Essays on Foreign Direct Investment in Three Resource-Rich Developing Countries

A thesis submitted to the School of Economics of the University of East Anglia for the Degree of Doctor of Philosophy

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Abstract

This thesis aims to investigate and study a variety of dimensions of the relationship between FDI, economic performance, the determinants of FDI, firm ownership and firms' efficiency in developing host countries. To achieve the aim and to examine the arguments of this thesis, the thesis's structure includes six chapters, including four empirical chapters. The first empirical chapter attempts to find an answer to the question whether FDI contributes positively to the economic performance of the destination country. This chapter also provides insights into how the relationship of FDI's depends on other important aspects, such as the geographical location, the nature of destination sector, the technological distance between the source and the destination countries. The second empirical chapter takes a broader, regional perspective and studies the determinants of the inflow of FDIs towards GCC countries, with a specific attention to their governments' strategies to attract FDIs in priority sectors and priority source country. Finally, the third and the fourth empirical chapters turn to efficiency analysis. Specifically, they discuss the role of foreign-owned firms in promoting efficiency amongst domestic firms, FDI inflows and controlling for other selected key determinants: composition of the labour force, the firm size and the firm age. The analysis is performed for Dubai-based firms in the manufacturing and construction in the third empirical chapter, while the fourth empirical chapter seeks to answer the same questions for the financial sector.

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List of acronyms

AED	Arab Emirates Dirham
CRS	Constant Returns to Scale
DEA	Data Envelopment Analysis
DIFC	Dubai International Financial Centre
DMU	Decision Making Unit
FDI	Foreign Direct Investment
GCC	Gulf Co-operation Council (member countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the UAE)
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GLS	Generalized Least Square
GMM	Generalized Method of Moments
KSA	Kingdom of Saudi Arabia
MPI	Malmquist Productivity Index
OECD	The Organisation for Economic Co-operation and Development
OFDI	Outward Foreign Direct Investment
OLS	Ordinary Least Square
UNCTAD	United Nations Conference on Trade and Development
QAR	Qatar Riyal
PPML	Poisson Pseudo-Maximum Likelihood estimator
SAR	Saudi Arabia Riyal
TFP	Total Factor Productivity
UAE	United Arab Emirates
USD	United States Dollar
VRS	Variable Returns to Scale

Chapter 1

Introduction

1.1 Motivation

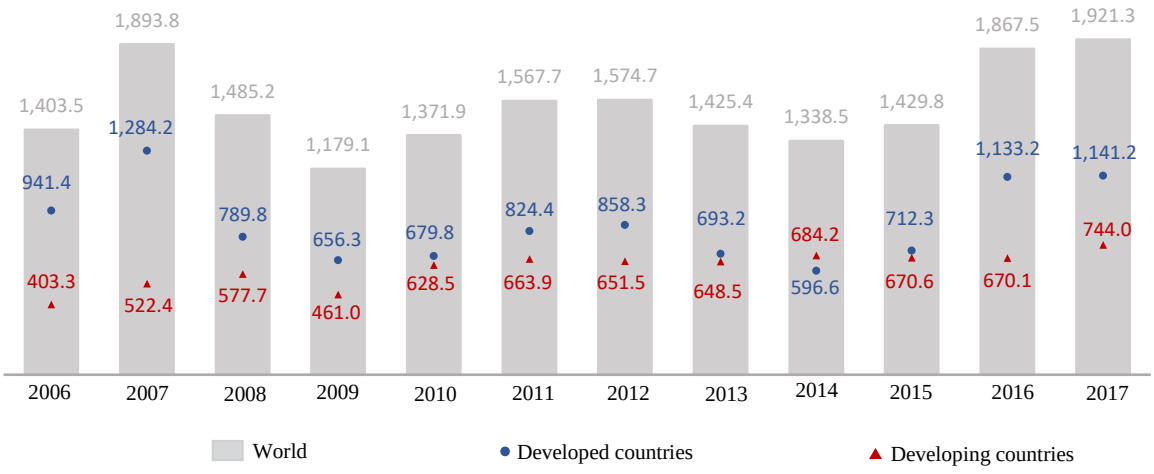
The world economy has become increasingly integrated, and foreign capital globalisation, particularly Foreign Direct Investment (FDI) flow, which is a particularly significant driving force behind the interdependence of national economies, has also increased significantly in developing countries, due to the fact that FDI is the most stable and prevalent component of foreign capital inflows (Adams, 2009). FDI, it has been argued, plays a significant role in creating positive externalities in economic growth by providing financial resources, creating jobs, transferring technological know-how, accessing new management and organisational skills, boosting exports and enhancing competitiveness (Kobrin, 2005; Adams, 2009).

FDI plays a crucial role in economic growth in developing countries by generating benefits for the host economies and solving their short-term capital deficiency problems. FDI stimulates the target country's economic development, creates a more conducive environment for the foreign investor and benefits domestic industries. FDI facilitates resource transfer, exchanges of knowledge, transfer of technologies and spillovers towards domestic firms. It also helps to make them more competitive in both national and international markets. FDI brings positive externalities to the economy, such as training and labour management opportunities. These may then be made generally available in the economy, and lead to a further increase in the standards of productivity and efficiency. FDI creates new jobs, as the foreign investors build new firms and companies in the target country, creating new opportunities. This leads to an increase in income and provides purchasing power for the people, which in turn leads to an economic boost. The United Nations Conference on Trade and Development (UNCTAD) (2008) reports that the facilities and equipment provided by foreign investors through FDI inflows have the potential to create employment, increase the workforce's

productivity and develop human capital resources. The attributes gained by training and sharing experiences would increase the education and overall human capital of a country. FDI contributes to national income and wellbeing, with more jobs, higher wages and improved working conditions. As a result, economic growth is spurred. FDI is seen as the largest source of external financing for developing countries. Capital inflows from FDIs can help to finance the deficit in the host developing country, but not all host developing countries are attracting FDIs to fill this gap in their economics as they might need other benefits of FDIs such as the rich developing countries which hope to benefit from FDIs' knowledge and technologies.

According to UNCTAD (2018), the annual amount of FDI inflows globally in 2006 was USD 1.4 trillion, while it increased to reach USD 1.9 trillion in 2017. Moreover, in 2006 FDI inflows accounted for only 2.1% of world Gross Domestic Product (GDP), while in 2017 this had increased to close to 2.5%. FDI inflows as a percentage of Gross Fixed Capital Formation (GFCF) equalled 9.3% in 2006, while they increased to approximately 11.1% in 2017. Figure 1.1 shows that developed countries still account for the largest share of FDI inflows, although FDI into developing countries has continuously increased for the period from 2006 to 2017.

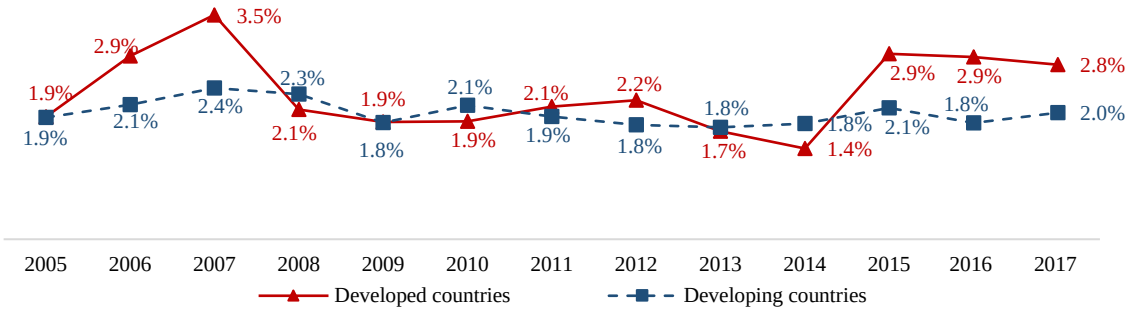
Figure 1.1: FDI inflow to the world countries in billion USD



Data source: UNCTAD and United Nations

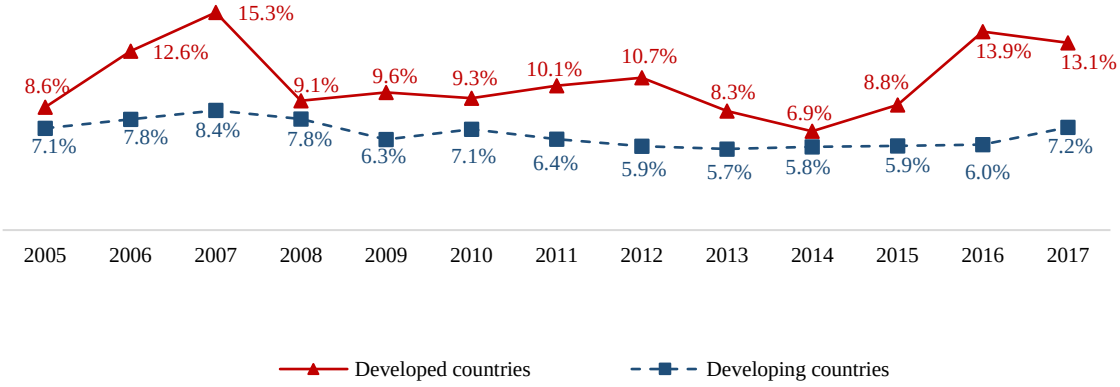
Figure 1.2 and Figure 1.3 generally show that FDI inflows have become increasingly important as a source of economic growth and investment in the world's economies. Given its volume, FDI can be seen as an important source of financial liquidity and a significant determinant of the future growth rate of an economy.

Figure 1.2: FDI inflow as a share of GDP



Data source: UNCTAD and United Nations

Figure 1.3: FDI inflow as a share of GFCF

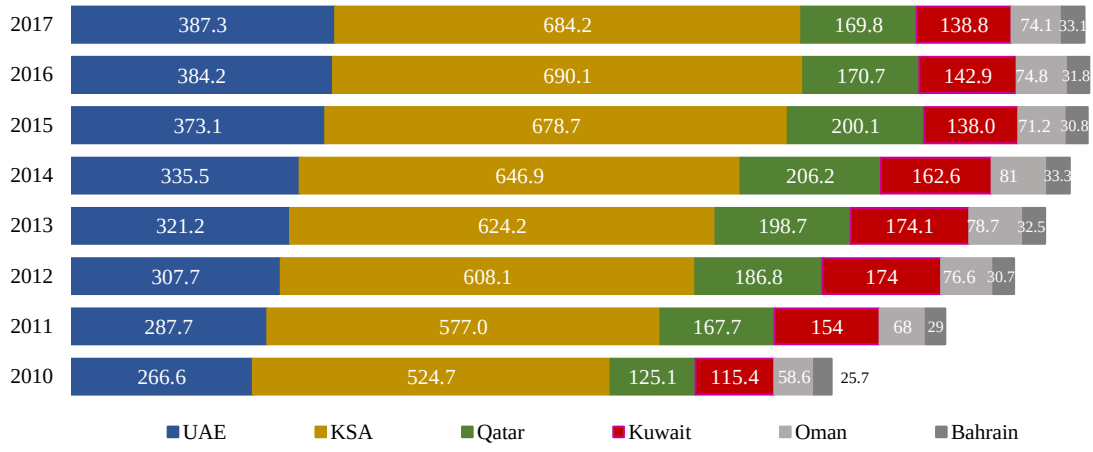


Data source: UNCTAD and United Nations

By looking at FDI as a share of GDP and GFCF and comparing it across developed and developing countries, Figures 1.2 and 1.3 above indicate that the significance of FDI has increased in both groups of countries. However, the fact is that the FDI ratios of developing countries as a share of GDP and GFCF are slightly close to those of developed countries in some years. This fact points to the importance of FDI inflow in developing countries as, in spite of the fact that they receive a far smaller amount of FDI than the developed economies, it represents a bigger share of their GDP. The large increase in the volume of FDI and the share of FDI offer a strong motivation to research this phenomenon.

The Gulf Co-operation Council (GCC) countries are considered to be one of the most important developing regions in the world; the region has a stable economy due to world oil and gas supplies and this facilitates great wealth from oil and gas exports. The largest three countries as measured by GDP, according to the World Bank, are the Kingdom of Saudi Arabia (KSA), the United Arab Emirates (UAE) and Qatar.

Figure 1.4: GCC's GDP in billion USD

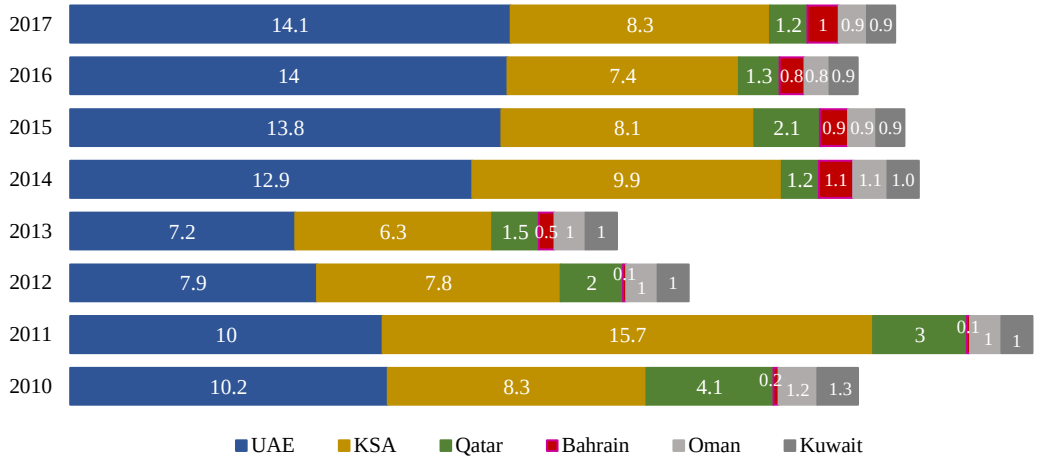


Data source: The World Bank

Figure 1.4 shows the sizes of the economies in the GCC. In 2017, KSA represented 46% of the total GDP from GCC countries, UAE occupied the second place with 26%, and finally Qatar represented 11.4%. These three countries have the largest GDP in the GCC and together they represented approximately 83.4% in the mentioned year due to their richness in natural resources and the contribution of the non-oil sector, which has strengthened and fortified economic growth.

These three countries are also considered to be the main countries in terms of FDI inflows, compared with other GCC countries. According to fDi Intelligence (2018), in 2017 these three countries received 89.3% of the total FDI inflows into GCC countries.

Figure 1.5: GCC's FDI in billion USD



Data source: fDi Intelligence

In 2017, the UAE received the highest FDI inflows with 53.4% of the total FDI inflow into GCC countries, followed by the KSA with 31.4% and then Qatar with 4.5%. The UAE, KSA and Qatar maintained their position as an investment hub, not only for developing countries but also for developed ones. While FDI in these three destinations continues to grow, the governments offer an effective and supportive legal framework for businesses and investments; in order to achieve the goal of making their countries more attractive to FDI. This thesis focuses on these three countries.

Geographically, UAE covers 83,600 square kilometres with a total population of 9.5 million in 2018. The UAE is located in the Southeast of the Arabian Peninsula, between the KSA and Oman, bordering the Gulf of Oman and the Arabian Gulf. In December 1971, the UAE was established and became a federation of six emirates – Abu Dhabi, Dubai, Sharjah, Ajman, Umm Al-Quwain and Fujairah, and successively, in 1972, Ras Al Khaimah joined the federation country as the seventh emirate. The capital of the UAE is Abu Dhabi, which is the largest and wealthiest emirate.

KSA occupies most of the Arabian Peninsula, from the Red Sea and the Gulf of Aqaba to the west and the Arabian Gulf to the east. It is the 14th largest country in the world, covering around two million square kilometres. Neighbouring countries are Jordan, Iraq, Kuwait, Qatar, UAE, Oman, Yemen and Bahrain (connected to the Saudi mainland by a bridge). KSA contains the world's largest continuous sand desert, called “The Empty Quarter” (Rub Al-Khali). Formerly, the area of KSA contained four main distinct regions: Hejaz, Najd, and parts of Eastern Arabia (Al-Ahsa) and Southern Arabia ('Asir). The KSA was founded in 1932 by Ibn Saud and the capital is Riyadh, which is the largest city in the Kingdom.

The State of Qatar is an independent emirate in the Gulf region. Doha city is the capital city of Qatar. Qatar is situated on a peninsula that extends from the Arabian Peninsula north into the Arabian Gulf.

Its sole land border is with KSA. Qatar shares maritime borders with Bahrain, Iran, and the UAE. The country covers an area of 11,586 square kilometres. Qatar gained independence in 1971 having been under a British protectorate in the early 20th century. The country has been ruled by the House of Thani since the early 19th century.

Economically, these three GCC countries rely heavily on natural resources, namely crude oil and natural gas, which are considered as the main drivers of their economies. The UAE has developed rapidly and it is considered to be one of the wealthiest countries in the world. According to OPEC (2014), UAE has 8.1% of the world's crude oil reserves and controls the sixth largest proven natural gas reserve. The UAE has an open economy with a high GDP per capita and a sizeable annual trade surplus. UAE's GDP per capita reached USD 41,699.1 in 2017, while total GDP totalled USD 387.3 billion and the real GDP growth rate was 4.3%. GFCF was USD 90.9 billion in 2017. Successful efforts at economic diversification have reduced the portion of GDP from the oil and gas sector to 30% in the country. The UAE's strategic plan is to develop the country as a global trade and tourism hub, develop manufacturing, and create more job opportunities for UAE nationals through improved education and increased private sector employment.

KSA has an oil-based economy with strong government controls over major economic activities. It possesses about 18% of the world's proven petroleum reserves, ranks as the largest exporter of petroleum, and plays a leading role in OPEC. The oil and gas sector accounts for about 40% of GDP, recorded at a total of USD 684.2 billion in 2017, when levels of GFCF were USD 90.9 billion. Despite possessing the largest petroleum reserves in the world and being considered one of the richest countries, the GDP per capita was 'only' USD 25,001 in 2017, mostly due to the large population of approximately 33 million, and the weak oil prices in that year, which affect domestic production in the KSA.

Qatar is one of the smallest countries in the GCC region. However, what the country lacks in size, it makes up with wealth in natural resources. Almost 14% of total world natural gas reserves are found in Qatar (approximately 25 trillion cubic metres), the third largest after Russia and Iran. It is also the largest supplier of liquefied natural gas. This wealth of natural resource translates into a GDP of USD 169.8 billion and GFCF levels of USD 69.3 billion in 2017. Qatar has a small population estimated at about 2.6 million. Consequently, its GDP per capita of USD 63,249 was the highest, not only in the GCC region, but also in the whole world, in 2017.

Figure 1.6: GDP, GFCF and GDP per capita in USD

Data source: fDi Intelligence, Federal Competitiveness and Statistics Authority-UAE, General Authority for Statistics –KSA, Ministry of Development Planning and Statistics-Qatar, World Bank

Politically, the governments are eager to devise strategies for economic diversification, by seeking to promote the development of the private sector as a complement to oil and gas, especially with declining oil prices. The dependence on oil and gas may stall economic development as there is a possibility of depletion of the natural resources in the long run. Moreover, these three GCC countries would worry about the Dutch Disease. Economically, the Dutch disease is the apparent causal relationship between the increase in the economic development of a specific sector such as natural resources and a decline in other sectors which that lead to the substantial appreciation of the domestic currency. However, since the discovery of oil, these three GCC countries have worked to diversify its economies and develop development programs that strengthen its economic base on the establishment of investment funds that support the private sector in all areas and sectors such as: health, industrial, agricultural and real estate. There was no retroactive effect on the local currency of the GCC countries, because the they pursue a policy of fixed rate its local currency by pegging it to the US dollar (the world's most powerful economy), keeping its currency at an acceptable level that serves its domestic and foreign interests. As a result, imported goods have generally become more expensive than domestic commodities as a result of continued government support to the private sector to keep competition and encourage new businessmen and projects to enter different industries and sectors.

Furthermore, one of the key steps that these governments have taken in terms of economic diversification is to attract foreign investments. UAE is reported to have political and economic stability, rapid GDP growth, fast-growing capital markets, swift population growth and an absence of corruption, all positive factors contributing to the UAE's attractiveness to foreign investors. The UAE ranked twelfth out of 143 economies in the world, according to the Global Competitiveness Report issued by the World Economic Forum in 2017. The report's mandates are to identify different pillars of a country such as institutions, infrastructure, macroeconomic environment and labour market efficiency. It assesses the competitive landscape of the country. According to the World Bank (2017), UAE was 11th out of 189 countries in ease of doing business in 2017, and according to the Global Investment Report - 2017 published by UNCTAD, the UAE ranked as the second largest FDI recipient in the West Asia region, after Turkey. The UAE attracted FDI inflows of USD 14.1 billion in 2017, according to fDi Intelligence (2018).

KSA seeks to sustain the current development boom through a development strategy in which foreign investment plays a significant role. In recent years, KSA has seen major, rapid, successive and consecutive economic and institutional developments and reforms, paving the way for the Kingdom's membership of the World Trade Organization (WTO). The KSA is ranked as one of the top five home economies for FDI recipients in the West Asia region, according to the Global Investment Report - 2017 published by UNCTAD. KSA was ranked 92nd in Ease of Doing Business

2017 published by the World Bank, while it attracted FDI inflows of USD 8.3 billion in 2017, according to fDi Intelligence. In addition, according to the Global Competitiveness Report issued by the World Economic Forum in 2017, KSA is ranked 25th out of 140 economies in the world.

Qatar is ranked as one of the top five economies in terms of FDI receipts in the West Asia region, according to the Global Investment Report - 2017 published by UNCTAD. It is ranked number 4 after Turkey, the UAE and KSA. Qatar ranked 83 in Ease of Doing Business 2017 published by the World Bank while it attracted FDI inflows of USD 1.2 billion in 2017, according to fDi Intelligence. Qatar's economic freedom score is 71.2 and it was ranked 28th in the 2017 Index of Economic Freedom. In June 2014, an embargo of a full land, sea and air blockade on Qatar was introduced by four countries: KSA, UAE, Bahrain and Egypt as Qatar has violated a 2014 agreement with the members of the GCC. Since then, economists expected a decrease in Qatar's economy.

The above mentioned details indicate the desire of these three countries to stabilise the growth and development of their economies away from dependence on the oil and gas sector. With this aim in mind they have turned to economic diversification and attracting FDI.

Legally and in terms of FDI laws, regulations and incentives in these destinations, UAE is upgrading several major legislations in investment law; this helps to remove a large part of the regulatory and administrative obstacles and to attract more FDI. It also creates a unified regulatory framework for foreign investment in terms of regulating investment procedures, licensing and registration. The law deals with advantages, tax exemptions, guarantees for foreign investors, and ownerships. 100% foreign ownership has been allowed since 2010. In KSA, a number of incentives and facilities for FDI have been delivered such as reducing the tax levied on foreign investors from 45% to 20%. The Saudi Industrial Development Fund (SIDF) allows the extension of loans to foreign investors. By 2016, KSA had updated the FDI law by allowing 100% ownership for foreign investors in the wholesale and retail trade sector only. In Qatar, foreign investments are generally limited to 49% of the capital for most business activities, with a national Qatari partner(s) holding at least 51%. Nevertheless, Qatar has continued to modify and amend the investment law in recent years. The new law allows foreign investors to hold 100% ownership in certain sectors that have been selected by the government, including agriculture, health, manufacturing, communication, tourism, real estate, education, finance, electricity and gas, and other service sectors. The Qatar government offers a variety of incentives for foreign investors such as tax exemptions, energy subsidies and low-cost financing.

Based on the above overview, generally, we would like to examine the role of FDI on economic performance by focusing on rich developing countries. The relationship between FDI and economic performance has largely been explored empirically. Several studies reveal that FDI brings with it

vehicles for technology transfer, and promotes competition, product diversity, spillovers and management techniques, which could be adapted by the host country (Wang and Blomstrom, 1992; Sjoholm, 1999; Moura and Forte 2013). However, there is ambiguity in the literature on the role of FDI in economic performance. Some studies find positive relationships between FDI and economic growth (Borensztein, De Gregorio, and Lee, 1998; Woo, 2009) while other researchers find negative and ambiguous relationships (Aitken and Harrison, 1999; Alfaro et al., 2004). Therefore, it is important to study FDI inflow in a certain country in order to clarify its contribution to the host country's economic performance. This is especially true for FDI inflows into rich developing countries that have not yet been studied at a detailed sectoral level and not only looking deeper into the relationship between FDIs and economic performance as a capital and financial liquidity but also look at the spillovers affects from FDI inflows.

Furthermore, some determinants of FDI have been examined in various studies empirically, as well as their related on FDIs. To attract FDIs, host countries seek to understand which main pull factors and determinants of FDI are key for foreign investors to be attracted and to enhance the FDI inflows (Chakrabarti, 2001; Banga, 2003). Thus, it is important to identify the importance of each offered determinant of FDI and its relationship with FDI inflow in a host country, particularly for rich developing host countries located in the same region that need to illustrate the variations accurately.

Moreover, the idea of foreign firms' entry and their association with firms' efficiency have been studied in a growing literature. Studies indicate the potential benefits of FDI inflows whereby foreign firms that are characterised as more efficient are viewed as important drivers in increasing the productivity and competitiveness of domestic firms (Jemric and Vujcic, 2002; Bottasso and Sembenelli 2004; Suyanto and Salim, 2011; Khalifah, 2013). The two mechanisms identified in the literature are the introduction and adoption of technologically superior techniques and the spread of strong management capabilities. On the other hand, a number of studies find that domestic firms are more efficient than foreign-owned firms (DeYoung and Nolle, 1996; Claessens et al., 2001; Isik and Hassan, 2002; and Ong et al., 2011). Hence, it is importatnt to study the efficiency of foreign firms and FDI inflows in order to clarify the effectiveness of firms and sectors in a host country.

Thus, it is interesting to see how FDI contributes to a host country's economic growth in different aspects. The main purpose of this thesis is to examine empirically the implications of the role of FDI in rich developing countries. Firstly, it examines the relationship between FDI and economic performance in a rich developing country. Secondly, in order to attract FDIs into any host country, the country needs to know the determinants of FDI, so this thesis aims to identify the importance of the determinants of FDI and their relationships on FDI inflows. Then, it will assess whether foreign firms are actually most efficient, by looking at firms' ownership and firms' efficiency in a host

country in different economic sectors. There are some unique contributions in this thesis; the first is studying rich developing countries' FDI inflows. The most comprehensive is that it studies 14 economic sectors. It is the first study to use a recent and confidential dataset. There are distinctive features in the research questions that have not been considered yet in previous studies. The choice of this topic provides the opportunity to find results that may help governments and policymakers of host countries make suitable decisions.

1.2 Methodology and research questions

The methodology of this thesis is empirical. Different econometric models have been chosen to study different aspects of FDI. The dataset is collected from international organizations and governmental entities such as fDi Intelligence, the World Bank, the Federal Competitiveness and Statistics Authority in UAE, the Statistics Centre in Abu Dhabi, the Dubai Statistics Center, the Ministry of Development Planning and Statistics in Qatar, the General Authority for Statistics in KSA, and the Ministry of Finance in UAE, KSA and Qatar. In all studies in this thesis a panel data set is employed.

The first empirical chapter (Chapter 2) attempts to find an answer to these questions: (a) does FDI contribute positively related with economic performance in the UAE's emirates? and (b) how does FDI's related vary by sector? and (c) how does the geographical and sectoral extent relate FDI technology spillover and the associated spatial diffusion in the UAE, as a host country of FDI?. To investigate these questions, we will use detailed sectoral level panel data from three groups of emirates in the UAE over the period 2006-2014 and use Solow's growth accounting technique by employing production functions.

Based on the results of Chapter 2, if the FDI inflows have a significant positive or insignificant related with economic performance in the UAE, and if this relationship depends on FDI and how distant in technological sense the FDI source is, then the question raised is: what are the most important determinants of FDI that a host country has control over to increase and enhance its attractiveness to FDIs? This is investigated empirically in the following chapter (Chapter3).

The second empirical chapter (Chapter 3) employs a country sectoral panel dataset for three rich countries from the GCC: UAE, KSA and Qatar. Our particular focus will be on investigating and assessing these questions: (a) what are the important determinants of FDI inflows? and (b) has GCC's strategic plan been effective? This will be determined by looking at the strategic plan and identifying priority sectors for FDI and priority source countries. The period under investigation is 2006-2014 and each economy is broken down into 14 economic sectors, into which FDI flows from 66 source countries worldwide. To answer the research questions, a gravity model is employed.

Based on the results of Chapter 3, if the selected determinants of FDI have a significant relationship with FDI inflows and if we find the main priority sectors to attract FDIs, then the question raised is: are foreign firms more efficient than their domestic counterparts? This will be investigated empirically in the last two empirical chapters (Chapter 4 and 5), which consider different firms' sectors and methodologies, focusing on the efficiency distance between foreign-owned and domestic firms in a number of priority sectors.

Therefore, the third empirical chapter (Chapter 4) attempts to find an answer to these two questions: (a) are foreign-owned firms in the manufacturing and construction sectors more efficient than their domestic counterparts in Dubai? and (b) do FDI inflows and other selected key determinants (composition of the labour force, firm size and age) affect efficiency? To answer these questions, we will use a distinct confidential dataset of firm-level panel data from the Annual Economic Survey from the period 2014-2016. Empirically, we will use Data Envelopment Analysis (DEA) input-oriented Constant Returns to Scale (CRS) and Variable Returns to Scale (VRS) in the first stage to measure firms' efficiency scores and in the second stage we will study the relationship between efficiency and firm ownership, FDI inflow, the composition of the labour force, firm size and firm age.

The last chapter (Chapter 5) seeks to answer the same set of questions with respect to the financial sector in Dubai. The banking sector in Dubai is considered the main tertiary sector, as well as being one of the most important development sectors in Dubai's strategy. Dubai has established itself as a financial hub for the Middle East and the centre of its international financial market. We will use a distinct confidential dataset of bank-level panel data from the Annual Financial Survey from the period 2013-2016 in Dubai by employing DEA and the Malmquist Productivity Index (MPI) input-oriented VRS model in the first stage to measure banks' efficiency scores. In the second stage we will we adopt the DEA double bootstrap of Simar-Wilson's model and MPI bootstrap Generalised Least Square (GLS) regression to determine the relationships of bank ownership, FDI inflow, skilled labour, bank size and bank age on banks' efficiency.

1.3 Thesis structure

The main purpose of this thesis is to examine empirically the implications of the role of FDI in rich developing countries. To achieve our aim and to examine the questions and the arguments in this thesis, it has been designed to include six chapters. The following chapter is our first empirical chapter (Chapter 2), titled "FDI, Economic Performance and Technological Spillover Effects: Evidence from UAE". This is followed by the second empirical chapter (Chapter 3), titled "Determinants of FDI Flows to the Gulf Countries: A Comparison of Estimation Techniques of a

Panel Data Approach". Our third empirical chapter (Chapter 4) follows, titled "Foreign Ownership and Firms' Efficiency: a Two-Stage Analysis of Dubai's Manufacturing and Construction Sectors". Our last empirical chapter (Chapter5) is titled "An Analysis of Dubai's Banking Sector Performance: Are Foreign Banks More Efficient than Domestic Banks?" The last chapter is the Conclusion.

Chapter 2

FDI, Economic Performance and Technological Spillover Effects: Evidence from UAE

Abstract: This study is an attempt to empirically examine the relationship between FDI and economic performance and investigate the geographical and sectoral spillover effects from the FDI inflows into the UAE. Using a detailed sectoral-level panel dataset covering the period 2006 – 2014 and computing the Total Factor Productivity (TFP) using growth accounting framework. The main empirical finding indicates that FDI has a mixed relationship with economic performance in the UAE and this relate depends on sectoral and geographical characteristics of the destinations. Our results further show that FDI from more technologically advanced countries tends to have a positive relationship with economic activity. The findings suggest that FDI inflows from countries with far distance of UAE seem to bring high benefit quality of technology**.**

2.1 Introduction

Today's world is witnessing a sizable volume of FDIs flowing into different countries. In 2005, the global FDI flow was around USD 1 trillion and in 2015 it reached USD 1.9 trillion, according to the UNCTAD World Investment Report 2016. Due to these massive inflows, much attention has been given to the relationship between FDI and economies.

