	Accept	UK	0.40467	0.00038	Accept

The column headed Country Number identifies the country (see TBL_TSeries for the key to country numbers) to which the row refers to.
The column headed Probability Value gives the probability value for each individual country's GNC test arranged in ascending order of magnitude.

The column headed Alpha / r gives the nominal level of significance (alpha) divided by r calculated in TBL_SHH_W, where alpha = 0.050, r = 135 (column 3) and r = 133 (column 7).
The column headed Accept or Reject Null indicates whether the GNC null is accepted or not for each cross-sectional unit in the panel.
NOTE: if r = 0 the GNC null is rejected for ALL cross-sectional units. If r > 0 the null is rejected when p(i) <= (alpha / r).

Table 7.5 : The SHH GNC test (final result) applied to (ascending) ordered p-values from the Wald statistic (continued)

GDPG to FDIG				FDIG to GDPG			
Country number	Probability value	Alpha / r	Accept or reject null	Country number	Probability value	Alpha / r	Accept or reject null
Botswana	0.49474	0.00037	Accept	Norway	0.41208	0.00038	Accept
Swaziland	0.50100	0.00037	Accept	Angola	0.42295	0.00038	Accept
Korea Rep	0.50523	0.00037	Accept	Sri Lanka	0.43117	0.00038	Accept
New Zealand	0.53494	0.00037	Accept	Bolivia	0.44049	0.00038	Accept
Cyprus	0.54970	0.00037	Accept	Ghana	0.44495	0.00038	Accept
Zambia	0.56862	0.00037	Accept	Mozambique	0.45733	0.00038	Accept
Fiji	0.57331	0.00037	Accept	Yemen	0.45854	0.00038	Accept
Yemen	0.57419	0.00037	Accept	Denmark	0.46618	0.00038	Accept
Uganda	0.59876	0.00037	Accept	Slovak Rep	0.46626	0.00038	Accept
Uruguay	0.60340	0.00037	Accept	Malawi	0.46895	0.00038	Accept
Equatorial	0.61558	0.00037	Accept	Switzerland	0.47573	0.00038	Accept
France	0.61599	0.00037	Accept	Ethiopia	0.50684	0.00038	Accept
Peru	0.62676	0.00037	Accept	Vietnam	0.50807	0.00038	Accept
Bulgaria	0.63171	0.00037	Accept	Oman	0.50819	0.00038	Accept
Switzerland	0.63730	0.00037	Accept	Fiji	0.50897	0.00038	Accept
Syria	0.65138	0.00037	Accept	Kenya	0.51703	0.00038	Accept
Sudan	0.65486	0.00037	Accept	Botswana	0.51795	0.00038	Accept
Costa Rica	0.66692	0.00037	Accept	Paraguay	0.52542	0.00038	Accept
Congo Dem	0.66833	0.00037	Accept	Albania	0.52805	0.00038	Accept
Guinea Bissau	0.66948	0.00037	Accept	China	0.54117	0.00038	Accept
Guinea	0.66978	0.00037	Accept	Australia	0.54527	0.00038	Accept
Albania	0.67074	0.00037	Accept	Bangladesh	0.56733	0.00038	Accept
Cambodia	0.67098	0.00037	Accept	Thailand	0.58201	0.00038	Accept
Tanzania	0.68490	0.00037	Accept	Madagascar	0.60018	0.00038	Accept
Paraguay	0.68859	0.00037	Accept	Sudan	0.60908	0.00038	Accept
Finland	0.68865	0.00037	Accept	Somalia	0.63350	0.00038	Accept
Sweden	0.69078	0.00037	Accept	Belarus	0.63741	0.00038	Accept
Mali	0.69561	0.00037	Accept	Bulgaria	0.64540	0.00038	Accept
Togo	0.69805	0.00037	Accept	Benin	0.65089	0.00038	Accept
Germany	0.70456	0.00037	Accept	Congo Rep	0.65476	0.00038	Accept
Egypt	0.71223	0.00037	Accept	Swaziland	0.65500	0.00038	Accept
Jamaica	0.72135	0.00037	Accept	Colombia	0.65549	0.00038	Accept
Venezuela	0.72471	0.00037	Accept	Niger	0.67344	0.00038	Accept

The column headed Country Number identifies the country (see TBL_TSeries for the key to country numbers) to which the row refers to.
The column headed Probability Value gives the probability value for each individual country's GNC test arranged in ascending order of magnitude.

The column headed Alpha / r gives the nominal level of significance (alpha) divided by r calculated in TBL_SHH_W, where alpha = 0.050, r = 135 (column 3) and r = 133 (column 7).
The column headed Accept or Reject Null indicates whether the GNC null is accepted or not for each cross-sectional unit in the panel.
NOTE: if r = 0 the GNC null is rejected for ALL cross-sectional units. If r > 0 the null is rejected when p(i) <= (alpha / r).

Table 7.5: The SHH GNC test (final result) applied to (ascending) ordered p-values from the Wald statistic (continued)

GDPG to FDIG Country number	Probability value	Alpha / r	Accept or reject null	FDIG to GDPG Country number	Probability value	Alpha / r	Accept or reject null
Djibouti	0.73297	0.00037	Accept	Dominican	0.68997	0.00038	Accept
Iceland	0.73439	0.00037	Accept	Greece	0.69002	0.00038	Accept
Croatia	0.74004	0.00037	Accept	Romania	0.71369	0.00038	Accept
Armenia	0.75839	0.00037	Accept	Djibouti	0.71436	0.00038	Accept
Nicaragua	0.76729	0.00037	Accept	Sierra Leon	0.73568	0.00038	Accept
Singapore	0.77450	0.00037	Accept	Argentina	0.75428	0.00038	Accept
Zimbabwe	0.77492	0.00037	Accept	New Zealand	0.75857	0.00038	Accept
Ghana	0.78016	0.00037	Accept	Vanuatu	0.75977	0.00038	Accept
Senegal	0.83007	0.00037	Accept	India	0.80709	0.00038	Accept
Kyrgyz Rep	0.83020	0.00037	Accept	Venezuela	0.80935	0.00038	Accept
Denmark	0.84587	0.00037	Accept	Iran	0.81854	0.00038	Accept
Belarus	0.85124	0.00037	Accept	Croatia	0.82153	0.00038	Accept
Belize	0.86124	0.00037	Accept	Uganda	0.82837	0.00038	Accept
Austria	0.86372	0.00037	Accept	Spain	0.82947	0.00038	Accept
Liberia	0.87580	0.00037	Accept	Jordan	0.83024	0.00038	Accept
Tonga	0.88008	0.00037	Accept	South Africa	0.85020	0.00038	Accept
Bolivia	0.88070	0.00037	Accept	Rwanda	0.85079	0.00038	Accept
Kazakhstan	0.88162	0.00037	Accept	Philippines	0.86168	0.00038	Accept
Ivory Cost	0.88704	0.00037	Accept	Tajikistan	0.86223	0.00038	Accept
Slovenia	0.88842	0.00037	Accept	Liberia	0.87648	0.00038	Accept
Guatemala	0.89904	0.00037	Accept	Kuwait	0.87787	0.00038	Accept
Barbados	0.89924	0.00037	Accept	Belgium	0.87803	0.00038	Accept
Lesotho	0.90139	0.00037	Accept	Kazakhstan	0.88720	0.00038	Accept
Ecuador	0.90305	0.00037	Accept	Mongolia	0.90137	0.00038	Accept
Slovak Rep	0.91125	0.00037	Accept	Hungary	0.90593	0.00038	Accept
Italy	0.91371	0.00037	Accept	Mali	0.92362	0.00038	Accept
Czech Rep	0.92498	0.00037	Accept	Central Africa	0.93253	0.00038	Accept
Burkina Faso	0.92731	0.00037	Accept	Tonga	0.95292	0.00038	Accept
Sri Lanka	0.94074	0.00037	Accept	Nepal	0.96103	0.00038	Accept
Panama	0.94358	0.00037	Accept	Kazakhstan	0.96547	0.00038	Accept
Philippines	0.95790	0.00037	Accept	Equatorial	0.97696	0.00038	Accept
Pakistan	0.96590	0.00037	Accept	Cambodia	0.97977	0.00038	Accept
Somalia	0.96663	0.00037	Accept	Israel	0.98414	0.00038	Accept
Nepal	0.96803	0.00037	Accept	Armenia	0.99252	0.00038	Accept
Chile	0.99016	0.00037	Accept	Belize	0.99968	0.00038	Accept

The column headed Country Number identifies the country (see TBL_TSeries for the key to country numbers) to which the row refers to.
The column headed Probability Value gives the probability value for each individual country's GNC test arranged in ascending order of magnitude.

The column headed Alpha / r gives the nominal level of significance (alpha) divided by r calculated in TBL_SHH_W, where alpha = 0.050, r = 135 (column 3) and r = 133 (column 7).
The column headed Accept or Reject Null indicates whether the GNC null is accepted or not for each cross-sectional unit in the panel.
NOTE: if r = 0 the GNC null is rejected for ALL cross-sectional units. If r > 0 the null is rejected when p(i) <= (alpha / r).

7.7 Conclusion

This chapter provides an extensive survey of the literature on the relationship between FDI and growth, examining both the theory that underlies the work in this area and the results of empirical studies published since 1986. Overall, a larger number of studies seem to favour the conventional assumption that FDI positively causes growth. The consensus reached among academia and practitioners is that FDI tends to have a significant effect on economic growth through multiple channels such as capital formation, technology transfer and spillover, human capital (knowledge and skill) enhancement and so on. The main objective of our work was to reinvestigate the issue of causality across a sample of diverse countries applying Granger causality approach to panel data model using the advanced econometric techniques developed by Hurlin (2004), Fisher (1948), Sims (1986), Hommel (1988) and Hanck (2008).

The result of testing HNC hypothesis can be summarised as follows. Using the Fisher panel tests, we found that FDI Granger-causes growth for at least one country and growth Granger-causes FDI for at least one country.

Using Hurlin's test, we found that there is causality from FDI towards GDPG in at least one country; however, GDPG does not Granger-cause FDI in any country. The application of Hanck's model identified at most three countries (Estonia, Guyana and Poland) where FDI Granger-causes GDPG and no countries where GDPG Granger-causes FDI. We note that those three countries have different histories of macroeconomic episodes, policy regimes and growth patterns. For instance, according to the World Bank, Estonia and Poland are European economies in transition that have policy decisions that attract even more FDI and their locations and growth prospects thus favour them.

Finding only three countries out of 136 above does not mean that there is no impact of FDI on economic growth for virtually all countries. In our opinion, this only shows that the relationship between the two variables is perhaps too complex to be identified in a bivariate Granger causality framework. Our results may also suggest that the share of FDI inflows to GDP have been quantitatively too small to have a high and significant impact on economic growth. However, the method applied suggests that the larger is the VAR the more errors it will have.

This may suggest that the causality tests in our case do not look so informative. Thus the relationship between FDI and economic growth may well depend on the determinants of FDI. (See analysis of robust determinants of FDI (chapter 6). If the determinants have strong link with growth in host country growth may be found to cause FDI, while output may grow faster when FDI takes place under other circumstances. The empirical evidence reported in this chapter supports and shows that there is no causality between FDI inflows and economic growth in both directions (3countries out of 136). Our results suggest that the relationship between the two variables is perhaps too complex to be identified in a bivariate Granger causality framework. Thus, we turn our focus to a more specific question in chapter8 where we test whether FDI is a determinant of Economic Growth.

Chapter 8

FDI as determinant of Economic Growth under a reassessed EBA

8.1 Introduction

Two types of theoretical models characterise the literature on the economics and econometrics of growth: the Solow (1956) exogenous growth model and the introduction of endogenous growth theory in the 1980s of Barro (1990) and Romer (1990). The improved availability of lengthy time series data sets covering broad cross-sections of countries have had an unequivocal impact on the empirical literature dealing with single equation macroeconomic models for cross-sections of countries or regions. The empirics are focused on explaining economic growth differentials. With virtually no theory on to the precise nature of the hypothesised relationships, plethoras of specifications exist, and thus empirics reach different conclusions depending on model specification. Durlauf and Quah (1999) stressed that empirical economists are inclined to follow theory rather loosely, and simply 'try' variables to establish the factors determining economic growth.

In response, to the great diversity of results, attempts have been made to identify "robust" variables, the "best" model specification or ways of combining alternative model specifications (Levine and Renelt, 1992; Crain and Lee, 1999; Granger and Uhlig, 1990; Sala-i- Martin, 1997; Fernandez et al., 2001; Sala-i-Martin et al., 2004; Hoover and Perez, 2004; Hendry and Krolzig, 2004).

This study follows this line of research by attempting to identify robust determinants of economic growth across 168 countries from 1970 to 2006. The main contribution of our work consists of taking into account the fact that there is no agreed theoretical growth models on how the estimated specifications of the growth equations should be derived (see Easterly et al., 2004; Durlauf, 2005)[99].

We innovate on previous studies by extending the Solow growth model and the Mankiw-Romer-Weil Specification to include FDI/GDP as a variable of interest and to test whether it can be considered as robust determinants of Economic Growth.

Our approach borrows and draws from Neoclassical and endogenous growth theories to allow for differences in countries' steady-state income levels. First, we extend the Solow growth model and the Mankiw-Romer-Weil Specification to estimate the effect of FDI as a determinant of economic growth. Second, we consider a wider assortment of potential economic explanatory variables than any previous study has. Finally, we use EBA to address the problem of model uncertainty in the context of Economic Growth determinants.