As one of the characteristics of the modern globalised economy, FDI is becoming an important element of the strategic vision for the development of any national economy. In particular, its development importance is further emphasised in the case of developing countries in transition, whereas the practice shows that among these countries the fastest-growing ones are those that receive the highest quantum of FDI inflows. FDI inflows have been regarded as having a beneficial relationship with developing host countries, since FDI drives reform, improves quality of life and ultimately brings prosperity (Wang and Blomstrom, 1992; Borensztein et al., 1998; Bengoa et al., 2003; Wang et al., 2010). FDI has been suggested to be beneficial for the host country at different levels. It creates a flow of capital across borders. It can spread best practices in corporate governance of management. It allows transfer of technology and know-how as well as promoting competition in the domestic market along with the domestic firms' development and reorganization (Moura and Forte, 2009). The FDI host country will gain through employee training while operating the new businesses, which will eventually contribute to the development of the human capital, raise productivity and enhance the host country's economic performance.

This study studies the relationships between FDI and economic performance and illustrates that FDI's impact varies by sector. It also investigates the presence of geographical and sectoral spillover effects of FDI, using the UAE as a case study. The UAE is an interesting case study because it is one of the rich developing countries that pursues an active policy to attract FDIs. The goal of this policy is to push forward and develop the UAE's investment climate. It must be stressed that the primary role of FDI is not to bring in capital but to bring in know-how and enhance productivity. In our analysis we take a sectoral approach and investigate what type of FDIs by origin and sectoral destination are most beneficial to the UAE's economy. We carry out an empirical examination of the relationship between the inflows of FDI and sectoral-level economic performance in the UAE. We extend standard analyses by controlling for the technological distance between the source of FDI and the recipient, which is done by weighting the source composition of FDI. We further study FDI spillovers along geographical and sectoral dimensions as channels of technological diffusion. We use a detailed FDI dataset that contains information on both the origin and the destination of FDI by each emirate and on 14 economic sectors in the UAE over the period of 2006-2014. To answer our questions, we calculate the TFP and employ an accounting model that has been applied to many countries and long been identified by several economists (Solow, 1956 and 1957; Abromovitz, 1956; Denison, 1962). To the best of our knowledge, this is the first study about FDI distance to frontier that uses a sectoral-level weight to distance index and FDI distance to frontier in order to explain the UAE's economic performance and technology spillovers from FDI inflows. Our empirical study finds that FDI has different relationship on economic performance, depending on the destination location. Attracting FDI inflows from source countries that are at a far distance brings higher quality technology to the UAE. The sectoral spillover effects of FDI are highest in the primary type sector

(which consists of one sector; mining and quarrying), as the primary sector affects the value added of the UAE more than other sectors.

There is a long-standing opinion among economists and policymakers that FDI is a greater contributor to long-term growth and development than any other form of capital inflow. The direct capital financing that it provides suggests that FDI can play an important role in modernising a national economy and promoting economic development. Moreover, economists have also reported on the role of FDI in upgrading the host country's economy through its relation. FDI inflows have direct physical and human capital relationships on a host country's outcome. Direct effects and relationship are reflected in employment and capital formation. This creates a flow of capital financing across borders, FDI is conceived as an addition to the capital stock of the recipient economy (Brems, 1970) and an important source element to boost and augment human capital (Bengoa et al., 2003).

On the other hand, there are indirect effects and related of FDIs, concerned with the diffusion of knowledge, which is more of a qualitative aspect. FDI brings in advanced technology and captures all the transfer from the multinational companies to the host country. This includes technology, know-how, and new management techniques as technological spillovers into a host economy; this improves labour qualification and increases the value-added content. The potential of FDI technological spillovers is the positive externality of FDI that host countries hope to benefit from (Johnson, 2005). The greatest relationship of FDI is that of technological spillovers, which occur when the advanced technology from FDI is able to trickle down to the entire economy. FDI induces more spillovers when the host country develops its institutions in such a way that they are able to absorb the technology from FDI. These technological spillovers can happen via imitation, employee training, and the introduction of new processes and products by foreign firms. Konings (2001) shows that FDI is important for transferring technology to a host economy. FDI brings technology, which translates into higher growth and productivity in the host country (Borensztein et al., 1998; Xu, 2000). FDI enhances the host economy, adjusts labour allocations and quality and allows the host country to take full advantage of the potential of new technology (Young, 1991). The FDI host country will gain employee training while operating the new businesses, which eventually contributes to the development of human capital. Apart from the inflow of foreign currency into a country, foreign expertise can be an important factor in improving the existing technical processes in the country, as well as improving productivity and competitiveness, and the efficiency of resources. It increases trade flows and creates jobs, which will reduce unemployment. FDI increases opportunities for local businesses and eventually promotes innovation.

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The direct and indirect relationships between FDI and economic performance have largely been explored empirically in several studies at both macro and micro levels. These studies have used data from developed and developing countries and have been inspired by theories of the Solow-type standard neoclassical growth models (Borensztein et al., 1998; Woo, 2009). Interestingly, despite the proposition of the theories, there is ambiguity in the literature over the role of FDI in economic performance. While some studies find positive relationships of FDI on the economy (Borensztein et al., 1998; Woo, 2009) others find negative relationships or are unclear (Aitken and Harrison, 1999; Alfaro et al., 2004).

Basu et al. (2003) use a panel cointegration framework of 23 developing countries to investigate the relationships between FDI and economic performance. The authors' empirical results suggest that there is a long-term steady-state relationship between FDI and GDP for a cross-section of countries. Hsiao and Hsiao (2006) examine the Granger causality relationships between FDI and economic performance among eight rapidly developing East and Southeast Asian economies (China, Korea, Taiwan, Hong Kong, Singapore, Malaysia, Philippines, and Thailand) by using panel data from 1986 to 2004. The study finds that the causality results reveal that FDI has a positive significant relationships on economic performance directly in the studied host countries. Campos and Kinoshita (2002) investigate the benefits of FDI in 25 Central and Eastern European and former Soviet Union transition countries between 1990 and 1998 and employ Solow's neoclassical model. The authors find that FDI related positively and significantly with economic performance as the theory predicts. Agrawal and Khan (2011) test the relationship of FDI on the economic performances of both China and India during the period of 1993-2009 by estimating a Cobb-Douglas production function including the following independent variables: FDI, GFCF, labour force and human capital, and GDP as a dependent variable. The authors show that a 1% increase in FDI would result in a 0.07% increase in GDP in China and a 0.02% increase in the GDP of India. Li and Liu (2005) identify a positive significant relationship between FDI and economic performance based on a panel of data for both developed and developing countries, using a large cross-country sample of 84 countries for the period 1970-1999. Wogbe (2014) states that FDI presents one of the main bases of external financing for developing countries. The author uses a cointegration approach to examine the relationship between FDI and economic performance, and also points out that FDI is likely to have a positive association on the economy since it enhances the productivity of capital through the adoption of more reliable technologies, and efficient management and production practices. Mullen and Williams (2005) examine the role of FDI in 48 states of the United States economic performance over the period 1977 to 1997 by using a model that explicitly considers the stock of foreign capital. The authors find that inward FDI plays a strong, vital role in regional economic activity and that FDI is likely to significantly affect regional productivity and economic performance. In contrary, Aitken

and Harrison (1999) show FDI negatively affects the productivity of domestically owned Venezuelan firms.

Another strand of the literature has focused on sectoral-level analyses of FDI inflows. FDI can benefit different sectors in the hosting economies in different ways. Alfaro and Charlton (2007) examine the relationship between FDI and the economic productivity output using sectoral data from The Organisation for Economic Co-operation and Development (OECD) member countries during 1990 to 2001 for 19 sectors and 22 countries. The model uses the Cobb-Douglas production function in a log form. The authors note that FDI has a positive relationship with real estate, oil and chemical, machinery, construction, and trade and repair, whereas in other sectors FDI is not statistically significant. Vu and Noy (2009) find observable differences across sectors too; they show that FDI causes crowding-in effects on the real estate, oil and chemical, machinery and trade and repair sectors. The relationships on other sectors such as food products, electricity, gas, water and construction are not significant. They say that aggregate FDI might mask differences in the relationships between FDI on economic performance across individual sectors. Alfaro (2003) revisits the FDI and GDP relationship, the empirical analysis uses 47 cross-country sets of data for the period 1981-1999, and the author suggests that FDI in manufacturing is positive, while in the primary sector it is negative and evidence from the service sector is ambiguous.

A number of studies have examined technological distance by looking at the role of technological distance to frontier. Aiming to boost productivity and foster economic growth is an economic policy that is context specific and depends on the country's distance to the international technological frontier. Distance to frontier is usually measured by the ratio or difference between a country's productivity measure, which is usually the TFP, and that of the FDI source country. The Neo-Schumpeterian growth theory suggests that economics are influenced by a country's income gap with advanced economies that describe the international technological frontier (Aghion and Howitt, 2008). A larger distance to frontier means that countries can exploit the technologies from advanced and developed countries (foreign firms). Furthermore, Aghion et al. (2005) reveal the benefits when the industry is far from the frontier, but these gradually reduce as the distance to frontier is reduced. Vandenbussche et al. (2006) examine the contribution of human capital to economy-wide technological improvements. They show that when labour is skilled they produce a higher growth relationship, closer to the technological frontier, taking into consideration the fact that innovation is a relatively more skill-intensive activity than imitation. Amable et al. (2008) show the positive relationship when the distance to the frontier is higher, and the magnitude of its relationship is lower when it is closer to the industry at the frontier. Wu (2010) show the productivity enhancement when a country is closer to the world technology frontier. Baltabaev (2013) investigates whether countries with larger distances to the technology frontier have greater potential to benefit from FDI by using

panel data for 49 countries over the period 1974-2008 and TFP. The author finds positive and statistically significant related from the interaction of the FDI variable with the distance to the technological frontier; the results suggest that the countries with larger technology gaps seemed to have benefited more from FDI. Findlay (1978) was one of the inventors of the FDI spillover theory. The author built a model to examine the relationship between FDI and technological change in a backward region, following Gerschenkron (1962). In brief, the larger the distance to frontier and the technological gap between the foreign firms and domestic firms, the larger the spillover effects and relationships. In addition, the finding is that the larger the share of foreign firms in backward regions, the faster the efficiency growth of backward firms. This theory indicates that larger distances to the technology of foreign firms are good for host countries. The more a host country attracts foreign firms, the more domestic firms benefit from FDI spillover effects. Sjoholm (1999) finds that a higher technology distance to frontier is good for domestic firms to derive high benefits from FDI inflows, by increasing the value added per employee. On the other hand, Li and Liu (2005) discover that a large technology distance to frontier has the opposite relationship as FDI has a negative significant sign in the interaction term with the distance to frontier. An analysis was done to test whether the relationships between FDI on/and income growth depends on the technology distance to frontier.

There is existing literature on the relationships between FDI and economic performance through technological and knowledge spillover effects. These papers have been influenced by theories of spillovers from FDI inflows. According to several authors (Findlay, 1978; Wang and Blomström, 1992), the extent of FDI spillovers will increase with the technological gap, as it increases the opportunities for domestic firms in a host country to obtain higher levels of efficiency through the imitation of foreign technology.

Theories identify several spillover channels such as know-how, technological knowledge or factor accumulation, which include physical and human capital. Blomström and Kokko (1997) reveal that FDI provides direct and indirect important channels of technology transfer and knowledge spillovers to developing countries. Damijan and Knell (2002) study the international knowledge spillovers and find that firms in Estonia, which were very open to FDIs, gain significant direct technology transfer through FDI. Das (1987) and Wang and Blomström (1992) examine FDI's technological spillovers from the domestic firms' imitation of technological production of multinational corporations and find that it is positive and significant. Javorcik (2004) reports positive spillover effects on Lithuanian productivity from FDI. Branstetter (2005) examines the spillovers of technological information resulting from FDI. The study finds that FDI increases the flow of knowledge spillovers at the firm level. Haddad and Harrison (1993) discover that the technological spillovers appeared strongest in the high-tech sector and vanished in law tech sectors. Human capital is an accumulation factor from FDI, as domestic firms hire workers of FDI firms to transfer the new technology – labour turnover

(Aitken and Harrison, 1999; Fosfuri et al., 2001). In terms of capital accumulation, this suggests that the accumulation of capital in the form of FDI generates, directly and indirectly, substantial spillover benefits (Ramirez, 2006).

Additionally, some existing scholars provide insight into the dynamic differential relationship of technological spillovers; we distributed a number of them on geographical and sectoral spillover dimensions. It has been suggested recently that FDI spillovers have a circumscribed geographical dimension or, at least, that they decrease with distance (Audretsch and Feldman, 1996; Audretsch, 1998; Keller, 2002; Madariaga and Poncet, 2007), as channels of technological diffusion are reinforced at the regional level (Girma and Wakelin, 2001; Girma, 2005; Torlak, 2004; Jordaan, 2005). Since knowledge may decay with distance, geographical spillover plays a significant role in knowledge diffusion and innovation (Wang et al., 2010). Meanwhile, geographical proximity is identified as an essential condition for firms or sectors to enjoy the benefits of externality, collaboration and interactions for knowledge flows and the transfer of technology (Boschma, 2005). Geographical distance determines the costs of technology diffusion; it is measured by destination and firm sector. According to Madariaga and Poncet (2007), using geographical information to study the relationship of FDI with aggregate data at the city level in China, they find that the economic growth of Chinese cities benefits not only from their own FDI inflows but also from FDI flows to the neighbouring cities in China. Geographic proximity is an important element in the process of knowledge spillover (Audretsch, 1998). For example, the closer a domestic firm is located to an FDI firm, the more frequently their employees interact with each other, as well as the more frequently labour moves between these domestic and FDI firms. On the other hand, the probability that knowledge flows from one firm to another decreases with geographic distance. High productivity locations as well as low productivity areas tend to be geographically clustered, thus creating strong spatial links or dependence between locations (Anselin, 2001).

In terms of sectoral spillover within and across sectors. Naturally, FDI's potential to aggregate productivity varies across sectors. Several macroeconomic studies investigate FDI's relationship with economic growth and the results vary. These studies do not distinguish between the different sectors where FDI is operating and that would hide the relationships that appear within and across sectors. Additionally, backward and forward linkages occur when output from one sector serves as an input (like building capital) in another sector. These linkages provide a potential diffusion channel to sector-specific knowledge through both profitable and beneficial knowledge transfer, and by enhancing productivity and efficiency. Aykut and Sayeck (2007) examine several developing countries where the sectoral related to the FDI on aggregate productive economic growth and they conclude that a high share of agricultural FDI is negative for economic growth, while a high share of manufacturing FDI is positive and has a significant relationship with economic growth. Akinlo

(2004) reveals that the relationship between FDI in Nigeria and sectoral spillover differ depending on the receiving sector. Recently, a few scholars have focused on technological relatedness in the process of sectoral innovation. The basic mechanism is that technology and know-how will spill over from one sector to another so that these sectors share technology and knowledge (Frenken et al., 2007). Imbriani and Reganati (1999) study empirically the relationships between FDI and productivity and focus in particular on productivity spillovers, using regional and cross-sector data from Italy. They found that productivity levels are higher in sectors where multinational companies have a greater active presence. Furthermore, Görg and Greenaway (2001, 2004) state that the availability of FDI and the presence of multinational companies have a positive relationship on firms in high-tech sectors. Dimelis and Louri (2001) find positive evidence of spillover effects by analysing 4056 domestic and foreign manufacturing firms operating in Greece in 1997, while Barrios and Strobl (2002) evaluate productivity spillovers generated from FDI by using a large panel data of Spanish manufacturing firms from 1990 to 1998. They find no convincing evidence for spillovers in the case of Spain. According to Nunnenkamp (2002), a host country's incentives may not essentially work in all sectors. At the same time, FDI spillover effects are not mandatory but are more likely to happen in sectors where the productivity gap between domestic and foreign firms is not extremely high. Thus, the benefits from FDI spillovers depend on the host country's technological absorptive capacity to increase its desired productivity. Some studies observe that spillovers vary across sectors.

Informed by the above literature and in order to achieve our objectives for examining the relationships between FDI and economic performance, technological distance to the frontier and investigating the geographic and sectoral spillover in the UAE's emirates, the structure of this study is as follows: the next section provides FDI trends, followed by the conceptual framework. Then, empirical specification is presented, followed by the empirical results and conclusion. An appendix section is provided at the end of this chapter.

2.2 FDI trends

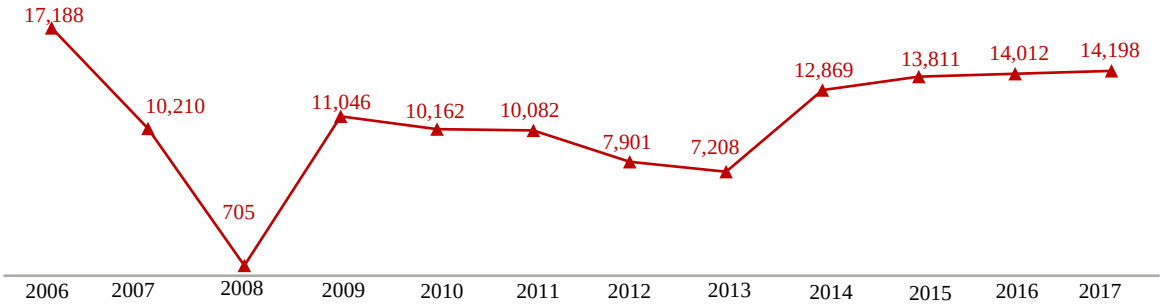
2.2.1 FDI trends in UAE

FDI plays a pivotal role in promoting and supporting the process of economic transformation, which can transfer UAE's economy from one based on oil and natural resources to a more diversified knowledge-based economy. FDI inflow can work as a bridge for the funding gap that might face UAE as a result of declining oil revenues. Furthermore, it generates more employment opportunities, improves the level of income and raises the standard of living in UAE, where FDI is a major channel in the transfer of advanced technology.

In order to attract FDI, the UAE is working to build a unique business environment and improve the investment climate within all the emirates. Additionally, UAE is trying to reduce and remove any obstacles or impediments that serious investors can face. According to the Ease of Doing Business Report 2016 published by the World Bank, UAE has maintained the rank of first among Arab countries for the third year in a row. There is no doubt that the UAE offers major benefits, which enables it to attract foreign investors, such as the availability of financial surpluses, world-class infrastructure and a competitive business platform.

UAE continues to enhance its position as a preferred global FDI destination. From Figure 2.1, we can see that historically, FDI investment steadily increased by 28.5% between 2009 and 2017. There was, however, a sharp decrease in FDI by 95.9% between 2006 and 2008 due to the global financial crisis.

Figure 2.1: FDI in million USD

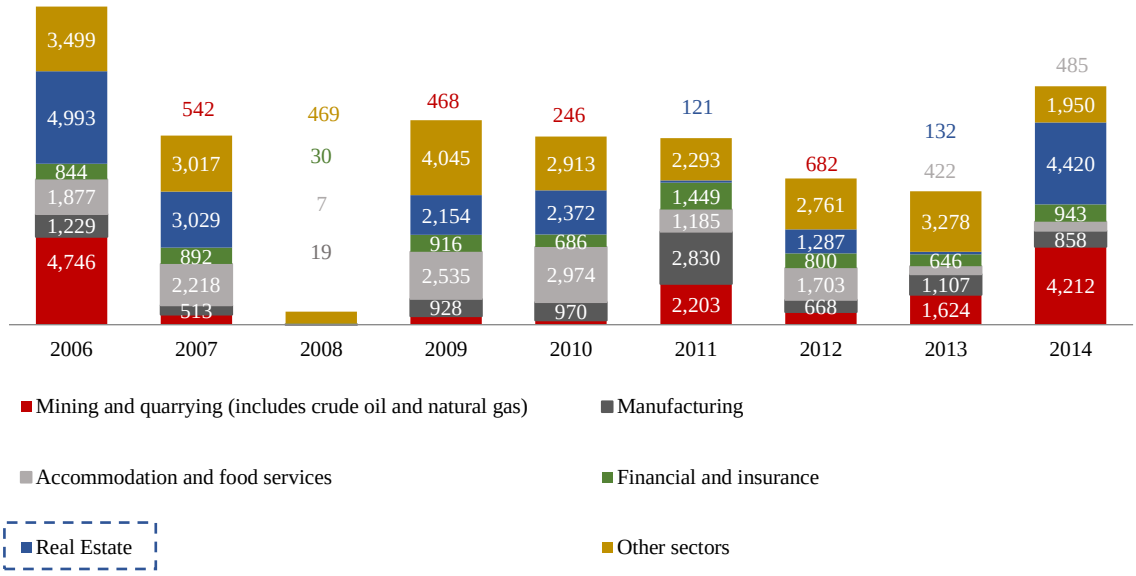


Data source: fDi Intelligence

The UAE is seeking to attract more FDI in order to enhance economic diversification and achieve its aim of building a knowledge-based economy. The following Figure 2.2 shows the evolution of FDI into the UAE by economic sector in million USD during the period of 2006 to 2014. During this period, a total of 2,707 FDI projects were recorded in the UAE, equating to a 2% share of global FDI. These projects in the mentioned period represent a total of FDI USD 87.37 billion and a total of 212,175 jobs were created. The volume of FDI in the UAE increased steadily by 26% from USD 10.2 billion in 2007 to USD 12.9 billion in 2014. During 2014, a total of 16,377 jobs was created and 293 projects were created by this FDI, equating to 7.7% and 10.8% of total jobs and projects respectively. Generally, the real estate sector is the most attractive sector for FDI in the UAE, followed by mining and quarrying, accommodation and food services, and the manufacturing sector.

The fourth largest contributor of GDP in the UAE is the real estate sector, which accounted for 9.2% of the total in 2014. The real estate sector has also generated the highest number of total jobs and greatest investments with a total of 50,046 jobs and USD 18.50 billion investment, seeing significant growth during the period from 2006 to 2014.

Figure 2.2: FDI by year and sector in million USD



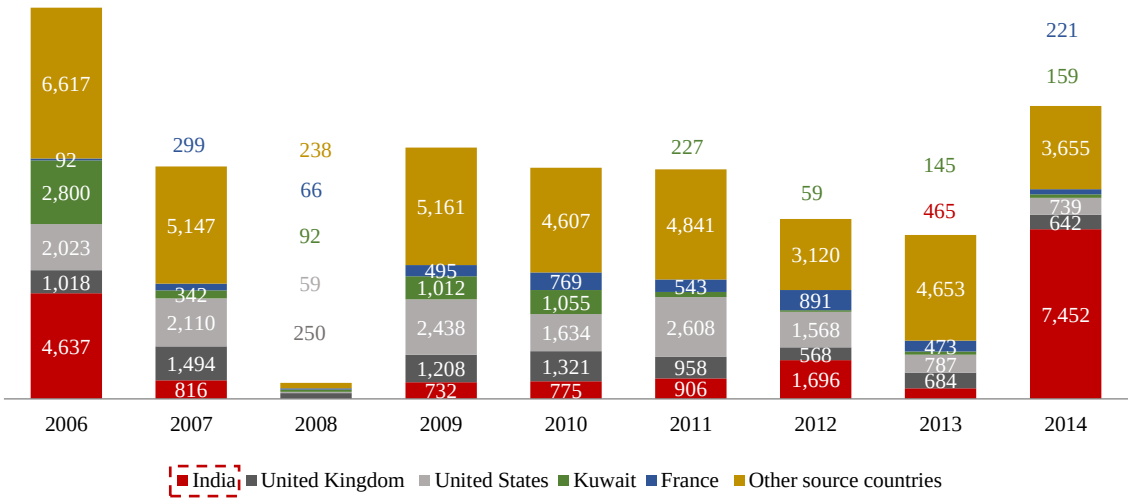
Data source: fDi Intelligence

Figure 2.3 shows the FDI by year and the top five FDI source countries. Between 2006 and 2014, India had the highest total FDI, followed by the United States and the United Kingdom. This is due to the historic trade ties that have long existed between these economies. The presence of an Indian community in the UAE is now helping to cement growing cultural, trade and investment relations. Bilateral trade between India and the UAE amounted to USD 53 billion in 2015; the UAE is India's third largest trading partner and the 10th largest investor in India in terms of FDI. Furthermore, the

UAE is the United States' largest export market in the Middle East region — a distinction the UAE has held for ten straight years. During the past decade, bilateral trade has doubled, exceeding USD 24 billion in 2018. The United States has a USD 14.5 billion trade surplus with the UAE, the United States' fourth largest trade surplus globally. These economic exchanges support hundreds of thousands of American jobs and contribute to growth for United States' companies. Moreover, the UAE is the United Kingdom's 12th largest trading partner, reaching USD 74 billion in bilateral trade in 2015. The UAE-United Kingdom business council has agreed an ambitious target of USD 33 billion of bilateral trade by 2020.

India increased its FDI in the UAE from USD 4.6 billion in 2006 to USD 7.4 billion in 2014. Indian companies have emerged as important investors in the free trade zones[1] in UAE such as Jebel Ali FTZ, Abu Dhabi Industrial City, Sharjah Airport, and Hamariya in Ras Al Khaima.

Figure 2.3: FDI by year and source country in million USD



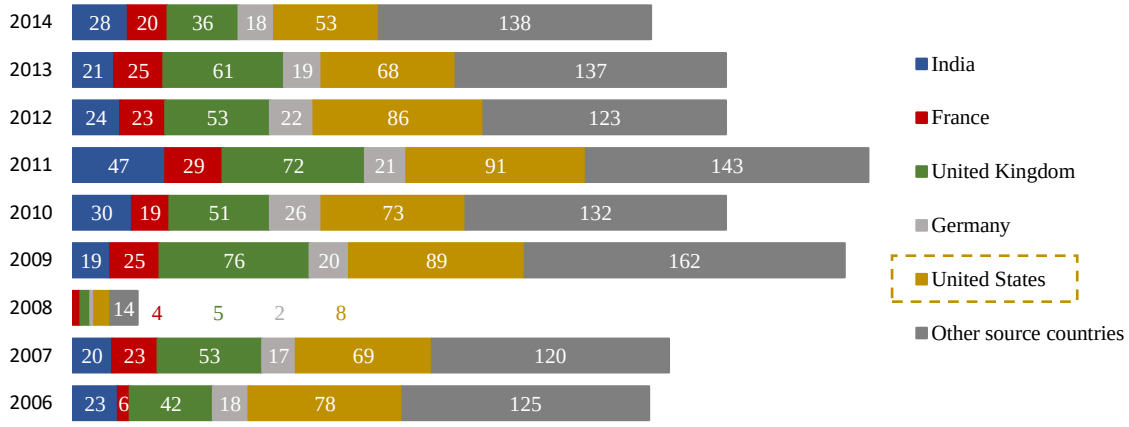
Data source: fDi Intelligence

Figure 2.4 shows the number of FDI projects by year and source country in the UAE from 2006 to 2014. By number of projects, out of a total of 76 source countries, the United States was the top source country, accounting for almost one-quarter of projects tracked. The United States was investing in different sectors; the main investment projects were centred on administrative and support services, manufacturing, and the financial and insurance sector. Project volume in this source country peaked during 2011, with 91 projects tracked. Moreover, from the period 2006 to 2014, the United States generated the highest number of total jobs, most of these being created in

[1] Free Trade zones (also known as free zones) are designed to boost international business by providing 100% ownership to expatriates and single window administration convenience. In UAE, free zones are either attached to ports or are industry specific

manufacturing, wholesale and retail trade, the repair of motor vehicles and motorcycles, and the administrative and support services sector. Some 403 projects, or 14.9% of FDI projects, were recorded in 2011. This was the year in which the highest numbers of projects were recorded. During that year, a total of 21,223 jobs were created and USD 10.1 billion capital was invested through these projects, equating to 10% and 11.5% of total jobs and FDI respectively. This was due to the actions of the Ministry of Economy in the UAE, which called for a speeding up of the ratification of the draft Foreign Investment Law. This law offers foreign investors similar rights to those extended to UAE nationals. It also called for clearer regulations governing foreign investment, especially on property rights protection, business dispute settlement and corporate governance.

Figure 2.4: Number of FDI projects by year and source country



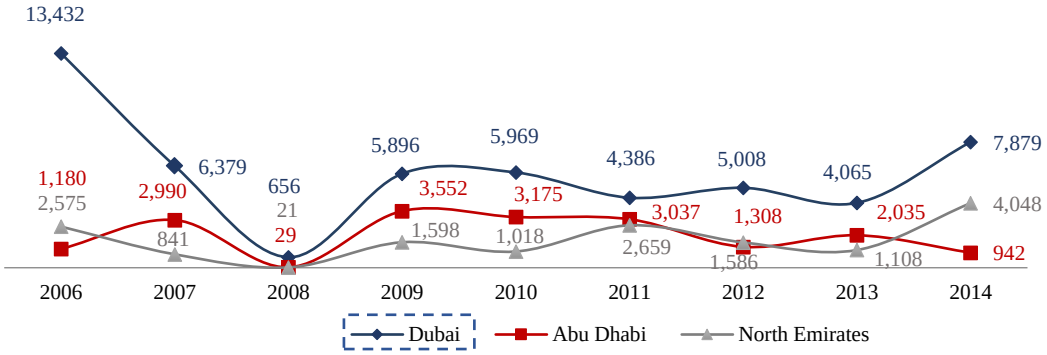
Data source: fDi Intelligence

2.2.2 FDI trends by emirate

Concerning UAE's FDI allocations amongst all its emirates, Dubai accounts for the majority of FDI projects. Total investment in Dubai resulted in the creation of 139,451 jobs and USD 53.67 billion FDI between 2006 and 2014.

According to the available data as in Figure 2.5, we notice that Dubai's FDI increased rapidly by 23.5% from USD 6.3 billion in 2007 to USD 7.2 billion in 2014. For the North Emirates, 2014 was the highest year for FDI, with FDI increasing by 57% from 2006 to 2014, to reach a total amount of USD 4 billion in 2014. While FDI in Abu Dhabi fluctuated widely year on year from 2006 to 2014, and fell by 20% in 2014 compared to 2006, this decline in FDI activity is due to corporate restructurings.

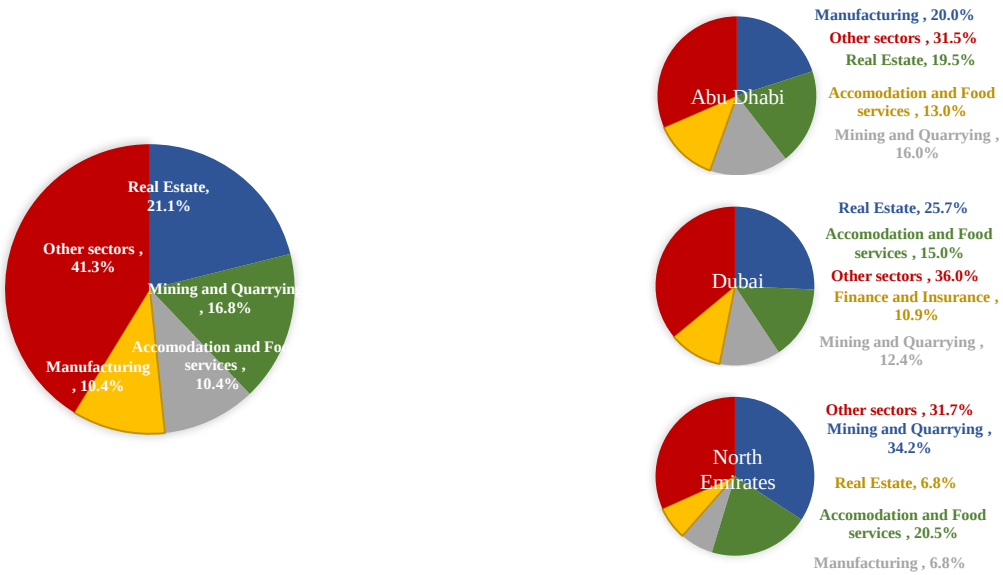
Figure 2.5: FDI by year and destination emirate in million USD



Data source: fDi Intelligence

Concerning the FDI structure and the main sectors receiving FDI by emirate between 2006 and 2014, as Figure 2.6 shows, Dubai's FDI is centralised in the real estate sector by 25.7%, followed by the accommodation and food services sector with a contribution of 15%, then the mining and quarrying sector with 12.4%. According to FDI capital invested in key sectors within Abu Dhabi from 2006 to 2014, it is observed that the concentration of FDI was greatest in the manufacturing sector at 20%, followed by the real estate sector at 19.5%. This percentage increased, allowing for the relaxation of rules regarding foreign ownership. The freeholding of real estate properties in certain areas of Abu Dhabi, known as Investment Zones, started in 2005 and the third largest allocation went to the mining and quarrying sector, obtaining 16% of total FDI. In the North Emirates, the mining and quarrying sector generated the highest value of FDI (USD 5.1 billion), equating to 34.2% of total FDI for all economic sectors between 2006 and 2014.

Figure 2.6: Main sectors represent capital investment FDI between the period 2006 and 2014



Data source: fDi Intelligence

Dubai is seen as the major hub and top destination of global FDI inflows among the UAE's emirates for a variety of reasons, including: its reputation of economic openness, investors' perceptions of Dubai's competitive advantage, founded on its safety and security and the availability of global infrastructure, and the reputation that has been built over the years to keep pace with the rapid speed of its economic development. Other contributing factors include: the increase in competitiveness indicators, the conducive business environment and the business friendly regulatory environment.

The UAE's government has identified the main economic sectors that would support the FDI diversification in the country between the years 2015 and 2021. The emirate of Dubai has ascertained its sector-specific needs to attract future FDI in its manufacturing, construction, real estate, financial services, and tourism sectors, while the emirate of Abu Dhabi planned a new diversification strategy in order to increase FDI inflow and attract new projects into five main sectors: manufacturing, construction, tourism, transport and logistics, and financial and insurance services. With regard to the FDI strategy for the North Emirates, the UAE's government is targeting improvements in FDI in manufacturing, the environment, transport and logistics, tourism, and the healthcare sector.

2.3 Conceptual framework

This section presents an overview of the theory that informs the discussion on the association of FDI on economic performance. This overview builds on insights from Neoclassical growth theory and the connected empirical growth-accounting framework. The existing literature proposes that the relationship be decomposed into direct and indirect relations. In this section, a discussion identifies the direct and indirect relationships between FDI and economic growth.

The first benefit of FDI to a host country is the possibility of bringing additional capital to the host country. FDI capital is essential for meeting the Sustainable Development Goals in a host country. Capital inflows support a host country's economy, and create higher output and jobs. Increased demand of labour and a rise in wages are expected to be further relationships of FDI inflows into developing economies. This is linked to the hope that the population in a host country will benefit from the job opportunities created from FDI inflows, which will eventually help to increase wages. More goods are produced in a host country from FDIs, meaning an increase in overall demand for labour and higher wages. The goods produced in a host country are more skill intensive, so demand for skilled labour in a host economy increases. Furthermore, FDI inflows target economies with less skilled labour. A host country with abundant labour would experience a raise in the demand for labour, and increase equilibrium wages in a host country. According to Nunnenkamp (2002), who empirically analysed FDI inflows across sectors into developing countries, FDI increases wages in all worker groups as multinational companies concentrate on technology-intensive sectors that

demand skilled labour. A host country with a skilled labour force will benefit from FDI inflows by offering higher wages but with regard to unskilled labour the outcome is uncertain. Moreover, FDI can generate an inflow of physical capital and human capital into the host country (Johnson, 2005). Pack (1994) states that high rates of FDI inflows into physical and human capital achieve high economic growth rates and enhance a host country's economic performance. Standard economic growth theory states that an increase in total investment would have a positive related with country's economic growth. Consequently, an increase in FDI inflows would lead to an increase in a host country's value added and improve and enhance its economic performance.

The indirect relationship of FDI (spillover effects of FDI) on a host economy has been widely debated in the literature. It is a vehicle for the transfer of technology and knowledge to host economies. The transfer of technology and know-how is another potential benefit associated with the FDI inflows into a host economy (Pavlinek, 2004). FDI is expected to expand the existing knowledge in a host economy through labour training and skill acquisition and diffusion. Indeed, even without a significant and huge physical capital accumulation in a host country from FDI inflows, FDI is expected to promote and advance knowledge transfers, for example licensing and agreements, management contracts and joint ventures (De Mello and Sinclair, 1995).

In general, multinational companies are expected and assumed to have a high level of technology, and they are the firms that are primarily expected to carry out FDIs. These multinational companies will have more advanced technology than the surrounding firms in the host economy, which means that the average level of technology and productivity in the host country will be higher (Uppenberg and Reiss, 2004). According to Blomstrom and Kokko (1997), one of the main reasons that a host country tries to attract more FDI inflows is the possibility of technology spillovers.

On the other hand, technology brings productivity spillovers to firms within the same sector that the FDI is in, which means that competitors will become more productive to stay competitive with foreign and domestic firms in the same sector. Furthermore, technology brings productivity spillovers to sectors other than the ones that FDI is in. This mainly drives a rise in the level of knowledge of production in a host country's economy in all sectors (Uppenberg and Reiss, 2004). According to Knell and Radosevic (2000), FDI inflows improve a host country's productivity and affect a host country's economic growth by increasing the returns generated in the interaction between domestic and foreign firms. According to Javorcik (2004), spillovers from FDI take place when the entry or presence of multinational corporations increases the productivity of domestic firms in a host country and the multinationals do not fully internalize the value of these benefits.

With regard to FDI technological spillovers on labour, Glass and Saggi (2002) worked theoretically on the presence and availability of FDI and its relationship with domestic firms' productivity. They found positive relationship through the labour mobility channel.

From the capital accumulation inflows into a host country, FDI is expected to enhance and encourage the incorporation of new inputs and technologies into the production function of the host economy. The new inputs have a positive relationship on the total output growth of production function (Feenstra and Markusen, 1994) and the new technologies; as FDI is a potential source of productivity, FDI is expected to affect positively the total output through spillovers to domestic firms.

2.4 Empirical specification

2.4.1 Data

Some data are at the sectoral level and emirate specific. These variables are: value added (VA), FDI, GFCF (K) and labour (L) of 14 sectors for each emirate destination in the UAE. The sources of these variables are: fDi Intelligence, the Federal Competitiveness and Statistics Authority (UAE), the Statistics Centre (Abu Dhabi) and the Dubai Statistics Center. The other variables are country specific. These variables are: value added (VA), GFCF (K) and labour (L). The source of these variables is the World Bank's World Development Indicators (Constant 2005 USD). The dataset is annual and covers the period of 2006-2014.

The three destinations of the UAE are Abu Dhabi, Dubai and North Emirates. The 14 sectors are classified into three main economic activities for the purpose of our estimations. First, the primary sector includes mining and quarrying (includes crude oil and natural gas). Then, the secondary sector includes: (1) manufacturing, (2) electricity, gas, and water supply; waste management, and (3) construction. Last is the tertiary sector, which consists of: (1) wholesale and retail trade; repair of motor vehicles and motorcycles, (2) transportation and storage, (3) accommodation and food services, (4) information and communication, (5) financial and insurance services, (6) real estate, (7) administrative and support services, (8) education, (9) human health and (10) social work and arts recreation services.

The GFCF variable for Dubai and North Emirates covers only 13 sectors excluding the administrative and support services sector (in the tertiary sector) as it is not available in the source for the period of 2006-2014.

Data is in local currency – Arab Emirates Dirham (AED) – and it has been converted to USD using a fixed exchange rate (1 USD = 3.67 AED), and then deflated by GDP– value added, adjusting all variables to 2006 values. GFCF and labour variables are taken in their natural logarithms to reduce any problems of heteroscedasticity. Value added is also in natural logarithm form. Data from the World Bank's World Development Indicators have been used to calculate the technological distance of the FDI portfolio. To calculate TFP[2], we use country-level data on GDP (GDP (constant 2005 USD)), GFCF (constant 2005 USD) and total number of workers.

For distance to the frontier variable, the weighted TFP of the source of FDI where weights are the relative value of FDI from each source country divided by the TFP of destination UAE. The following equation shows the distance to frontier to determine the technological intensity:

$$Dist_{ikt} = \frac{\sum_{j \in S} \frac{FDI_{ijkt}}{\sum_{j \in S} FDI_{ijkt}} TFP_{jt}}{TFP_{UAE_t}} \quad (1)$$

Where:

i = Emirate

j = Source country

k = Sector

t = Year

S = Set of source country

[2] We use a Cobb–Douglas aggregate production function specification: $Y = AK^{\alpha}L^{1-\alpha}$, we measure it as: $A = TFP_t = \left(\frac{Y_t}{L_t}\right)\left(\frac{L_t}{K_t}\right)^{0.35}$, Where t is a time index. As the output elasticities of coefficients are subject to change with respect to the structure of the economy and the estimation of the sample period, there is no consensus on the values of these parameters. İsmihan and Özcan (2005) and Bosworth and Collins (2003) indicated that the coefficient of capital may take values between 0.35 and 0.65. In terms of the capital stock series, based on Saad (2017) who constructed capital stock using perpetual inventory method to measure and compute TFP of the Lebanese economy, our K is constructed using the perpetual inventory method as: $k_t = (1 - \delta)\, k_{t-1} + I_t$, where I_t denotes FDI investment and δ is the depreciation rate ($0 < \delta < 1$). Moreover, the initial capital stock (k_t) is estimated by using: $k_t = \frac{I_t}{g+\delta}$. Where g denotes the average growth rate (the mean of GDP growth over the period of available data countries), and δ denotes depreciation rate – we have taken this to be 0.06, based on Mairesse and Jaumandreu (2005), who estimated a production function with firm-level data and information on book values of capital stock. They estimated output elasticities between 0.06 and 0.11.

We construct the FDI inflows in each emirate from the total FDI inflows in all UAE destinations for the 9 years from 2006 to 2014, in order to measure the geographical spillover effect across emirate region and between sectors during that period of time. Geographical spillover is conducted and defined as the total FDI that flows to a given emirate in a given year, excluding that of the FDI that flows to the given sector. To estimate the sectoral spillover effects, we construct the sectoral spillover of the three main sectors (primary, secondary and tertiary). Primary sector spillover is conducted as follows: for each primary sector in each emirate and each year; primary spillover equals all FDI that flows into the UAE in this year in all primary sectors, minus the FDI that flows to the given sector in this year. For each sector that is not a primary sector; primary spillover equals all FDI that flows into the UAE in this year to all primary sectors. We define secondary and tertiary spillovers in the same way.

Descriptive statistics are represented in Table 2.1. We have in total 378 observations across 14 sectors, 3 emirates and 9 years. As in some sectors we do not have information on capital, we have 360 observations in total on capital. With regard to FDI, the minimum value of FDI is zero. The highest value added registered in the mining and quarrying sector was in Abu Dhabi in 2014 and in terms of the lowest value added, the North Emirates was lowest in the social work and arts recreation services sector in 2006. The technological distance observations were only 219 observations, which this means that in some cases when the distance of the FDI portfolio was calculated, TFP was not available for some of the source countries. We calculated as follows: first, distance was calculated using the original weight, but the weights did not equal 1; second, the weights of the source countries were recalculated to reflect only those countries for which TFP was available. For some observations, distance has a value < 1 and for others it is >1. A distance below 1 means that the weighted average of the source countries' TFP is lower than the TFP of UAE in that year. Similarly, a distance above 1 indicates that the weighted average of TFP of the source countries is above the TFP of UAE in that year. The highest distance is in Dubai in 2010 in the construction sector and the lowest distance is in North Emirates in the mining and quarrying sector in 2014. Variables' definitions and expected signs are showing in Table 2.2.

Table 2.1: Descriptive statistics

Variable	Observation	Mean	Standard Deviation	Minimum	Maximum
Value added	378	6654.324	13992.11	238.5	99663.4
FDI	378	231.1413	517.4048	0	4744
Capital	360	1741.016	2186.511	6.6	15865.3
Labour	378	97412.03	135989.2	2067	756209
Abu Dhabi Emirate	378	0.333333	0.472029	0	1
Dubai Emirate	378	0.333333	0.472029	0	1
Primary	378	0.071429	0.257881	0	1
Secondary	378	0.214286	0.41087	0	1
Geographical spillover	336	443.4661	688.8369	0	4746.2
Primary spillover	331	412.8462	956.3592	0	4744
Secondary spillover	336	389.7006	418.1948	0	2027.3
Tertiary spillover	336	1895.201	2011.7	0	8088.8
Distance	219	0.612307	0.429219	0.002647	1.801495

2.4.2 Empirical model

This study intends to examine whether FDI has relationship with the economic performance of 14 sectors in three destinations in the UAE.

The base line regression model is:

$$\ln VA_{ikt} = \beta_0 + \beta_1 FDI_{ikt-1} + \beta_2 \ln K_{ikt-1} + \beta_3 \ln L_{ikt-1} + \alpha_i + \delta_k + \lambda_t + \varepsilon_{ikt} \quad (2)$$

Where the subscripts i,k and t denote emirate, sector and year respectively, VA is the value added, FDI is the value of FDI, K represents the capital and L represents the labour. All controls are in lags to avoid problems of endogeneity.

To estimate the relationships between FDI and economic performance, we use a fixed-effect model. α_i is an emirate fixed effect to control for variables that vary across emirates but are constant over time and sector; δ_k is a sector fixed effect to control for variables that vary across sector but are constant over time and emirate; and λ_t is a time fixed effect to control for variables that vary across time but are constant across emirate and sector.

We include the measure of the technological distance of the FDI portfolio. The regression model becomes:

$$\begin{aligned} Ln\, VA_{ikt} &= \beta_0 + \beta_1 FDI_{ikt-1} + \beta_2 Dist_{ikt-1} + \beta_3 FDIDist_{ikt-1} + \beta_4 \ln K_{ikt-1} + \\ &\beta_5 \ln L_{ikt-1} + \beta_6 FDIAD_{ikt-1} + \beta_7 FDIDXB_{ikt-1} + \beta_8 FDIPrim_{ikt-1} + \\ &\beta_9 FDISecond_{ikt-1} + +\alpha_i + \delta_k + \lambda_t + \varepsilon_{ikt} \end{aligned} \quad (3)$$

Where $Dist$ stands for technological distance and $FDIDist$ stands for the interaction between FDI and distance. $FDIAD$ stands for the interaction between FDI and Abu Dhabi emirate indicator variable, $FDIDXB$ is the interaction term between FDI and Dubai emirate indicator, $FDIPrim$ stands for the interaction between FDI and primary sector indicator, and $FDISecond$ stands for the interaction between FDI and secondary sector indicator.

To identify and quantify FDI spillovers effects, we construct the geographical and sectoral spillovers and regress them separately with other variables.

$$\begin{aligned} Ln\, VA_{ikt} &= \beta_0 + \beta_1 FDI_{ikt-1} + \beta_2 \ln K_{ikt-1} + \beta_3 \ln L_{ikt-1} + \beta_4 GeoSpill_{ikt-1} + \\ &\beta_5 PrimSpill_{ikt-1} + \beta_6 SecondSpill_{ikt-1} + \beta_7 TertSpill_{ikt-1} + \beta_8 Dist_{ikt-1} + \\ &\beta_9 FDIDist_{ikt-1} + \alpha_i + \delta_k + \lambda_t + \varepsilon_{ikt} \end{aligned} \quad (4)$$

Where $GeoSpill$ is the geographical spillover. $PrimSpill$ stands for primary sector spillover, $SecondSpill$ stands for secondary sector spillover, and $TertSpill$ stands for tertiary sector spillover.

2.5 Empirical results

The results of the panel regressions are reported in Tables 2.3-2.6. Table 2.3 shows the base regression of FDI and value added. We study the relationship between FDI and economic performance. We see that FDI has an ambiguous relationship with the value added, depending on the sector. In specifications 3.1, 3.2, 3.6 and 3.7, we find that FDI is a positive and significant relationship with value added with a magnitude of 0.0002, 0.0003, 0,0003 and 0.0003 respectively, as we expected. The coefficients are positive and highly significant signs at 1% level, but very small, which suggests that the association between FDI on value added and UAE economic performance is not large. These positive significant results for FDI are in line with Reisen and Soto (2001) and Li and Liu (2005). Both studies focused on developed and developing countries to investigate the relationship between FDI and economic performance and both studies found a positive and significant association; they reported that foreign portfolios and FDI boost the host country's economy. This result indicates that there is a potential benefit from attracting FDI and attracting FDI in UAE as a host country increases the economic performance of the country.

Furthermore, in the same table (Table 2.3), the results show that capital and labour have a positive and statistically significant with value added, as we expected. This result indicates that physical capital and human capital contribute to economic performance, probably due to the capital accumulation and the improvement of labour productivity. In specification 3.1, the coefficient of capital is 0.3109 and the coefficient of labour is 0.3480. That means that a 1% increase in capital will lead to a 0.31% increase in value added, holding all else constant. While for labour, a 1% increase in labour will leads to a 0.35% increase in value added, holding all else constant.

With regard to the capital results, the results are consistent with Levine and Zervos (1998) as they investigated the association between capital and value added and found that capital has a positive significant related to value added. This means that a host country with physical capital assets increases the value added. In terms of labour, these findings are in line with Warr (2006), who studied productivity in Thailand and Indonesia between 1981 and 2002 and found that human capital increases GDP.

We study whether FDI has a different association with the value added depending on the location and /or sector. In particular, potential advantages derived from FDI might differ markedly across the primary, secondary and tertiary sectors, and the same for locations. Each location offers different determinants of FDI to foreign investors, which might affect the levels of FDI. From specifications

3.2-3.4, we see that the fixed effects are statistically significant, and the interaction of the sectoral-level fixed effect reduces the positive significance magnitude of the coefficient of FDI from 0.0003 in specification 3.2 to 0.0001 in specifications 3.3 and 3.4. This result indicates that the sectors related to the the magnitude of FDI and its related to value added.

In specification 3.5, we see whether FDI has different association and relationship depending on the location. The interaction terms between FDI and Abu Dhabi, FDI and Dubai are not statistically significant, either individually or in groups. This means that locations related on the magnitude of FDI and value added.

For more detail, in specifications 3.6 and 3.7 we add primary and secondary sectors and the results show that the primary sector has a higher value added on average. The primary sector is the average of value added, about 1.7451 on average, compared to the secondary and tertiary sectors. In the same these two specifications FDI becomes positively significant. This result indicates that the variation of the association of FDI depends on sectors. Furthermore, in these two specifications and following Alfaro and Charlton (2007), we test for differential relationship of FDI on different type sectors. We interact FDI with sector classification, primary and secondary. We see that on average, the value added in the primary and secondary sectors is higher than the value added in the tertiary sector. The interaction coefficients with FDI are jointly significant. These results are in line with Alfaro and Charlton (2007) and Vu and Noy (2009), as both found that the primary and the secondary sectors related positively and significantly to value added compared to the tertiary sector.

In specifications 3.8 and 3.9, we look at locations by adding FDI in Abu Dhabi and FDI in Dubai. We see in specification 3.8 that FDI in Dubai is positive and significant and FDI in Abu Dhabi has no related with the value added. This indicates that Dubai's FDI has a higher value added on average compared to Abu Dhabi's FDI and the North Emirates' FDI. This may be due to Dubai's friendlier business environment, excellent infrastructure, solidity of regulations, relatively diversified economy, and political stability, which continue to position it as one of the most preferred investment destinations, according to economists at the Institute of International Finance (2016). In specification 3.9, the interaction terms between FDI in Abu Dhabi and FDI in Dubai and the result show that it is jointly significant at 1% level, although FDI has a higher related with the value added in both Abu Dhabi and Dubai compared to the North Emirates. In these two specifications, FDI becomes negative and significant by adding the location, which means that FDI is conditional on the host environment and absorptive capacity of the host economy; this finding is in line with De Mello (1997).

From specifications 3.5-3.9, the results indicate that attracting FDI in different sectors and locations is matter as found in different studies (Basu et al., 2003; Hsiao and Hsiao, 2006; Campos and Kinoshita, 2002; Ray, 2012). This indicates that FDI related to the value added vary by sector.

Indeed, from Table 2.3 with regard to FDI, we find that when we control for primary and secondary sectors, year and interaction between sectors and FDI, the relationship between FDI and economic performance is no longer ambiguous but rather positive and significant. This result is in line with Alfaro and Charlton (2007) as they examined the quality of FDI and found that the relationship between FDI and economic performance is positively significant and stopped being ambiguous when they controlled for sectors and time. Importantly, the table also demonstrates that FDI, capital and labour in UAE led to a higher increase in value added during the period 2006-2014. In terms of the magnitude between them, labour has the highest magnitude on the value added, followed by capital then FDI with small coefficients. This result is in line with the UAE government's strategy of attracting FDI, not to get the benefit from its capital but to benefit from foreign investors' technologies.

The main element of Table 2.4 is the distance to frontier. We add distance and the interaction term between FDI and distance. In specification 4.1, distance related negative and significant with a magnitude of -0.5399. This means that the distance to technology frontier has a negative relationship on productivity in the UAE, while the interaction term between FDI and distance has a positive insignificant relationship with value added and its coefficient is 0.0002, similar to FDI, as it is positive and insignificant with value added, once the distance is added, with a coefficient of 0.0001. The association of distance of technology transfer is found to be weak with regard to UAE economic performance, as we expected. This implies that the higher the level of technological development in a host country, the bigger the relationship of FDI with value added and the country's economic performance (Baltabaev, 2014). This result is in line with Sjoholm (1999), who showed that the huge technology gap may constitute an obstruction to the absorption of any potential spillover from FDI. Capital and labour are found positively related to economic performance. A 1% increase in capital leads to a 0.28% increase in value added, holding all else constant. A 1% increase in labour leads to a 0.32% increase in value added, holding all else constant.

In specification 4.5, FDI has a negative sign and the interaction between FDI and distance is positive. This means that the more positive the distance is, the more positive related of FDI becomes with the value added. The FDI signs changes from a positive to negative by 1.75 level of distance greater than the mean of distance. Distance changes from a positive to negative sign by 1485 level of FDI greater than the mean of FDI.

We add location of FDI in specification 4.6, and we see that FDI in Abu Dhabi and FDI in Dubai have no relationship with value added. Distance and FDI have negative insignificant signs but the interaction between FDI and distance is positive and significant when controlling for sector and year. This indicates that the higher the level of technological development in the host country, the bigger

the capacity of the host country to absorb potential spillovers from FDI. This result shows the importance of FDI in technological transfer in the UAE to enhance the country's economic performance; this is the UAE government's main aim in attracting FDI, to strengthen the technologies and reduce the technology gaps, if any. This result is consistent with Findlay (1978), who demonstrated that the technological gap should not be huge.

We also add the specific sector in specification 4.7 and we see that the primary sector has a higher value added, on average by 1.4067, compared to the other sectors. This result is in line with Alfaro (2003) who revealed that FDI in the primary sector affects value added significantly. This indicates that the primary sector dominates and controls the country's economic performance, and this is due to the abundant and rich natural resources available in the country.

In specifications 4.10 and 4.11, distance is negatively significant and the interaction between FDI and distance is positively significant. These results indicate that FDI's distance away from the frontier is catching up with diffuse technology at a fast pace. In other words, attracting FDI from a far distance brings high technology to the host country. This result is in line with Findlay (1978), Madariaga and Poncet (2007) and Aghion and Howitt's (2008) empirical findings, when they examined the technology frontier. The larger the distance to the frontier of the foreign firms, the larger the spillover relationship.

In specification 4.11, we add distance, FDI, the interaction between FDI and distance, sectors, FDI in Abu Dhabi and FDI in Dubai, and we control for emirates, primary secondary and year. We see from the results that FDI in Dubai has a higher value added (the average is about 0.0012) than in the other emirates. This indicates that Dubai's FDI has a strong relationship with the value added and that Dubai's economy has diversified, as the government planned in its strategy. In the same specification, FDI and distance are negative and significant and the interaction between FDI and distance has a positive significant relationship with value added. This indicates that FDI inflows to the UAE bring in technology and enhance the country's economic performance. The positive significance of this result means that if distance increases, the relationship between FDI and value added becomes higher and positive. These results indicate that FDI distance away from the frontier is catching up with diffuse technology at a fast level. In other words, attracting FDI from a far distance brings high technology to the host country. This is in line with Findlay (1978), Madariaga and Poncet (2007) and Aghion and Howitt's (2008) empirical findings, when they examined the technology frontier. The larger the distance to the frontier of the foreign firms, the larger the spillover effects. This result is also in line with Aghion et al. (2005) and Amable et al. (2008), who showed the positive relationship when the distance to the frontier is higher and farther. We deduce from these results that a host country with smaller technology gaps seems to benefit less from FDI. This

result is in line with Baltabaev (2013), who used a panel of 46 countries over 1974-2008, measured TFP and employed the Generalized Method of Moments (GMM) estimation method to examine technological distance and FDI. It was found that host countries with large technology gaps benefit more from FDI inflows. Generally, from Table 2.4 the results indicate that the distance to frontier of FDI inflows from the source countries influences on the size of the value added.

Table 2.5 focuses on the geographical spillovers from FDI and their relationship with value added. Geographical distance determines the costs and the attenuation pattern of technology diffusion; in all specifications the geographical spillovers have positive relationships with the value added, as we expected, with a magnitude of 0.0001. This indicates that geographical spillovers have a positive role and that it is important to match sectors and emirates to region, in order to enhance the economic performance of the UAE. Geographical spillovers are positively influenced by sector. This result is in line with Madariaga and Poncet (2007) as they investigated the geographical spillovers from FDI in China and its related to the economic performance. The authors found that geographical spillovers had a positive relationship with the country's economic performance. Moreover, this positive relationship indicates that knowledge would flow easily and rapidly among sectors and emirates from FDI and foreign investors' firms to domestic firms. An increase in the contribution of FDI generates positive geographical spillovers towards the host country's firms and market. In specification 5.4, FDI is positive by a magnitude of 0.000, and capital and labour are positively significant. The primary sector has a higher value added on average. Distance is negatively significant and the interaction between FDI and distance is positively insignificant on value added. From this table we conclude that geographical spillovers from FDI matter and have a positive relationship on knowledge spillover and diffusion in the UAE.

Table 2.6 presents the sectoral spillovers for the three main sectors (primary spillover, secondary spillover and tertiary spillover) to see the relationship of each sector's spillovers from FDI on value added. Primary spillovers on value added are negative in specification 6.1 and become positive in specifications 6.2 and 6.3 when we control the primary and sector effects. These results indicate that FDI in the primary sector related positively with knowledge spillover and diffusion in the UAE. These results are in line with Akinlo (2004), who revealed that the sectoral spillover from FDI inflows in Nigeria differs depending on the receiving sector. In general, in this table the sectoral spillovers have different signs. The result is similar for secondary spillovers. Primary spillovers and secondary spillovers have a positive relationship with value added. In other words, the primary sector's spillovers and the secondary sector's spillovers from FDI inflows have larger technological spillovers, knowledge transfer and know-how, which enhance the value added more than the tertiary sector's spillovers. This is due to high competition in these two sectors in the UAE as well as the fact that these two sectors have more technologically advanced firms. This result is in line with Sun

et al. (2017), who utilised data from the Republic of South Korea to quantify the spillover effect of inward FDI across sectors during the period of 2000-2004. They found that there are positive FDI spillover effects from the primary sector spillovers and secondary sector spillovers compared to the tertiary sector spillovers. In specification 6.4 we add the control years and we see that tertiary spillovers related positively with value added and primary spillovers and secondary spillovers related negatively with the value added. This result indicates that each sector has technological diffusion that spreads within the sector and across the economy. We conclude from this table that domestic firms can benefit more from sectoral spillovers.

2.6 Conclusion

This study has examined the relationship of FDI on economic performance. It has illustrated how the effect of FDI varies between sectors and it has explored the geographical and the sectoral extent of FDI technological spillovers and associated spatial diffusion in the UAE. It used sectoral-level panel data covering 14 economic sectors over the period 2006-2014 and three destinations in the UAE, using Solow's growth accounting technique by employing a production function model. The empirical study finds contradictory results; FDI has different relationships with value added (Aitken and Harrison, 1999; Alfaro et al., 2004; Keller, 2004; Keller and Yeaple, 2009; Woo, 2009) depending on the location and sector. FDI has a higher association on the value added in both Abu Dhabi and Dubai compared to the North Emirates and attracting FDI to the primary sector appears to matter and it improves the economic performance more than other sectors. In terms of technological distance, FDI flows from source countries that are far away bring higher quality technology to the UAE. The geographical spillovers from FDI influence economic performance positively. In addition, the quality of FDI from sectoral spillovers is positive in all sector spillovers. In sum, the results so far suggest that the positive relationship from FDI depends on the absorptive capacity of the destination. Finally, attracting FDI, and the entry of FDI to all sectors, will no doubt lead to greater technological spillovers (geographical and sectoral spillovers), which will contribute to enhancing economic performance in the country.