We then apply this approach by considering a large number of explanatory variables in order to find robust determinants of a country's economic growth. In line with earlier studies, we generate results that take into account the criteria proposed by Levine and Renelt (1992) and Sala-i-Martin (1997).

The aim of this chapter is to test the role of FDI in affecting Economic Growth. To evaluate that we first check for robustness of the role of FDI in Economic Growth within a broad set of growth determinants suggested in the literature. For this purpose, we estimate an unbalanced panel model for 168 countries over the period 1970–2006 where we add to the growth equation FDI as one of the main variables to test whether growth affects it. In this chapter, we employ the recent econometric EBA method to gauge the robustness of the selected determinants of economic growth, with particular emphasis on FDI.

[99] Few empirical studies faced the case of inconsistent empirical estimates which arises with omitted country specific effects which, if not uncorrelated with other regressors, lead to a misspecification of the underlying model, or with endogenous variables which may be incorrectly treated as exogenous

The chapter proceeds as follows. Section 2 develops a theoretical model of economic growth that provides the framework for the subsequent empirical analysis discusses estimation issues and describes the estimator used for the robustness analysis. Section 3 describes the full set of variables that can be considered as possible growth determinants. Section 4 presents the proposed approach for identifying robust determinants of economic growth. Section 5 describes the presented data and discusses details about the estimation procedure. Section 6 presents the empirical results. Section 7 concludes.

8.2 Background of the theoretical model of Economic Growth

The extensive empirical literature is mainly concerned with the estimation of cross-country and time series growth regressions, known as 'Barro regressions' (after Barro, 1991)[100]. The review below covers both the theoretical and empirical studies of the subject following different approaches. It provides a complete list of the theoretical determinants of economic growth as well as their impact. As much of the literature of this area, the conventional model underlying the empirical estimations is based on a simple exogenous growth framework proposed by Mankiw et al. (1992). We consider the case where aggregate output in country i at time t, $Y_{i,t}$ is determined by the Cobb- Douglas production function[101].

[100] Exceptions are those studies using panel data, such as Islam (1995) and Caselli et al. (1996).

[101] The inclusion of FDI flows in an augmented production function such as equation (8.1) presents two immediate problems. First, all other explanatory variables are stock variables, so that, strictly speaking, it would not be correct to include FDI, namely a flow variable. Second, FDI can only be taken to be a crude proxy for the impact of foreign technologies and spillovers on growth, since they are financial flows that capture (or obscure) transactions of foreign investors (MNCs) in the recipient economy, which may not be the ones expected to be growth enhancing (De Mello, 1996).

The model is based on a human capital-augmented production function where human capital is treated as an additional factor of production to capital, population and technology:

$$Y_{i,t} = K_{it}^{\alpha} H_{it}^{\beta} (A_t L_{i,t})^{1-\alpha-\beta} \quad (8.1)$$

where: Y, K, H, A and L represent: GDP , physical capital, human capital; the level of technology and the labour force, respectively. With $\alpha+\beta< 1$, the production function exhibits decreasing returns to all capital. L and A are assumed to grow exogenously at rates n and g so that:

$$L(i,t)=L(0)e^{n,t} \quad (8.2)$$

$$A(i,t)=L(0)e^{g,t} \quad (8.3)$$

Assuming that s is the constant fraction of output that is saved and invested, and defining output and the stock of capital per unit of effective labour as $\hat{Y}=Y/AL$ and $\hat{K} = K/AL$, respectively, the dynamic equation for $\hat{K}$ is given by:

$$k(t) = (s^K)\, y(t)-(n+g+\delta)\, k(t) \quad (8.4)$$

$$h(t) = (s^h)\, y(t)-(n+g+\delta)\, h(t) \quad (8.5)$$

All variables are assumed to evolve in continuous time. The level of technology and labour grow at constant rates n_i and g, respectively. Each country augments its physical and human capital stocks at the constant savings rates s^k , s^h while both stocks depreciate at the same rate δ. The steady-state conditions in equations (8.3) and (8.4) establish the main prediction of the Solow model, namely how savings and population growth rates affect real income. From the above equations, both physical and human capital in the steady state are negatively related to population growth and positively related to the savings rate.

Recent empirical cross-country studies of growth have been inspired by the Neoclassical model extended to include government policies, human capital and some measure of technology diffusion.

Differences in country coverage, empirical methodologies and periods covered by the various analyses account for some of the lack of unanimity in the empirical literature[102]. Of course, each study has presented valid theoretical justifications for how the specifications have been identified and chosen. However, looking across the vast literature, there seems to be little consensus on the theory. The findings that are presented as statistically significant in the presence of some variables may or may not be significant in the presence (or absence) of other variables that other scholars have proposed. This highlights the issue of model uncertainty and points to the fundamental problem of open-ended theory[103] in modern growth research (Brock and Durlauf, 2001).

Easterly and Levine (2001) state that "This literature has the usual limitations of choosing a specification without clear guidance from theory, which often means there are more plausible specifications than there are data points in the sample." Rogers (2003) also took a similar view on the *ad hoc* nature of specifications but justified them because of the complexity of economic growth and the lack of an encompassing model. Consequently, as found by Durlauf, Johnson, and Temple (2005), the number of potential growth improving variables used in the empirical works is as many as 145variables[104].

Therefore, consistent with the empirical literature limitations on cross-country comparisons of economic growth, that can be estimated at best with annual data in unbalanced panels, we add to the growth equation FDI as one of the main variables. This can be carried out by simply regressing the average growth rate of output per capita on variables considered to have some growth effects. It is well known that in the Solow model steady-state growth rates equals the TFP growth rate.

Edwards (1998), Bernanke and Gurkaynak (2001) and Dollar and Kraay (2004) suggested that the permanent growth effects of the growth-improving variables should be estimated by estimating their effects on TFP growth rate. Senhadji (2000) used this approach to estimate TFP for 88 countries using the growth accounting framework of Solow (1956). He then regressed TFP on some potential growth improving variables. Our approach is somewhat similar to the spirit of these works, but our method is different and simpler than was that of

---

[102] Durlauf et al. (2005) reported that more than 140 regressors have been identified as growth determinants corresponding to about 43 different growth theories. Each of these theories was found to be statistically significant in at least one study.

[103] Refers to the dilemma that the validity of a particular growth theory does not per se preclude the relevance of another theory.

[104] Any variable that has externalities can cause positive growth in the long run. This explains why a large number of growth variables have been used in the empirical works.

Senhadji because there is no need for growth accounting exercises. We follow the methodology of Bhaskara and Chaitanya, (2004) where we extend the production function by making TFP depend on growth-improving variables, and thus directly estimate their permanent growth effects.

We choose to base our work on the Solow growth model for various reasons (Durlauf, Johnson, and Temple (2005) Bhaskara and Chaitanya, (2004)). First, the Solow model can be easily extended and estimated compared with a variety of endogeneous growth models, which need complex non-linear dynamic specifications and unobservable parameters such as the inter-temporal elasticity of consumption substitution and the risk aversion rate. Second, there is no convincing evidence that endogeneous growth models, with increasing returns, empirically perform better than the Solow model; see Jones (1995) and Solow (2000)[105]. Finally, Bernanke and Gurkaynak (2001) noted that the Solow growth model is also useful to evaluate other types of growth models if they have a balanced growth path.

Solow (1956) argued that productivity growth results from increases in the amount of capital that each worker is set to operate. However, as capital per worker increases, the marginal productivity of capital declines. Ultimately, the capital-labour ratio approaches a constant productivity growth in GDP per capita ceases. Solow (1956) added an exogenous term "technological progress". On this assumption, the Neoclassical model of economic growth predicts that in the long run, GDP per capita in all countries will grow at the same exogenously determined rate of technological progress. To the extent that capital is internationally mobile and moves to the countries where the prospects for profits are highest, this tendency should be considerably strengthened. Hence, the gaps in income levels between rich and poor countries should be expected to narrow and ultimately disappear. Solow (1956) concluded that countries where capital is scarce compared with labour or where the capital: labour ratio is low should be expected to have a higher rate of profit on capital, a higher rate of capital accumulation and higher per capita growth.

[105] Bernanke and Gurkaynak tested the validity of the Solow model against the endogenous models of Lucas (1988) and Uzawa (1965) and found that more parameter restrictions are satisfied in the Lucas-Uzawa model. However, they admitted that the Solow model, as extended by Mankiew et al. (1992) is valid to analyse all types of growth models if eventually they reach a balanced growth path.

8.2.1 Extended Solow model

Our extended Solow model may be called a Solow model with an endogenous framework. Our extension differs from the well-known extension to the Solow model of Mankiw et al. (1992) because we assume the typical specification:

$$Ln(Y_{i,t}) - Ln(Y_{i,t-1}) = \beta_0 \ln (Y_{i,t-1}) + \beta'_1 Z_{i,t-1} + \varepsilon_i \quad (8.6)$$

Where the growth rate of the income per capita of country i in period t is a function of the logarithm of initial income[106] and a set of control variables Z. The terms μ_i, ν_t and $\varepsilon_{i,t}$ represent country-specific, time constant and overall error terms, respectively. The textbook and augmented Solow models are nested in (8.6) as follows, respectively[107]:

$$\Delta \ln (Y_{i,t}) = \varphi_0 \ln (Y_{i,t-1}) + \varphi_1 \ln (n_i + g + \delta) + \varphi_2 \ln (School)_i + \varepsilon_i \quad (8.7)^{108}$$

$$\Delta \ln (Y_{i,t}) = \varphi_0 \ln (Y_{i,t-1}) + \varphi_1 \ln(n_i + g + \delta) + \varphi_2 \ln(School)_i + \varphi_3 \ln (I/Y) + \varepsilon_i \quad (8.8)$$

where the new variable is $\Delta \ln (Y_{i,t})$ = the logarithm of the difference of growth of per capita income in PPP, n_i is the population growth rate, g is labour augmenting technological change, δ is the rate of depreciation and k_i and h_i measure physical and human capital accumulation, respectively.

All variables are assumed to evolve in continuous time. The level of technology and labour grow at constant rates g and n_i, respectively. Each country augments its physical and human capital stocks at constant saving rates, while both stocks depreciate at the same rate δ.

---

[106] We use the $\ln(Y_{t-1})$ and not the $\ln(Y_{1970})$ as if we fixed the lagged Y to the initial year of our sample (1970),then, with fixed effects panel estimation, the ln(Y) is effectively a cross- sectional dummy,in addition to the one contained in the fixed effects estimator.Thus,it cannot be done (see Temple 2000for further details).

[107] In the panel setup, due to the fact that GCF,RATIO, NGPand FDI in our dataset include do have some negative values, the levels value has been used instead of the logarithm. In the original cross –section setting of MRW the GCF,NGP, Ratios rate are a non –negative multi-year average, thus poses no such problem.

[108] The variables n,school and h grow at a constant rate that is why they do not have a time subscript.

Equations (8.6) to (8.8) are the basis for the approach taken in this study. We reformulate the regression equation used in the study where we incorporate FDI as it is assumed to be an additional factor of production. We use a similar approach to Levine and Renelt (1992). Appropriately, an equivalent equation can be derived:

$$\Delta \ln(Y_{i,t}) = \varphi_0 \ln(Y_{i,t-1}) + \varphi_1 \ln(n_i + g + \delta) + \varphi_2 \ln(School)_i + \varphi_3 \ln(I/Y) + \varphi_4 \ln(fdi)_i + \varepsilon_{,t} \qquad (8.9)$$

Where the new variable ln $(fdi)_i$ = is the logarithm of foreign direct inflows. All other variables are as stated before. More precisely, FDI is treated as additional investment that can increase economic growth. (This growth equation is based on neo-classical theory suggested by Barro and Sala-i-Martin (1995, Chapter 10).

However, the inclusion of FDI in the Neoclassical equation (8.9) may raise the issue of causality: where it is possible that growth itself or factors that affect Economic Growth can also influence FDI. We already addressed this issue in chater 7 and we found that there is no causality that runs from GDP to FDI according to our GNC tests.

8.2.2 Determinants of growth

This section presents a review of the policies, institutional characteristics and other exogenous factors that stimulate growth. In addition to the four variables suggested by the augmented Solow model namely, initial per capita GDP, rates of human and physical capital accumulation and population growth. Durlauf and Quah's (1999) survey of the empirical growth literature identified 36 different categories of variables and nearly 100 different variables have been used in cross-country growth regressions in order to capture different growth theories. Our sample of growth determinants for the robustness analysis is a subset of the one identified by Sachs and Warner (1996) Durlauf and Quah (1999) and Sala-I- Martin (1997). We consider the broad categories below.

Solow determinants and human capital

Empirical studies have consistently reported a positive role for the investment ratio in explaining international differences in both the standard of living (as measured by GDP per capita) and economic growth rates. Various studies have also investigated the possibility that the public and private components of investment have different impacts on economic growth, for example Ghura and Hadjimichael (1996), although both components tend to be growth promoting. Given a conductive environment, the productivity of the labour supplied is an important determinant of their ability to benefit from the enhanced opportunities, a situation that point to important synergies between growth promotion and initial conditions.

Recent work in development economics has acknowledged that a fundamental reason for the success of some East Asian countries in promoting equitable growth is the labour-intensive nature of production as well as the relatively large stock of education and skills embodied in the labour force.

Tsangarides (2005) mentioned that t: "the consequences of rapid population growth on the pace of economic development have been debated since Malthus' visions of overcrowding, starvation and resource exhaustion". During recent decades, views have shifted. High fertility hinders development because families with more children have to spend more on education and health, thus reducing the amount of savings and investment in physical capital. The latest report by the United Nations Population Fund (2002) argued that larger families and rapid population growth obstruct development and perpetuate poverty by slowing growth and diverting consumption away from the poor, which creates a "demographic dividend" of growth.