2.7 Appendices

Table 2.2: Variables' definitions and expected signs

Abbreviation	Variable	Definition	Expected signs	Source
Ln VA_{ikt}	Value_added	GDP deflator per ikt		Federal Competitiveness and Statistics Authority – UAE, Statistics Centre - Abu Dhabi and Dubai Statistics Center, The World Bank
FDI_{ikt-1}	FDI	Value of FDI inflows as a percentage of GDP (FDI deflated by GDP deflator) per ikt	+	fDi intelligence
Ln K_{ikt-1}	Capital	Value of GFCF of GDP taken in natural logarithms (Logarithm of GFCF deflated by GDP deflator) per ikt	+	Federal Competitiveness and Statistics Authority – UAE, Statistics Centre - Abu Dhabi and Dubai Statistics Center, The World Bank
Ln L_{ikt-1}	Labour	Number of worker of GDP taken in natural logarithms (Logarithm of worker deflated by GDP deflator) per ikt	+	Federal Competitiveness and Statistics Authority – UAE, Statistics Centre - Abu Dhabi and Dubai Statistics Center, The World Bank
$Dist_{ikt-1}$	Distance	Sum of FDI share per country, year and sector multiply it by the TFP for the same country, year and sector then divide that sum by UAE TFP for the same year and sector $Dist_{ikt} = \frac{\sum_{j\in5} \frac{FDI_{ijkt}}{\sum_{j\in5} FDI_{ijkt}} TFP_{jt}}{TFP_{UAE_t}}$	+	Author calculation, data source from Penn World Table, version 9.0
$GeoSpill_{ikt-1}$	Geographical spillover	Total FDI that flows to a given Emirate in a given year, excluding that of the FDI that flows to the given sector $\sum FDI_{ijt-1} - FDI_{jkt-1}$	+	Author calculation
$PrimSpill_{ikt-1}$	Primary spillover	For each primary sectors in each Emirate and each year; primary spillover equals all FDI that flows to UAE in this year in all primary sector minus the FDI flows to the given sector in this year. $\sum_{P\in(AD,DXB,NE)\ j\in primary\ sector} \sum FDI_{pjt-1} - FDI_{jkt-}$ For each sector that is not primary; primary spillover equals all FDI that flows to UAE in this year to all primary sector. $\sum_{P\in(AD,DXB,NE)\ j\in primary\ sector} \sum FDI_{pjt-1}$	+	Author calculation
$SecondSpill_{ikt-1}$	Secondary spillover	Similar is sense as primary spillover	+	Author calculation
$TertSpill_{ikt-1}$	Tertiary spillover	Similar is sense as primary spillover	+	Author calculation

Table 2.3: Value added and FDI

Ln value added	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9
FDI_{t-1}	0.0002*** (0.0001)	0.0003*** (0.000)	0.0001 (0.0001)	0.0000 (0.0001)	-0.0004 (0.0005)	0.0003*** (0.0001)	0.0003** (0.0001)	-0.0007* (0.0004)	-0.0005* (0.0003)
Ln $capital_{t-1}$	0.3109*** (0.0465)	0.3277*** (0.0519	0.2087*** (0.2620)	0.1993*** (0.0235)	0.3444*** (0.0532)	0.2699*** (0.0366)	0.2664*** (0.0383)	0.3597*** (0.0541)	0.2832*** (0.0366)
Ln $labour_{t-1}$	0.3480*** (0.0369)	0.3356*** (0.0348)	0.7044*** (0.0718)	0.8015*** (0.0700)	0.3279*** (0.0351)	0.4614*** (0.0388)	0.4676*** (0.0386)	0.3470*** (0.0346)	0.4582*** (0.0391)
$FDIAD_{t-1}$					0.0006 (0.0006)			0.0007 (0.0005)	0.0005 (0.0004)
$FDIDXB_{t-1}$					0.0008 (0.0006)			0.0009** (0.0005)	0.0009 (0.0003)
Primary						1.7440*** (0.2047)	1.7451*** (0.2097)	1.7440*** (0.2047)	1.7606*** (0.2126)
Secondary						0.1055 (0.1009)	0.0858 (0.1053)	0.1055 (0.1009)	0.0643 (0.1081)
$FDIPrim_{t-1}$						-0.0002* (0.0001)	-0.0003* (0.0001)	0.0005 (0.0003)	-0.0002 (0.0001)
$FDISecond_{t-1}$						-0.0002 (0.0001)	-0.0002 (0.0002)	-0.0000 (0.0002)	0.0000 (0.0002)
Constant	2.3138*** (0.4415)	2.1576*** (0.4668)	-1.3412 (0.8225	-2.2431** (0.8256)	2.2881*** (0.4754)	1.0463* (0.5025)	1.1894* (0.5537)	2.0392*** (0.5118)	1.3348* (0.5565)
Fixed Effects									
Emirate (F-test)	NO	YES (9.41***)	YES (57.59***)	YES (60.03***)	YES (7.04***)	YES (11.70***)	YES (11.22***)	YES (10.14***)	YES (9.53***)
Sector (F-test)	NO	NO	YES (94.10***)	YES (123.29***)	NO	NO	NO	NO	NO
Primary/ secondary (F-test)	NO	NO	NO	NO	NO	YES (36.27***)	YES (34.66***)	YES (35.84***)	YES (34.42***)
Year (F-test)	NO	NO	NO	YES (2.81***)	NO	NO	YES (0.37*)	NO	YES (0.36)
Interaction Terms									
FDIPrim/ FDISecond (F-test)	NO	NO	NO	NO	NO	YES (2.18*)	YES (2.11*)	YES (0.91)	YES (1.01)
FDIAD/ FDIDXB (F-test)	NO	NO	NO	NO	YES (1.27)	NO	NO	YES (3.74**)	YES (3.56***)
Observations	231	231	231	231	231	231	231	231	231
R-squared	0.4318	0.4839	0.9067	0.9158	0.4926	0.6104	0.6154	0.5061	0.6257

* p<0.1, ** p<0.05, *** p<0.01
Robust standard errors in parenthesis under coefficients

Table 2.4: Value added, FDI and distance

Ln value added	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	4.10	4.11
FDI_{t-1}	0.0001 (0.0001)	0.0001 (0.0001)	0.0000 (0.0001)	0.0000 (0.0001)	-0.0007 (0.0006)	-0.0001 (0.0002)	0.0001 (0.0001)	-0.0010** (0.0004)	-0.0011** (0.0003)	-0.0010** (0.0004)	-0.0011** (0.0004)
$Dist_{t-1}$	-0.5399*** (0.1615)	-0.5330*** (0.1491)	-0.0465 (0.0702)	-0.0252 (0.0774)	-0.5942*** (0.1519)	-0.0691 (0.0801)	-0.4965*** (0.1324)	-0.0762*** (0.0848)	-0.6049*** (0.14299)	-0.5709*** (0.1282)	-0.6138*** (0.1385)
$FDIDist_{t-1}$	0.0002 (0.0003)	0.0002 (0.0003)	0.0001 (0.0001)	0.0001 (0.0001)	0.0004 (0.0003)	0.0002* (0.0001)	0.0002 (0.0002)	0.0004 (0.0003)	0.0004 (0.0003)	0.0004* (0.0002)	0.0004* (0.0003)
Ln $capital_{t-1}$	0.2774*** (0.0512)	0.2703*** (0.0540)	0.2542*** (0.2707)	0.2341*** (0.0243)	0.3002*** (0.0562)	0.2404*** (0.0260)	0.2687*** (0.0439)	0.3049*** (0.0424)	0.2942*** (0.0424)	0.3040*** (0.0371)	0.2978*** (0.0377)
Ln $labour_{t-1}$	0.3237*** (0.5197)	0.3065*** (0.0425)	0.6620*** (0.0861)	0.7766*** (0.0833)	0.2891*** (0.0433)	0.7616*** (0.0857)	0.4219*** (0.0444)	0.4016*** (0.0449)	0.4105*** (0.0443)	0.4028*** (0.0445)	0.4107*** (0.0437)
$FDIAD_{t-1}$					0.0003 (0.0007)	-0.0001 (0.0002)		0.0005 (0.0005)	0.0006 (0.0005)	0.0006 (0.0004)	0.0006 (0.0005)
$FDIDXB_{t-1}$					0.0009 (0.0006)	0.0001 (0.0002)		0.0011*** (0.0004)	0.0012*** (0.0004)	0.0011*** (0.0004)	0.0012*** (0.0004)
Primary							1.4067*** (0.2308)	1.4130*** (0.2178)	1.4611*** (0.2297)	1.4190*** (0.2073)	1.4360*** (0.2135)
Secondary							-0.0379 (0.1242)	-0.1090 (0.1337)	-0.0852 (0.1365)	-0.0512 (0.1016)	-0.0641 (0.1037)
$FDIPrim_{t-1}$							-0.0001 (0.0001)	0.0001 (0.0001)	-0.0000 (0.0001)		
$FDISecond_{t-1}$							-0.0001 (0.0002)	0.0002 (0.0002)	0.0001 (0.0002)		
Constant	3.2374*** (0.5197)	3.1771*** (0.5213)	-1.0613 (0.9662)	-2.1080* (0.9684)	3.3915*** (0.5433)	-1.9361* (0.9895)	1.8742*** (0.6155)	2.1515*** (0.6131)	2.3718*** (0.6619)	2.1346*** (0.6064)	2.3500*** (0.6491)
Fixed Effects											
Emirate (F-test)	NO	YES (10.63***)	YES (33.64***)	YES (37.50***)	YES (7.82***)	YES (29.32***)	YES (10.86***)	YES (10.68***)	YES (3.26***)	YES (10.95***)	YES (9.64***)
Sector (F-test)	NO	NO	YES (67.21***)	YES (81.63***)	NO	YES (83.00***)	NO	NO	NO	NO	NO
Primary/ secondary (F-test)	NO	NO	NO	NO	NO	NO	YES (19.22***)	YES (22.69***)	YES (21.66***)	YES (23.71***)	YES (22.90***)
Year (F-test)	NO	NO	NO	YES (2.87***)	NO	YES (2.71***)	NO	NO	YES (0.88)	NO	YES (0.93)
Interaction Terms											
FDIPrim/ FDISecond (F-test)	NO	NO	NO	NO	NO	NO	Yes (0.33)	Yes (0.37)	Yes (0.09)	NO	NO
FDIAD/ FDIDXB (F-test)	NO	NO	NO	NO	YES (1.81)	YES (2.84***)	NO	YES (5.12***)	YES (5.67***)	YES (5.71***)	YES (6.63***)
FDIDist / FDI	YES (1.07)	YES (2.05)	YES (0.76)	YES (0.74)	YES (0.99)	YES (1.84)	YES (1.23)	YES (2.84***)	YES (2.98***)	YES (3.36***)	YES (3.80***)
Observations	178	178	178	178	178	178	178	178	178	178	178
R-squared	0.4292	0.4948	0.8972	0.9107	0.5114	0.9133	0.6005	0.6234	0.6917	0.6872	0.6877

* p<0.1, ** p<0.05, *** p<0.01
Robust standard errors in parenthesis under coefficients

Table 2.5: Value added, FDI, Distance and Geographical spillover

Ln value added	5.1	5.2	5.3	5.4
FDI_{t-1}	0.0001 (0.0001)	-0.0000 (0.0001)	0.0000 (0.0001)	0.0000 (0.0001)
Ln $capital_{t-1}$	0.2703*** (0.0544)	0.2812*** (0.0401)	0.2716*** (0.0391)	0.2639*** (0.0399)
Ln $labour_{t-1}$	0.3077*** (0.0433)	0.4462*** (0.0473)	0.4219*** (0.0442)	0.4293*** (0.0437)
Geo $Spill_{t-1}$	0.0000 (0.0001)	0.0001 (0.0001)	0.0000 (0.0001)	0.0000 (0.0001)
Primary		1.4180*** (0.2599)	1.3689*** (0.2104)	1.3771*** (0.2193)
Secondary		-0.1204 (0.1054)	-0.0796 (0.0998)	-0.0910 (0.1015)
$Dist_{t-1}$	-0.5244*** (0.1516)	-0.4941*** (0.1384)	-0.5031*** (0.1285)	-0.5295*** (0.1344)
$FDIDist_{t-1}$	0.0002 (0.0003)	0.0001 (0.0002)	0.0002 (0.0002)	0.0002 (0.0002)
Constant	0.1342*** (0.5465)	1.7660*** (0.0002)	1.8701*** (0.6209)	2.0891** (0.6673)
Fixed Effects				
Emirate (F-test)	YES (10.53***)	NO	YES (10.64***)	YES (10.83***)
Primary/ secondary (F-test)	NO	YES (15.81***)	YES (21.84***)	YES (20.35***)
Year (F-test)	NO	NO	NO	YES (0.74)
Interaction Terms				
FDIDist / FDI	YES (0.60)	YES (0.20)	YES (0.89)	YES (0.83)
Observations	178	178	178	178
R-squared	0.4953	0.5476	0.6000	0.6141

* p<0.1, ** p<0.05, *** p<0.01
Robust standard errors in parenthesis under coefficients

Table 2.6: Value added, FDI, Distance and Sectoral spillover

Ln value added	6.1	6.2	6.3	6.4
FDI_{t-1}	0.0001*	0.0000	0.0000	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Ln $capital_{t-1}$	0.2708***	0.2861***	0.2659***	0.2638***
	(0.0556)	(0.0391)	(0.0412)	(0.0425)
Ln $labour_{t-1}$	0.3058***	0.4449***	0.4221***	0.4275***
	(0.0435)	(0.0471)	(0.0447)	(0.0438)
Prim $Spill_{t-1}$	-0.0001	0.0000	0.0000	-0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Second $Spill_{t-1}$	-0.0001	0.0001	0.0000	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Tert $Spill_{t-1}$	0.0000	-0.0001*	-0.0000	0.0000
	(0.0001)	(0.0000)	(0.0001)	(0.0001)
Primary		1.4791***	1.3881***	1.3384***
		(0.2625)	(0.2246)	(0.2361)
Secondary		-0.0607	-0.0619	-0.1261
		(0.1134)	(0.1076)	(0.1177)
$Dist_{t-1}$	-0.5434***	-0.5250***	-0.5115***	-0.5309***
	(0.1478)	(0.1353)	(0.1271)	(0.1350)
$FDIDist_{t-1}$	0.0002	0.0002	0.0002	0.0002
	(0.0003)	(0.0002)	(0.0002)	(0.0002)
Constant	3.1969***	1.8204***	1.9288***	2.1590***
	(0.5747)	(0.6523)	(0.6569)	(0.6860)
Fixed Effects				
Emirate	YES	NO	YES	YES
(F-test)	(8.91***)		(8.23***)	(9.10***)
Primary/ secondary	NO	YES	YES	YES
(F-test)		(16.39***)	(19.82***)	(17.87***)
Year	NO	NO	NO	YES
(F-test)				(0.82)
Interaction Terms				
Spillover primary/secondary/tertiary	YES	YES	YES	YES
(F-test)	(0.56)	(2.32*)	(0.17)	(0.25)
FDIDist / FDI	YES	YES	YES	YES
	(2.60*)	(0.72)	(0.99)	(0.65)
Observations	178	178	178	178
R-squared	0.5000	0.5588	0.6013	0.6157

* p<0.1, ** p<0.05, *** p<0.01
Robust standard errors in parenthesis under coefficients

Chapter 3

Determinants of FDI Flows to the Gulf Countries: A Comparison of Estimation Techniques of a Panel Data Approach

Abstract: This study examines empirically the important determinants of FDIs in three high-income developing countries (UAE, KSA and Qatar) and controls for government policies and strategy plans in identifying the priority sector and priority source country. The analysis uses 14 economic sectors and FDI inflows from 66 source countries during the period of 2006-2014 by employing the gravity model approach. They study finds that government business strategy, market size, openness and infrastructure are the most important determinants of FDI in our selected host countries and the government business strategies are effective in attracting FDI.

3.1 Introduction

The potential impulses to FDI in an economy have always been of great interest to researchers. Intuitively FDI should flow into countries that have a strong market size, low production costs for workers, a stable economic and political environment, steady government regulations, and protective investment incentives. This means that the governments are engaged in a policy competition by changing the key factors of their economic policies, such as labour market conditions, corporate taxes, trade openness, subsidies, privatization, business ownership and regulatory regime policies so as to improve FDI activity in their countries.

As mentioned by Chakrabarti (2001) and Banga (2003), many countries have been actively trying to attract FDIs by offering subsidies to foreign investors, income tax holidays, and investing in infrastructure. Determinants of FDI have been explored both theoretically and empirically. Theoretically, these theories are significant steps towards the development of a systematic framework for the emergence of FDI. However, the capacity of each to serve as a self-contained general theory, which could explain all types of FDI, such as outward and inward FDI at the firm, sectoral, and country level, has been questioned in the works of various scholars (see Agarwal, 1980; Parry, 1985; Itaki, 1991).

Others have investigated the determinants of FDI empirically. Piteli (2010) finds that TFP is a determinant of FDI within the two sets of countries, European Union and Non-European Union. In terms of distance as important determinants of FDI, according to Trkulja (2005), distance, population, transportation and market power of surrounding countries also geographic size, all play a significant role in attracting foreign capital.

It is important to understand which factors are key for investors when it comes to decisions on location for FDI. Investors are keen to understand what sort of political system prevails in any particular country and what has been its recent record in terms of attracting FDIs. Furthermore, country's determinants of FDI would support the country's strategy in attracting FDIs.

Several existing papers in the literature on empirical determinants of FDI in different economic approaches employ the gravity models. The gravity model appears to be an adaptation of the law of universal gravitation for socio-economic phenomena like FDI inflows, trade and migration (Zysk and Śmiech, 2014). Azeem et al. (2012) evaluate determinants of FDI in Pakistan by using the gravity approach. Similarly, Wach and Wojciechowski (2016) explain the important factors of determinants of FDI for Visegrad Group countries by using the gravity model. Furthermore, Sfar and Mtar (2015) use the gravity model to evaluate the determinants of FDI in Tunisia. The basis of the gravity model is linkage and interaction of different countries across borders. This model has an indirect relationship between the destination and the base.

Motivated by the literature, we examine the important of determinants of FDI inflows through sectoral level and country level data from 2006-2014 (host and source country), and assess whether our selected host countries' strategic plan has been effective by looking at the strategic plan entailed in identifying priority sectors for FDI and priority source countries using the gravity model approach. The focus of this study is to look at different sectors in different countries. Different sectors have different needs such as capital, sources and labour. Furthermore, different countries have different needs even if host countries are located in the same region. Our host countries are UAE, KSA and Qatar. We are focusing on these three GCC countries because they ranked as being the highest FDI

inflows receivers, with the greatest GDP amount and GDP per capita for the period 2006-2014 according to the World Bank and fDi Intelligence. A common thread in the literature about these three countries is that they are rich in oil and their governments are trying to diversify their economies away from oil. We have 66 source countries grouped into six source regions (Asia, Africa, Europe, North America, South America and Australia). In particular, our goal is to take a sectoral level approach, with 14 economic sectors grouped into primary, secondary and tertiary sectors. We investigate bilateral inflows of FDI and their key determinants. This study uses nine different comprehensive institutional categories: (1) government strategy, (2) market size, (3) macroeconomic stability, (4) labour cost, (5) openness, (6) infrastructure and internet, (7) investment incentives, (8) corruption, (9) and government regulations, to understand whether these categories are robust determinants of FDI inflows in each host country and sector.

The previous determinants of FDI literature neglected the importance of government strategy, and no study has covered most of these arguments in one study as well as applied government strategies as one of the important determinants of FDIs. This study is the first in combining these three rich developing countries which are located in the same region to identify the importance of their determinants of FDI and illustrate their priority sector in attracting FDI. Additional to that, this study is the first to combine sectoral and country level datasets. Thus, there is a need for further empirical research to restructure the host country's economy and that is why we are using a sectoral and country level and the gravity model approach that is widely used in literature. Furthermore, we use gravity model and since we have zero trade flow, we use Heckman is used to test for selection bias, and the marginal effects (elasticities) of the explanatory variables are derived to help interpret the estimated parameters. In addition, this study provides more robust results, we are censoring method where the zero is substituted by a small positive constant an arbitrary small value one and log the dependent variable, and then this is estimated using OLS. Furthermore, a nonlinear estimator, the Poisson Pseudo-Maximum Likelihood (PPML), is used to deal with the zero trade observations as it is unbiased and consists of estimates that are robust to the presence of heteroskedasticity in the data, and naturally takes care of the zero observations on the dependent variable. We are using these different estimation techniques as more of a robustness check. Our empirical study finds that government business strategy, market size, openness and infrastructure are the main and most important determinants of FDI in our selected host countries, and the host countries' government business strategies that related to their priority sectors in which to attract FDI, priority source countries from which to attract FDI, and allowing 100% ownership to foreign investors, are effective.

In order to achieve our objectives, the structure of this study is as follows: The next section presents FDI trends in UAE, KSA and Qatar, followed by a discussion of conceptual framework. Then, we

discuss the empirical specification and empirical results. Finally, we conclude. An appendix section is provided at the end of this chapter.

3.2 FDI trends in UAE, KSA and Qatar

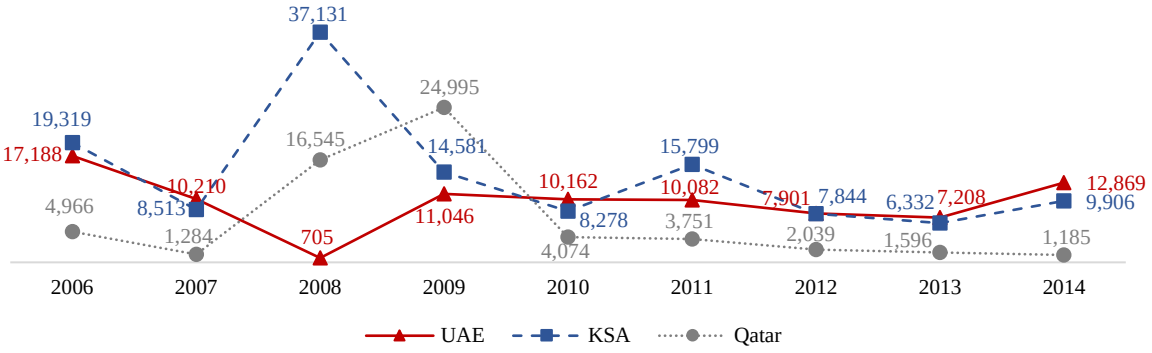
FDI flows into UAE, KSA and Qatar have been increasing. Figure 3.1 below shows the FDI in million USD in UAE, KSA and Qatar from 2006-2014. In 2014 in the UAE, FDI increased sharply by 79% from 2013. KSA's statistics show that FDI steadily increased by 56% between 2013 and 2014. With regard to Qatar, FDI decreased by 25.7% from 2013 to 2014.

From the period between 2006 and 2014, a total of 1,031 FDI projects were recorded in KSA, equating to a 1.3% share of global FDI. These projects represent a total FDI of USD 127.7 billion and a total of 141,675 jobs were created. The volume of FDI in KSA increased steadily by 16% from USD 8.5 billion in 2007 to USD 9.9 billion in 2014. During 2014, a total of 13,020 jobs and 84 projects were created by this FDI, equating to 1% of total jobs and 1% of total projects. In terms of Qatar and FDI, between 2006 and 2014 a total of 559 FDI projects were recorded in Qatar. These projects represent a total FDI of USD 60.4 billion and a total of 63,777 jobs were created. During 2014, a total of 2,027 jobs were created, through 45 projects amounting to USD 1.2 billion FDI. As regards the UAE and FDI, the statistical facts have been mentioned in the previous chapter.

We can see that although the KSA received the greatest amount of FDI during the period 2006-2014, the UAE attracted the highest number of projects and experienced the creation of most jobs. This indicates that foreign investors have high levels of confidence in the UAE, strengthening its reputation as both a trustworthy and stable home for foreign capital and an ideal location for foreign businesses, entrepreneurs and new ventures, as the country has stable government regulations and openness in polarising foreign labour.

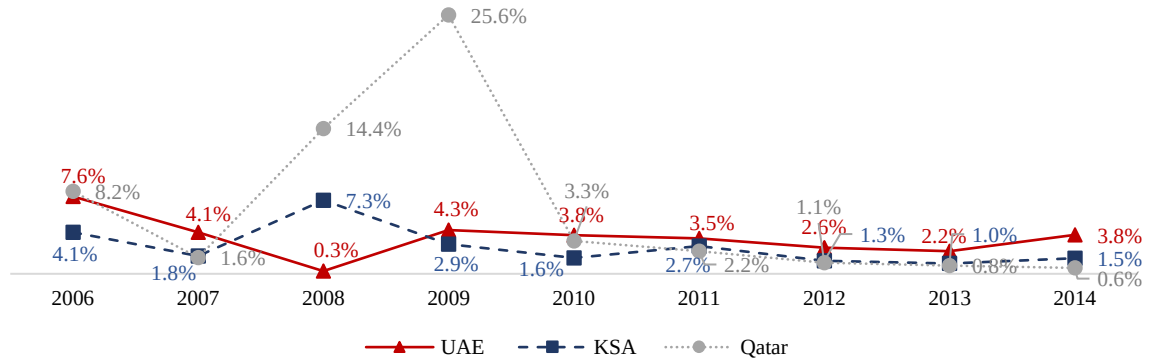
Figure 3.2 represents FDI inflows in UAE, KSA and Qatar as proposition of the country GDP and it indicates the significance of FDI inflow has increased in the mentioned countries. FDI flows to UAE has the biggest proportion percentage of it GDP during the period 2010-2014 by an average of 3.2% compared to KSA and Qatar.

Figure 3.1: FDI in million USD



Data source: fDi Intelligence

Figure 3.2: FDI inflow as a share of GDP

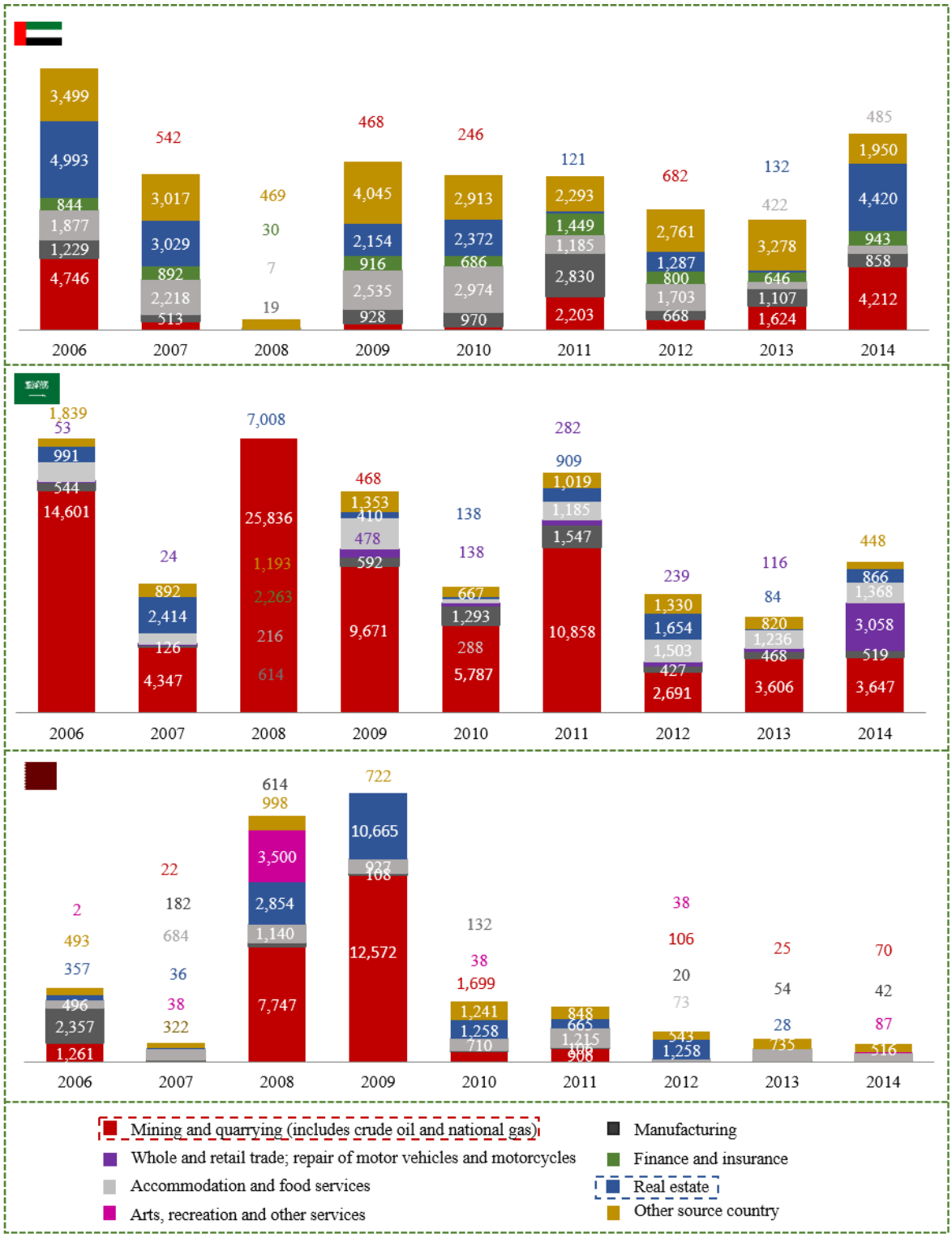


Data source: fDi Intelligence, Federal Competitiveness and Statistics Authority-UAE, General Authority for Statistics –KSA, Ministry of Development Planning and Statistics-Qatar

The UAE, KSA and Qatar are seeking to attract more FDI in order to enhance their progression towards economic diversification. Figure 3.3 shows the evolution of FDI in UAE, KSA and Qatar by economic sector in million USD during the period of 2006-2014 as three charts. Generally, the real estate sector is the most attractive sector for FDI in the UAE, followed by mining and quarrying, accommodation and food services, and the manufacturing sector. The real estate sector has generated the highest number of total jobs and greatest investments with a total of 50,046 jobs and USD 18.50 billion investment. In the KSA, the mining and quarrying sector is the most attractive sector for FDI, followed by the real estate sector, accommodation and food services, and the manufacturing sector. The mining sector has attracted USD 81 billion investment and created the biggest number of jobs with a total of 28,652 jobs. It has the fifth highest number of projects – 101. For Qatar, the mining and quarrying sector also generated the greatest investments, attracting USD 23.4 billion investment. Moreover, this sector saw the second highest number of jobs created, with a total of 8,744 jobs in

wholesale and retail trade and 9,217 jobs in the repair of motor vehicles and motorcycles sector. The mining and quarrying sector has the sixth highest number of projects, 34, in Qatar during the period 2006-2014.

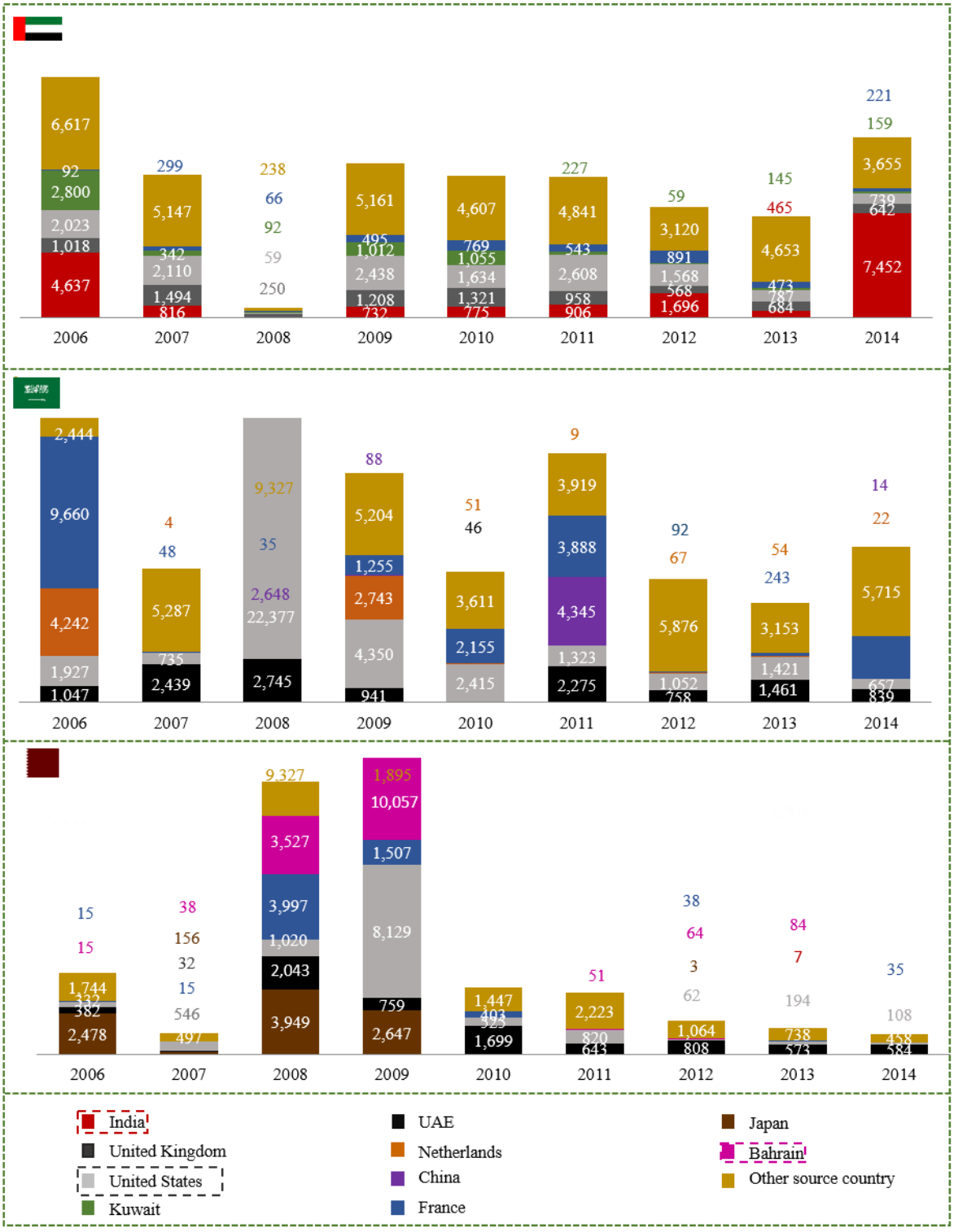
Figure 3.3: FDI by year and sector in million USD



Data source: fDi Intelligence

The following Figure 3.4 shows the FDI by year and the top five FDI source countries in the UAE, KSA and Qatar in million USD. Between 2006 and 2014, for the UAE as a host country, India has the highest total FDI. It invested around USD 7.4 billion in 2014, followed by the United States and the United Kingdom. For KSA as the host destination, the United States has the highest total FDI followed by France and the UAE. In terms of Qatar, the United States and Bahrain are the top source countries followed by Japan. These are all due to the several strong relationships between the countries. Looking at the UAE's relationship with India, the geographical location of these two countries promotes their close economic relationship, as well as their history of trade openness before the 1960s. The UAE maintains a steady and long-standing trade and economic relationship with India, and India enjoys close and multifaceted bilateral ties with the UAE. As real estate is the top sector in UAE's FDI inflows, it continues to attract a lot of investment from Indians. According to Dubai Land Department (2018) Indian investors occupy a leading position among the top nationalities investing in the UAE every year. The United States, first through its oil industry and then through government contacts, established a relationship with Saudi Arabia's founder. American businesses have been involved in Saudi Arabia's oil industry since 1933 and they won a sixty-year concession to explore Saudi Arabia; until today the United States is the largest investor in KSA in the mining and quarrying sector. The United States also has a strong relationship with Qatar, as it is the world's leading exporter of liquefied natural gas, and for that reason the United States is one of the largest investors in Qatar in the mining and quarrying sector.

Figure 3.4: FDI by year and source country in million USD

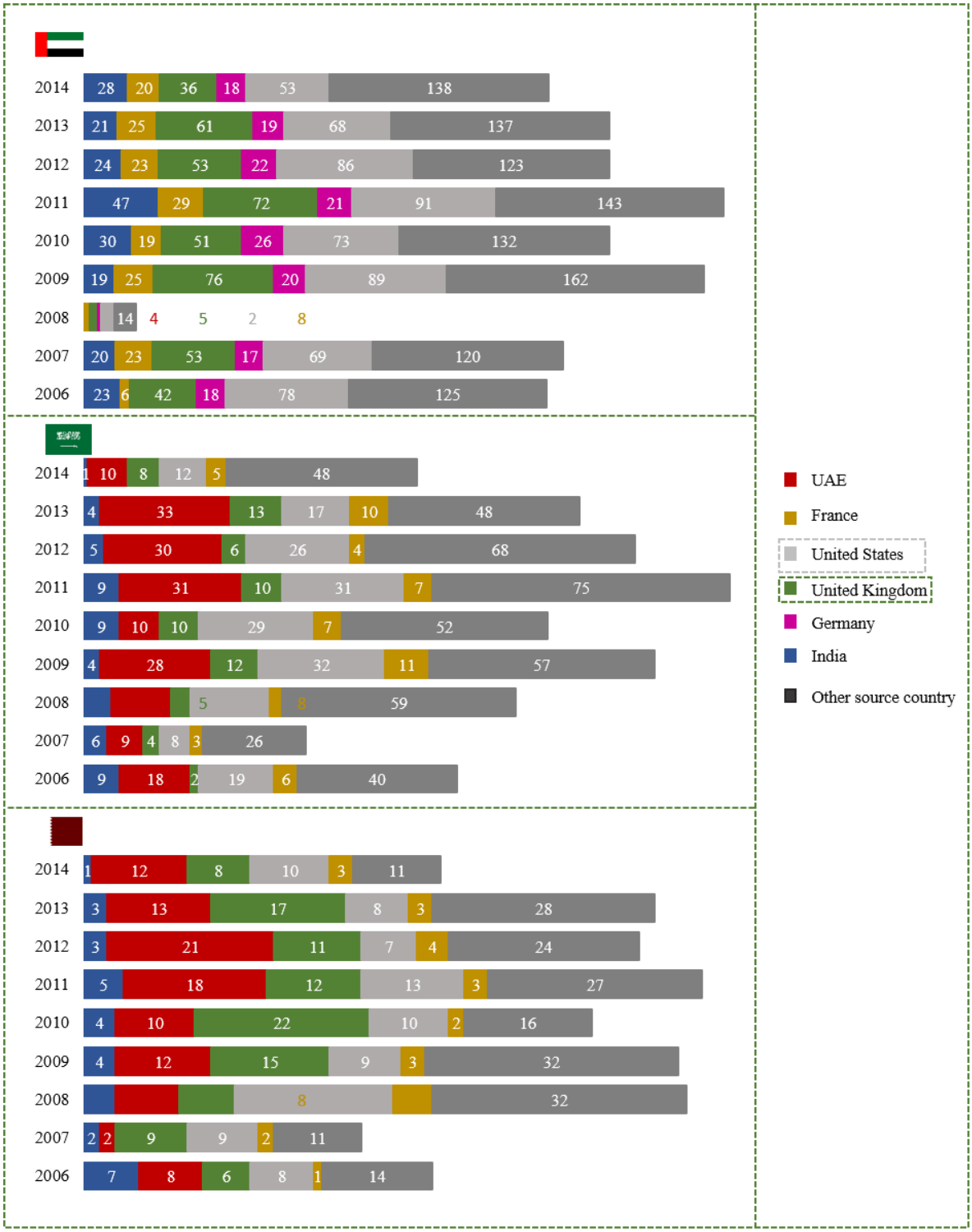


Data source: fDi Intelligence

Figure 3.5 shows the number of FDI projects by year and source country in UAE, KSA and Qatar from 2006-2014. In the UAE, the projects came from a total of 76 source countries, and 80 source countries invested in the KSA. The United States was the top source country for number of projects in these two destinations. FDI projects from the United States were investing in different sectors, but the main investment projects were centred on administrative and support services, manufacturing, and the financial and insurance sector. Moreover, from 2006 to 2014, the United States generated the highest number of total jobs; most of the jobs created were in manufacturing, wholesale and retail trade, the repair of motor vehicles and motorcycles, real estate and the administrative and support services sector in these two destinations as host countries. For Qatar as an attractive destination for FDI projects worldwide, the United Kingdom was the highest source country by the number of FDI projects. It was among the 80 source countries investing in Qatar during the period of 2006-2014, accounting for almost 19.1% of projects tracked and invested in manufacturing, administrative and support services, information and communication, and financial and insurance during the mentioned period of time.

In general, during the period 2006-2014, the number of projects from different source countries in these three destinations countries has increased. The three destinations countries kept attracting a similar range of FDI values from the same source countries that had already invested before. The administrative and support services sector attracted a high number of projects during the period of 2006-2014 with almost the lowest value of FDI in these destination countries. This is due to the needs of this sector, where it is inexpensive to invest.

Figure 3.5: Number of FDI projects by year and source country



Data source: fDi Intelligence

3.3 Conceptual framework

The economic geography theory of FDI searches for success factors in attracting FDI by a given country, region or city in which internationally successful economic sectors operate (Porter, 1990). The gravity approach towards FDI (Isard, 1954) utilises the gravitational force concept as an analogy to explain the volume of FDI among countries and it explores the allocation of FDI through the study of geography, economic or cultural distance. The gravity model is an important and effective tool for explaining FDI between different countries. Jan Tinbergen in 1962 presented the gravity theory between two countries (i the origin and j the destination country), which takes the following form:

$$X_{ij} = G\frac{Y_i E_j}{D_{ij}} \quad (1)$$

Where: X is international flow from i to j (for example: FDI), G is gravitational constant, Y_i is the relevant economic activity mass (for example: GDP, capital, labour, population) at origin i, E_j is the relevant economic activity mass at destination j and D_{ij} is the distance between i and j.

Since Tinbergen's gravity theory was presented, the gravity equation has been one of the most popular empirical tools. It has been widely and successfully used to examine and analyse a wide range of interactions between international economies. The gravity equation assumes that the amount of flow between two locations/destinations increases with their economic sizes and decreases with the costs between them, measured by the distances.

The gravity model has been extensively used. Bergstrand (1985, 1989) explores the theoretical determination of bilateral trade, with regards to which gravity equations are associated with simple monopolistic competition models. Helpman (1987) uses a differentiated product framework with increasing returns to scale to justify the gravity model. Recently, Deardorff (1998) demonstrated that the gravity equation characterises many models and can be justified from standard trade theories.

Researches has focused empirically on illustrating the determinants of FDI and their relationship with FDI using the gravity model approach. The gravity model has been used to study the movements of a wide variety of goods and factors of production across regional and national boundaries under many different circumstances (Oguledo and Macphee 1994). Egger and Pfraffermayr (2004) analyse the relationship of distance as a common determinant of FDI by using the gravity model approach. Frenkel et al. (2004) examine the determinants of FDI inflows into emerging economies by using a panel dataset and a gravity model approach. Kahouli and Maktouf (2015) evaluate the determinants of FDI in 39 host countries during the period 1990-2011 using a

gravity model. Thus, the gravity model has become an appreciated approach to analyse the importance of appealing factors for FDI (Buch et al., 2003).

3.3.1 Empirical evidence on determinants of FDIs

The literature examines a large number of variables that have been proposed to explain the determinants of FDI. Some of these variables are derived from the theories of determinants of FDI, while others are suggested because they make sense intuitively. Existing empirical studies considered different combinations of variables with mixed results. Most of the variables in empirical studies rely on UNCTAD's classification of the determinants of inward FDI. According to the World Investment Report 1998 by UNCTAD, the determinants of FDI in the host country can be classified into three main groups: political factors, business facilitation and economic factors.

Some of the factors affecting FDI inflows are legal and political factors, administrative and institutional factors, economic conditions, and host country policies and strategies. Existing empirical studies summarise the determinants of FDI inflows by bringing in the host country's national economy and its importance Chakrabarti (2001), Banga (2003), Blonigen (2004), Assunçao et al. (2011). In the following section we explain the determinants and their relationship with FDI in a detailed manner.

Government strategy

There are a variety of government strategies focused on FDI and the relationship between FDI inflows in different ways. These government strategies may assist with providing a tactical framework to enhance FDI inflows. A host country needs to analyse its strategies and incentives that focus on FDI, in order to find out how they attract foreign investors and FDIs. Not only that, but foreign investors naturally prefer to see how a host country's strategies affect FDI inflows. There are several government strategies that focus on FDI: strategy by sector, strategy by source country and strategy based on 100% ownership incentive.

These three strategies are the main government strategies of FDI in our host countries. The governments of the UAE, KSA and Qatar have specialised in adopting these strategies and praised their importance in attracting FDIs. Each of these governments has selected sectors that are a priority for foreign investment and called them strategy sectors. They also priorities a list of source countries for FDI and call them strategy source countries. In terms of the incentives, these host countries provide 100% ownership for foreign investors, which is rare for a developing host country to provide. These government strategies have never been measured and tested as determinants of FDI, although they can be seen as an advantage in attracting FDI.

We distinguish and identify host countries government strategies based on their FDI strategy by sector, by source country, and by the government law of 100% ownership for foreign investors. These variables investigate the direction of the government strategy and its relationship with FDI inflows.

Market size

Empirical literature on the determinants of FDI has shown that market size is one of the most important determinants of FDI (Wheeler and Mody, 1992; Krugell, 2005; Asiedu, 2006; Cleeve, 2008; Tintin, 2013; Kahouli and Maktouf, 2015; Wach and Wojciechowski, 2016), indicating a positive relationship with FDI inflows. Market size is defined as the GDP of the host countries. It is accepted that the size of the market is significant in terms of economies of scale due to resource utilisation and exploitation (Chakrabarti, 2001). The most common argument for the relevance of market size and growth in attracting FDI goes like this: a large domestic market size generates economies of scale, while a growing market improves the prospects of the market potential (Tsai, 1994). Thus, an economy with a large market size should attract more FDI and countries that have high and sustained growth rates should receive more FDI inflows than volatile economies.

Bevan and Estrin (2004) focus on determinants of FDI across Western countries between 1994 and 2000 by using the gravity model. They state that market size as measured by GDP is a key determinant of FDI inflows, through the use of panel datasets of bilateral flows of FDI. They were mainly interested in countries in the European Union, particularly Eastern and Central European countries. The results revealed that FDI is positively related to the host country and source GDP.

Morris and Jain (2016) analysed the connection between Outward Foreign Direct Investment (OFDI) stocks, investigating 34 OECD source and 160 host countries. The gravity model variables were used to explain the variation in the OFDI stock. The variables included population of the host country as market size. This factor has a significant relationship with FDI. Sethi et al. (2003) consider population as a pull factor of FDI inflows into the United States, and find a positive significant relationship.

Macroeconomic stability

Inflation, government expenditure and value added are used to measure macroeconomic stability. An economy with a great record of financial stability, managing inflation and interest rates will gain foreign investors' confidence and attract FDI, since countries with a high inflation rate are considered risky for investment. As a rule, the higher the rate of inflation, the more discouraged the FDI decision maker is to engage in the economy (Al-Sadig, 2009). The reason for this is that the

anti-inflationary policies that demand a contractionary related obstruct the company's income generation opportunities. Thus, price stability is important to foreign investors. Empirically, Asiedu (2006) and Schneider and Frey (1985) use the inflation rate as a proxy for economic stability, finding a significant and negative relationship with FDI inflows. Cleeve (2008) measures macroeconomic instability by means of nominal exchange rates and unemployment and finds a significant and positive influence on FDI inflows.

Labour costs

Labour costs are frequently considered to be among the key economic variables in the discussion of the determinants of FDI and the investment location decisions of firms (e.g. Havlik, 2005a). It has been suggested that s labour-cost-related factor should be included in an empirical study explaining FDI flows (Fontagné and Mayer, 2005). Bevan and Estrin (2000) use a panel data set of FDI flows from 18 source countries to ten European countries from the period of 1994 to 1998. The study finds that FDI inflow is positively and significantly affected by labour costs. Similarly, Carstensen and Toubal (2004) use the GMM technique and find that determinants of FDI such as labour costs are important for FDI inflows. Chakrabarti (2001) states that wage as an indicator of labour cost has been found to be an important factor of the determinants of FDI, ranging from higher host country wages discouraging the inflow of FDI to having no significant or positive relationship. Lower labour costs reduce the cost of production, all other factors remaining unchanged (Schneider and Frey, 1985). However, rather than just considering low wages, it is important that wages reflect productivity (Krugell, 2005). It is generally believed that highly educated personnel are able to learn and adopt new technologies faster, and the cost of retraining is also less (Pigato, 2001). Thus, countries with a large supply of cheap but skilled human capital attract more FDI.

Openness

Generally, the ratio of foreign trade volume (exports + imports) to GDP is an important indicator of the degree of openness of a country. The more the economy is engaged in international trade activity, the more it will succeed and attract FDIs. Trade allows the transfer of host country information to foreign investors. Then, trade transactions may directly generate cross-border FDI inflows. The more open the economy and the easier the trade, the more the country attracts foreign investors (Blomström and Kokko, 1997). Mexico drew in FDI, despite trade and investment liberalisation, which led many other developing countries to open up their economies (Nunnenkamp, 2002). Ang (2008) studies the determinants of FDI in Malaysia and concludes that trade openness promotes FDI inflows. The finding on the relationship between trade openness and FDI is also consistent with the studies by Tintin (2013) and Sfar and Mtar (2015). On the other hand, Cleeve (2008) finds an

insignificant link between openness and FDI. Chakrabarti (2001) measures openness by the ratio of exports plus imports to GDP, and points out that there is mixed evidence concerning the significance of openness in determining FDI.

Infrastructure

The availability and quality of infrastructure is an essential factor for the smooth functioning of foreign firms. Foreign investors are expected to prefer a host country with developed and well-established infrastructure. Strong economies provide a competitive advantage for infrastructure investment such as transportation and communication. According to Asiedu (2004), better infrastructure would significantly reduce the overhead costs and would thus positively affect investor decisions in terms of the location (Shah and Ahmed, 2003).

Shah (2014) uses annual data for a panel of 90 developing countries over the years 1980-2007 and examines the significance of the availability of good infrastructure within a developing host country for attracting overseas investors by using a linear regression model. The author measures infrastructure through telephone density, which positively influences overseas investor's location choice, and finds that the availability of infrastructure positively attracts overseas investors. Sfar and Mtar (2015) use a gravity model to identify the determinants of FDI within Tunisia. The econometric estimation reveals that the infrastructure factor attracted FDI within Tunisia from 1980 to 2013.

Investment incentives - Tax

Another element affecting FDI inflows is investment incentives – tax. For tax competition, there is an obvious hypothesis that higher taxes discourage FDI. Governments must induce tax distribution in such a way that it attracts FDI. The empirical literature remains indecisive with regard to whether FDI is sensitive to tax incentives.

Some studies find that host country corporate taxes have a significant negative relationship with FDI inflows. Others report that taxes do not have a significant relationship with FDI. Cassou (1997) and Kemsley (1998) find that the host country's corporate income taxes have a negative relationship on attracting FDI inflows. Peter and Kiabel (2015) examine the relationship of tax incentives on Nigerian FDI by taking annual tax revenue as a percentage of GDP. They find that the tax incentive is negatively significant. Ang (2009) concludes that a higher corporate tax rate dampens the relationship with FDI inflows. Nevertheless, Jackson and Markowski (1995) examine the relationship of tax on FDI, by considering two variables of taxes: corporate profit taxation and capital gains taxation. They conclude that taxes do not have a significant relationship with FDI. Similarly, Root and Ahmed (1979), Porcano and Price (1996) and Gastanaga et al. (1998) conclude that taxes

do not have a significant relationship with FDI flows. Wheeler and Mody (1992) measure investment incentives by means of corporate taxation, and state that corporate taxation plays a minor role in the decision regarding FDI location and has an insignificant relationship with FDI flows. These different results may be due to the way of measuring the tax.

Corruption

Dunning (2001) argues that the level of corruption is becoming an important factor that influences the location of foreign firms' FDI inflows. Al-Sadig (2009) and Asiedu (2006) use the International Country Risk Group (ICRG) corruption index and find that corruption has a significant and harmful relationship with FDI inflows. Morrissey and Udomkerdmongkol (2012) approach corruption from another perspective in terms of absence of corruption and control of corruption; their findings also indicate a significant and positive relationship with inward FDI, which confirms the previous findings. The empirical literature reached a clear agreement regarding the role of corruption to the FDI inflows.

Government regulations

In the institutional theory, the regulatory quality of the government is seen as a created asset in the host countries (Dunning, 2001). Regulatory quality[3] captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development (World Bank - Worldwide Governance Indicators, 2018). Government economic regulation is one of the policy decisions that matters the most for the functioning of an economy. It concerns the extent of a country's intervention in the market economy. A major impetus in the trend towards a stable regulatory quality has been its connection to economic outcomes, such as the intensity of foreign investors' participation and FDI inflows into an economy. The empirical literature on government regulation that fits into the constraints of this study is limited. In spite of that, Morrissey and Udomkerdmongkol (2012) show the importance of regulatory quality, finding a

[3] Regulatory quality has been measured by considering many representative and non-representative sources. Representative sources are: Unfair competitive practices, Price controls, Discriminatory tariffs, Excessive protections, Discriminatory taxes, Burden of government regulations, Extent and effect of taxation, Prevalence of Trade Barriers, Intensity of Local Competition, Ease of starting a new business, Effectiveness of anti-trust policy, Stringency of environmental regulations, Investment freedom, Financial freedom, Ease of starting a business governed by local law?, Ease of setting up a subsidiary for a foreign firm?, Share of administered prices, Investment profile, Regulatory burden, Tax inconsistency. The non-representative sources are: Trade policy, Regional integration, Business regulatory environment, Business regulatory environment, How problematic are labor regulations for the growth of your business? How problematic are tax regulations for the growth of your business?, How problematic are customs and trade regulations for the growth of your business? Business regulatory environment, Trade policy.

significant and positive relationship between regulatory quality and inward FDI into 46 developing countries. A high regulatory quality attracts higher FDI inflows.

3.3.2 Empirical evidence on zero trade flows and the estimation models

Interest in recent years has focused on developing estimation methods to accurately predict trade flows. The gravity model explains trade relationships well, but there are still important questions to be answered with regard to the proper estimation techniques that would give reliable estimates when there are many zero observations in the dependent variable.

In the next section, we look at how recent theoretical developments in the trade literature account for the existence of zero trade flows, provide a brief summary of Heckman sample selection model and other estimation methods (OLS and PPML) as used in this study as robustness check and review related empirical literature.

The Heckman sample selection model

Some solutions have been proposed such as selection models with a two-stage estimation procedure, where the first-stage estimates the amount of zeros in the system, and the second stage subsequently estimates the bilateral trade values.

For addressing the zero trade flow issue is to use a sample selection model, such as the Heckman model. Heckman (1979)[4] two stage selection correction: 1) an equation for selection into trade partners in the first stage; 2) a trade flow equation in the second).

Linder and Groot (2006) use the sample selection model and find that the information provided by the zero value trade observations, while arbitrary truncating and censoring (OLS estimator), are ad-hoc crude methods, and that they give less accurate results than the sample selection model. Linders and de Groot (2006) observe that the sample selection model, which has been widely used in other fields of applied economics, is rather novel to the literature on bilateral trade. Because the sample selection model offers a theoretically sound and econometrically elegant solution for including zero trade flows in the gravity model of bilateral trade, it deserves more attention in applied work. In other word, Linders and de Groot (2006) concluded that the sample selection model is theoretically sound and offers an econometrically elegant solution to estimating a gravity equation that includes zero trade flows.

[4] See Heckman J. (1979)

The Heckman solution to the gravity econometric model retains the log linear transformation of the model and treats zero trade values as censored observations. The Heckman sample selection model consists of a sample selection (first equation) and an outcome equation (second equation). Consider the following sample selection equation:

$$Y_{ijt}^{*} = \alpha_0 + \alpha_t + \alpha_i + \alpha_j - \delta_3 lnD_{ij} + u_{ijt} \quad (2)$$

$$lnT_{ijt}^{*} = \alpha_0 + \alpha_t + \alpha_i + \alpha_j - \beta_3 lnD_{ij} + \varepsilon_{ijt} \quad (3)$$

Where Y_{ijt}^{*} is a latent variable and it is deciding whether or not bilateral trade between two countries i and j in the sample is observed and lnT_{ijt}^{*} determines the logarithm of the volume of bilateral trade. u_{ijt} is the error term associated with the selection process. We do not observed Y_{ijt}^{*} in the selection equation and the logarithm of the volume of trade lnT_{ijt}^{*} in the outcome equation.

We do observe; Y_{ijt} = 1 if $Y_{ijt}^{*} > 0$; and Y_{ijt} = 0 if $Y_{ijt}^{*} \leq 0$; and $lnT_{ijt} = lnT_{ijt}^{*}$ if $Y_{ijt}^{*} > 0$ and lnT_{ijt} is not observed if $Y_{ijt}^{*} \leq 0$.

The Heckman model requires that error terms u_{ijt} and ε_{ijt}, i = 1,…, N have a bivariate normal distribution with zero means, standaer deviation σ_u and σ_ε and correlation ρ

$$\begin{bmatrix} u_{ijt} \\ \varepsilon_{ijt} \end{bmatrix} \sim \mathrm{N}\left\{ \begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \rho\sigma_u\,\sigma_\varepsilon \\ \rho\sigma_\varepsilon\,\sigma_u & \sigma_\varepsilon^2 \end{bmatrix} \right\} \quad (4)$$

The Heckman model can be estimated by the two-step procedure as suggested by Heckman (1979) or the one-step maximum likelihood estimation. Which the one-step approach estimates the selection and outcome equation simultaneously. Whereas, the two-step procedure first estimates the bivariate selection equation using a probit model and generates the inverse of the Mills ratio:

$$\lambda(\alpha_u) = \frac{\phi\left[\frac{\alpha_0+\alpha_t+\alpha_i+\alpha_j-\delta_3 lnD_{ij}}{\sigma_u}\right]}{\Phi\left[\frac{\alpha_0+\alpha_t+\alpha_i+\alpha_j-\delta_3 lnD_{ij}}{\sigma_\varepsilon}\right]} \quad (5)$$

Where ϕ and Φ are the standard normal density function and the cumulative distribution function, respectively. The $\lambda(\alpha_u)$ is then included as an additional regressor, allowing the parameters β of the outcome equation to be consistently estimated by the OLS method.

Liu (2009) argues that since the Heckman gravity model adopts the log linear specification as the conventional OLS estimation, it is still subject to heteroskedasticity due to the Jensen's inequality problem raised by Santos Silva and Tenreyro (2006).

The advantage of the Heckman model is that it can deal effectively with the zero trade observations and also allows researchers to distinguish the relationship of bilateral barriers on the extensive as well as the intensive margins of trade (Linder and Groot (2006). A small number of bilateral trade studies using both the two-step Heckman estimation approaches have been carried out by economic researchers (Linders and Groot, 2006; Helpman et al., 2008).

Helpman et al. (2008) use a Heckman-type selection model that is derived from theory and accounts for firm heterogeneity and fixed trade costs that predict zero trade flows by allowing all firms in country j to choose not to export to country i if it is not possible for any firm in country j to make a profit shipping to country i. In other words, the model allows both positive and zero trade flows between countries to be predicted and it also allows exports to vary according to the destination country. Alternatives such as zero inflated models deliver biased results. Helpman et al. (2008) go on to argue that the standard Heckman (1979) correction is valid in a world where firm heterogeneity is not correlated with the export decision. The implication is that all firms are identically affected by trade barriers and country characteristics; assumptions that seem reasonable for our empirical model. We are applying the Heckman estimator in this study.

The log-linearizing model and OLS (used as robustness check)

By the presence of zero trade flows in the trade dataset and by using the gravity model, these zero trade flows imply both theoretical and methodological problems, especially in cases where the presence of such zero values is excessive. The logarithmic transformation of the dependent variable is therefore problematical least in cases in which the zeros contain relevant information. From that, the logarithm of zero is indeterminate or not feasible.

Common literature practices employed to deal with the problem of zero observations in the data are the truncation and censoring methods (Linders and Groot, 2006; Gomez-Herrera, 2013; Kareem, 2014), and afterwards applying linear estimation techniques. With regard to the truncation method, the zero value observations of trade flows are dropped completely from the trade data, while in the censoring method the zero observations are replaced by a small positive number. These two methods have no strong theoretical or empirical justification, reduce efficiency due to the loss of information and may lead to biased estimates due to the omission of data. Furthermore, as Westerlund and Wilhelmsson (2011) and Eichengreen and Irwin (1998) point out, the elimination of trade flows when zeros are not randomly distributed leads to sample selection bias. Linders and Groot (2006) and Burger et al. (2009) find inconsistent estimates. In addition, Flowerdew and Aitkin (1982) find sensitive results to small differences in the constant substituted, which can result in distortion in the outcomes.

From the above and to avoid the problem of dropping zero observations and to use this estimator as a robustness check, we are replacing the zero observations in our dependent variable with a small number, which is one (Linnemann, 1966; Wang and Winters, 1991; MacCallum, 1995 and Raballand, 2003) and log the dependent variable - this estimator is the only in this study that we replaced the 0 observations 1. We use this estimator in our study as a robustness check.

The Poisson model - PPML (used as robustness check)

Attention has been given to PPML while modifying it for the gravity model. Silva and Tenreyro (2006; 2011) advocate a PPML estimator to deal with the zero trade flows, heteroscedasticity and the logarithm transformation. In the presence of zero observations, as well due to the logarithm transformation of the gravity equation, OLS for both truncated and censored OLS are inconsistent and would have a large bias (Silva and Tenreyro 2011).

To avoid the OLS problem with regard to the logarithm transformation, Silva and Tenreyro (2006) suggest PPML as its take of observed heterogeneity. Moreover, the fixed effects PPML estimation technique provides a natural way of dealing with zero trade flows because of its multiplicative form. Additionally, they argue that the PPML estimator does not need to be log linearised and this estimator is the best performing estimator that naturally deals with zero trade flows consistently as well as giving the lowest bias among the other estimators.

Burger et al. (2009) note that the model is vulnerable to the problem of over-dispersion in the dependent variable and excess zero flows. They suggest that the model only considers observed rather than unobserved heterogeneity and that this is an important limitation of the PPML model. From here, Sliver and Tenreyro (2011) find that PPML is consistent and generally well behaved even in the presence of over-dispersion in the dependent variable, and the predominance of a large proportion of zero observations does not affect its performance. In addition, Sören and Bruemmer (2012) find that the PPML estimator performs quite well under over-dispersion and the authors show that the PPML is well behaved under bimodal distributed trade data. In other words, PPML is well behaved in a wide range of situations and is resilient to the presence of a specific type of measurement error of the dependent variable.

In this study as a robustness check estimator as well, we present the simulation evidence on the performance of the PPML estimator when the data are generated by a constant elasticity model, the dependent variable has a large proportion of zeros, and the probability of observing a zero varies with the regressors. We employ PPML in this study as robustness check.

Researchers have dealt with trade values of zero in many ways; every method has advantages and disadvantages and it cannot be asserted that any one of them absolutely outperforms the others. For that reason, it has become a frequent practice in the literature to include several estimation methods for the same database. In this study, we are focusing on the Heckman sample selection model (Emlinger et al., 2008; Disdier and Marette, 2010; Jayasinghe et al., 2010) and using OLS (McCallum, 1995; Raballand, 2003) and PPML (Silva and Tenreyro, 2006; Martin and Pham, 2008)

3.4 Empirical specification

This study aims to examine what factors influence the allocation of FDI in three host countries (UAE, KSA and Qatar) and in each 14 sector grouped into 3 categories: (primary, secondary and tertiary) over the period 2006 -2014. The factors are classified as government strategy, market size, macroeconomic stability, labour costs, openness, infrastructure development, tax incentives, corruption, and government regulations. There are the three GCC countries, and 66 source countries worldwide that are grouped into 6 source regions (Asia, Africa, Europe, North America, South America and Australia). We are going to use three different estimation techniques (OLS, PPML and Heckman) to investigating the performance of these estimators.

3.4.1 Data

Refer to Table 3.1 in terms of variables' definition and expected sign. The three destination countries of the GCC are: UAE, KSA and Qatar. The 14 sectors are classified as a classic breakdown to three main activities of economic sectors in our estimations. First, primary sector, which includes mining and quarrying (includes crude oil and natural gas). Second, secondary sector contains (1) manufacturing, (2) electricity, gas, and water supply; waste management, and (3) construction. Third, is the tertiary sector, which consists (1) wholesale and retail trade; repair of motor vehicles and motorcycles, (2) transportation and storage, (3) accommodation and food services, (4) information and communication, (5) financial and insurance, (6) real estate, (7) administrative and support services, (8) education, (9) human health, and (10) social work arts recreation services. The 66 source countries are grouped as 6 regions; (1) Asia: Azerbaijan, Bahrain, Bangladesh, China, Hong Kong, India, Iran, Iraq, Japan, Jordan, Kazakhstan, Kuwait, Lebanon, Malaysia, Nepal, Oman, Pakistan, Philippines, Singapore, South Korea, Sri Lanka, Syria, Thailand, Turkey. (2) Africa: Egypt, Ghana, Morocco, Nigeria, South Africa, Togo, Tunisia. (3) Europe: Austria, Belarus, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Finland, France, Germany, Greece, Hungary,

Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Russia, Spain, Sweden, Switzerland, United Kingdom, Ukraine. (4) North America: Bahamas, Canada, Mexico, United States. (5) South America: Argentina, Brazil. And (6) Australia: Australia and New Zealand.

Data regarding the host country level, sectoral level and year ikt are FDI (FDI), value added (VA), capital - GFCF (K), worker wages(W), openness(OPN), strategic sector(GSS) and strategic government 100% ownership for foreign investors (GSW). Data in host country level for each year it are: native population (POP), expenditure(EXP), internet (INT) and infrastructure($INFR$). Data in source country level for each year jt are GDP(GDP) and openness(OPN). And data combines both host and source country per year ijt are: inflation(INF), investment incentives – tax(TAX), corruption(COR), government regulations ($GREG$), strategic source(GSR), distance to technology(TFP), and distance to business(DTF).