In our testing, we employed the secondary school enrolment ratio (divided by active population) to measure and capture the rate of human capital accumulation. This is expected to enhance growth with higher rates by expanding people's capacity to use knowledge as mentioned by Barro and Lee (1994).

We captured the effect of physical capital accumulation through ratios of gross fixed capital formation to GDP, human capital development through measures of educational status (school enrolment rates), initial level of GDP (to capture convergence effects) and population through population growth rates. Those variables constitute the Solow model added to FDI as the variable of interest. We refer to Table 8.1 below for a summary of previous work on the Solow growth determinants variables.

Table 8.1 Growth regressions Compilation from the literature

Explanatory Variable	Reference / Source	Finding
Solow determinant		
Initial income	Barro (1991,1997)	Negative (significant)
	Barro and Sala-i-Martin (1992)	Negative (significant)
	Levine and Renelt (1992)	Negative (robust)
	Caselli et al. (1996)	Negative (significant)
	Kormendi and Meguire (1985)	Negative (significant)
	Levine and Renelt (1992)	Negative (significant)
	Barro(1997)	Positive(not significant)
Investment	Barro (1991)	Positive (significant)
	Barro (1997)	Positive(not significant)
		Negative (robust)
	Levine and Renelt (1992)	Negative(significant)
	Mankiw,Romer and Weil (1992)	
Population growth	Barro and Lee (1994)	Positive (significant)
	Caselli et al. (1996)	Positive (significant)
	Levine and Renelt (1992)	Negative (not robust)
	Mankiw et al. (1992)	Negative (significant)

Source: Durlauf and Quah (1999), Tsangarides (2005).

Macroeconomic stability and external environment

Macroeconomic policies affect economic growth directly via their effect on the accumulation of capital or indirectly through their impact on the efficiency with which the factors of production are used. Macroeconomic stability according to Tsangarides (2004) can be reflected in sustainable budget deficits and low consumption to GDP ratios, low and stable rates of inflation and sound financial development and outward-oriented trade policies.

Fischer (1993) showed that growth is negatively associated with inflation, large budget deficits and distorted foreign exchange markets. Keeping all else constant, higher budget deficits crowd out private investment because of higher real interest rates. The role of government in the economy continues to be one of the most heavily debated issues in economics (Barro,1990).To take account of fiscal policy we use in our Z variable combinations the share of government consumption in GDP.

Government investment can further be used as a proxy for a government's involvement in capital accumulation and as an indicator of social infrastructure. Using the government consumption to GDP ratio as a measure of fiscal policy also captures the concern of supply-side theories that higher government spending creates expectations of future tax liabilities, thereby distorts incentives, and lowers growth.

In our estimation, we tried to capture the effect of macroeconomic stability through various proxies such as inflation level, courant account balance, Government final consumption.

Monetary policy can promote the stable financial environment necessary for economic growth by maintaining a low inflation rate. High and variable rates of inflation are expected to lower the monetary authorities' credibility and reduce the returns on private savings and investment.

Thus, high inflation rates are expected to decrease private investment and domestic savings, but also diminish consumer welfare and create uncertainty in an economy by reducing macroeconomic stability. Maintaining a low inflation rate using appropriate macro policy and a stable financial system is believed to enhance growth prospects (De Gregorio, 1992).

The literature has shown that financial development is robustly correlated with future rates of economic growth, physical capital accumulation and economic efficiency improvements. For example, King and Levine (1993) presented evidence that various measures of the level of financial development are strongly associated with real per capita GDP growth. Financial deepening lowers the cost of borrowing, increases the rate of domestic saving and thus stimulates investment. In addition, financial sector development may grow by facilitating access to credit and improving risk sharing and resource allocation. To take in to account the financial deepening effect in our testing we include in our Z variables exchange rates, liquidity, interest rates.

The view that more outward-oriented economies tend to grow faster has been tested extensively in the literature (Dollar and Kraay (2004)). The majority of the evidence tends to support the idea that openness to international trade accelerates development and growth through increased access to free market and returns from specialisation. In addition, it is possible that policies such as trade openness affect human development more favourably in certain circumstances, for example in a context of wider civil or economic freedom. Perhaps through improved equality of opportunity (either social mobility or degree of structural flexibility), a society characterised by a higher degree of economic freedom may provide its members faster access to the benefits of global competition.

Finally, according to Tsangarides (2005), trade restrictions that tend to protect capital – intensive importable reduce the returns to labour, and overvalued exchange rates that reduce the profitability of tradable, turn the terms of trade against those who are net producers of tradable. Improvements in terms of trade have been associated with higher growth rates through improvements in a country's international competitiveness[109] .

In summary, a stable macroeconomic environment characterised by low and predictable inflation, sustainable budget deficits and a limited departure of the real exchange rate from its equilibrium level tend to be important signals to the private sector about the commitment and credibility of a country's authorities to efficiently manage their economies and increase the opportunity set of profitable investments.

[109] See Easterly et al(1993) for further details.

8.3 EBA Model Uncertainty and Estimation Approach

This section discusses the empirical method for dealing with the model uncertainty faced by research on the determinants of economic growth, with the central focus on EBA approaches.[110] Since there are substantial studies that have investigated the determinants of growth, there is a long list of potential explanatory variables. Studies have often restricted their analyses to certain preferable subsets of these variables and have often ignored the effects of any omitted variable bias when other variables are not included.

Essentially, the associated theories, developed under specific settings, are not mutually exclusive, raising concerns over the robustness of these candidate determinants in any cross-section regression used to explain economic growth. We employ variants of the so-called EBA as suggested by Leamer (1983) and Levine and Renelt (1992) to examine which explanatory variables are robustly related to our dependent variable.

This is a neutral way of coping with the problem of selecting variables for an empirical model in situations where there are conflicting or inconclusive suggestions in the literature.

The EBA method can be presented as follows. Equations of the following general form are estimated to be:

$$Y= \alpha M + \beta F+ \delta Z + \mu$$

The growth rate is simply regressed on some potential determinants, similar to when Y is the dependent variable and M is a vector of standard explanatory variables that appear in every regression estimated in the EBA. For notational convenience, we will refer to this as M and include the four variables that represent growth determinants as suggested by the Solow growth model. F is the variable of interest that is FDI/ GDP and Z is a vector of up to three other covariates selected from dataset and μ is an error term.

[110] We refer to chapter 5 for the justification of EBA with unbalanced panel data. The EBA approach is the most appropriate compared with other approaches of model uncertainty such as Bayesian Model Averaging.

As mentioned by Durlauf (2005), the distinction between the Solow variables and Z is important in understanding the empirical literature. Although the Solow variables usually appear in different empirical studies, reflecting the treatment of the Solow model as a baseline for growth analysis, choices concerning which Z variables to include vary greatly. The extreme bounds test for variable F, being FDI/GDP, says that if the lower and upper extreme bound for β do not have the same coefficient sign, the variable F is not robustly related to Y.Whereas, if the extreme bounds exhibit the same sign F is a robust determinant of Y.

Since the first approach to model uncertainty pioneered by Leamer (1978), consensus has formed to apply EBA techniques to account for model uncertainty. Either EBA or Bayesian Model Averaging has been successfully applied in the context of linear cross-country growth regressions[111]. Note, however, that despite the large number of growth determinants considered, none of the existing studies has included and tested FDI as a determinant of growth within model uncertainty. This is the primary contribution of this chapter.

The first step in the presented approach consists of identifying a "best" specification. We employ the Solow model variables as the starting point, which will be considered our core model. One of the main justifications of using the Solow model is that of the 41 growth studies surveyed in Levine and Renelt (1991), 33 included the investment share, 29 included population growth, 13 included a human capital measure and 18 included a measure of initial income.

There are several ways to identify extreme points and several ways to deal with the identified points. This section gives a brief explanation of the identification tests and the robust regression technique used; we refer the reader to chapter 6 where we previously used the EBA method for more detail on the method in general.

[111] Please note that previous studies applied Bayesian Model Averaging techniques to account for model uncertainty in the context of linear cross-country growth regressions, such as the work Ley and Steel (2001) and Sala-i- Martin et al. (2004). However, in our context we cannot apply BMA.

8.4 Data and samples

The database constructed for the robustness analysis consists of annual data from WDI (2006). We employed unbalanced panel data that included 168 countries running from 1970 to 2006. The explanatory variables used are contained in table 8.2 below. The dependent variable, the core variables and the variable of interest are defined as follows:

The dependent variable in this study is the logarithm of the difference of Y,that is, $Ln(Y_{i,t}) - Ln(Y_{i,t-1})$ where Y is real GDP per capita in PPP of the total population in country i at t.

The core variables (M) are:

Ln Y_{t-1} = the logarithm of initial income in the previous period.

GCF = gross fixed capital formation used as a proxy of the fraction of investment.

$(n+g+\delta)$[112] = where the population growth rate (written n), the labor augmenting technological change (written g), the sum of the depreciation rate at which capital wears out (written δ).

$SCHOOL_i$ = fraction of the working age population enrolled in secondary school in country i annual average 1970–2006.

For Z variables we used mainly the same economic variables employed in chapter 6 (in the second testing see table 8.2).[113]

A question that arises is what the appropriate length of such time span is for each period. Islam (1995) opted for five-year time intervals[114] because these are thought to be less influenced by business cycle fluctuations, they minimise errors from misspecifying lag effects and they reduce time specification issues (i.e. because data can have different start and end periods within a given calendar year, see Grier and Tullock, 1989).

---

[112] We follow Mankiw et al. (1992) in assuming that g=0.02 and δ =0.03, figures that are approximately true for the United States.

[113] We had to exclude in this testing few variable to avoid endoeinety bias such as GDPG,GDPPPP,ratios, population active.

[114] Please note that we tried to use five-year data spans at first; however, applying these within an EBA context meant losing too many observations.

Finally, they are less likely to be serially correlated than they would be in a yearly dataset. Instead, we use yearly time spans because time-averaged data loses dynamic information and because both the lack of dynamics and degrees of freedom increase the risk of serious omitted variable bias (Reichert and Weinhold, 2000). Further, and most importantly the substantial loss of degrees of freedom in our application substantially reduced the results that we could obtain.

The main variable of interest (variable F) is FDI/GDP. With regard to other growth determinants, our aim was to test the robustness of FDI/GDP as the main variable of interest whilst accounting for a broad range of growth theories. Thus, to account for theory uncertainty, we nested the theory of FDI within a larger model space that accounts for recent fundamental as well as proximate growth theories. The reason for using the FDI to GDP ratio rather than the (log) level of FDI is to avoid the simultaneity bias associated with the fact that FDI, via the national income accounting identity, is itself a component of GDP. More specifically, a positive correlation between FDI and GDP may emerge simply because FDI is part of GDP rather than because of any extra contribution that FDI makes to GDP (Herzer et al., 2008).

In addition, as previously specified in our previous chapter (chapter 5) FDI is likely to be nonstationary whereas, arguably, FDI/GDP is a stationary process (FDI will not grow faster than GDP forever).

Table 8.2: **Variables definitions and Data sources**

Variable	Source	Definition
dependent Variable		
ΔLnY	WDI	Real GDP per capita (US dollars at PPP).
Core explanatory Variables (M)		
$1LnY_{t-1}$	WDI	Initial real GDP per capita (US dollars at PPP).
2 GCF		Gross fixed capital formation (% of GDP)--
	WDI	Annual Gross fixed capital formation (% of GDP)
3 (n+g+δ)	WDI	Annual population growth rate plus (g=0.02 and δ=0.03)
4 SCHOOL	WDI	Annual population enrolled in secondary school
Variable of interest (F)		
5 FDI/Y	WDI	FDI as % GDP
Z variables		
6 INFL	WDI	Inflation, consumer prices (annual %)--
7 Openness	WDI	**Trade (% of GDP)--**
8 Ttrade	WDI	Taxes on international trade (% of revenue)--
9 wage	WDI	Wage as %GDP
10 Cab	WDI	Current account balance (% of GDP)--
11 Lir	WDI	Lending interest rate (%)-
12 Cgd	WDI	Central government debt, total (% of GDP)--
32 HMT	WDI	Highest marginal tax rate, corporate rate (%)

Table 8.2: Variables definitions and Data sources (continue)

Variable	Source	Definition
Z Variables		
14 GFE	WDI	General government final consumption expenditure (% of GDP)
15 Gs	WDI	Gross savings (current US$)--
16 Internet	WDI	Internet users (per 1000 people)--
17 Intsprd	WDI	Interest rate spread (lending rate minus deposit rate)--
18 Liquid	WDI	Liquid liabilities (M3) as % of GDP--
19 Nreserve	WDI	Total natural reserves (includes gold, current US$)--
20 Rail	WDI	Rail lines (total route-km)--
21 Ratiop	WDI	Primary school enrolment/labour force
22 Ratiot	WDI	Tertiary school enrolment/labour force
23 Rex	WDI	Real effective exchange rate index (2000 = 100)--
24 Rir	WDI	Real interest rate (%)--
25 Roads	WDI	Roads, total network (km)--
26 Taxproft	WDI	Taxes on income, profits and capital gains (% of total taxes)-
27 Tel	WDI	Telephone mainlines (per 1000 people)--
28 Unem	WDI	Unemployment, total (% of total labour force)--
30 SURFACE	WDI	Surface area (sq. km)
31 TAXPAY	WDI	total number of taxes paid by businesses,

8.5 Econometric results

8.5.1 Robustness analysis of growth determinants

Our investigation into robust growth determinants began by examining the Solow model and then extending it. In our analysis, we conduct a robustness test of the Solow model variables and the variable of interest[115]. This means one variable of interest (F), four core model variables (M) and three other variables from Z. However, in contrast to Durlauf (2005), we limit the set of explanatory variables (Z), which helps us avoid potential multicollinearity, which is a problem that invariably arises in EBA.