One of the determinants of FDI category in this study is the government strategy which includes three variables:(GSS),(GSR), and (GSW). The purpose of measuring and constructing these variables is to investigate the host countries government strategies in attracting FDI per their priority of sectors, source country and the effectiveness of allowing the law of 100% ownership for foreign investors as they planned within their needs of FDIs to diversify their economies away of oil. These variables will reflect the government strategy in attracting FDI and FDI law as a pull factor of FDI and in existing literature no studies have linked government strategy as one factor of determinants of FDI. For the strategic sector(GSS) variable, from the host countries government strategies 2030, we focus on the main sectors that these host countries prioritized and mentioned them in their government strategy 2030 of attracting FDIs. UAE's government strategy selected priority sectors to attract FDI. These sectors are: manufacturing, construction, real estate, human health, wholesale and retail trade; repair of motor vehicles and motorcycles, financial and insurance, tourism, and information and communication. In the KSA host country, sectors selected by the government's strategy to attract FDI are: manufacturing, human health and social work, transportation and storage, education, wholesale and retail trade; repair of motor vehicles and motorcycles, financial and insurance, information and communication and real estate. For Qatar, the priority sectors selected by the government's strategy to attract FDI are: real estate, wholesale and retail trade; repair of motor vehicles and motorcycles, financial and insurance, manufacturing and information and communication. For strategic source (GSR) variable, as UAE is the only host country from the selected host countries has prioritized and identified in its government strategy specific foreign investments countries list as source countries of FDI inflows to the UAE, we construct the FDI inflows into UAE as a host country from the period 2006-2014 from country: United States, Argentina, Brazil, Canada, Turkey, Germany, India, China and South Korea. For strategic

government 100% ownership for foreign investors (GSW) variable, the selected host countries have different incentives and subsidies they offer to attract FDIs especially the foreign ownership. The foreign ownership law has been allowed in different years and selected different sectors in our host countries. From this variable we are trying to assess the effectiveness of this FDI law of ownership among the three host countries. We construct for the UAE as a host country on all of the 14 sectors from year 2010 to 2014, and Qatar as a host country on the sector: mining and quarrying (includes crude oil and natural gas), manufacturing, human health and social work, electricity, gas, and water supply; waste management, and construction, education, accommodation and food services on year 2000 to 2014, real estate, information and communication, financial and insurance on year 2004 to 2014, social work arts recreation services, administrative and support services on year 2010 to 2014, and KSA as a host country in wholesale and retail trade; repair of motor vehicles and motorcycles sector since 2016, manufacturing from 2015 which based on our dataset that is from 2006 -2016; KSA has no ownership allowed for foreign investors for any sectors from 2006 – 2014.

In terms of gravity model to predict distance, as the distance between origin, we look at two different criteria of distance that illustrate the attractiveness of FDIs to the host country during the period 2006-2014, we construct two main distance variables: first, distance technological to frontier (TFP) to captures the technology transfer from the origin distance to the selected host countries, which host countries are able to import and exploit the technologies developed from the advanced source countries (Gerschenkron, 1962). We measure (TFP) by calculating the TFP for host and source country and then take the ratio of host country TFP to source country TFP. The second variable is distance to business (DTF) which demonstrates the start business performance and the gap between host country economy's performance and the best performance of the source country. Moreover, its measure complements the annual ease of doing business ranking, which compares host country economies with one another of source country economy at a point in time, we measure (DTF) by taking the ratio of source country DTF to host country DTF. Measurements and calculations precisely of all variables used in the main model in this study are reported in Table 3.1 as well as the same table represents the expected signs of each variable.

FDI data obtained from the fDi Intelligence, other host and source countries data are gained from Federal Competitiveness and Statistics Authority – UAE, Ministry of Development Planning and Statistics – Qatar, General Authority for Statistics – KSA, Ministry of Finance in the UAE, KSA and Qatar, KPMG's corporate tax table and the World Bank. As data on value added (VA) (2000 base year AED, Saudi Arabia Riyal – SAR, and Qatar Riyal - QAR), and GDP and GFCF for the source countries attained from the World Bank's World Development Indicators (Constant 2005 USD). The dataset is from the period of 2006-2014.

Data in local currency – AED have been converted to USD using fixed exchange rate (1 USD = 3.67 AED), for Qatar (1 USD = 3.64 QAR), for KSA (1 USD = 3.75 SAR) and then deflated by GDP– value added, adjusted all variables to have 2006 values. Data are between lagged to avoid problems of endogeneity and taken in their natural logarithms to reduce the problems of heteroskedasticity to the maximum possible extent.

Table 3.2 below represents descriptive statistics for each variable used in the empirical estimation including number of observations, means, standard deviations, and minimum and maximum values. From the observations, the highest FDI inflow is in KSA in 2008 in mining and quarrying sector from USA. Highest worker wages in Qatar in 2011 especially in electricity, gas, and water supply; waste management sector. In terms of inflation, Qatar has the highest inflation rate in 2008 and the UAE has the highest trade openness in 2008. Looking at the capital, Qatar is the highest in 2014 in mining and quarrying sector and KSA is the lowest capital in 2006 in social work arts recreation services sector. Highest internet in Qatar in 2014 but KSA is the lowest in 2006. Infrastructure has the highest in the UAE and lowest in Qatar in 2007. Looking at the tax rate, KSA is the highest tax rate from the period 2006 to 2014 and the UAE has the lowest tax rate. UAE has the highest TFP in 2011 and distance to business in 2010, and Qatar is the lowest in 2006 in value added and TFP. FDI has a maximum value of 20577.8 while its minimum value is 0. Qatar has the minimum native population 209120 and KSA has the maximum of the destination native population 20800000. For destination countries' corruption, the minimum is -0.37 and the maximum is 1.72 and in regards the source countries' corruption, the minimum is -1.58 and the maximum is 2.56. Our destination countries are less weak governance performance compared to the source countries. Similarly, to destination countries' regulations the minimum is -0.06 and the maximum 0.98 and for source countries' regulations the minimum is -1.73 and the maximum is 2.23.

Table 3.2: Descriptive statistics

Category	Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
	FDI	24,948	9.893327	193.7375	0	20577.8
Business Strategy	Strategic sector	24,948	0.476191	0.499443	0	1
	Strategic source	24,948	0.035354	0.184676	0	1
	Strategic 100% ownership	24,948	0.425926	0.494493	0	1
Market size	Destination native population	24,948	6758117	8644459	209120	20800000
Macroeconomic stability	Destination inflation	24,948	5.493761	11.33025	-24.2181	22.89956
	Source inflation	24,654	5.786706	9.325484	-25.1281	103.8228
	Government expenditure	24,948	324688.9	318940.2	15825	1109903
	Value added	24,654	0.382099	2.144094	3.65E-05	102.8119
Labour cost	Worker wages	24,948	0.072939	0.159652	0.000479	1.253073
Openness	Destination openness	24,948	543803.1	1363885	0.005998	9821988
	Source openness	24,654	0.038711	0.127006	6.99E-06	2.364503
Infrastructure	Capital	24,948	4311.167	5460.077	18	32651.04
	Internet	24,948	58.8162	19.83161	19.45955	91.49
	Infrastructure	22,176	5.421669	0.667331	4.368683	6.5
Investment incentive – Tax	Destination tax rate	24,948	-7.6847	19.72858	-55	35
	Source tax rate	24,948	24.35234	9.065477	0	55
Corruption	Destination corruption	24,948	0.740741	0.612995	-0.37	1.72
	Source corruption	24,948	0.410051	1.130167	-1.58	2.56
Government regulation	Destination regulations	24,948	0.432963	0.287418	-0.06	0.98
	Source regulations	24,948	0.507576	0.951109	-1.73	2.23
Gravity model distance	Technology to frontier TFP	24,948	0.487382	0.244595	0.049002	1.770529
	Distance to business	24,948	0.973612	0.174726	0.539972	1.401985
Select	Destination distance to business	24,948	69.20933	2.751759	64.48	75.26
	Source distance to business	24,948	67.29209	11.84118	38.23	91.24
	Asia	24,948	0.363636	0.481055	0	1
	Africa	24,948	0.106061	0.307921	0	1
	Europe	24,948	0.409091	0.491676	0	1
	North America	24,948	0.060606	0.238611	0	1
	South America	24,948	0.030303	0.171423	0	1

3.4.2 Empirical model

In this study, we have a collected number of variables and our aim is to empirically evaluate their relationship with FDI inflows. We begin with the following multiplicative gravity equation:

$$Y_{ijkt} = \varphi S_{ijkt} + \beta X_{it} + \gamma M_{ijt} + \delta L_{ikt} + \theta O_{ijt} + \vartheta I_{ijkt} + \rho T_{ijt} + \sigma C_{ijt} + \tau R_{ijt} + \omega Z_{ijt} + \alpha_i + \delta_j + \lambda_k + \nu_t + \varepsilon_{ijkt} \quad (6)$$

Where (for more clarification in the definition for the observation, refer to Table 3.1):

Y = amount of FDI inflow in million USD per $ijkt$ - (FDI),

S = government business strategy measured by government strategic sector that calculated as dummy variable per ikt - (GSS) , government source country which calculated as dummy variables per ijt - (GSR) and government strategic 100% ownership which is also calculated as dummy variable per ikt - (GSW),

X = market size measured as number of local population per it - (POP),

M = macroeconomic stability measured by inflation, GDP deflator (annual %) per it - (INF) and government expenditure of consumption of fixed capital in million USD per it - (EXP), value added that calculated as the ratio of value added in million USD per jkt to GDP in million USD per it - (VA),

L = labour cost measured by the ratio of wages in monthly average to number of workers per ikt - (W),

O = openness measured as the ratio of exports plus imports to GDP per ijt - (OPN),

I = infrastructure measured by capital which the amount of GFCF in million USD per ikt - (K), internet users per 100 people per it - (INT) , and quality of port infrastructure per it - $(INFR)$,

T = investment incentives measured as corporate tax rates per ijt - (TAX),

C = corruption measured as governance performance of corruption per ijt – (COR),

R = government regulations measured as governance performance of the government regulations per ijt - $(GREG)$,

Z = a group of the gravity model distance variables that run with each determinant category of FDI which include technology to frontier TFP which calculated as the ratio of TFP per it to TFP per jt - (TFP). And distance to business which is the ratio of source country distance to frontier (DTF) to host country DTF per ijt - (DTF).

The subscripts $i, j, k,$ and t denote host country (destination country), source region, sector and year.

To estimate the relationship of determinants of FDI on FDI inflows in the three main host countries, we use fixed effect regressions. α_i is host country fixed effect to control for variables that vary across host country but constant over source region, sector and time, δ_j is source region fixed effect to control for variables that vary across source region but constant over host country, sector and time. λ_k is sector fixed effect to control for variables that vary across-sector within sector category (primary, secondary and tertiary) but constant over host country, source region and time; and ν_t is time fixed effect to control for variables that vary across time but constant across host country, source region and sector.

3.5 Empirical results

The main regression results in Heckman and the OLS as well as PPML are considered as robustness check. The determinants of FDI have a mixed influence on FDI inflows depending on which sector is the destination of FDI.

Table 3.3 reports the estimation outcomes resulting from the Heckman estimator. Table 3.4 represents the results from the OLS estimator and Table 3.5 shows the outcomes on results by using the PPML technique and these two estimators used as robustness check. We add all determinants of FDI variables to avoid bias and conduct joint significance tests, and we compare the results across different estimations. The dependent variable is the logarithm of FDI in OLS and Heckman except for PPML regression, in which this variable is introduced in levels. Overall, the estimation techniques seem to affect the magnitude of the coefficients as well for the sign of the parameters for gravity variables. These different relationships are expected due to the different estimators we used. As expected, business strategy, market size, openness and infrastructure increase FDIs inflow regardless of the estimation method used, while tax, corruption and government regulations reduce FDIs. Gravity variables are also highly significant, and proximity tends to increase FDIs.

One of the most important elements of determinants of FDI that are based on host countries' government strategy plan is a business strategy, which reveals government strategies and their relationship with FDI. By looking at the strategic sector in the three estimations in Table 3.3-3.5, we find that it is positive and significant in all sectors as we expected. This indicates that the strategic

sector has a higher FDI in overage. In Heckman when the business strategy is a strategic sector, the overage of FDI is about 0.64, on average, than it's not a strategic sector. In the OLS estimator, the strategic sector inflows FDI by 0.0594 compared to the non-strategic sector, in PPML the strategic sector compared to the non-strategic sector by 0.0105. The secondary sector has the highest coefficients in all estimators used; it shows as positive significant of government strategic sector in the secondary sector as we expected and has the biggest relationship with FDI, which indicates that the governments' strategies, in terms of their priority sectors in attracting FDIs specifically in the secondary sector from the period 2006-2014, are effective and reflected their needs as they had outlined in their planned strategy.

With regards to UAE government strategy for priority source country to attract FDI from, the variable has a positive significant relationship with FDI inflows in all estimators and sectors as we expected. This means that the strategic source has a higher FDI on average, and this finding indicates that the UAE strategy plan in their selected priority source country to attract FDI from is effective and in line with the government strategy as they had planned, and focusing on these source countries would increase the amount of FDI more than from another source country. Generally, results in the Heckman and PPML estimators show the highest magnitude of strategic source country compared to OLS. In Heckman, a strategic source country compared to a non-strategic source country by 1.1451 in the tertiary sector. Based on the coefficients, North America, Asia and Europe have the highest magnitudes in all sectors. This indicates that attracting FDI from these source countries increases FDI inflows in the UAE in all sectors. This result is in line with UAE's government source country priority strategy plan for attracting FDI. The last variable in the business strategy category is the 100% ownership strategy for foreign investors. This is as we expected and, as the governments planned, positively significant for primary and tertiary sectors in the OLS estimator only. This means that primary and tertiary sectors which allow 100% ownership incentive have a higher FDI on average. Moreover, 100% ownership strategy related with FDI insignificantly in the secondary sector in all estimators used. This indicates the ownership law of FDI needs to be reviewed by the governments, especially as it may diminish the FDI inflows in the secondary sector. Although our host countries allow 100% ownership in the primary, secondary and tertiary sectors, our results do not show any relationship in the secondary sector. Perhaps it is enough to attract FDI in secondary sectors in these host countries, and this incentive of allowing 100% ownership for foreign investors does not promote FDI inflows in the secondary sector as the governments had expected.

Market size variable (native population in the destination country), is negative and significant in all sectors in Heckman while in our robustness check estimators it is a positive and significant in all sectors and especially in the secondary sector in OLS and PPML as we expected with a magnitude of 1.4557 and 16.0803 respectively. This result is in line with Sethi et al. (2003) and Trkulja (2005)

where the market size was population in their studies and found it as having a positive relationship with FDI inflows. An increase in the size of a host country is associated with more FDI inflows. In other words, an increase in the size of the population would increase FDI in secondary sectors more than other sectors as the secondary sector includes manufacturing, electricity, gas and water supply, waste management, and construction. These three sectors would need more investment from foreign investors while the market size of the host county increases.

By considering the relationship between FDI inflows and macroeconomic stability (inflation, expenditure and value added), we have mixed findings on all estimations. Destination inflation is positive in all sectors and source inflation is positive and significant in all sector in Heckman model. By looking at the other estimators; inflation in the destination country is negative and not significant in the secondary sector on OLS and PPML estimations. This result is in line with the empirical findings of Asiedu (2006) who used panel data for 22 countries over the period 1984–2000 and is consistent with Schneider and Frey (1985) who studied 80 less developed countries. The higher the inflation rate, the lower the FDI inflows. The negative relationship between inflation and FDI inflows would be due to the increase in input prices, raw material costs, labour wages, capital costs and land prices. High prices of product adversely affect domestic and foreign demand for commodities. These factors ultimately lead to a reduction in business profits, thus discouraging FDI inflows in a host country which has a high inflation rate. While in primary and secondary sectors, destination inflation in the Heckman estimator is positive. For primary, a 1% increase in destination inflation will lead to an increase of 0.1% in FDI. Similarly, to source country inflation significant in tertiary sector in all estimations, these coefficients of inflation are showing that the increase in consumer prices causes a decrease in inward FDIs. These findings are in line with Anitha (2012) who investigated the relationship of inflation in India with FDI inflows from the period of 2008 – 2012 and found a positive relationship between inflation and FDI inflows. On the basis of these different findings in different sectors, it can be said that the inflow of FDI depends on a number of factors other than inflation and importantly, governments wanting to attract more FDIs have to monitor and manage inflation to encourage foreign investors. Government expenditure in a destination country is significant in Heckman and the value added has a significant relationships in all sectors and estimations. These results indicate a country with a stable economy is one in which foreign investors are considering to invest.

For labour costs as a determinant of FDI, worker wages related to FDI inflows. It appears that worker wages, especially in Heckman and OLS is significant in all sectors which is indicating that the lower wage rate acts as a pull in attracting foreign capital, and a host country with low wages tends to attract more FDIs. This finding is in line with Chakrabarti (2001) who studied 15 developed countries in 21 years and 11 developing countries in 23 years and found that low host country wages

would increase the interest of foreign investors. Comparing Heckman results and other two estimators OLS and PPML, labour costs show different results between negative and positive and between significant and insignificant in various sectors. In Heckman and PPML the worker wage is positive and significant in primary, secondary and tertiary sector, while in OLS is negative and not significant relationship in primary sector as primary sector is controlled by the government and this sector has special restrictions to attract FDI. These destination as host countries are classified as having the highest GDP compared with other countries, so their high labour wages would reduce FDI inflows. Moreover, the availability of FDIs and foreign firms in a host country may affect the domestic labour market by raising the labour demand, thereby bidding up wages. The high wages might reduce FDI inflows. In sum, different results in regards the relationship between worker wage and FDI due to the difference sector, destination countries and technical estimators used. Additionally, the contribution concept of different role of labour input is different due the type of sector.

Moving to openness as one of the pull factors in the determinants of FDI, we can see mixed results. Destination country openness has a negative sign and is significant in primary and tertiary sectors from Heckman (-2.3190, -0.1253 respectively) and PPML (-1.3595, -0.1743 respectively), which can be explained as follows: First, the lower level of trade openness and higher trade protection require the foreign firms to enter the host market via FDIs. Second, our host countries in the study are rich in natural resources, so a large proportion of their exports are resource-intensive products. At the same time, these resource-intensive industries in the host countries are highly regulated by the government as natural monopoly industries. Limited access to foreign capital in these industries results in the negative sign of openness. These results stand in line with Sfar and Mtar (2015) who examined FDI in Tunisia from 1980 – 2013 and revealed the importance of a good trade openness as a determinant of FDI and found as well that the availability of an open economy will attract more FDI from investors.

Infrastructure variables are capital, internet and infrastructure, and the capital used as an alternative proxy of infrastructure is significant with FDI inflow in the secondary and tertiary sectors as expected. This indicates the host country with higher capital would attract higher FDIs. The internet related positively and strongly significant on FDI in Heckman and PPML which supports the evidence that the availability of better internet in a host country leads foreign investors to choose a particular location of the host country to invest in. Infrastructure has a negative sign in the estimations, which implies that a host country with good infrastructure systems tends to attract a greater amount of FDI. These findings in terms of infrastructure are comparable to those of Asiedu (2004) and Sfar and Mtar (2015).These two studies focused on developing countries and found that

the availability of developed infrastructure gives a unique advantage to the host country in attracting FDIs, and this would lead the foreign investors to keep these countries on their priority list.

Investment incentives - tax is one of the determinants of FDI. Mainly, destination tax rate has a significant negative relationship with FDI in all sectors in Hackman and other robustness check estimations. This reflects the findings of Cassou (1997) and Kemsley (1998) who both focused on the United States' taxes and found a negative relationship with FDI inflows. This indicates that a lower tax percentage in a host country would attract more amount of FDIs. For the source country, tax rate related positively and significantly with FDI inflows, and this result indicates that whenever a host country increases its corporate tax rate, investors experience a reduction in their existing after-tax rate of return and start moving mobile capital from their own country to invest abroad in a country with less tax or which has incentives and subsidies for foreign investors in terms of the tax rate.

Now to corruption, in general, when looking at the destination corruption in all sectors in Hackman and other robustness check estimators, we find that destination corruption can have a negative relationship with FDI. A host country with high corruption levels does not seem attractive to foreign investors and FDI inflows because corruption creates a high degree of uncertainty, raises business costs, negatively affecting the return on investment and reducing incentives to invest, and diminishing FDI inflows. This result is in line with Alemu (2012) who used panel data of 16 Asian countries and investigated the relationship between corruption and FDI. The author found that there is a negative relationship between corruption and FDI. Furthermore, this is also in line with Castro and Nunes (2013) after they examined 73 developed and developing countries and found a negative relationship of corruption with FDI and indicated that keeping corruption under control might be an important strategy for increasing FDI inflows. Corruption has no relationship with FDI in all specifications in Heckman and same in PPML. This is in line with Akçay (2001) and Jadhav (2012), who both found that corruption does not have a significant relationship with FDI inflows while other determinants of FDI, such market size, openness, labour wage and tax are the most powerful determinants of FDI in their studied countries.

Demonstrating government regulations as one of the determinants of FDI, destination country government regulations in the Heckman model as well as in OLS estimator are positively significant in all sectors including primary. This finding is in line with Morrissey and Udomkerdmongkol (2012) who used annual aggregate data for 46 developing countries covering the period 1996–2009 to investigate governance regulations' related with FDI. This finding is in line with Fazio and Talamo (2008) who showed that the quality of government regulations, including intervention, price controls, and free movement of capital, boosts FDI inflows. However, a destination country's government regulations are between positive and negative insignificance in all specifications in

PPML estimators. For source country government regulations, there is positive and significant relationship with FDI inflow in all sectors in Heckman. This indicates that the more regulated government regulations, the more FDI inflows. Thus, foreign investors are more likely to invest in countries and sectors that have no manipulation.

From gravity model distance variables, the TFP shows in the Heckman estimator as positive and significant in all sectors' specification and secondary. Similarly to the OLS estimator, the technology to frontier distance is positive and significant in all sectors' specification, secondary and tertiary sector as well, as expected. These results indicate that foreign investors are wanting to invest in great value economies and countries with high technology to reduce costs, as well as great business environments. Higher TFP and greater business performance would attract higher FDIs in the secondary and tertiary sectors, and this is what our host countries prefer as they are aiming to diversify their economy by attracting FDIs in a sector other than primary.

In addition, in Table 3.3 we limit business strategy category by considering strategic sector variable only and all other categories variables by employing Heckman model in all sector. We find that strategic sector, openness and value added are positively significant. Which there results indicate that the more FDI inflows into strategic sector, the more openness trade to international and the more value added; the more FDI inflows to the selected host countries. Moreover, worker wages and destination tax rate are negative and significant, same results as considering all business strategy variables. Which these results indicate that the low average wage and limit taxation, the more FDI inflows to the selected host countries in all sector.

Based on the coefficients, the primary sector has the highest coefficients, which indicates that the availability of the selected determinants of FDI in our selected host countries attracts more FDI in primary sectors. This result is contrary to UAE, KSA and Qatar governments' general plan in terms of its desire to attract FDI to diversify its economies away from the oil and gas sector.

3.6 Conclusion

This study has examined the importance of determinants of FDI and their relationship with FDI inflows and assessed whether our selected host countries' strategic plan has been effective by looking at the strategic plan entailed in identifying priority sectors and priority source countries from 66 source countries grouped in 6 regions to specific 14 sectors classified to three main sectors by types into three allocation of developing countries from GCC (UAE, KSA and Qatar), using panel data from 2006 -2014. The study utilized a gravity model approach, which is considered one of the most successful empirical frameworks in international economics. The empirical study tends to support all categories of determinants of FDIs identified in the literature that help a host country in

attracting FDIs. Our results find that government business strategy, market size, openness and infrastructure are the main and most important determinants of FDI in our selected host countries. The results show that the host countries' government business strategies that related to their priority sectors in which to attract FDI, priority source countries to attract FDI from, and allowing 100% ownership to foreign investors are effective. Moreover, the results also find that from all of the selected determinants of FDI, the coefficients of the primary sector are the highest in attracting FDI compared to the secondary and tertiary sectors. This finding is against these selected host countries' general strategy on attracting FDI, in general, the countries are aiming to attract FDI to diversify their economies away from oil. The governments of UAE, KSA and Qatar need to study and address new policies in this matter.

3.7 Appendix

Table 3.1: Variables definitions and expected signs

Category	Variable	Definition	Expected sign	Source
Dependent variable	Ln FDI	Amount of FDI inflow in million USD per $_{ikt}$ and zeros have been replaced to ones in OLS	Dependent variable	fDi intelligence
	FDI	Amount of FDI inflow in million USD per $_{ikt}$ in PPML		
	Ln FDI	Amount of FDI inflow in million USD per $_{ikt}$ in Heckman		
Business Strategy	Strategic sector	Dummy strategic sector = 1 if UAE and Manufacturing, Construction, Real estate, Health, Trade, Finance, Tourism, and Information and Communication, and if KSA and Manufacturing, Health, Transportation, Education, Trade, Finance, Information and Communication, and Real estate, and Qatar Real estate, Trade, Finance, Manufacturing, and Information and Communication per ikt Note: based on countries strategy plan 2030 that issues on 2004, some of these sectors allow 100% ownership for foreign investors	+	Author calculation based on documents
	Strategic source	Dummy strategic country = 1 if UAE and United States, Argentina, Brazil, Canada, Turkey, Germany, India, China and South Korea per ijt	+	Author calculation based on documents
	Strategic 100% ownership	Dummy of government 100% ownership based on FDI law per country, sector and year of releasing the law of ownership = 1 if UAE on all sectors on year 2010 to 2014, and if Qatar on Mining, Manufacturing, Health, Electricity, Education, Accommodation on year 2000 till2014, Real estate, Information, Finance on year 2004 till2014, Arts, administrative on year 2010 till2014, and if KSA Trade from 2016 , Manufacturing from 2015 per ikt Note: based on KSA FDI law, there is no ownership for any sectors from 2006 - 2014	+	Author calculation based on documents
Market size	Ln Destination native population	Number of local population per it	+	Federal Competitiveness And Statistics Authority – UAE, Ministry of Development Planning and Statistics – Qatar, General Authority for Statistics – KSA
Macroeconomic stability	Destination inflation$_{t-1}$	Inflation, GDP deflator (annual %) per it	+/-	The World Bank
	Source inflation$_{t-1}$	Inflation, GDP deflator (annual %) per jt	+/-	The World Bank
	Ln Expenditure$_{t-1}$	Government expenditure of consumption of fixed capital in million USD per it	+/-	Ministry of Finance – UAE, Ministry of Finance – KSA, Ministry of Finance – Qatar
	Ln value added $_{t-1}$	$Vale\ added_{ijkt} = \left(\frac{Value\ added\ in\ million\ US_{jkt}}{GDP\ in\ million\ US_{it}}\right)$	+	Federal Competitiveness And Statistics Authority – UAE, Ministry of Development Planning and Statistics - Qatar, General Authority for Statistics – KSA, The World Bank
Labour cost	Ln worker wages$_{t-1}$	$W_{ikt} = \left(\frac{Wages\ and\ salaries\ in\ monthly\ average\ _{ikt}}{Number\ of\ worler\ _{ikt}}\right)$	+/-	Federal Competitiveness And Statistics Authority – UAE, Ministry of Development Planning and Statistics – Qatar, General Authority for Statistics – KSA
Openness	Ln Destination openness$_{t-1}$	$DOPN_{ikt} = \left(\frac{Exports+Imports\ _{ikt}}{\mathrm{GDP}_{ikt}}\right)$	+/-	Federal Competitiveness And Statistics Authority – UAE, Ministry of Development Planning and Statistics – Qatar, General Authority for Statistics – KSA
	Ln Source openness$_{t-1}$	$SOPN_{ikt} = \left(\frac{Exports+Imports\ _{jt}}{\mathrm{GDP}_{jt}}\right)$	+/-	The World Bank

Table 3.1 Continued: Variables definitions and expected signs

Infrastructure	Ln capital$_{t-1}$	Amount of GFCF in million USD per ikt	+	Federal Competitiveness And Statistics Authority - UAE Ministry of Development Planning and Statistics - Qatar General Authority for Statistics - KSA
	Ln Internet	Internet users per 100 people per it	+/-	The World Bank
	Ln Infrastructure	Quality of port infrastructure, WEF (1=extremely underdeveloped to 7=well developed and efficient by international standards), per it	+/-	The World Bank
Investment incentives - Tax	Destination tax rate	Corporate tax rates per it	+/-	KPMG's corporate tax table
	Source tax rate	Corporate tax rates per jt	+/-	KPMG's corporate tax table
Corruption	Destination corruption	Estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance) per it	+/-	The World Bank, The Worldwide Governance Indicators (WGI)
	Source corruption	Estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance) per jt	+/-	The World Bank, The Worldwide Governance Indicators (WGI)
Government regulation	Destination regulations	Estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance) per it	+	The World Bank, The Worldwide Governance Indicators (WGI)
	Source regulations	Estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance) per jt	+	The World Bank, The Worldwide Governance Indicators (WGI)
Gravity model distance	Ln Technology to frontier TFP$_{t-1}$	$DTFP_{it} = \left(\frac{Y_{it}}{L_{it}}\right)\left(\frac{L_{it}}{K_{it}}\right)^{0.35}$ $STFP_{jt} = \left(\frac{Y_{jt}}{L_{jt}}\right)\left(\frac{L_{jt}}{K_{jt}}\right)^{0.35}$ $TFP_{ijt} = \left(\frac{STFP_{jt}}{DTFP_{it}}\right)$	+	Author calculation using data source The World Bank
	Distance to business	The ratio of source country DTF to country DTF - DTF in start business: An economy's distance to frontier is reflected on a scale from 0 to 100, where 0 represents the lowest performance and 100 represents the frontier per ijt	+	Doing business, The World bank
Fixed effects	Country	Fixed effect between KSA and Qatar - (i)		
	Source country	Fixed effect between Asia, Africa, Europe, North America and South America - (j)		
	Year	Fixed effect between year 2007 -2013 - (t)		
	Sector	The interaction between sectors. For secondary specifications, the interaction between Construction and Manufacturing sector. For tertiary specifications, the interaction between Accommodation and food, Administrative and support services, Arts, recreation and other services sector, Education, Financial and insurance sector, Human and health social work, Information and communication, Real estate and Transportation and storage sector - (k)		
	Asia	Azerbaijan, Bahrain, Bangladesh, China, Hong Kong, India, Iran, Iraq, Japan, Jordan, Kazakhstan, Kuwait, Lebanon, Malaysia, Nepal, Oman, Pakistan, Philippines, Singapore, South Korea, Sri Lanka, Syria, Thailand, Turkey		
	Africa	Egypt, Ghana. Morocco, Nigeria, , south Africa, Togo, Tunisia		
	Europe	Austria, Belarus, Belgium, Bulgaria, Croatia, Cyprus Czech republic, Finland, France Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Russia, Spain, Sweden, Switzerland, United Kingdom, Ukraine		
	North America	Bahamas, Canada, Mexico, United States		
	South America	Argentina, Brazil		