A novel feature of our work is that we investigate the robustness of the four core variables as well as the robustness of the variable of interest (in our case, the FDI/GDP ratio variable) using Eviews program software that produces statistics for the five variables. (F variable and the four variables in M). We undertake our analysis based on the following set of regressors as specified in equation (8.6). Several key results are worth mentioning (Table 8.3). This table shows which variables and methods lead to findings of robustness for specific variables. The table is organised as follows.

N of Reg in column (1) states that 2301 is the maximum number of possible regressions used in the EBA application. The second value (1463) gives the number of regressions that produced valid in the EBA. The difference between the two values is because there are insufficient observations preventing the estimation of some models. This arises due to different numbers of observations being available for different variables.

Column 5 **(% sign)** reports the percentage of the regressions in which the coefficient of the variable of interest differs significantly from zero. In other words, when the t-statistic for F has an absolute value larger than approximately 2.

Column 2 **(AVG beta)** and column 3 **(AVGSE)** give, respectively, the unweighted averages over all regressions of the estimated coefficients and their associated standard errors.

Column 4 **(AVGT)** reports the average absolute value of the T-ratio averaging across all regressions.

[115] In our estimation ,we did not report the results of OLS estimation of equation (8.9) for reasons mentioned in chapter 6(Adding variables to the Solow determinants change the significance and the sign of various coefficients. Further,the fragility of OLS estimation can be detected by observing Table8.1.

Using the Leamer criteria in columns 6 **(Lbound)** and 7 **(Ubound)** gives Leamer's lower and upper bounds, respectively. It can be seen that in all cases these bounds have different signs so that none of the variables robustly affects economic growth when Leamer's EBA is used. However, this is not remarkable given the fact that 2301 estimates per variable are carried out, and the EBA implies that if only one of these variables is not significant, the analysis indicates no robust relationship with Growth.

The value of unweighted non-normal CDF in column (8) and the unweighted normal CDF in column (7) are almost identical see chapter 6 for a discussion of this criterion. School and Y_{t-1} are robust because both CDF measures exceed 0.9 (indeed, they are at least0.98.

However, for the variables of interest FDI/Y and GCF are possible determinants of economic growth because their non – normal CDF values are 0.89 and 0.86 respectively, this may be there is non-linearity between FDI and GCF,as FDI inflows may stimulate domestic investment. Finally, we assign fragile robustness to **(n+g+δ)** as its CDF is 0.78.

Our findings on the importance of the Solow determinants are to some extent similar to the results found in Mankiw et al. (1992). The robustness of education in general highlights the importance of including human capital within physical capital when analysing growth patterns. Other studies based on SSA have included other measures of human development such as life expectancy, infant mortality rates and primary school enrolment. These have been reported to be significantly and positively associated with human progress[116].

The fragility of population growth is subject to ongoing debate regarding its importance as a growth determinant. In fact, empirical research in the 1960s and 1970s favoured a neo-Malthusian view that suggested that high fertility hindered development (and growth) since families with more children had to spend more on education and health and thus reduce the amount of savings and investment in physical capital. However, the focus in the 1980s seemed to discredit these neo-Malthusian ideas, and favoured the view that human capital and technical change were the engines for growth. Although the negative impacts of rapid population growth were judged to vary considerably by country, population growth had a lesser impact on growth compared with other determinants such as macroeconomic policies and natural resources[117] (Tsangarides, 2004).Finally, all the tested variables however are fragile determinants of growth according to Leamer criterion.

---

[116] See Ranis,Stewart and Ramiez (2000).

[117] A study by the National Research Council in 1986concluded that "slower population growth would be beneficial to the economic development of developing countries"(p90).

Table 8.3 robustness of the economic determinants of growth

	1	2	3	4	5	6	7	8	9	10
						Leamer EBA test		Sala -I-Martin EBA test		
variables	N of Reg	AVG βeta	AVG S.E	t	% sign	L_bound	U_bound	CDFnon normal	CDF normal	robustness
lnY_{t-1}	2301/1463	0.061	0.019	3.31	0.91	-1.30	0.39	**0.99**	**0.99**	**Robust*** **
SCHOOL	2301/1463	0.062	0.020	3.14	0.92	-0.08	0.09	**0.98**	**0.99**	**Robust*** **
FDI/Y	2301/1463	0.38	0.34	1.68	0.41	-0.21	0.11	**0.89**	**0.90**	**Possibly robust**
GCF	2301/1463	0.002	0.004	1.50	0.31	-0.06	0.15	**0.86**	**0.89**	**Possibly robust**
$(n+g+\delta)$	2301/1463	0.012	0.109	0.92	0.06	-5.21	5.71	0.78	0.74	Fragile

Notes: 'Avg. Beta' and 'Avg. S.E.' give the unweighted averages over all regressions of the coefficient and the standard error, respectively. '%Sign.' gives the percentage of regressions in which the respective coefficient is statistically significant at the five percent level. 'CDF (0)' yields the result of the CDF criterion as described in the previous chapter. All variables are sorted according to this criterion. The cut-off value for a variable to be considered robustly linked to our dependent variable is 0.9. Finally, 'N of Reg.' report the number of regressions run for testing each variable and the average number of observations for each regression.

Please note that *, **and *** refers to the significances level at 10%,5%and 1% respectively

8.6 Conclusion

There has been much debate in the literature over the long run determinants of growth, but, as highlighted by Levine and Renelt (1992), there is no magic ingredient for sustained growth and no standard proportion at which the factors should be applied. In this chapter, we attempted to provide new evidence by using a relatively recent technique (namely EBA) to investigate the existence of the robust determinants of economic growth by including FDI/GDP as one of the main determinants. We used unbalanced panel data mainly from WDI (2006) of 168 countries from 1970–2006 using the Solow growth model as a base for our work.

From our literature overview, we considered 28 potential explanatory variables that have been previously proposed as determinants of growth. Using the Solow model as our base combined with EBA we tested the robustness FDI/GDP and four of these factors as determinants of growth. The relevance of our findings is strengthened by the use of an EBA robustness check, which explicitly accounts for model uncertainty and a large set of growth determinants. Even if FDI inflows being growth inducing is accepted in principle, empirical support is lacking. We analysed the effect of the extended Solow model on economic growth and found that FDI/GDP is only a possibly robust determinant of growth. Our results support the view that there may be no direct effect of FDI on economic growth.

The validity of our conclusion, therefore, needs further investigation and refinement in order to derive policy implications about how to improve growth. In fact, we should try to understand why certain channels influence growth differently and recognise that the average experience of a large number of countries should not obscure the importance of dealing effectively with country-specific circumstances.

Chapter 9
General conclusions

9.1 Introduction

The literature review and empirical analysis presented in the previous chapters demonstrated that economic, political and geographical variables matter in determining the inflows of FDI. This final chapter briefly summarises the major findings and gives a short outlook on further research.

9.2 Contributions of the Thesis

This study has contributed to the literature by explaining the determinants of FDI as a strategy to improve FDI inflows. This contribution can be categorised into two parts: by the scope of analysis and by the econometric approach used to obtain better results. Previous empirical studies of the determinants of FDI or of its causality with economic growth have approached this relationship with traditional and new econometric techniques but with a limited framework, either using only cross-section (not panel) data or using traditional estimation methods that do not account for model uncertainty. Therefore, their models might be misleading.

In this thesis, we tried to overcome these shortcomings and contribute to previous studies in four aspects. First, by considering a larger panel data set than has been previously employed. This includes more than 150 countries over the period 1970 to 2006 and containing more than 50 different explanatory variables, which can be clustered into market size, labour cost tax intensives, openness, human capital, infrastructure, geographical proximity, macroeconomic and institutional factors.

The second aspect was to identify the main economic and geopolitical determinants of FDI. The quality of the data, the discipline in performing the regressions according to theoretical flows and employing methods that account for model uncertainty, such as EBA, were crucial to getting our results.

The third aspect consists of testing the HNC hypothesis between FDI and growth using relatively new econometric methods. In our methodology, we employed an extension of Granger's (1969) time –series method. In addition to time- series tests, we used three panel methods associated with Fisher (1948), Hurlin (2008) and Hanck (2008). The later was not been applied in the context of GNC tests before.

Our fourth aspect was to investigate whether FDI can be considered as a robust determinant of Economic Growth using EBA techniques for a large panel dataset.
Over all, the major contribution of this thesis is to provide a better understanding of the determinants of FDI and to analyse the interrelationship between FDI and economic growth.

9.3 Main empirical results

The empirical results throughout chapter 5 and 6 answered the question posited in the general introduction, which is related to the economic and political determinants of FDI.
In chapter 5, OLS regression analysis was applied to our panel, the results have enabled identification of several key determinants of FDI inflows. We have found that the main economic determinants of FDI are GDP growth, openness, inflation, wage, market size and tax on trade. Those variables were significant and with the correct sign. Moreover our result regarding the geopolitical variables supported the gravity model theory where language, great common border contribute positively in attracting FDI.

Sensitivity analysis using EBA technique was then performed as second step in chapter 6 to check the robustness of our previous finding. We identified the robust determinants of FDI through three EBA applications.

The identification of the determinants of FDI within the EBA approach covering a large dataset of variables and countries is currently missing in the academic literature.
We found that identifying the various economic, political and geographical determinants of FDI is not as straightforward as the abundant literature proposes. Only seven variables out of 53 survived our extensive robustness analysis. In general, the results tell us that countries that are more successful in attracting FDI are those countries that have growing economies, that pay attention to education, have a good infrastructure, have a large common boundaries , being landlocked and that have low country risk to the economy.

Our results seem to be a reasonable description of the countries that are successful in attracting MNCs. While the problems associated with the procedure used in this work are previously discussed, we still believe that EBA is the most appropriate method to deal with model uncertainty within unbalanced panel data. EBA permits to enlarge the search and requires us to report the most favourable and the least favourable outcomes.

In chapter 7, we tried to investigate the direction of the causal relationship between FDI and Economic Growth as this question still generates mixed and inconclusive results. That is why we re-examined this issue using a panel data test. We carried out GNC tests with a sample of 136 developed and developing countries in 1970–2006. The results do not support the hypothesis that there is bi – causality between FDI and economic growth. However, these results only imply that, if such a relationship exists, it cannot be easily identified in a simple bivariate Granger causality test.

These results merit further investigations as the relationship between the two variables seems to be too complex to be identified in a bivariate Granger causality framework. In fact the direction of causality between FDI and Economic Growth may well depend on the determinants of FDI. If the determinants have strong link with growth in host country, growth may be found to cause FDI, while output may grow faster when FDI takes place under other circumstances.

In chapter 8, we extend the augmented Solow growth model and its Mankiw-Romer-Weil specification to include FDI to GDP ratio as a variable of interest and test whether the variables included in general and FDI to GDP in particular constitute robust determinants of Economic Growth. EBA growth regressions confirm that, initial income and human capital have a robust positive effect on long-term growth, FDI inflows formally speaking is a possible determinant of growth as we found its CDF equal to 0.89%.

Our results suggest that empirical work should include as matter of routine FDI in their testing for the determinants of growth.

This thesis however has some limitations. With respect to the inherent data constraints of the unbalanced panel data and the nature of the method used (EBA method in chapter6). It is possible that the determinants of FDI will differ within the use of other robust testing methods such as Bayesian Averaging Based on Classical Estimates (BACE) approach that require balanced panel data that and might yield better results.

Also doubts can be cast upon the testing especially in chapter 5 where we humbly faced the substantial conceptual and statistical problems that plague huge dataset (that involve 168 countries over 36 years for 56 variables). Results were sometimes inconsistent and difficult to interpret. Indeed, it is conceptually difficult to interpret the coefficients on regressions that involve large dataset and where the potential number of explanatory variables is large compared to the number of observations. This makes it infeasible to condition on all variables in order to determine whether a particular variable has or no a positive effect on FDI.

Moreover, it is generally seen that in ideal action research the "theory" stems from the practice. However, our result in chapter7 regarding the causality testing suggest that; there is no bivariate granger causality between FDI and Economic Growth. Our results may also suggest that the share of FDI inflows to GDP have been quantitatively too small to have a high and significant impact on economic growth. However, the method applied suggests that the larger is the VAR the more errors it will have.

9.4 Policy recommendations

So what are the policy implications that we can draw from our analysis? The distribution of FDI inflows is highly unequal and countries compete to attract foreign investors, this one should undertake a number of policy measures proactively to build up necessary infrastructures to attract FDI and to affect the patterns of investment in the region. Countries interested in attracting FDI should reinforce its infrastructure facilities, education skills ,liberalise its local and global investment policy and maintain macroeconomic and political stability (such as high democracy, low international conflict) to improve its inward FDI performance and to become an attractive destination for foreign investors.

Since our results have shown that FDI facilitates the economic growth through its determinants, then it is desirable that economic policies pursue its promotion.
One fact stands out very clearly that to benefit from FDI; a country has first to receive it. To obtain FDI, it must be an attractive location for MNCs. Economic conditions conductive to investment are the key determinants. Any strategy has to suit to the particular conditions of a country at a particular time, and evolve as its needs change and its competitive position in the world alters. Making effective strategy requires above all a development vision, coherence and coordination.