Table 3.3: Heckman estimation results

Ln FDI		All	Primary	Secondary	Tertiary	All
Business strategy	Strategic sector	0.6455***		1.2661*	0.2867	0.1162***
		(0.1368)		(0.8495)	(0.4920)	(.0397)
	Strategic source	1.4333***	0.7037	0.9050**	1.1451***	
		(0.2157)	(0.6616)	(0.4149)	(0.2237)	
	Strategic 100% ownership	0.0534	-5.5415	-0.7976	0.4033	
		(0.3634)	(54.4398)	(2.7601)	(0.3505)	
Market size	Ln Destination native population	-0.8168***	-6.3528	-0.5912	-0.6176**	-0.3313***
		(0.3188)	(13.1859)	(1.7518)	(0.3045)	(0.0930)
Macroeconomic stability	Destination inflation$_{t-1}$	0.0016	0.0839	0.0118	-0.0139	0.0061
		(0.0190)	(0.0960)	(0.03760	(0.0188)	(0.0059)
	Source inflation$_{t-1}$	0.0213**	-0.0520	0.0250	0.0165*	-0.0025
		(0.0101)	(0.0593)	(0.0248)	(0.0093)	(0.0021)
	Ln Government expenditure$_{t-1}$	0.0974	0.6151	-0.1705	0.1006	0.0312
		(0.2286)	(1.6227)	(0.5141)	(0.2233)	(0.0754)
	Ln value added$_{t-1}$	-0.2630***	0.0544	-0.1151	-0.4749***	0.1075***
		(0.0631)	(0.3965)	(0.1968)	(0.0700)	(0.0158)
Labour cost	Ln worker wages$_{t-1}$	-0.1091**	0.4823**	0.1509*	0.2086*	-0.0923***
		(0.0489)	(0.8003)	(0.2256)	(0.1342)	(0.0137)
Openness	Ln Destination openness$_{t-1}$	-0.2470***	-2.3190*	-0.3981	-0.1253**	0.0638***
		(0.0389)	(1.4196)	(0.4549)	(0.0548)	(0.0136)
	Ln Source openness$_{t-1}$	-0.1285**	-0.0972	-0.1969*	0.1138**	0.0892***
		(0.0568)	(0.2443)	(0.1068)	(0.0575)	(0.0087)
Infrastructure	Ln capital$_{t-1}$	0.0751	2.0620	-0.3472	0.1791*	0.0178
		(0.0659)	(3.0760)	(1.2972)	(0.0952)	(0.0212)
	Ln Internet	0.2365*	4.7542**	2.4518*	1.0000*	0.0440
		(0.8065)	(6.3705)	(2.3551)	(0.7781)	(0.2625)
	Ln Infrastructure	3.3268	26.5258*	20.0227*	-1.4508	-0.1468
		(4.5348)	(16.3378)	(10.9696)	(4.2428)	(1.2988)
Investment incentives - Tax	Destination tax rate	-0.0523**	-0.2628	0.0400	-0.0521**	-0.0229***
		(0.0271)	(0.4877)	(0.1217)	(0.0258)	(0.0072)
	Source tax rate	0.0830***	0.3241	-0.0052	0.0551**	0.0351***
		(0.0285)	(0.4991)	(0.1223)	(0.0270)	(0.0076)
Corruption	Destination corruption	-0.0838	5.2593*	1.3984	-0.5432	-0.0644
		(0.5243)	(2.9174)	(1.2078)	(0.4855)	(0.1710)
	Source corruption	0.1871	-0.1399	0.0007	0.3095**	0.0487
		(0.1600)	(0.6469)	(0.3887)	(0.1625)	(0.0392)
Government regulations	Destination regulations	0.0027*	2.5768*	1.4280	0.1311	0.0440
		(0.6041)	(3.7800)	(1.4249)	(0.5906)	(0.2464)
	Source regulations	0.4515**	-0.3827	0.2528	0.1955	0.1943
		(0.2146)	(0.8690)	(0.5025)	(0.2111)	(0.0525)
Gravity model distance	Ln Technology to frontier TFP$_{t-1}$	0.3449**	-0.0330	0.6954*	0.1404	0.1096**
		(0.1604)	(0.4431)	(0.3894)	(0.1519)	(0.0535)
Constant		-0.2524	-9.6329	-34.7437	8.6793	-0.6117
		(10.0037)	(173.7372)	(37.5354)	(9.1113)	(2.8562)
Fixed effects	Sector	YES		YES	YES	YES
	(F-test)	(60.03***)		(0.29)	(383.48***)	(63.18***)
Joint effects	Business strategy	YES	YES	YES	YES	
	(F-test)	(73.86***)	(3.98)	(51.60***)	(35.90***)	
	Macroeconomic stability	YES	YES	YES	Yes	YES
	(F-test)	(17.30***)	(4.11)	(4.14)	(9.11*)	(17.48***)
	Openness	YES	YES	YES	YES	YES
	(F-test)	(133.76***)	(3.08)	(5.07)	(7.81*)	(157.43***)
	Infrastructure	YES	YES	YES	YES	YES
	(F-test)	(2.56)	(5.08)	(5.68)	(6.22)	(3.28)
	Investment incentives - Tax	YES	YES	YES	YES	YES
	(F-test)	(26.22***)	(5.74)	(2.58)	(11.12**)	(27.84***)
	Corruption	YES	YES	YES	YES	YES
	(F-test)	(1.60)	(7.97*)	(2.72)	(6.63*)	(2.36)
	Government regulations	YES	YES	YES	YES	YES
	(F-test)	(17.34***)	(2.25)	(2.43)	(17.55***)	(13.79***)
Select	Destination distance to business	0.0292*	0.0335	-0.0352	0.0253	0.0284*
		(0.0223)	(0.2166)	(0.0797)	(0.0279)	(0.0213)
	Source distance to business	-0.0027	0.0078	-0.0001	-0.0085***	-0.0015
		(0.0024)	(0.0154)	(0.0077)	(0.0029)	(0.0015)
Observations		21,905	1,564	4,691	15,650	21,905

* p<0.1, ** p<0.05, *** p<0.01
Robust standard errors in parenthesis under coefficients

Table 3.4: OLS estimation results

Ln FDI		All	Primary	Secondary	Tertiary
Business strategy	Strategic sector	0.0594***		0.3397***	-0.0882***
		(0.0129)		(0.0576)	(0.0228)
	Strategic source	0.4458***	0.7110***	0.4099***	0.3949***
		(0.0613)	(0.2863)	(0.1127)	(0.0710)
	Strategic 100% ownership	0.0142	1.4362*	-0.0188	0.1030***
		(0.0206)	(0.9324)	(0.1118)	(0.0293)
Market size	Ln Destination native population	0.4637*	-4.3534	1.4557***	0.0389
		(0.2981)	(3.8653)	(0.5778)	(0.3284)
Macroeconomic stability	Destination inflation$_{t-1}$	0.0055*	0.0614*	-0.0022	0.0102***
		(0.0033)	(0.0378)	(0.0058)	(0.0039)
	Source inflation$_{t-1}$	0.0011**	-0.0002	0.0002	0.0016***
		(0.0005)	(0.0032)	(0.0010)	(0.0006)
	Ln Government expenditure$_{t-1}$	0.0252	0.5309	-0.0600	0.0589
		(0.0432)	(0.4550)	(0.0859)	(0.0476)
	Ln value added$_{t-1}$	-0.0237***	-0.1387***	-0.0657***	-0.0554***
		(0.0058)	(0.0489)	(0.0150)	(0.0078)
Labour cost	Ln worker wages$_{t-1}$	-0.0197***	-0.2452	0.00171	-0.0027
		(0.0053)	(0.6327)	(0.0178)	(0.0129)
Openness	Ln Destination openness$_{t-1}$	-0.0311***	0.1270	0.0031	-0.0235***
		(0.0033)	(0.1761)	(0.0210)	(0.0077)
	Ln Source openness$_{t-1}$	-0.0349***	-0.0264	-0.0100	-0.0102*
		(0.0050)	(0.0325)	(0.0105)	(0.0062)
Infrastructure	Ln capital$_{t-1}$	0.01281*	0.2812	0.1867***	-0.0237***
		(0.0069)	(0.3702)	(0.0764)	(0.0093)
	Ln Internet	1.0447***	4.1774***	1.1508***	1.0162***
		(0.2195)	(1.6505)	(0.4058)	(0.2541)
	Ln Infrastructure	-1.8921***	0.0273	-2.8655***	-1.1871***
		(0.3371)	(3.1850)	(0.6764)	(0.3828)
Investment incentives - Tax	Destination tax rate	-0.0057***	-0.0181	0.0034	-0.0073***
		(0.0017)	(0.0148)	(0.0050)	(0.0020)
	Source tax rate	0.0147***	0.0380***	0.0028	0.0129***
		(0.0020)	(0.0158)	(0.0056)	(0.0023)
Corruption	Destination corruption	-0.2706***	-0.1968	-0.1982	-0.3075***
		(0.0846)	(0.5640)	(0.1551)	(0.0936)
	Source corruption	0.0466***	0.2716***	0.0537**	0.0500***
		(0.0135)	(0.0802)	(0.0265)	(0.0154)
Government regulations	Destination regulations	0.2180*	1.7016*	0.1531	0.1677
		(0.1189)	(1.0100)	(0.2131)	(0.1345)
	Source regulations	0.0812***	-0.0599	0.0205	0.0869***
		(0.0126)	(0.0737)	(0.0240)	(0.0149)
Gravity model distance	Ln Technology to frontier TFP$_{t-1}$	0.0362***	0.0151	0.0434*	0.0227*
		(0.0144)	(0.0802)	(0.0263)	(0.0166)
	Distance to business	-0.0706	-0.2792	-0.0377	-0.1202*
		(0.0740)	(0.4466)	(0.1317)	(0.0838)
KSA		-1.8705***	17.5833	-4.4495***	-0.4888
		(0.7883)	(14.0765)	(1.5651)	(0.8768)
Qatar		0.4779	-6.1125	1.6486*	-0.0817
		(0.4585)	(5.5260)	(0.9007)	(0.5090)
Asia		0.3931***	1.0109***	0.2753***	0.3546***
		(0.0344)	(0.1543)	(0.0601)	(0.0413)
Africa		0.3059***	0.7850***	0.2715***	0.2744***
		(0.0346)	(0.1462)	(0.0644)	(0.0417)
Europe		0.2815***	0.8119***	0.2222***	0.2265***
		(0.0322)	(0.1263)	(0.0586)	(0.0390)
North America		0.5855***	1.1178***	0.4901***	0.5228***
		(0.051)	(0.2385)	(0.0985)	(0.0587)
South America		-0.0522	0.0177	-0.1594**	-0.0522
		(0.0440)	(0.2195)	(0.0741)	(0.0527)
Constant		-8.4386**	31.2938	-21.8971***	-3.2581
		(4.0690)	(41.9380)	(7.7091)	(4.5333)
Fixed effects	Country (F-test)	YES (8.51***)	YES (0.89)	YES (8.00***)	YES (1.69*)
	Source country (F-test)	YES (64.54***)	YES (12.62***)	YES (17.57***)	YES (42.35***)
	Year (F-test)	YES (14.38***)	YES (2.38**)	YES (3.97***)	YES (8.96***)
	Sector (F-test)	YES (22.25***)		YES (1.96*)	YES (33.42***)
Joint effects	Business strategy (F-test)	YES (25.41***)	YES (4.00***)	YES (25.68***)	YES (20.70***)
	Macroeconomic stability (F-test)	YES (2.23*)	YES (0.94)	YES (0.22***)	YES (4.38***)
	Openness (F-test)	YES (97.55***)	YES (0.54)	YES (0.45***)	YES (9.24***)
	Infrastructure (F-test)	YES (11.46***)	YES (2.22*)	YES (6.13***)	YES (8.33***)
	Investment incentives - Tax (F-test)	YES (45.74***)	YES (7.47***)	YES (6.66***)	YES (18.37***)
	Corruption (F-test)	YES (11.31***)	YES (5.76***)	YES (2.97**)	YES (10.91***)
	Government regulations (F-test)	YES (22.40***)	YES (1.65*)	YES (0.62)	YES (17.44***)
Observations		21,905	1,564	4,691	15,650
R-squared		0.0957	0.1566	0.1350	0.1165

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

Robust standard errors in parenthesis under coefficients

Table 3.5: PPML estimation results

FDI		All	Primary	Secondary	Tertiary
Business strategy	Strategic sector	0.0105		2.9449***	-0.1340
		(0.2150)		(0.7724)	(0.3650)
	Strategic source	0.8542***	1.5007**	0.9966***	0.8971***
		(0.3370)	(0.7845)	(0.3077)	(0.3269)
	Strategic 100% ownership	0.7864	0.6997	-0.3699	0.4273
		(0.8431)	(3.4819)	(0.9422)	(0.9614)
Market size	Ln Destination native population	2.0690	-1.4555	16.0803**	-7.2797*
		(7.2089)	(12.9347)	(7.9083)	(5.1357)
Macroeconomic stability	Destination inflation$_{t-1}$	-0.0143	0.0077	-0.0249	0.0458
		(0.0553)	(0.1523)	(0.0623)	(0.0381)
	Source inflation$_{t-1}$	-0.0327	0.0034	0.0213***	-0.0332
		(0.0340)	(0.0473)	(0.0091)	(0.0333)
	Ln Government expenditure$_{t-1}$	0.2131	0.5390	-1.4668*	1.2001*
		(0.9080)	(1.4483)	(0.9770)	(0.7517)
	Ln value added$_{t-1}$	-0.2454***	-0.7628**	-0.1854	-0.1761**
		(0.0833)	(0.3301)	(0.1456)	(0.0849)
Labour cost	Ln worker wages$_{t-1}$	-0.0387	1.7359**	0.4078*	0.5416**
		(0.0758)	(0.8660)	(0.2227)	(0.2377)
Openness	Ln Destination openness$_{t-1}$	-0.2086***	-1.3505***	-0.0778	-0.1743*
		(0.0460)	(0.5760)	(0.1333)	(0.1097)
	Ln Source openness$_{t-1}$	-0.1247**	0.0221	-0.0789	-0.0862
		(0.0608)	(0.1914)	(0.0822)	(0.0893)
Infrastructure	Ln capital$_{t-1}$	0.4337***	1.5336*	0.5680	-0.3089*
		(0.1498)	(1.1617)	(0.4806)	(0.1816)
	Ln Internet	7.5304***	7.6569	5.5084*	9.4037***
		(3.1087)	(6.0788)	(3.9660)	(2.7173)
	Ln Infrastructure	-4.8761	-7.6737	-6.7787	-8.4914
		(6.4000)	(13.5584)	(5.7010)	(8.4346)
Investment incentives - Tax	Destination tax rate	-0.1039***	-0.1699***	-0.0095**	-0.1423***
		(0.0321)	(0.0486)	(0.0440)	(0.0431)
	Source tax rate	0.1303***	0.2612***	0.0880*	0.1252***
		(0.0323)	(0.0542)	(0.0573)	(0.0363)
Corruption	Destination corruption	-0.7164	0.8190	-0.7957	-0.7415
		(1.1443)	(1.7322)	(1.2706)	(1.2711)
	Source corruption	-0.0461	0.5938*	-0.3720*	-0.2677
		(0.2045)	(0.3875)	(0.2316)	(0.3136)
Government regulations	Destination regulations	1.2737	3.4015	-0.3811	1.5294
		(1.7448)	(3.1931)	(1.9861)	(1.7932)
	Source regulations	0.8316***	-0.0685	1.0193***	1.2876**
		(0.3130)	(0.5077)	(0.3853)	(0.5577)
Gravity model distance	Ln Technology to frontier TFP$_{t-1}$	0.2599	-0.4229	0.4377	0.4658*
		(0.2589)	(0.3532)	(0.3702)	(0.2984)
	Distance to business	-1.2620	-1.4445	0.3114	-1.7455
		(1.4261)	(2.2458)	(1.4600)	(1.4855)
KSA		-2.1186	-3.7559	-44.4694**	22.7211*
		(18.1409)	(44.9367)	(21.3553)	(14.6554)
Qatar		5.7562	-1.0244	23.1385*	-8.6316
		(12.0574)	(19.3524)	(12.7719)	(8.2790)
Asia		2.3954***	4.9366***	1.4344**	1.8080***
		(0.5325)	(1.1656)	(0.71457)	(0.5799)
Africa		1.3616*	3.8085***	1.7197**	1.0293
		(0.7360)	(1.5946)	(0.8718)	(0.9824)
Europe		1.16457**	4.6721***	1.3597*	0.2928
		(0.5551)	(1.1059)	(0.7383)	(0.6366)
North America		2.4919***	5.2040***	2.0312***	1.8579***
		(0.5546)	(1.1405)	(0.7271)	(0.5789)
South America		-0.1362	2.2933*	-4.5596***	-0.4184
		(0.8679)	(1.5828)	(1.2848)	(0.8844)
Constant		-65.2654	-29.6228	-237.8623**	67.6796
		(108.3745)	(150.9189)	(107.2722)	(71.0268)
Fixed effects	Country	YES	YES	YES	YES
	(F-test)	(1.64)	(0.17)	(4.98*)	(2.65)
	Source country	YES	YES	YES	YES
	(F-test)	(52.24***)	(28.37***)	(41.51***)	(43.75***)
	Year	YES	YES	YES	Yes
	(F-test)	(21.34***)	(20.09***)	(12.49*)	(21.51***)
	Sector	YES		YES	YES
	(F-test)	(74.21***)		(2.53*)	(223.31***)
Joint effects	Business strategy	YES	YES	YES	YES
	(F-test)	(7.02*)	(3.68*)	(29.87***)	(7.83**)
	Macroeconomic stability	YES	YES	YES	YES
	(F-test)	(1.36)	(0.23)	(7.82**)	(3.46)
	Openness	YES	YES	YES	YES
	(F-test)	(32.83***)	(5.52*)	(1.39)	(5.80**)
	Infrastructure	YES	YES	YES	YES
	(F-test)	(12.75***)	(2.67)	(3.04)	(13.46***)
	Investment incentives - Tax	YES	YES	YES	YES
	(F-test)	(16.58***)	(24.26***)	(14.54***)	(12.85***)
	Corruption	YES	YES	YES	YES
	(F-test)	(0.53)	(2.59)	(3.09)	(2.28)
	Government regulations	YES	YES	YES	YES
	(F-test)	(9.87***)	(1.16)	(7.07**)	(8.66***)
Observations		21,905	1,564	4,691	15,650
R-squared		0.2740	0.5339	0.5026	0.0278

* p<0.1, ** p<0.05, *** p<0.01
Robust standard errors in parenthesis under coefficients

Chapter 4

Foreign Ownership and Firms' Efficiency: A Two-Stage Analysis of Dubai's Manufacturing and Construction Sectors

Abstract: This study examines the efficiency distance between foreign-owned and domestic firms in manufacturing and construction sector. In the first part of our analysis, we use a confidential dataset containing firm-level information for Dubai over the period 2014-2016. Within a DEA framework, we estimate each firm's relative efficiency score. In the second-stage, we resort to econometric techniques to investigate the determinants of differences in efficiency, focusing on firms' ownership, sectoral level FDIs, and other firms' specific factors such as composition of the labour force, the firm size's and its age. We find that foreign-owned firms are more efficient in both the manufacturing and construction sectors, compared to domestic firms. We further show that the association between the amount of FDI in manufacturing and efficiency is positive, possibly thanks to the role of FDI in improving competitiveness in the domestic market and transferring managerial know-how. Skilled labour is an important relationship of efficiency in manufacturing and construction sectors. This finding may be explained by the fact that a more competent, more skilled labour-force, better educated and better paid staff would enhance performance, productivity and efficiency in both manufacturing and construction firms. Firm age and size do not seem to be statistically related to efficiency among manufacturing and construction firms.

4.1 Introduction

Host countries offer a wide range of incentives to attract FDI by foreign investors and foreign firms. The incentives are justified on a common argument that FDI not only brings capital and labour but also brings new technology and transfers knowledge. The potential benefits of FDI inflows, which make foreign firms more efficient, are viewed as important in increasing the productivity and competitiveness of domestic firms. The efficiency of the firms has a substantial influence on the economy and the efficiency measurement is one aspect of a firm's performance. Efficiency measurement potentially captures a broader range of changes within firms, compared to other traditional measurements like productivity measurement. Foreign-owned firms from developed countries typically enjoy technological superiority and strong management capabilities, and their technologies and management practices can be transferred to or imitated by domestic firms in emerging markets by training domestic employees. This might increase the efficiency of the domestic firms. Multinational companies, through their subsidiaries, may spillover into host countries' entire economies and increase the economic performance of domestic firms (Blomstrom and Kokko, 1998).

In this study, we examine the efficiency distance between foreign-owned firms and domestic firms in manufacturing and construction sectors in Dubai to analyse whether ownership of manufacturing and construction firms is associated to firms' efficiency. We also analyses whether FDI inflows and other selected key determinants such as: composition of the labour force, firm size and firm age affect firms' efficiency. Using confidential firm-level panel dataset from 2014-2016, a two-stage analysis is using in this study, in the first-stage we employ DEA to measure firms' efficiency and in the second-stage we use bootstrap GLS regression in order to evaluate the signs and the magnitudes of foreign ownership, FDI and the selected key determinants on firms' efficiency. To the best of our knowledge, this study is the first to use this confidential dataset from Dubai, the first to measure and analyse the efficiency of Dubai manufacturing and construction firms, the first to assess the association of foreign ownership and FDI inflows on firm efficiency, and the first study to analyse efficiency by applying the two-stage DEA model in Dubai firms. The study finds that foreign-owned firms are more productive in both manufacturing and construction sectors. The association between FDI inflows in manufacturing and firms' efficiency is positive, due to FDI's roles in improving competitiveness in the domestic market and transferring knowledge. Skilled labour has an important relationship and association with efficiency in both manufacturing and construction firms; this is explained by the fact that a more competent, skilled and better-paid staff will enhance performance and efficiency in both manufacturing and construction firms. Firm size and age do not appear to help to promote the efficiency of manufacturing and construction firms.

It is widely known in the literature that productivity increases when companies are owned by foreign investors (Bartelsman and Doms, 2000; Lipsey and Sjoholm, 2005; Javorcik, 2008). However, there is less analysis of the relationship of foreign-owned firms on efficiency. Generally, when a firm becomes more efficient, it automatically becomes more productive. However, the reverse does not hold true. For example, increased productivity does not cause higher efficiency. Productivity can improve either due to the availability of resources, improvements in technology or increases in the amount of capital per worker. Furthermore, it is well known that foreign investors can bring in new technologies and know-how (Blomstrom and Kokko, 1998); yet, given the different restrictions and constraints that a foreign owner might face compared with a domestic owner in a host country, there is a risk that part of the productivity gain due to improved technology might reduce the firms' efficiency. Thus, if this happens, a host country that seeks to attract FDI because of its several benefits might lose the efficiency benefit.

Measuring efficiency is one of the main aspects of today's world; the efficiency of firms makes substantial changes to any economy. The non-parametric method – DEA – is a technical approach for measuring efficiency. It uses linear programming, where the efficient frontier curve is estimated from a series of points. Efficiency is a more comprehensive measure as it depends on input and output variables. The mutual criteria for measuring efficiency are to maximise output and minimise the cost; in other words, efficiency requires a firm to produce the maximum output for a given level of input.

In 2016, the Government of Dubai launched the "Dubai Industrial Strategy 2030" to enhance and develop the manufacturing and construction sectors. The strategic plans have several aims: to increase the total output and value-added of the manufacturing and construction sectors, in order to make Dubai a preferred manufacturing platform for global businesses; to promote environmentally friendly and energy-efficient manufacturing; to make Dubai a centre for the global Islamic product market; and to enhance the depth of knowledge and innovation in the sector. Moreover, the Government of Dubai expects the manufacturing sector to grow by an additional USD 5 billion by 2030, creating 27,000 jobs (Dubai Executive Council, 2017).

Furthermore, the government launched new initiatives, strategic plans and new and ongoing developments to drive the development of construction sector which has a promising outlook; as the Education Strategic Plan 2021 and National Strategy for Higher Education 2030, the Energy Strategy 2050, the Sheikh Zayed Housing Programme and the Tourism Strategy. These strategies will keep the construction sector busy in addition to the on-going mega projects, such as Dubai South, Dubai Hills Estate, Shindagha Corridor, Union Railway, Deira Islands.

Manufacturing firms are the critical component of the economic growth of any country. In Dubai, the contribution of manufacturing firms is increasing day by day, as they are key players in the field of employment creation and income generation. Dubai over the last decade has been one of the dominant powers in the regional construction market. As a consequence, according to GlobalData 2018, Dubai is the world's top city for construction. It is widely agreed that Dubai's manufacturing and construction firms have grown rapidly, with their contribution to GDP amounting to around 9.5% and 7.7% respectively in 2016. Dubai manufacturing has made a significant contribution to the economic growth of the country, and additionally Dubai's construction sector has grown rapidly due to the new demands for infrastructures and housing, resulting from rapid domestic economic growth. Moreover, these two sectors are instrumental to targeting and attracting FDIs from different economies; between 2014 and 2016 they received the highest values of FDIs. Dubai attracted USD 3.7 billion and USD 2.7 billion in manufacturing and construction respectively, indicating that firms in these two sectors play a major role in attracting FDI to enhance their productivity and competitiveness. In 2016, Dubai employed 8.4% of their workers in manufacturing firms and 25.6% in construction firms, the highest percentage of employed workers.

In general, FDI provides direct and indirect benefits for host economies. Often, the direct benefits are in the form of additional capital and labour. The indirect benefits on the other hand, emerge from the externalities resulting from the FDI and foreign firms' presence (Hymer, 1960). The argument for the indirect benefits is that, due to FDI inflows, the presence of foreign firms may related to domestic firms, which might then experience increasing efficiency or productivity, raising profits and gaining knowledge. All of these benefits come from FDI spillovers (Blomstrom and Kokko, 1998; Lipsey and Sjoholm, 2005). In the last few decades, researchers have been concerned with efficiency or productivity spillovers and this attention is not surprising because the efficiency of firms is an important aspect of production functions. It throws light on the efficiency of the production environment in a host country's economy, as well as enabling the assessment of whether the existing and available resources are being used efficiently in the FDI regime in the recipient economy.

The literature on the productivity of foreign firms suggests that foreign-owned firms tend to be more productive. This could be due to technological spillovers and know-how from FDIs. This has been revealed empirically based on samples of manufacturing firms in Venezuela, studied by Aitken and Harrison (1999). Bartelsman and Doms (2000) discussed the factors that are most important in explaining firm productivity; these factors are ownership, technology, openness and the quality of the workforce. Consequently, foreign ownership has been found to be an important factor.

A number of scholars have indicated that firms under foreign ownership are more productive than domestic firms (Aitken and Harrison, 1999; Djankov and Peter, 2002). This interpretation is consistent with the hypothesis that firms established overseas have an advantage over the efficiency of firms in a host country due to the different incentives that offered by a host country.

The association between foreign ownership and FDI on efficiency have been studied in a growing body of literature. Bottasso and Sembenelli (2004) have provided empirical evidence for the relationship between foreign ownership and efficiency in Italian firm-level panel data for 12 manufacturing firms over the period 1978–93. They found that the foreign-owned firms had a positive relationship with their efficiency. Saranga and Phani (2008) used DEA to study the efficiency in the Indian pharmaceutical industry and dataset during 1992-2002, and found that foreign-owned firms tended to be more efficient. Similarly, Suyanto and Salim (2013) studied Indonesian pharmaceutical firms and found that foreign firms are more efficient than their domestic competitors. Khalifah (2013) studied Malaysia's automotive firms using panel data over the years 2000–2004. The author found that foreign-owned firms were more efficient in general. Svedin and Stage (2016) studied the association between FDI on efficiency in Swedish manufacturing and found that the association between foreign ownership and efficiency is positive. On the other hands, several literature found that domestic firms are more efficient compared to foreign-owned firms. Koirala and Koshal (1999) used firm level data of manufacturing sector in Nepal to analyse the productivity and technology of foreign and domestic firms. The authors found that foreign firms were technically less efficient. Zhou et al. (2008) examined the association between FDI and the productivity of domestic firms in China and found that regions that attract more FDI tend to have high domestic firms' productivity and able to compete with foreign firms and be more efficient. Bekes et al. (2009) analysed empirically the domestic Hungarian firms and found that the more productive domestic firms are more to reap spillovers from foreign firms and tend to be more efficient in the long run.

In an example of the theoretical literature on the FDI spillovers on a host country's efficiency, Das (1987) revealed that FDI inflows, FDI spillovers and foreign firms' presence in a host country's domestic market encourage domestic firms to imitate new knowledge, which helps to increase their efficiency or productivity. Ghali and Rezgui (2008) used a panel data for 674 of Tunisian manufacturing firms over the period 1997 -2001 and found that FDI spillovers related positively with firms' efficiency. Similar findings were reported by Dimelis and Lauri (2002) when they investigated the Greek manufacturing sector. Cross-sectional studies mostly confirm a positive relationship between FDI and efficiency. However, more recent studies using panel data analysis show mixed evidences. So, the relationship between FDI and firms' efficiency still remains unsettled and mixed. Lipsey and Sjoholm (2005) pointed out that the evidence for FDI's relationship

on firms' efficiency tends to vary across countries and across sectors within countries. Suyanto and Salim (2010) found that FDI in Indonesia led to increased efficiency in one sector but reduced efficiency in the other. Where the resutls of these two studies indicate the importance of studying across-sector study. Kinda (2011) used manufacturing firm-level data on five developing countries (Brazil, Morocco, Pakistan, South Africa and Vietnam) over the mid-2000s to compare the efficiency. The author found that FDI in the recipient country had a marked relationship not only on the efficiency of foreign-owned firms, but also on the efficiency of the local firms selling to them.

Various studies have been carried out to examine the relationship between composition of the labour force and firms' efficiency. Batra and Tan (2003) focused on skills and efficiency in manufacturing enterprises using firm-level data from 6 countries (Malaysia, Indonesia, Mexico, Colombia, Taiwan and Guatemala). Skilled workers are defined as managers, engineers and professionals, technicians, line supervisors and skilled production workers. The study found that skilled workers have a positive and significant association with efficiency. Vu (2003) investigated the improvement of efficiency for Vietnamese industrial enterprises firms between 1997 and 1998 by using the DEA method and a dataset of 164 manufacturing firms. The author defined skilled labour as the proportion of skilled workers in the total workforce, and found that number skilled labour had a positive and significant relationship with the efficiency of manufacturing firms in Vietnam.

There are many studies that analyse the relationship between efficiency and firm size based on firm-level datasets (Pitt and Lee, 1981; Lundvall and Battese, 2000; Kim, 2003; Alvarez and Crespi, 2003). Mengistae (1996) used a survey dataset covering a random selection of 220 firms in several manufacturing firms in Ethiopia, to analyse the relationship between firms' size, defined as the log of the average employment size of the firm, and firms' efficiency, in 1989, 1991 and 1993. The author found a positive affect. Kim (2003) used panel data of Korean manufacturing firms to identify and investigate whether efficiency is systematically related to firm size. The firm size was measured as the share of an individual firm's output to the total industry output (firm's sales/industry's total sales). The empirical results showed that firm size has a positive and significant relationship with the firms' efficiency. From across-sectoral studies, Biggs et al. (1996) focused on firms in the food, wood, textile and metal sectors in Ghana, Kenya and Zimbabwe, and used a survey dataset in 1992 and 1993 to investigate the relationship between firm size and firm efficiency. The authors considered firm size as the number of workers and found a positive relationship between size and efficiency in the selected countries. Similarly, Little et al. (1987) examined the relationship between a firms efficiency and size by defining firm size as the number of workers in 345 firms in different sectors in India during the period 1978-1980. The authors found that a positive association between firm size in machine tooling firms and firm efficiency, while in other sectors association was

insignificant. Studies observe that the association between firms' size and efficiency tends to vary across-sectors.

Additionally, numerous studies have analysed firm efficiency and age based on firm-level data sets. With regard to firm age, older firms are usually considered to be more efficient than younger or mature firms as they have already gained experience and tried to avoid making mistakes, and their survival per se may reflect their superior efficiency. As has been long debated in existing literature, however, the relationship between firm age and firm's efficiency is ambiguous. Amornkitvikai and Harvie (2010) employed SFA and a two-stage DEA approach to investigate the relationship between firm age and firm efficiency. They used a panel dataset of 178 Thai manufacturing firms covering the period 2000-2008 and considered age as the number of operating years. The authors found that a firm's age has a positive relationship with its efficiency. Similarly, Pitt and Lee (1981) found a positive relationship between firm age and efficiency. However, Teece (1997) stated that younger firms tend to have updated knowledge, which can make them more efficient than older firms. Other studies have observed a negative relationship between age and efficiency, for example Chen and Tang's (1987) study, which used a production frontier to examine foreign firms in Taiwan's electronics sector. Nevertheless, a number of empirical studies have reported that age has no significant association with firms' efficiency (Suyanto and Salim, 2010).

Lundvall and Battese (2000) examined 235 Kenyan manufacturing firms in order to investigate whether firm's efficiency is systematically related to firm age. They used the SFA method and found that the relationship of firm' age is less systematic and insignificant in all sectors except textiles on firms' efficiency. Tran et al. (2007) examined the efficiency performance of the manufacturing sector in Vietnam. Using firm-level data from the period 1996-2001, the empirical study investigated firm age (defined as the number of years since establishment) and its relationship with efficiency. The results were mixed and ambiguous, between age and efficiency.

In order to achieve our objectives and to answers our research questions, the structure of this study as follows: a brief overview of Dubai, followed by conceptual framework, empirical specification. Finally, the empirical results and the conclusion. We also include an appendix at end of this chapter.