9.5 Future research

Our empirical research has contributed to shield a light on the robust determinants of FDI and its effect on Economic Growth. However to establish more conclusive results, future research should perhaps be conducted on:

The direction of causality between FDI and growth should include some fundamentals drivers. This could involve the inclusion of variables such as human capital, infrastructure, population ...etc.

Empirical work on the determinants of growth should include as matter of routine FDI in their testing.

In addition, it could be useful a breakdown of FDI inflows determinants by economic sector.

I believe the potential for future research along these lines is warranted.

Bibliography

Abdus Samad (2009) "Does FDI Cause Economic Growth? Evidence from South-East Asia and Latin America," Woodbury School of Business Working Paper 1-09Affiliates. *International Journal of Industrial Organization* 27 (5): 572-581.

Agrawal, J.P,(1980). Determinants of Foreign Direct Investment:A survey. *Weltwirtscheftliches Archive*. 116 (4):739-773.

Agrawal, P. (2001) Economic Impact of Foreign Direct Investment in South Asia, *Working Paper, Indira Gandhi Institute of Development Research,India.*

Agresti A. (1990) Categorical Data Analysis. *John Wiley and Sons, New York.*

Aharoni, Yair, The Foreign Investment Decision Process, Boston, *Harvard Business School*, 1966.

Aitken, B. and A. Harrison, 1999, Do domestic firms benefit from foreign investment? Evidence from Venezuela. *American Economic Review*, 89, No. 3, June.

Ajami, R.A. and BarNiv, R. (1984) "Utilizing Economic Indicators in Explaining Foreign Direct Investment in the U.S.," *Management International Review,* vol. 24, pp. 16-26.

Akinlo, A. E. (2004) "Foreign Direct Investment and Growth in Nigeria: An Empirical Investigation," *Journal of Policy Modelling*. Vol. 26, pp 627-639.

Alfaro, L., (2003)" Foreign Direct Investment and Growth: Does the Sector Matter?" *Harvard Business School.*

Alfaro, L., A. Chanda, S. Kalemli-Ozcan and S. Sayek. (2006) How Does FDI promote Economic Growth? Expoloring the effects of financial Markets on linkages. *Internet download American Economic Review* 94(4),813-835.

Aliber, Robert Z. "A Theory of Foreign Direct Investment." In The International Corporation: A Symposium, ed. Charles P. Kindleberger, 17–34. Cambridge, MA, and London: *MIT Press, FourthPrinting,* April 1973 (1970).

Aliber,R.Z.1971.The Multinational Entreprise in a Multiple Currency World. London 49-56

Ancharaz,V.D.2003. The determinants of FDI in a comparative perspective:Is there a bias against Sub-Saharan Africa?Forthcoming in: *university of Mauritius Research journal.*

Apergis, N., and Katrakilidis, C. (1988) "Does Uncertainty Matter in Foreign Direct Investment Decisions? An Empirical Investigation for Portugal, Spain, and Greece," *Rivista Internazionale do Scienze Economiche Commercialli*, vol. XLV, No. 4, pp. 729-744.

Arellano, M., Bond, S.R., 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies* 58, 277-297.

Asiedu, E. (2002). "On the Determinants of Foreign Direct Investment to Developing Countries: Is Africa Different?". *World Development*, 30 (1): 107-19.

Asiedu, E., 2006. Foreign direct investment in Africa: The role of natural resources, market size, government policy, institutions and political instability. *The World Economy* 29 (1), 63-77.

Azemar, C. and R. Desbordes (2009), .Public governance, health and foreign direct investment in Sub-Saharan Africa, *Journal of African Economies* 18 (4), 667-709.

Bacic, K., Racic, K., and Ahec-Sonje, A. (2005)" The Effects of FDI on Recipient Countries in Central and Eastern Europe, *Hamburg Institute of International Economics.*

Bajo-Rubio, O. and Sosvilla-Rivero, S., (1994). "An Econometric Analysis of Foreign Direct Investment in Spain", *Southern Economic Journal*, No.61, pp. 104-20.

Balasubramanyam, V.N., Salisu, M. and Sapsford, D. (1996). "Foreign Direct Investment and Growth in EP and IS Countries", *Economic Journal*, 106, 92-105. Bank,Washington D.C

Baltagi,B.H.(2001). Econometric Analysis of panel Data. Second Edition.*JohnWiley& Sons,Ltd.* New York.

Bandera, V.N. and J.T. White (1968). "U.S. direct investments and domestic markets in Europe", *Economia Internazionale,* 21, pp. 117-133.
Barrell, R. and Pain, N. (1997). Foreign Direct Investment, Technological Change, and Economic Growth within Europe, *Economic Journal*, Vol. 107, pp. 1770-1786.
Barrell, R., Pain, N., 1997. Foreign direct investment, technological change, and economic growth within europe. *The Economic Journal* 107 (445), 1770-1786.
Barro R J and Sala-i-Martin X (1995) Economic Growth. New York: *McGraw-Hill.*
Barro, R. J. (2001). Determinants of economic growth: a cross-country empirical study. LionelRobbins lectures. Cambridge, Mass: *The MIT Press.*
Barro, R.J. (1991). 'Economic growth in a cross-section of countries',*Quarterly Journal of Economics,* 106, 407-444.
Barro, R.J. (1999) Inequality, growth and investments. *Paper No.* 7038,NBER
Barry, F.,J.Bradelly and E.O'Malley (1999),"Indigenous and Foreign Industry: Characteristics and Performance", in F. Barry (ed.),Understanding Ireland´s Economic Growth, London: *Macmillan.*
Basu, P., and Guariglia, A., (2005) "Foreign Direct Investment, Inequality and Growth" *Research Paper Series* 2005/41, The University of Nottingham.
Basu, P., Guariglia, A. (2007) „Foreign Direct Investment, inequality and growth , *Journal of Macroeconomics*, 29(4), 824-839.
Bazzoni, S., Giani, G., and Nicolas F., (2002)" The FDI-Growth Nexus in the Mediterranean Economies, Regional Development: Reality or Myth. Selected Papers from *ERF's Ninth Annual Conference.*
Bellak, C., Leibrecht, M., 2009. Do low corporate income tax rates attract fdi? – evidence from central- and east european countries. *Applied Economics* 41(21), 2691-2703.
Bellak, C., Leibrecht, M., Stehrer, R., 2010. The role of public policy in closing foreign direct investment gaps: an empirical analysis. *Empirica springer* 37 (1), 19-46.
Benassy-Quere, A., Gobalraja, N., Trannoy, A., 04 2007. Tax and public input competition. *Economic Policy* 22, 385-430.
Bende-Nabende, A. and J.L Ford. FDI, Policy Adjustment and Endogenous Growth: Multiplier Effects from a Small Dynamic Model for Taiwan 1959–1995[J]. *World Development*, 1998, 26(7):1315–30
Bengoa,M.and Sanchez-Robles,B.(2003),"Foreign direct investment, economic freedom and growth: new evidence from Latin America", *European journal of political, Economy*,vol.19,pp.529-45.
Bernanke & Gurkaynak, 2001. "Is Growth Exogenous? Taking Mankiw, Romer and Weil Seriously," NBER Working Papers 8365, *National Bureau of Economic Research.*
Beugelsdijk S, de Groot HLF, Schaik ABTM van (2004) Trust and economic growth: a robustness analysis. *Oxford Economic Papers* 56: 118–134
Bevan,A. And Estrin, S. (2000) " The determinants of Foreign Direct Investment in Transition Economies",*Working paper, no* .342, Centre for New and Emerging Markets,London Business School.
Billington, N. (1999). The Location of Foreign Direct Investment: An Empirical Analysis, *Applied Economics,* 31, pp. 65-76.
Biswas, R. (2002), "Determinants of Foreign Direct Investment", *Review of Development Economics,* Vol. 6, Num. 3, pp. 492-504.
Blomstrom Magnus and Ari Kokko, 2003. The Economics of Foreign Direct Investment Incentives. *NBER Working Paper* 9489. Cambridge, MA.
Blomström, M., Lipsey, R.E. and Zejan, M. (1994). "What explains developing country growth", *NBER Working* Paper No. 4132.
Blomstrom,M.and A. Kokko. 1996. The impact of FDI on Host Countries: A review of the empirical Evidence. *Working Paper* N° 1745, World Bank.
Blonigen, Bruce and Robert C. Feenstra, 1997, "Protectionist Threats and Foreign DirectInvestment," in Robert C. Feenstra, ed. *The Effects of U.S. Trade Protection and Promotion Policies,* Chicago: *Univ. of Chicago Press*, 55-80.
Borensztein, E, J.De Gregorio,and J. Lee (1998). 'How Does Foreign Direct Investment Affect Economic Growth'. *Journal of International Economics*, 45(1):115-35.

Borghesi, S. and Giovannetti, G. (2003). "The role of institutional set-up in the success of FDI: do countries attracting FDI grow at higher rates?",*Preliminary draft*, October 2003.
Bosworth, B. and Collins, S. (1999). "Capital flows to developing economies: implications for saving and investment", *Brookings Papers on Economic Activity*, 1: 143-169.
Brainard, W. and J. Tobin (1992), 'On the Internationalisation of Portfolios', *Oxford Economic Papers, vol.* 44, pp. 533-65.
Brock, W. And S. Durlauf (2001), "Growth Empirics and Reality", *World Bank Economic Review*15,2,229-272.
Brock, W., S. Durlauf and K. West (2003), "Policy Evaluation in Uncertain Economic Environments (with discussion)", *Brookings Papers on Economic Activity* 1:235-322.
Buckley, P. J. (2008). Do we need a Special Theory of Foreign Direct Investment for Extractive Industries? *Journal of Chinese Economic and Foreign Trade Studies*, 1, pp93-104.
Buckley, Peter J. and Casson, Mark (1981): "The Optimal Timing of a Foreign Direct Investment". *Economic Journal*. Vol. 91. pp. 75-87.
Buckley, P.J. and Casson, M.C. (1976): "The Future of the Multinational Enterprise", *Homes & Meier:London.*
Busse, M., Groisard, J.L.,(2008). Foreign direct investment, regulation, and growth. *The World Economy* 31, 569-592.
Busse, M., Hefeker, C., (2007). Political risk, institutions and foreign direct investment.*European Journal of Political Economy* 23 (2), 397-415.
Calvo, M.B., Robles, B.S. (2003), "Foreign direct investment, economic freedom and growth: new evidence from Latin-America", *European Journal of Political Economy*, Vol. 19 No.3, pp.529-45.
Campos, N. F., and Y. Kinoshita. 2002. Foreign direct investment as technology transferred: Some panel evidence from the transition economies. *Working Paper* 438, William Davidson Institute, *University of Michigan*, Stephen M. Ross Business School.
Campos, Nauro F & Kinoshita, Yuko, 2002. "Foreign Direct Investment as Technology Transferred: Some Panel Evidence from the Transition Economies," *CEPR Discussion Papers* 3417, C.E.P.R. Discussion Papers.
Carkovic, M. and Levine, R. (2005). "Does Foreign Direct Investment Accelerate Economic Growth", *University of Minnesota, Working Paper.*
Carstensen, K. si Toubal, F.,(2004) "Foreign direct investment in Central and Eastern European countries: a dynamic panel analysis", *Journal of Comparative Economics,* no. 3, 2004.
Caselli, F., et. al., 1996, Reopening the Convergence Debate, *Journal of Economic Growth* 1,363-389.
Casson, M. (1990), "The Theory of Foreign Direct Investment", in Buckley P. (ed.), *International Investment, Aldershot*: Edward Elgar Publishing.
Caves, R. 1996. Multinational Enterprise and Economic Analysis. Cambridge, England: *Cambridge UniversityPress.*
Chakraborty, C., and Basu, P., (2002). Foreign Direct Investment and growth in India: a co-integration approach, *Applied Economics* No. 34, pp. 1061-1073.
Caves,R.E.1971. International Corporations: The industrial Economics of Foreign Investment. *Economica*.38:1-27.
Chakrabarti, A. (2001) The Determinants of Foreign Direct Investment: Sensitivity Analyses of Cross-Country Regressions, *KYKLOS*, 54, 89-114.
Chakrabarti, A. (2003) "A theory of the spatial distribution of foreign direct investment",*International Review of Economics and Finance* 12, pp149-169.
Chan, Vei-Lin. 2000. "FDI and Economic Growth in Taiwan's ManufacturingIndustries." In Takatoshi Itoh and Anne O. Krueger,The Role of Foreign DirectInvestment in East Asian Economic Development,Chicago and London: *ChicagoUniversity Press*. pp.349-366.
Cheng, L.K. and Kwan, Y.K. (2000) what are the Determinants of the Location of Foreign Direct Investment? The Chinese Experience, *Journal of International Economics*, 51, 379-400.
Cheung,Y,Lai,K,S,1993.Finite –Sample Sizes of Johansen's Likelihood Ratio Test for Cointegration .*Oxford Bulletin of Economics and Statistics* 55,313-328.
Choe,J.I (2003). " Do foreign direct investment and gross domestic investment promote economic growth?",*Review of development Economics*,7,pp44-57.

Chowdhury, A., and Mavrotas, G., (2005). FDI and Growth: A Causal Relationship, United Nations University, WIDER, *Research Paper* No:2005/25.
Ciccone,A. and Jarocinski, M.(2005,2010).Determinants of economic growth: will data tell? *American Economic journal*:Macroeconomics.forthcoming
Cleeve, E. (2000) Why Do Japanese Firms Locate in Particular British Regions? Asia Pacific *Journalof Economics and Business*, 4, pp112-124.
Clegg, J. (1987), Multinational Enterprises and World Competition: A Comparative Study of the USA, Japan, the UK, Sweden and West Germany, *St Martin's Press: New York.*
Contessi, S. and Weinberger (2009) "Foreign Direct Investment, Productivity, and Country Growth: An Overview." *FRBSL Review* (March/April 2009) pp. 61-78.
Contessi,S&Weinberger,A.(2009)FDI, productivity, and country growth: an overview, *Review, Federal reserve bank of St.(3): 61- 78.*
Coughlin, C.C., Segev, E., 2000. Foreign direct investment in China: a spatial econometric study. TheWorld Economy 23Countries E uropean Economic.–country regressions *KYKLOS* 54,89-114
Crain, W. M., and Lee, K. J. (1999) "Economic Growth Regressions for the American States: A Sensitivity Analysis." *Economic Inquiry*37 (2): pp242–57.
Culem, C., 1988. The locational determinants of direct investments among industrialized countries, *European Economic Review* 32 (4), 885-904.
Cuyvers, et al (2008). Determinants of Foreign Direct Investment in Cambodia: country –specific factor differentials. *CAS Discussion* Paper No. 61, Centre for ASEAN Studies, University of Antwerp.
Daniels, J. D. and C. J. Quigley, Jr. (1980). "Pull factors for direct investment: a cross regional comparison", *Foreign Trade Review*, 15(3), pp. 263-288.
Darrat A.F,Kherfi S. And Soliman M.(2005)FDI and Economic Growth in CEE and MENA Countries: A Tale of Two Regions,12 th *ERF's Annual Conference*, Cairo.
Davidson, W. 1980. The location of foreign direct investment activity: Country characteisitics and expereince effects, *Journal of International Business Studies*, 11(2): 9-22.
De Boyrie, M. E., 2010. Structural changes, causality, and foreign direct investments: Evidence from the asian crises of 1997. *Global Economy Journal* 9 (4).
De Gregrio, J. ,"Economic Growth in Latin America," *Journal of Development Economics*, Vol. 39 (1992) pp. 59-84.
De Mello, L.R. Jr. (1997), "Foreign Direct Investment in Developing Countries and Growth: A Selective Survey", *The Journal of Development Studies*, 34(1),115-135.
De Mello,L.R,(1996). "Foreign direct investment, international knowledge transfers, endogenous growth: time series evidence",*Department of Economics,*
Dees, Stephane, 1998. " Foreign Direct Investment in China: Determinants and Effects," Economic Change and Restructuring, *Springer,* vol. 31(2-3), pp 175-94.
Dhakal, D., Mixon, F. Jr. and Upadhyaya, K. (2007), Foreign Direct Investment and Transition Economies: Empirical Evidence From a Panel Data Estimator, *Economics Bulletin*,pp. 1-9.
Disdier A. and Mayer T. (2004) How different is Eastern Europe? Structure and determinants of location choices by French firms in Eastern and Western Europe, *Journal of Comparative Economics*, 32, pp280-296.
Dollar, D. (1992) Outward-oriented developing economies really do grow more rapidly: Evidence from 95 LDCs, 1976-1985, *Economic Development and Cultural Change*, pp523-544.
Dollar, D. and Kraay, A. (2004) Trade, growth and poverty, Economic Journal, 114(493), pp22–49
Doppelhofer,G,R.Miller and X. Sala –I-Martin (2004),Determinants of long – term Growth: A Bayesian Averaging of Classical Estimates (BACE) Approach, *American Economic Review*94 (4):pp813-835.
Dunning, J. (1980), "Toward an Eclectic Theory of International Production: Some Empirical Tests", *Journal of International Business Studies*, Vol. 11,pp 9-31.
Dunning, J. H. (1973): "The determinants of international production", Oxford Economic Papers 25.
Dunning, J. H. (1988). The eclectic paradigm of international production: A restatement and some possible extensions. *Journal of International Business Studies*, 19 (1), pp1–32.
Dunning,J.H,1993. "Multinational enterprises and the global economy", *Addisson-Wesley Publishing Company, Reading, UK.*

Dunning,J.H2002. Determinants of FDI:Globalisation induced chanes and the role of FDI policies. *Economist IntelligenceUnitWorld Investment prospects*:London.
Durham,J.B 2004. 'Absorptive Capacity and the effects of foreign Direct Investment and Equity Foreign Portfolio Investment on Economic Growth '*European Economic Review*,48(2):pp285-306.
Durlauf, S., and D. Quah, 1999. "The New Empirics of Economic Growth." In J. Taylor and M. Woodford, eds., *Handbook of Macroeconomics. Amsterdam: North Holland.*
Durlauf, S.N. and P.A. Johnson (1995), Multiple regimes and cross-country growth regressions. *Journal of Applied Econometrics* 10, pp365-384.
Durlauf, Steven N. & Johnson, Paul A. & Temple, Jonathan R.W., 2005. "Growth Econometrics," Handbook of Economic Growth, in: Philippe Aghion & Steven Durlauf (ed.), *Handbook of Economic Growth,* edition pp 555-677 Elsevier.
Duttaray, M. (2001). "Essays on Foreign Direct Investment and Growth: Causality and Mechanism".
Easterly, W. and Levine, R. 2000. Troubles with the Neighbours: Africa's Problems, Africa's Opportunity. *Journal of African Economics*, 7 : pp120-142.
Easterly, W., and R. Levine, 2001. "It's Not Factor Accumulation: Stylized Facts and Growth Models." *World Bank Economic Review* 15(2):pp177-219.
Eaton, J. and Tamamura, A., (1994). Bilateralism and Regionalism in Japanese and US Trade and Direct Foreign Investment Patterns, *NBER Working Paper* No. 4758, Cambridge, Mass.
Edwards, R.2003. FDI Strategic issues. Foreign Direct Investment Research Issues.Edited by Bora,B.Routledge: *London and New York.*
Edwards, S. (1998). 'Openness, productivity and growth: What do we really know?', *Elgar.Empirical Economics* 30 (3), 2005, pp.1-22,
Engle,R.F.and Granger,C.W.J. (1987). Co-integration and error correction: Representation,estimation and testing. *Econometrica*,55,pp251-76.
Enyang,G.and Osman,S , (2009) corporate operating characteristics and capital structure causality testing in a Heterogeneous Panel data ,*discussion paper.*
Ericsson, N.R, Irons, J.S., Tryon. R.W., 2001.Output and inflation in the long-run. *Journal of Applied Econometrics* 16,pp 241-253.
Estrin, Saul, Hughes, Kirsty, Todd, Sarah, 1997. Foreign Direct Investment in Central and Eastern Europe. *Cassel, London.*
European Countries: A Dynamic Panel Analysis. *Journal of Comparative Economics, 32:3-22.*
Faeth, I., 2009. Determinants of foreign direct investment - a tale of nine theoretical models. *Journal of Economic Surveys* 23 (1), pp165-196.
Farrell, R., Gaston, N. and Sturm, J.E. (2000). *Determinants of Japan's Foreign Direct Investment: A Panel Study,1984-1995*, CJES Research Papers, No. 2001-1, *Centre for Japanese Economic Studies, Macquarie University*
Felipe, J ,(1997).Total Factor Productivity Growth in East Asia: A critical survey ,*economics and development research center report series N° 65.*
Fernandez C, Ley, E., Steel, M.F.J. 2001a. Model Uncertainty in Cross-Country Regression.J. *Applied Econometrics* 16: pp563-76.
Findlay, R. (1978) Relative Backwardness, Direct Foreign Investment, and the Transfer of Technology: a Simple Dynamic Model, *Quarterly Journal of Economics*, 92, (1), pp1-16.
Fischer,S,1993.The Role of Macroeconomic Factors in Economic Growth .*Journal of Monetary Economics*32,pp485-512.
Fisher, R.A.,(1932). Statistical Methods for Research Workers,4th Edition. Oliver & Boyd,*Edinburgh.*
Florax, R.J.G.M., H.L.F. de Groot, and R. Heijungs (2002): The Empirical Economic Growth Literature: Robustness, Significance and Size, Tinbergen *Discussion Paper*, TI 2002- 040/3, Amsterdam-Rotterdam.
Fölster, Stefan and Magnus Henrekson (2001), "Growth effects of government expenditure and taxation in rich countries", *European Economic Review* 45(8), pp1501-1520.
Frey, (1993), Foreign Direct Investment in Southeast Asia Differential Impacts, Institute of Southeast Asian Studies, Singapore.

Froot, K.A. and Stein, J. C. (1991) "Exchange Rates and Foreign Direct Investment: An imperfect capital markets approach. *Quarterly Journal of Economics 106: 1191-217.*
Fung, K.C., Lizaka, Hitomi, Parker, Stephen, 2002. Determinants of US and Japanese direct investment in China.
Gallup, J.L., Sachs, J.D. & Mellinger, A. 1999. Geography and Economic Development. *CID Working Paper no. 1.* Harvard University.
Gao, T.(2001). FDI, openness and income. *Journal of International Trade and Economic Development* 13 (3): pp305-323.
Gastanaga,V.M, Nugent ,J. B. And Pashamova ,B. (1998). Host country reforms and FDI inflows: How Much Difference do they Make?*World Development* 26(7): pp1299-1314.
Ghosh and Wang (2009).Does FDI accelerate economic growth?.Global economy journal,vol 9, No4.
Ghura, D., and M. T. Hadjimichael, 1996, Growth in Sub-Saharan Africa, International *Monetary Fund Staff Papers* 43, pp 605-634.
Gilbert, C.L. (1986) Professor Hendry's Econometric Methodology, *Oxford Bulletin of Economics and Statistics,* 48, pp 283-307.
Globerman, S. and D. Shapiro (2002), "Global Foreign Direct Investment Flows: The Role of Governance Infrastructure", *World Development*, 30 (11), pp1898-1919.
Goldberger, A. S. (1991). A Course in Econometrics. Cambridge, MA: Harvard University Press.Leon-Gonz´alez, Roberto and Daniel Montolio (2004), "Growth, Convergence and Public Investment: A BMA Approach," *Applied Economics*, 36: pp1925–36.
Granger, C.W.J, 1969. Investigating causal relationd by econometric models and cross-spectral methods. *Econometrica* 37, pp424.438.
Granger, C.W.J., Uhlig, H.F., 1990. Reasonable extreme-bounds analysis. *Journal of Econometrics* 44, pp159–170.
Granger, C.W.J.,2003.Some aspects of causal relationships ,*journal of econometrics*112,pp 69-71
Greene, W.H. (2000), *Econometric Analysis*, McGraw-Hill, New York.
Grier, K.B. and G. Tullock (1989). An Empirical Analysis of Cross-National Economic Growth,1951-80, *Journal of Monetary Eamomics*. 24: 259-276.
Grosse, R. and Behrman, J.N. (1992). Theory in International Business,Transnational Corporations, Vol. 1(1), pp.93-126.
Grossman, G.M., and E. Helpman (1991). Innovation and Growth in the Global Economy, *Cambridge MA: MIT Press.*
Hank C.(2008). "An Intersection Test for Panel Unit Roots", *Mimeo*, Department of Economics, University of Dortmund.
Hansen H.and Rand J. (2006) "on the causal links between FDI and Growth in developing countries" , *Mimeo,Development Economics Research Group (DERG)*
Hansen, M. Transnational Corporations in Sustainable Development.An appraisal of the environmental implications of foreign direct investment in less developed countries.,Copenhagen Business School,Ph.D.-series 3.98, 1998.
Hanson, G. (2001): "Should Countries Promote Foreign Direct Investment?",*G-24 Discussion Papers9,United Nations Conference on Trade and Development*
Harms, P., and H. Ursprung (2002). Do Civil and Political Repression Really Boost Foreign Direct Investment? *Economic Inquiry* 40 (4): pp651-663.
Harrison,A. (1994). "The Role of Multinationals in Economic Development", *The Columbia journal of World Business, winter.*
Hartman, D. G. (1984), Tax policy and foreign direct investment in the United States, *National Tax Journal* 37, pp475-488
Hattari, R., Rajan, R. S., 2009. Understanding bilateral FDI flows in developing asia. *Asian-Paci_c Economic Literature* 23 (2), pp73-93.
Hausmann, J.A. (1976) Specification tests in Econometrics, *Econometrica*,46 (6), pp1251-1271
Hausmann, R., and Fernandez-Arias, E. 2000. *The New Wave of Capital Inflows: Sea change or just another title? Inter-American Development Bank working paper no 417.*
Head ,Keith (2002) "Elements multinational strategy"chapter 7,fourthcoming book.IMF committee on balance of payments statistics,*AnnualReport,various year*.

Hecksher, E. and Ohlin, B. (1933), Interregional and International Trade, *Harvard University Press, Cambridge, MA.*
Hendry,D.F and Krolzig H-M,(2004).We Ran One Regression unpublished paper. *OXFORD bulletin of economics and satisics*, 66(5),pp799-810.
Hermes, N., and Lensink, R., (2003), Foreign direct Investment, Financial Development and Economic Growth, *The Journal of Development Studies*, Vol 40, No.1,pp142-163.
Herzer, D., 2008. The long-run relationship between outward FDI and domestic output: Evidence from panel data. *Economics Letters* 100, pp146-149.
Herzer, D., Klasen, S., Nowak-Lehmann D., F., 2010. In search of FDI-led growth in developing countries. *The way forward Economic Modelling* 25, pp793-810.
Hines, J. (1997), Tax policy and the activities of multinational corporations, in: Auerbach,A. J., (ed.), *Fiscal Policy: Lessons from Economic Research*, Cambridge et al., pp 401-445.
Hirsch, Seev (1967), Location of Industry and International Competitiveness, Oxford: *OxfordUniversity Press.*
Hoeffler, E. Anke, (2002), "The augmented Solow model and the African growth debate" *Oxford Bulletin of Economics and Statistics, 64: pp135-158.*
Holland, D. and Pain, N., 1998, "Accession, integration and the diffusion of innovations: a study of the determinants and impact of FDI in Central and Eastern Europe", *NIESR Discussion Paper No. 137.*
Holtz-Eakin, D.; W. Newey and H. Rosen, (1988), "Estimating Vector Autoregressions with Panel Data,"*Discussion paper.*
Hommel G (1988). "A Stage wise Rejective Multiple Test Procedure Based on a Modified Bonferroni Test",Biometrika,75,2,pp383-386.
Hood, M.V., Kidd, Q. and Morris, I.L. (2008) Two Sides of the Same Coin? Employing Granger Causality Tests in a Panel Framework. *Forthcoming in Political Analysis.*
Hoover,K.D,.and Perez,S.J.(2004)Truth and Robustness in cross -country growth regressions Oxford *Bulletin of economics and Statistics* 66,forthcoming
Horisaka, K., (1993). Japan's Economic Relations with Latin America, Japan, the United States and Latin America, *London, Macmillan.*
Horst, T. (1972). The Industrial Composition of US Exports and Subsidiary Sales to the Canadian Market, *American Economic Review*, Vol. 62, pp. 37-45.
Hsiao, F.S.T. and Hsiao, M-C.W. (2006). "FDI, Exports and GDP in East and Southeast Asia – Panel Data Versus Time-Series Causality Analysis". *Journal of Asian Economics* 17. pp: 1082 – 1106.
Hufbauer, G.C. "The Multinational Corporation and Direct Investment." *In International Trade and Finance: Frontiers for Research*, ed. Peter B. Kenen. Cambridge: Cambridge University Press,1975.
Hurlin, C., (2004). Testing Granger Causality in Heterogeneous Panel Data Models with Fixed Coeficients. *Document de recherche LEO,*
Hurlin C., 2005, Un Test Simple de l.Hypothèse de Non Causalité dans un Modèle de Panel Hétérogène, *Revue Economique*, 56(3), 799-809.
Hurlin, C., 2008., Testing for Granger Non Causality in Heterogeneous Panels, Working Paper LEO, *Université d.Orléans*, 2007-10
Hurlin,C. and Venet,B. (2008) " Financial development and Growth:A Re-Examination using a Panel Granger Causality test",*Mimeo, University of Orleans.*
Hussain, Mumtaz/Brookins, Oscar T., 2001, "On the Determinantsof National Saving: An Extreme-Bounds Analysis", *Weltwirtschaftliches Archiv*, Vol. 137, pp150–174.
Hymer, S. H. (1960) The International Operations of National Firms: A Study of Direct Foreign Investment. *Cambridge MA: MIT Press.*
ICRG, various years, International Country Risk Guide Annual, PRS Group.
Ikiara, M.M. "Foreign Direct Investment (FDI), Technology Transfer, and Poverty Alleviation: Africa's Hopes and Dilemma",African Technology Policy Studies Network (ATPS) *Special Paper Series* No. 16, 2003,Nairobi, Kenya.
Im, K.S., Pesaran, M.H., Shin, Y., (2003). Testing for Unit Roots in Heterogeneous Panels. *Journal of Econometrics* 115(1), pp53.74.
International Finance Statistic , various editions.

International Monetary Fund, (1993), *Balance of Payments Manual,* fifth edition *(BPM5)* (Washington).
Islam, N. (1995); "Growth Empirics: A Panel Data Approach", *Quarterly Journal of Economics*, 110.
Jackson, Sharon, Stefan Markowski (1995). The Attractiveness of Countries to Foreign Direct Investment: Implications for the Asia-Pacific Region.*Journal of World Trade* 29 (5): pp159–179.
Jaspersen, F.Z., A.H. Aylward, and A.D. Knox. 2000. "The Effects of Risk on Private Investment: Africa Compared with Other Developing Areas." In Investment in Risk in Africa, edited by P. Collier and C. Pattillo. New York: *St. Martins Press*.
Johansen, S. and Juselius, K. (1990) "Maximum Likelihood estimation and inference on cointegration with application to the demand for money", *Oxford Bulletin of Economics and Statistics*, Vol. 52, pp169-210.
Johnson, A. (2006). "The Effects of FDI inflows on Host Country Economic Growth". *CESIS Electronic Working Paper Series.* Paper No. 58.
Johnson, T., (2005), Dynamic liquidity in endowment economies, forthcoming, *Journal of Financial Economics.*
Jones G. (1996) The evolution of international business : an introduction Routledge London ,New York
Jones, C. (1995) R&D-Based Models of Economic Growth, *Journal of Political Economy* 103, pp759-784.
Jong, N. de and Vos, R., Patterns of International Finance between Major Trading and Investment Partners, *Institute of Social Studies*, The Hague, 1994 (Mimeo).
Jordaan, J. 2004. Foreign direct investment and neighboring influences. University of Pretoria
Joseph, A., Raffinot, M., Venet, B. (1998), "Approfondissement financier et croissance : analyses empiriques en Afrique subsaharienne", Techniques financières & développement, septembre/octobre 1998, pp17-25. *Journal of Comparative Economics* 30, pp567–578.
Kamaly,A, (2004). "Evaluation of FDI flows into the MENA region",*Economic Research ForumWorking* Paper Series,Cairo,Egypt.
Kang, Y. nd Du, J., (2005). Foreign direct Investment and Growth: Empirical Analyses on Twenty OECD Countries.
Karbasi, A., Mohamadi, E., and Ghofrani, S., (2005). "Impact of Foreign Direct Investment and Trade on Economic", *Economic Research Forum, 12th Annual Conference*, 19th-21st December 2005, Cairo, Egypt.
Kindleberger, C.P. (1969), American Business Abroad, New Haven: *Yale University Press*.
King, Robert G., and Ross Levine, "Finance and Growth: Schumpeter Might Be Right," *World Bank Working Paper No. 1083, 1993*
Kinoshita Y, (1998), Micro-determinants of Japanese Foreign Direct Investment in Asia, Eastern Economic Association and Japan Economic *Seminar at Columbia University.*
Kojima, K. (1973), 'A Macroeconomic Approach to Foreign Direct Investment', *Hitotsubashi Journal of Economics,* 14, 1, pp1-21.
Kojima, K. 1982. Macroeconomic Versus International Business Approach to Direct ForeignInvestment, *Hitotsubashi Journal of Economics*, 23: pp. 488-494.
Kojima,Kand Ozawa,1994. Micro and Macro Economic Models of Direct Foregn investment: Toward a synthesis. *Hitotsubashi Journal of economics*,june1984,S: pp1-20.
Kokko, A. (1994). 'Technology, Market Characteristics, and Spillovers', *Journal of Development Economics,* Vol.43, No.2, pp.279-93.
Koop, G., Osiewalski, J., Steel, M.F.J., 1997, Bayesian efficiency analysis through individual effects: Hospital cost frontiers, *Journal of Econometrics* 76, pp77-105.
Kumar, N. and J. P. Pradhan (2002) "Foreign Direct Investment, Externalities and Economic Growth in Developing Countries: Some Empirical Explorations and Implications for WTO Negotiations on Investment," *RIS Discussion Paper* No. 27/2002.
Leamer, E. [1983] "Lets Take the Con out of Econometrics", *American Economic Review* , vol. 73, pp.31-43.

Leamer, Edward E., 1985, Sensitivity Analyses would Help, *American Economic Review* 75, pp308-313.
Leamer, Edward E., Specification Searches: Ad Hoc Inference with Nonexperimental Data. New York: John Wiley & Sons, 1978.
Leamer,E.E. and Leonard,H.(1983) Reporting the fragility of regression estimates .
Leon-Gonzalez,R.and D.Montolio(2004), " Growth,Convergence and Public Investment:A Bayesian Model Averaging Approach,"*Applied Economics,36,pp1925-1936.*
Leiderman, L. and A. E. Thorne (1996).The 1994 Mexican crisis and its aftermath: what are the main lessons? In G.A. Calvo, M. Goldstein and E. Hochreiter (eds.), *Private capital flows to emerging markets after the Mexican crisis*. Washington, D.C: *Institute for International Economics.*
Lensink, R., and Morrissey, O. (2006). Foreign Direct Investment: Flows, Volatility, and the Impact on Growth, *Review of International Economics, 14(3),pp 478–493.*
Levine, R. and Renelt, D. (1992). 'A sensitivity analysis of cross-country Growth regressions, *American Economic Review, 82,pp 942–63.*
Levine, R., Loayza, N., Beck, T., 2000. Financial intermediation and growth: causality and causes. *Journal of Monetary Economics 46, pp31.77.*
Levine, Ross and Zervos, Sara."What We Have Learned About Policy and Growth from Cross-Country Regressions," *American Economic Review, May 1993, pp. 426-430.*
Li, Q. and Resnick A. (2003). Reversal of Fortunes: Democratic Institutions and Foreign Direct Investment Inflows to Developing Countries, *International Organization, Vol. 57, Winter, pp. 175-211.*
Li, Xiaoying and Xiaming Liu, (2005).Foreign Direct Investment and Economic Growth: An Increasingly Endogenous Relationship, *World Development, Vol. 33,* No. 3, pp. 393-407.
Lipsey, R. E. 2002. "Home and Host Country Effects of FDI." *NBER Working Paper* 9293.
Lipsey, Robert E. (2003), "Foreign Direct Investment, Growth, and Competitiveness in Developing Countries," in Peter K. Cornelius, Editor, The Global Competitiveness Report 2002-2003, New York and Oxford, *Oxford University Press, pp. 295-305.*
Lipsey,R.E and F.Sjoholm (2001), "FDI and wages in Indonesian Manufacturing", *NBER n°8299.*
Liu, X., Burridge, P. and Sinclair, P.J.N., (2002). Relationships between economic growth, foreign direct investment and trade: Evidence from China, *Applied Economics No. 34, pp. 1433-1440.*
Loree D W, Guisinger S. (1995) "Policy and Non-policy Determinants of U.S. equity Foreign Direct Investment", *Journal of International Business Studies 26 (2),pp281-299.*
Lucas R. E., [1993]: "On the Determinants of Foreign Direct Investment: Evidence from East and Southeast Asia". *World Development, 21(3):pp 391-406.*
Lucas,R.E.Jr. (1988), "On the Mechanics of Economic Development",*journal of Monetary Economics,Vol. 22,pp.3-42.*
Lunn J., "Determinant of U.S. Investment in the EEC: Further Evidence," *European Economic Review* 13, 1980, pp. 93-101.
Lunn, J. (1980). "Determinants of US direct investment in the EEC", *European Economic Review*, 13, pp. 93-101.
Mallampally, P. and K. P. Sauvant (1999) "Foreign direct investment in developing countries," *Finance and Development, 36 (1), p. 36.*
Malthus, T.R. 1989a. An Essay on the Principle of Population, ed. P. James, 2 vols. *Cambridge University Press for the Royal Economic Society.*
Mankiw, N.G., Romer, D. and Weil, D.N. (1992), A contribution to the empirics of economic Manufacturing Industries." *Weltwirtschaftliches Archiv, 129, pp. 120-37.*
Markusen, J.R., (1995), "The Boundaries of Multinational Enterprises and the Theory of International Trade," *The Journal of Economic Perspectives, 9(2), pp169-189.*
Masanjala,W. And C. Papageorgiou,(2005), " Rough and lonely road to prosperity :A Reexamination of the sources of Growth in Africa using Bayesian Model Averaging," *Mimeo,IMF.*
McAleer, M., Pagan, A., Volker, P.A., 1985. What will take the con out of econometrics? *American Economic Review 75, 293–307.*

McCloskey, D. N. and S. T. Ziliak (1996), "The Standard Error of Regressions," *Journal of Economic Literature, Vol. 34, pp. 97-114.*
Mencinger, J., (2003), "Does Foreign Direct Investment Always Enhance Economic Growth?", *Kyklos, 56(4), pp. 491-509.*
Meyer, K. E., 2001. Institutions, transaction costs, and entry mode choice in Eastern Europe. *Journal of International Business Studies 32 (2), pp357-367.*
Mody, A. and Wang, F.Y. (1997) 'Explaining Industrial Growth in Coastal China: Economic Reforms and What Else?'. *World Bank Economic Review 11,pp 293-325.*
Moon, H. C., & Roehl, T. W. (1993). An imbalance theory of foreign direct investment. *Multinational Business Review, 1 (1), pp56–65.*
Moore, M. O. (1993). "Determinants of German Manufacturing Direct Investment in Manufacturing Industries." *Weltwirtschaftliches Archiv, 129, pp. 120-37.*
Moosa, I.A. (2002). FDI: Theory, Evidence and Practice. *New York: Palgrave.*
Moosa, I.A. and Cardak, B.A. (2005) The Determinants of Foreign Direct Investment: An ExtremeBounds Analysis, *Journal of Multinational Financial Management (forthcoming).*
Mundell, R A. (1957): "International Trade and Factor Mobility," *American Economic Review, Vol.47.*
Nair-Reichert, Usha, and Diana Weinhold (2000), "Causality Tests for Cross-Country Panels:New Look at FDI and Economic Growth in Developing Countries." *Oxford Bulletin of Economics and Statistics. 64,pp153-71.*
Nath, K. Hiranya, (2005), Trade, Foreign Direct Investment and Growth: Evidence from Transition Economies, *80th Annual Conference of the Western Economic Association International*, June 2005.
Nigh, D.1985. The Effect of Political Events on United States Direct Foreign Investment: APooled Time-Series Cross-Sectional Analysis. *Journal of International Business Studies*,16(1): pp1-17.
Nunnenkamp, Peter (2001). Foreign Direct Investment in Developing Countries: What Policymakers Should Not Do and What Economists Don't Know. *Kiel Institute for World Economics, Discussion Papers 380. Kiel.*
Nyatepe-Coo, A., (1998). Foreign Direct Investment and Economic Growth in Selected LDCs, 1963-1992, *Handbook on the Globalization of the World Economy Chapter 4* edited by Amnon Levy-Livermore, pp. 87-100, Edward Elgar Publishing Inc., Massachusetts, 1998. *OCDE report* Various issues.
Olofsdotter. K (1998), "Foreign Direct Investment, Country Capabilities and Economic Growth", *Review of Wold Economics, n°134, vol.3.pp.535-547.*
Omran, M., and Bolbol, A., (2003). Foreign Direct Investment, Financial Development and Economic Growth: Evidence from Arab Countries, *Rev. Middle East Econ. Fin., December 2003, Vol. 1, No. 3,* pp231–249 Oxford Bulletin of economics and Statistics66,forthcoming .
Ozturk, I. Foreign Direct Investment-Growth Nexus: A Review of Literature ,*International Journal of Applied Econometrics and Quantitative Studies* Vol. 4-2 (2007)
Pacheco-López, P. (2005) "The impact of trade liberalization on exports, imports, the balance of payments and growth: the case of Mexico," *Journal of Post Keynesian Economics, vol. 27, no. 4, pp. 595–619.*
Pan, Y. (2003). The Inflow of Foreign Direct Investment to China: the Impact of Country-specific Factors, *Journal of Business Research, Vol. 56, pp. 829-833.*
Pantelidis, P. and D. Kyrkilis (2005), 'A cross country analysis of outward foreign direct investment patterns', *International Journal of Social Economics,* 32(6), pp510-519.
Parsons, C. and S. Titman, 2007, Capital structure and corporate strategy, unpublished working paper.
Penn World Tables 6.1. (2003). *Center for International Comparisons. University of Pennsylvania.*
Pistoresi, B. (2000). Investimenti diretti esteri e fattori di localizzazione: L'America Latina e il Sud Est asiatico, *Rivista di Politica Economica.* 90, 27– 44.
Raff,H ,Ryan,M., and Stahler,A.(2009). 'Whole versus shared ownership of foreign affiliates'. *International journal of industrial Organization*,27 (5),pp572-581.
Ranis, G., F. Stewart and A. Ramirez, 2000, 'Economic Growth and Human Development', *World Development,28,2, pp197-219.*

Rao Bhaskara and K. Chaitanya (2004), 2004, Globalization & Growth in the low income African countries with the extreme bounds analysis, *Economic Modelling, vol 28*
Rasciute et al (2007) An Empirical Investigation of the Determinants of the Location of Foreign Direct Investment in the Central and Eastern European Countries Using Multilevel Data, *Loughborough University Economics Research Paper 07-22.*
Razin,A.2003. The Contribution of FDIflows to domestic investment in capacity and vice versa. *NBERWorking paper 9204.*
Reisen H. and M. Soto (2001), Which Types of Capital Inflows Foster Developing-Country Growth?, *International Finance, 4(1), pp. 1-14.*
Robert J. Barro & Xavier Sala-i-Martin, 1990. "Economic Growth and Convergence across the United States," NBER Working Papers 3419.
Root, F. and Ahmad, A. (1979) "Empirical Determinants of Manufacturing Direct Investment in Developing Countries," *Economic Development and Cultural Change*, Vol.27, pp. 751-767.
Rugman, A.M. (1979). International Diversification and the Multi- national Enterprise, *Lexington Books: Lexington, MA.*
Sachs, Jeffrey (2003) Institutions Don't Rule: Direct effects of geography on per capita Income,*NBER Working paper N°9490.*
Sachs, Jeffrey and Andrew Warner (1996) ,Natural Ressource Abundance and Economic, Growth Mimeo .
Sala -I-Martin,X,1996 .I just Ran four million Regressions,Department of Economics , Columbia university,Mimeo.
Sala-i-Martín, X.1997. "I Just Ran Two Million Regressions." American Economic Review 87:pp178-83.
Sala-i-Martin, X. Doppelhofer, G. and R. Miller (2004). Determinants of Long-Term Growth:A Bayesian Averaging of Classical Estimates (BACE) Approach. American Economic Review, 94: pp813-835.
Saltz, I. S. (1992), "The Negative Correlation between Foreign Direct Investment and Economic Growth in the Third World: Theory and Evidence", Rivista Internationale Di Scienz Economiche e Commerciale, 19(7), pp617-633.
Sass,M,(2003), " Competitiveness and economic policies related to foreign direct investment" Hungary Ministry of Finance WorkingPaperN°3,
Schmitz, A. and J. Bieri, "EEC Tariffs and U.S. Direct Investment," *European Economic Review* 3, 1972,pp. 259-270.
Schneider F, Frey B. (1985) "Economic and Political Determinants of Foreign Direct Investment", *World Development* 13(2), pp161-175
Sekkat, K., Veganzones-Varoudakis, M.-A., November 2007. Openness, investment cli-mate, and fdi in developing countries. *Review of Development Economics* 11 (4), pp607- 620.
Senhadji, A. (2000), "Sources of economic growth: An extensive growth accounting exercise," *IMF Staff Papers,* pp. 129-57.
Sethi, D., Guisinger, S.E., Phelan, S.E. and Berg, D.M. (2003). Trends in Foreign Direct Investment Flows: A Theoretical and Empirical Analysis, *Journal of International Business Studies*, Vol. 34, pp. 315-326.
Shamsuddin, A. F.M. [1994]: "Economic Determinants of Foreign Direct Investment in Less-Developing Countries" *The Pakistan Development Review,* 33 (1): pp41-51.
Shapiro, D. and S. Globerman (2001) National Infrastructure and Foreign Direct Investment, *Mimeo,* Simon Fraser University
Sims RJ(1986). "An improved Bonferroni Procedure for Multiple Tests of significance",*Biometrika,* 73,3,pp751-754.
Singh, H. and K.W. Jun. 1995. "Some new evidence on determinants of foreign direct investment in developing countries". Policy Research Working Paper No.1531. The World Bank, Washington,D.C.
Singh, H. and K.W. Jun.
Sjöholm, F. (1999c), "Technology Gap, Competition and Spillovers from Direct Foreign Investment: Evidence From Establishment Data", *Journal of Development Studies*, Vol.36, pp. 53-73.
Solow, R. (2000): "Toward a Macroeconomics of the Medium Run," *Journal of EconomicPerspectives*, 14(1), 151-58.

Solow,R.(1956), "A contribution to the theory of economic Growth",*Quarterly journal of Economics,*Vol70N°1,pp65-94.
Staiger,D.,and J.H.Stock (1997): "Instrumental Variables Regression with Weak Instruments", *Econometrica* ,65,557-86.
Stewart,C (2010) Hurlin and Venet's Granger non Causality tests for heterogeneous panels,London:*London Metropolitan University.*
Stock, J.H,and M. Yogo (2005), "Asymptotic Distributions of Instrumental Variables Statistics with Many Weak Instruments,"Chapter 6 in this volume .
Sturm Jan-Egbert and Jakob de Haan (2002), How robust is Sala-i-Martin's robustness analysis?, *Mimeo.*
Sturm,jan-Egbert and jakob de Haan(2005) ,Determinants of long –term Growth: New Results Applying Robust Estimation and Extreme Bounds Analysis, *Empirical Economics* 597-617.
Swenson, Deborah L., The impact of U.S. tax reform on foreign direct investment in the United States, *Journal of Public Economics*, June 1994, *54*(2), 243-266.
Taveira, E. (1984), "Foreign direct investment in Portugal. The present structure, determinants and future evolution after the accession to the EEC", unpublished PhD thesis, *University of Reading.*
Taylor, C.T. (2000), "The Impact of Host Country Government Policy on US Multinational Investment Decisions," *The World Economy (May), pp. 635-647.*
Temple, Jonathan (1998), "Robustness Tests of the Augmented Solow Model", *Journal ofApplied Econometrics*, 13, 361-375.
Temple, J. R. W. (1999). The New Growth Evidence. *Journal of Economic Literature*, March 1999, 37(1), pp112-156. Reprinted in Dutt, A. K. (ed.) *The political economy of development, Volume 1. Development, growth and income distribution.*
Temple,Jonathan (2000),Growth Regressions and What the Textbooks don't tell The Chinese experience. *Journal of international economics* 51,379-400.
Tobin, J. (1969), .A General Equilibrium Approach to Monetary Theory., Journal of Money,Credit and Banking, Vol. 1, pp. 15-29.
Toda,H.Y,Yamamoto,T,1995, Statistical influence in Vector Autoregressions with possibly integrated processes,Journal of Econometrics66,pp225-250.
Todaro, Michael (2000) Economic Development. Adison Wesley Longman.
Townsend,I.2003. Does FDI Accelerate Economic Growth in less Developed Countries?*Olaf College,Northfield* ,MN
Tuman, J. and Emmert , C. (1999)"Explaining Japanese Foreign Direct Investment in Latin America," *Social Science Quarterly*, vol. 80, pp. 539-541.
Trevino, L. J., Thomas, D. E., Cullen, J., February 2008. The three pillars of institutional theory and fdi in Latin America: An institutionalization process. International Business Review 17 (1), pp118-133.
Tsai,P.1994. Determinants of FDI and its impact on Economic Growth.Journal of economic Development.19(1):pp137-163
Tsangarides, C. G. (2005). Growth empirics under model uncertainty: Is Africa different?IMF Working Paper 05/18, *International Monetary Fund.*
Tu, J.H. and Schive C. (1995). *Determinants of Foreign Direct Investment in Taiwan Province of China: A new Approach and Findings*, Transnational Corporations, Vol. 4(2), pp. 93-103.
Tuman, J. and Emmert , C. (1999) "Explaining Japanese Foreign Direct Investment in
UNCTAD, World Investment Report various issues.
Uzawa H., "Optimum Technical Change in an Aggregative Model of Economic Growth",International Economic Review, vol. 6, 1965, pp. 18-31.
Vernon,R.1966. International Investment and International Trade in the product Cycle. Quarterly journal of economics.May:pp190-207.
Vernon,R.1979. The product life Cycle Hypothesis in a new international Environment, Oxford Bulletin of Economics and statistics.41(4):pp35-55.
Veugelers, R. (1991) 'Locational Determinants and Ranking of Host Countries: An Empirical Assessment'. *Kyklos,* Vol. 44, pp. 363–82.

Vu,T.B and Noy, I,(2009). Sectoral Analysis of Foreign Direct Investment and Growth in the Developed Countries.Journal of international Financial Markets, Institutions and Money,19,pp402-413.
Wang ,M.2003. Manufacturing FDI and Economic Growth: Evidence from Asian Economies. *Applied Economics*, 41: 991–1002.
Wang, Z. Q. and N. J. Swain. (1995). "The Determinants of Foreign Direct Investment in Transforming Economies: Empirical Evidence from Hungary and China." Weltwirtschaftliches Archiv, 131, pp. 359-82.Wei, S.J. (1995). Attracting Foreign Direct Investment: Has China Reached its Potential?,China *Economic Review, Vol.* 6(2), pp. 187-199.
Weinhold, D. (1999) "A dynamic 'Fixed Effects' Model for Heterogeneous Panel Data", unpublished manuscript, London School of Economics. Van Zon, Adriaan H. and Joan Muysken (2001), "Health and Endogenous Growth", *Journal of Health Economics*, 20,pp169-85.
Weinhold, D., 1996. Tests de causalité sur données de panel: une application à l.étude de la causalité entre l'investissement et la croissance.Economie et Prévision126, 163.175.Western College Publishing, Cincinnati.
Wells, L.T. (1969), "Test of a product cycle model of international trade", *Quarterly Journal of Economics, February,* pp. 152-62.
Wheeler, D. and A. Mody. 1992. "International investment location decision: The case of US firms". *Journal of International Economics*, 33: pp57–70.
WINDER, G.M. 'A Trans-national Machine on the World Stage: representing McCormick's Reaper through World's Fairs, 1851-1902', *Journal of Historical Geography*, 33: pp 352-376, 2006.
Wooldridge ,J.M (2000).Introductory Econometrics: A modern Approach. South-World Bank (2005). World Development Indicators, Data on CD-ROM, World Bank: Washington, DC.
Xu, B. [2000], "Multinational Enterprises, Technology Diffusion, and Host Country You Bulletin of Economic Research,52 (3),pp181-205.
Yang,J.Y.Y.Groenewold,N. and Tcha,M.," The determinants of FDI in Australia",The Economic Record,76(232),2000,pp.45-54.
Zaheer, S. (1995). Overcoming the Liability of Foreignness, Academy of Management Journal, Vol. 38(2), pp. 341-363.
Zapata ,H.O,Rambaldi,A.N,1997.Monte Carlo evidence on cointegration and causation. Oxford *Bulletin of Economics and Statistics* 59,pp285-298.
Zhang, K.H. (2001b). How does Foreign Direct Investment Affect Economic Growth in China? Economics of Transition, 9(3), pp679-693.
Zhao, H., 1995, 'Technology Imports and Their Impacts on the Enhancement of China's Technological Capability', *Journal of Development Studies*, Vol.31, No.4, pp.585-602.