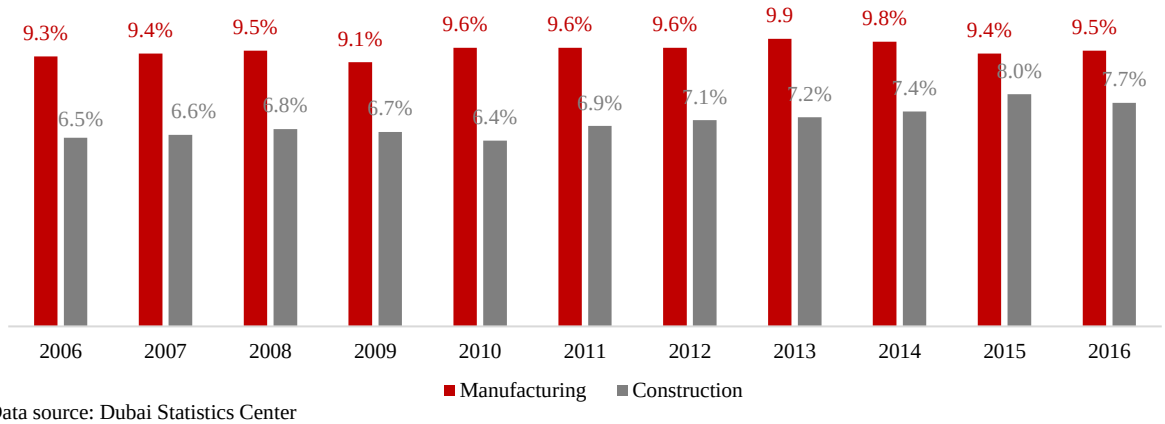
4.2 Dubai at a glance

Dubai has changed dramatically over the last three decades or so. Around 95% of Dubai's GDP is not oil based; rather it has become a major business hub with a more dynamic and diversified economy in order to survive the decay or depletion of oil. Dubai enjoys a vital and strategic location and is the biggest re-exporting centre in the Middle East region. Dubai benefits from low logistic and operation costs, world-class infrastructure, and business friendly government policies that are

attracting and enhancing investors. In 2016, the five top major economic sectors in Dubai by share of GDP were: trade 26.3%, transportation 12.3%, finance 11.1%, manufacturing 9.5% and construction 7.7%.

The three graphs below present a comparison of the manufacturing and construction sectors on the macro level of Dubai's economy, based on statistical data from the Dubai Statistics Center. Dubai's manufacturing sector is one of the primary pillars of the economy. It is the fourth largest and has the highest percentage share of GDP, representing 9.5% of Dubai's economy in 2016. Construction is the activity of building and constructing houses, residential and commercial buildings, infrastructure and civil engineering works such as roads, bridges and pipelines, as well as operation and disposal. The construction sector development has led to an increase in the sector's share of Dubai's GDP from 6.5% in 2006 to 7.7% in 2016.

Figure 4.1: Manufacturing and construction sectors contribution to GDP in Dubai (In constant price)

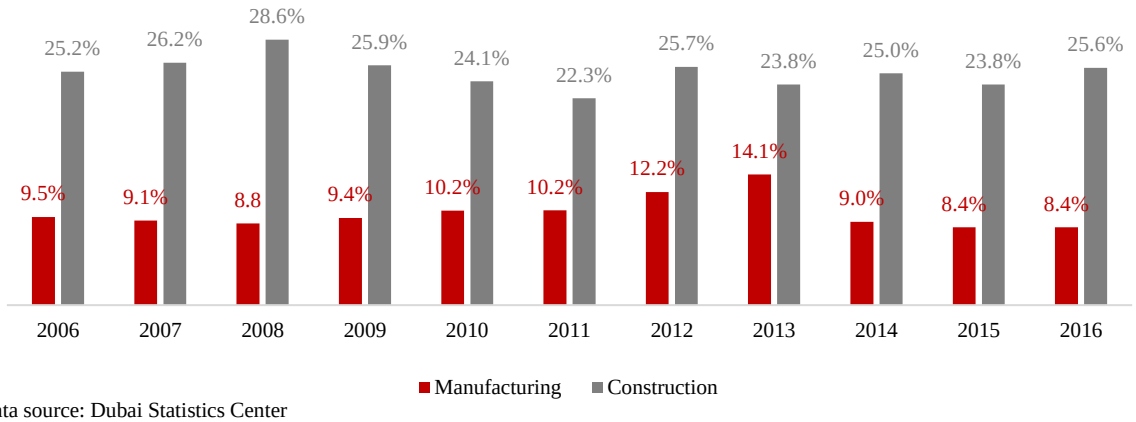


Data source: Dubai Statistics Center

The manufacturing sector is one of the main sectors of employment in Dubai, both in direct manufacturing operations and industry-related operations. According to the Dubai Statistics Centre, in 2016 a total of Dubai workforce estimated at around 2.6 million workers and the manufacturing sector employed 8.4% of the total Dubai workforce. In spite of its importance, the contribution of manufacturing as an employer decreased in the period 2006-2016; this is attributed to machines and digital equipment replacing humans, or structural transformation that transfers an economy from low productivity and labour- intensive economic activities to a modern economy with higher productivity, skill-intensive activities and less labour.

The construction sector employed 25.6% of Dubai's total workforce, in 2016. This indicates to a great extent that the construction sector is a labour-intensive cyclical sector. The number of workers increases with the expansion of construction works, and decreases upon their completion.

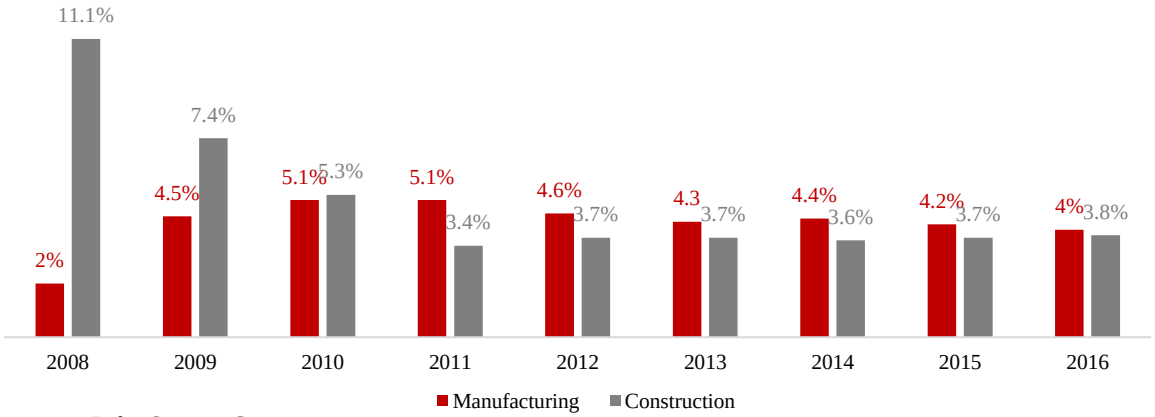
Figure 4.2: Share of manufacturing and construction sectors workforce in Dubai's total workforce



Data source: Dubai Statistics Center

FDI is one of the main and fundamental drivers of economic growth and it is considered to be a vital and important indicator determining future growth and sustainable development in each country. Attracting FDI has numerous benefits and a large FDI entry level allows the manufacturing and construction sectors to make technological and advanced achievements.

Figure 4.3: Percentage contribution of manufacturing and construction sectors of total FDIs in Dubai's



Data source: Dubai Statistics Center

In Dubai in 2016, manufacturing sector has a share of only 4% of total foreign investment. On the other hand, the value of FDI in the construction sector has been increasing steadily in Dubai. In 2016, Dubai's construction sector has a share of only 3.8% of total foreign investment

4.3 Conceptual framework

In this study we employ the non-parametric measure, the DEA, and this section describes the foundations of the DEA approach and some recent developments in the two-stage bootstrapping technique.

In principle, the popularity of DEA for measuring relative efficiency is due to several distinguishing features that make it a valuable and attractive tool for performance analysis. First, DEA is a methodology directed to frontiers rather than central tendencies (Cooper et al., 2000). Second, DEA as a non-parametric technique thus it does not need to make distributional assumptions regarding the residuals (Abbott and Doucouliagos, 2003). Thus, DEA rather than regression analysis is the ideal tool to fit the data. Third, multiple inputs and outputs can be used in the DEA model without any concerns over the relative importance of each input and output (Colbert et al., 2000). Fourth, in comparison to traditional methods based on predefined model structures such as the Stochastic Frontier Analysis - SFA, DEA has the advantage of avoiding the need to make prior assumptions regarding the functional form of the best practice frontier (Cooper et al., 2000). Ruggiero (2007) shows that the SFA model does not produce better results than DEA.

More comprehensive reviews of the methodology are presented by Lovell (1993), Ali and Seiford (1993), Seiford (1996), Cooper et al. (2000), Kao and Liu (2011) and Memon and Tahir (2011). Originally, Farrell (1957) proposed the piecewise-linear convex hull approach to frontier estimation. Chames, Cooper and Rhodes (1978) coined the term DEA, then DEA received wide attention and since then there have been a large number of papers, which have extended and applied the DEA methodology.

4.3.1 The first-stage (DEA estimation)

The DEA is a linear programming technique based on the pioneering work of Farrell's efficiency measure (1957), to measure the different efficiency of Decision Making Units (DMUs). Which is responsible for converting multiple inputs into multiple outputs.

Let's assume that the number of DMUs is n. Each DMU utilizes i inputs to produce k outputs. The inputs and outputs for all of the DMUs are assumed to be strictly positive when calculating the relative efficiency of each DMU. For each DMU, respectively, there is at least one positive input and one positive output as well.

The DEA model used to calculate the relative efficiency of DMU_0 is as follows:

To maximize the efficiency of DMU j_0 using fractional programming model to compute efficiency;

$$\max(eff) = \frac{\sum_k u_k y_{kj0}}{\sum_i v_i x_{ij0}} \quad (1)$$

Where u_k is the weight for each output k, v_i is the weight for each input i , y_{kj} are the outputs k produced by each unit j; x_{ij} are the inputs i used by each unit j; y_{kj0} are the outputs k in unit j_0; x_{ij0} are the inputs i in unit j_0.

To calculate the weights for each unit;

$$\frac{\sum_k u_k\, y_{kj}}{\sum_i v_i\, x_{ij}} \leq 1 \tag{2}$$

The weights calculated are non-negative.

$$u_k, v_i \geq 0 \tag{3}$$

Two fundamental types of DEA model are regularly being used in the literature. They differ according to the orientation with which the relative efficiency is measured: the input-oriented DEA model and the output-oriented DEA model. Input-oriented model focuses on the measurement of the variations in input and aims at reducing inputs while holding outputs constant. Conversely, output-oriented DEA model focuses on the measurement of variation in the output produced and aims to maximize output while holding the input quantities constant at their current levels.

The initial DEA model, as originally presented in Charnes, Cooper, and Rhodes (CCR) (1978), builds on the earlier work of Farrell (1957). In the CCR model, it is assumed that there are CRS. i.e., outputs change in the same proportion as the input amounts change (Khajavi et al., 2010). The CCR model, was followed by a model proposed by Banker, Charnes, and Cooper in 1984 which was called BCC and was designed based on the VRS (Azar and Motameni, 2004). Theoretically in VRS it's assumed that the outputs do not change in proportion to the input (Khajavi et al., 2010).

In this study, we use input oriented model and use a dual problem model to solve the problems. The CCR dual model is as follows:

$$\text{Max}_{u,v} = \sum_k u_k\, y_{j0} \tag{4}$$

Subject to

$$\sum_k u_k\, y_{kj0} - \sum_i v_i\, x_{ij0} \leq 0$$

$$\sum_i v_i\, x_{ik0} = 1$$

$$\sum_k u_k\, y_{kj} \;\leq \sum_i v_i\, x_{ikj}$$

$$u_k, v_i \geq 0$$

Where the objective function is equation (4); then determines that the sum of the virtual weights of the inputs is 1 and together with determine its orientation; then the last equation guaranties that the weights are non-negative.

By virtue of Linear Program Duality theorem, the linear program in (4) can be transformed into:

$$\Theta^* = \min \Theta_{j0} \qquad (5)$$

Subject to

$$\sum_j y_{kj}\, \lambda_j \;\geq y_{k,j0}$$

$$\Theta_{j0}\, x_{i,j0} \geq \sum_j x_{i,j0}\, \lambda_j \;\geq\; y_{r0}$$

$$\lambda_j \;\geq 0$$

Where Θ_{j0} is the efficiency of DMU, λ_j means the proportion of referencing DMU when measure the efficiency of DMU(eff).

And to obtain a VRS model, we have to use the previous model by adding the following:

$$\sum\nolimits_j \lambda_j \;= 1 \qquad (6)$$

From Banker et al. (1984) the VRS formula is given by:

$$\mathrm{Max}_z = \sum\nolimits_k u_k\, y_{kj0} - u_{j0} \qquad (7)$$

Subject to

$$\sum\nolimits_k u_k\, y_{kj} \;- \sum\nolimits_i v_i\, x_{ij} \;- u_{j0} \leq 0$$

$$\sum_i v_i \, x_{ij0} = 1$$

$$v_i \geq \varepsilon$$

$$u_k \geq \varepsilon$$

In the VRS approach due to the added above restriction, a convex hull of intersecting planes is formed that envelopes the data points more tightly than the CRS conical hull and, thus, the DEA model with VRS assumption provides efficiency scores that are always greater than or equal to those obtained using the CRS assumption (Mamatzakis et al., 2013).

4.3.2 The second-stage (DEA GLS estimator)

Numerous researchers have regressed the DEA estimates of efficiency on variables in two-stage procedures to account for exogenous factors that might affect the performance of producers. Simar and Wilson (2007) argue that a serious problem in all of the two-stage DEA studies arises from the fact that DEA efficiency estimates are serially associated. Therefore, standard approaches to inference in the second-stage are invalid. They propose that the single and double bootstrap procedures both permit valid inference, and that the double bootstrap procedure improves statistical efficiency in the second-stage regression.

In this study, the input-oriented CRS and VRS models are applied to obtain the overall efficiency (E) scores in the first-stage. By taking into account the year effect, the calculation of different efficiencies per year has been considered. This implicitly incorporates the time effect of this study analysis instead of computing it for the whole accumulated sample of the sector. The measure of DEA efficiency in a first-stage $\widehat{\Theta}_i$ for any data set (X_i ,Y_i) for each firm can be obtained by solving the following linear programming equation (8) below:

$$\widehat{\Theta}_i = \min(\Theta > 0 | Y_i \leq \sum_{i=1}^{n} \Upsilon_i \, Y_i \, ; \Theta_i \, X_i \geq \sum_{i=1}^{n} \Upsilon_i \, X_i \, ; \sum_{i=1}^{n} \Upsilon = 1; \Upsilon \geq 0, i = 1,2, \ldots, n \quad (8)$$

From equation (8): X and Y are the observed inputs and outputs and = 1, 2, … n is the firm. The $\Theta_i \, X_i$ is the efficient level of inputs, Θ is the scalar and Υ_i is the non-negative vector of constants defining the optimal weights of inputs to outputs. Put another way, non-zero weights Υ_i are assigned to the efficiency scores in the frontier. $\widehat{\Theta}_i$ is the value of the efficiency scores estimated for the i firm for which $\widehat{\Theta}_i \geq 1$. In input-oriented model, inputs should be decreased to obtain the highest

efficiency, where $\widehat{\theta}_i$=1 means that the firm is considered fully efficient while $\widehat{\theta}_i$>1means that the firm is inefficient, and it needs to reduce the inputs to reduce the inefficiencies.

The second-stage DEA method has been shown to be beneficial in a large number of studies such as Ray (1988, 1991), Muniz (2002), Dijk and Szirmai (2006) and Staat (2006). Recently, Simar and Wilson (2007) omitted the non-discretionary variables from the DEA model and introduced them in the second-stage. Moreover, different estimators have been used in different studies as in the second-stage analysis of the efficiency equation. Some of these models have used OLS (Dijk and Szirmai, 2006; Barnum et al., 2008, 2009), some have used GLS (Badunenko et al., 2008), logistic regression (Ray 1988), Tobit (Kooreman, 1994) and truncated regression (Simar and Wilson, 2007). In this study, the bootstrap method to correct for the small sample bias and serial correlation of the DEA efficiency estimates has been applied. Bootstrapping is a repeated simulation. The DEA score is re-estimated for each DMU from a resampling of the set of DMUs. The original estimator is applied to each simulated sample, resulting in estimates that imitate the original unknown sampling distribution of the estimators of interest.

GLS estimators that can simultaneously correct for serial and contemporaneous correlation, and for heteroskedasticity, are readily available (Barnum et al., 2009). A GLS estimator takes into account explicitly the bounded domain of the DEA efficiency estimates. The efficiency score (E) is a fractional variable bounded between zero and one. Using it directly in a GLS estimation might introduce a bias. From this boundary issue Ramanath (1996), Dijk and Szirmai (2006) and Aggry et al. (2010) use the logistic transformation[5] (1/E) which is ($1/\widehat{\theta}_i$) to make the efficiency continuous.

Our second-stage DEA efficiency analysis within GLS bootstraps regression method is as below:

$$\ddot{\widehat{\theta}}_i = b + \beta Z_i + \varepsilon_i \qquad (9)$$

In equation (9), $\ddot{\widehat{\theta}}_i$ is = ($1/\widehat{\theta}_i$), b is the constant term, ε is statistical noise, and Z is a vector of specific factor variables for firm i that may be related to the firms' efficiency.

4.4 Empirical specification

As mentioned above, our goal is to investigate the association between foreign ownership, FDI and selected key determinants of firms and firms' efficiency, by using the DEA bootstrap approach. In

[5] Originally suggested by Johnson (1949), the logistic transformation is applied to analyse responses that are restricted to a finite interval (for example (0,1)), so-called bounded outcome scores.

the first-stage we measure the efficiency scores and in the second-stage we use GLS truncated regression model in order to evaluate the magnitude of the control variables.

In fact, the selection of variables in efficiency studies will significantly affect the research's finding about the measurement of firms' efficiency in the first-stage. Differential inputs and outputs have been combined in various studies for firm's performance analysis, therefore, the selection of input and output variables is important. In this study, three inputs and one output are selected for measuring efficiency of manufacturing and construction firms, where most frequently used in previous studies (see Table 4.1). Our input variables are: labour (number of workers), capital (fixed assets), and raw materials (total cost of raw material inputs). The output is revenues (total revenues).

Table 4.1: Input and output variables for measuring efficiency in the first-stage from existing literature

Author	Inputs	Outputs
Chau and Wang (2003)	Capital, Number of employees, Construction materials, Office overhead expenses	Total revenues
Chau et al., (2005)	Total assets, Capital, Construction material	Total revenues, Payment to subcontractor
El-Mashaleh et al., (2007)	Number of employees, Operating expenses	Total revenues
Horta et al., (2010)	Number of employees, Total assets, Net fixed assets	Total revenues
Lee et al,. (2013)	Capital, Number of employees, Selling and administrative expenses	Total revenues

In the second-stage, our dependent variable is delivered from the first-stage as mentioned in equation (8), then we compute the logistic transformation (1/E) as mentioned in equation (9). In terms of our selected independent variables, we build on the following literature.

Table 4.2: Control variables for second-stage from existing literature

Variable	Author	Finding signs
Foreign ownership	Teece et al., (1997) Bottasso and Sembenelli (2004) Aggrey et al., (2010)	+
FDI value	Lipsey and Sjoholm (2005) Suyanto and Salim (2010)	+
Skilled labour	Ghali and Rezgui (2008) Batra and Tan (2003) Vu (2003)	+
Firm size	Mengistae (1996) Brada et al., (1997)	+/-
Firm age	Alvarez and Crespi (2003) Lundvall and Battese (2000) Tran et al., (2008) Park et al., (2009) Amornkitvikai and Harvie (2010)	+/-

Therefore, our second-stage regression model is given in the following form:

$$\ddot{\Theta}_{it} = B_0 + B_1 OWN_{it} + B_2 FDI_t + B_3 SKILL_{it} + B_4 SIZE_{it} + B_5 AGE_{it} + \varepsilon_{it} \quad (10)$$

Where $\ddot{\Theta}_{it}$ is $(1/\widehat{\Theta}_{it})$, OWN_{it} is foreign ownership, which is measured as a dummy variable, one when the firm is foreign-owned and foreign state licensed establishment while its head office or permanent company is outside UAE and zero otherwise. FDI_t is the value of FDI in manufacturing or construction sector. $SKILL_{it}$ represents the composition of the labour force, which includes two variables: the average wage, which is calculated by the total compensations divided by the number of workers, and the ratio of non-Emirati workers, which is measured as the number of non-Emirati workers/number of workers multiplied by 100. $SIZE_{it}$ represents the number of workers. AGE_{it} represents firm age, which includes two dummy variables, old firm, one when a firm was established on and before 1989 and zero otherwise. And mature firm is one when a firm was established between 1990 and 1999, and zero otherwise. Finally ε_{it} represents the statistical noise, and the subscripts i and t denote to firm and year.

4.4.1 Data

We dataset includes 150 firms from manufacturing and 135 firms from the construction sector for measuring the efficiency of Dubai. The data of inputs, output and firm-factors and determinant variables collected from the Annual Economic Survey between 2014 -2016 which conducted by Dubai Statistic Center and data has been deflated to USD.

Table 4.3: Manufacturing sector - descriptive statistics

		Variable	Observations	Mean	Standard Deviation
First-stage	Input	Number of workers	390	276.3974	898.5237
		Fixed assets	383	197000000	1830000000
		Raw materials	262	136000000	692000000
	Output	Revenues	390	258000000	1400000000
Second-stage		Foreign ownership	450	.0133333	.1148253
		Manufacturing FDI value	450	11576.97	1498.809
		Composition of labour force - Skilled labour (average wage)	390	53815	67369.2
		Composition of labour force – non-Emirati	390	99.47889	2.15755
		Firm size – workers	390	276.3974	898.5237
		Firm age – old	450	.2	.4003338
		Firm age – mature	450	.32	.4668654

Table 4.4: Construction sector - descriptive statistics

		Variable	Observations	Mean	Standard Deviation
First-stage	Input	Number of workers	343	1268	2635.906
		Fixed assets	323	43300000	110000000
		Raw materials	261	104000000	313000000
	Output	Revenues	342	264000000	555000000
Second-stage		Foreign ownership	405	.0222222	1475879
		Construction FDI value	405	9457.66	1231.463
		Composition of labour force - Skilled labour (average wage)	343	35589.98	33732.98
		Composition of labour force – non-Emirati	343	99.50168	5.39265
		Firm size – workers	343	1268	2635.906
		Firm age – old	405	.3481481	.476825
		Firm age – mature	405	.2	.4004947

The data consist 855 observations with different types of manufacturing firms and construction of building, civil engineering and construction firm, based on the International Standard Industrial Classification (ISIC) code. And each firm is considered as a single DMU. (For more clarifications on variables' definitions and expected signs see Table 4.7). For manufacturing firms: the sample contents 150 firms where 52 firms are foreign and 98 firms are domestic. In terms of the size of the workers in manufacturing firms; foreign firms have 81% of non-Emirati workers during the period of 2014-2016. In regards the manufacturing firms age in the sample, 30 firms are old (20 firms are foreign and 10 firms are domestic) while 50 firms are mature (32 firms are foreign and 18 are domestic firms). For construction sector firms in Dubai during the period 2014-2016, the sample contents 135 firms, where 35 are foreign firms and 100 are domestic. By looking at the firm size; 77% of non-Emirati workers work in foreign construction firms during. Moreover, 47 firms are old (34 firms are foreign and 13 firms are domestic) and 27 firms are mature (13 firms are foreign and 14 firms are domestic) in our sample. From Tables 4.3 and 4.4, in manufacturing sector the largest value of fixed assets was in 2015, the largest amount of raw materials was in 2016 and the highest value of the revenues was in 2014. Whether in construction sector, 2015 had the largest value of fixed assets, raw materials and revenues.

4.5 Empirical results

4.5.1 First-stage

DEA assigns weights to the inputs and outputs of a DMU that give it the best possible efficiency. Table 4.5 shows the descriptive statistics for efficiency using the DEA approach. From Table 4.4 we can see that the mean efficiency for manufacturing firms under the CRS assumption is 0.654 and for VRS assumption is 0.727, while for construction firms CRS is 0.372 and VRS is 0.440, using

DEA. So, the efficiency is slightly greater for VRS than for CRS and this finding is in line with Podinovski (2004), where the focus is on the gap between CRS and VRS models. Basically, the VRS model is essentially the CRS with an additional constraint added to the linear programming problem.

Table 4.5: Descriptive statistics for efficiency using DEA

Scale assumption	Sector/ firms	Observations	Mean	Standard Deviation
CRS	Manufacturing	262	0.654	0.227
VRS		262	0.727	0.230
CRS	Construction	254	0.372	0.247
VRS		254	0.440	0.280

Table 4.6: Yearly descriptive statistic for efficiency using DEA and summary of average efficiency and inefficiency scores

Scale assumption	Sector/ firms	Year	Obs	Mean	SD	Number of efficient firms	Number of inefficiency firms	Average efficiency	Average inefficiency
CRS	Manufacturing	2014	86	0.632	0.238	16	70	19	81
		2015	85	0.655	0.223	13	72	15	85
		2016	91	0.674	0.221	17	74	19	81
VRS		2014	86	0.705	0.240	20	66	23	77
		2015	85	0.726	0.234	24	61	28	72
		2016	91	0.748	0.217	27	64	30	70
CRS	Construction	2014	89	0.401	0.260	7	82	8	92
		2015	94	0.339	0.214	4	90	4	96
		2016	71	0.380	0.267	7	64	10	90
VRS		2014	89	0.446	0.297	13	76	15	85
		2015	94	0.402	0.253	7	87	7	93
		2016	71	0.483	0.289	11	60	15	85

The table above indicates VRS and CRS. VRS implies an increase in all input variables by 1% would lead to a more than 1% increase in output. For the manufacturing sector, the VRS DEA results above revealed that 27 of the firms in 2016 shape the frontier this represents a 30% in 2016. On the other hand, only 24 of the firms displayed VRS in 2015, representing 28%, and 20 firms did so in 2014, representing 23%. The efficiency scores of the 262 sampled manufacturing firms based on the CRS DEA model show that 17, 13 and 16 firms were efficient in 2016, 2015 and 2014 respectively. By looking at the mean changes over time, in CRA and VRS the mean efficiency is changing and improving overtime.

For construction firms, based on the VRS DEA model, 11, 7, and 13 firms were efficient in 2016, 2015 and 2014, representing 15%, 7% and 15% respectively. By looking at the CRS DEA model for the construction sector, we can see that out of 254 firms, only 7, 4, and 7 firms in 2016, 2015 and 2014 respectively were efficient. By looking at the mean changes over time, in CRA and VRS the mean efficiency is changing and improving over time, and the mean of inefficiency is decreasing over time.

From the above descriptive statistics, the input-oriented VRS DEA model results are shown in Table 4.8 and they are analysed below. We keep the CRS results as a robustness check (Table 4.9).

4.5.2 Second-stage

Since the efficiency scores from the first-stage were inverted ($1/\widehat{\theta}_{it}$) and used as our dependent variable $\ddot{\widehat{\theta}}_{it}$ which is larger or equal to 1 in the second-stage model, our results mean that any positive coefficients represent the negative association on efficiency and vice versa. The results from the second-stage are presented in Table 4.8, where the coefficients are bootstrapped 1000 times. This is illustrated in the two specifications for each sector below:

For the manufacturing sector, both manufacturing specifications 8.1 and 8.2, foreign ownership is a highly significant determinant of efficiency. In specification 8.1 and 8,2, foreign ownership has a coefficient of -0.349 and -0.375 with highly significant signs at the 1% level respectively compared to domestic ownership. Foreign firms have a higher banks' efficiency on average about 0.349 and 0.375 than domestic firms in specification 8.1 and 8.2 respectively. These results indicate that foreign-owned firms were more efficient than domestic firms during the period 2014-2016 in Dubai in the manufacturing sector, as we expected. This result is in line with Saranga and Phani (2008), who applied DEA to investigate the association between foreign firms' ownership and Indian pharmaceutical firms' efficiency from 1992 to 2002. They found that the association between foreign-owned firms and firms' efficiency is positive and significant. Overall, from the magnitudes in these two specifications, efficiency seems to be increasing over time, suggesting that catching up with foreign firms at the frontier, although it is hard to confirm this due to the fact that this study uses only three years of data.

Despite that, in the construction sector, foreign ownership is positive, but not significantly associated with inefficiency in both specifications 8.3 and 8.4, indicating that among construction firms, it is not the case that foreign-ownership conveys an efficiency advantage. This might be due to government regulations, as the government accords priority to domestic firms in the construction sector in all tenders offered, after domestic firms have proved their financial and technical capabilities. Thus, foreign-owned firms only play a minor role in the market.

FDI in the manufacturing sector in specification 8.2 shown a negative significant related to firms' efficiency, which this shows a positive association as we expected. This indicates that FDI improves efficiency and it's an important force driving manufacturing firms' efficiency. The more the manufacturing sector attracts FDIs, the more the sector's firms become efficient. This result is in line with Suyanto and Salim (2010) and Sun et al. (2011), both of which focused on the manufacturing sector in developing countries, finding that FDI enhances firms' efficiency. Recent years have witnessed huge FDIs in the manufacturing sector in Dubai. Foreign investors are very interested in investing heavily in Dubai's manufacturing sector in order to facilitate their presence in Dubai and to benefit from its strong maritime network, in light of the great expansion of the Dubai Port. They also wish to benefit from the great exemptions and privileges granted by the Government of Dubai. Today, many of the world's largest manufacturing firms are looking at Dubai in order to enter into strong investment partnerships and to benefit from the export of their products to Dubai, the UAE and countries with strong commercial ties with the emirate.

On the other hand, in the construction sector (see specification 8.4), our estimations show that the coefficient of the FDI indicator is positive and the magnitude is 0.0000500, which means that it has

a negative association with efficiency with small magnitude. This indicates that it does not help to promote the efficiency of the construction sector, which is in line with Banalieva et al. (2012), who empirically analysed efficiency performance using a sample of 645 multinational enterprises during 2000-2006. The negative relationship seen in our results might be due to the lower quality of FDI within the sector to affect the firms' efficiency or the other possibility might be due to the recent recession and slowdown in projects in the construction sector, a decline in the real estate market in prices in Dubai (Bloomberg, 2014). Foreign investors have invested in Dubai because of the strength of the sector in Dubai's economy in the past, but it has stagnated during the period of investment flow in our studied years.

In the composition of the labour force, all specifications for manufacturing and construction, skilled labour has a highly significant and negative coefficient, indicating that it is an important relationship and association with efficiency in these sectors. One possible explanation of the coefficient is that a more competent, more skilled labour force, and a better educated and better-paid staff enhance performance, productivity and efficiency in both manufacturing and construction firms. This result is in line with Mujaddad and Ahmed's (2016) findings. They analysed the efficiency of manufacturing firms in Pakistan using a methodology similar to ours and they found that skilled labour had a positive related to efficiency. With regard to the ratio of non-Emirati employees among firm workers, this is insignificant in all specifications, suggesting that this factor does not have a systematic relationship with (in)efficiency in this context.

Our firm size represents the number of workers. In the manufacturing sector, the number of workers in both specifications 8.1 and 8.2 has a positively significant coefficient. The magnitude of the coefficients was 0.0658 and 0.0708 respectively. The results indicate a negative association with firms' efficiency, suggesting that the firms' absorptive capacity is an important element, but the number of workers does not guarantee firms' efficiency. This result was also found in Aggrey et al. (2010), where they focused on the agriculture manufacturing sector in Kenya, Tanzania and Uganda. They used data from surveys from 2002 to 2003 and they found that the association between firm's size and firm efficiency is significant. Interestingly, in construction, firms' size is not significant.

By considering the estimates of the coefficient of the dummy variables that identify old and mature firms respectively, we can conclude that there is no significant association in our data between efficiency and firm age. This result is consistent with Lundvall and Battesse's (2000) findings. In their work, they used a Stochastic Frontier model to examine 235 Kenyan manufacturing firms and found that firms' age is insignificantly associated with firms' efficiency.

4.6 Conclusion

The purpose of this study is to examine the efficiency distance between foreign-owned and domestic firms in the manufacturing and construction sectors, which have great potential to promote economic growth and competitiveness in Dubai. Within a DEA framework, we estimate each firm's relative efficiency score. In the second-stage, we resort to econometric techniques to investigate the determinants of differences in efficiency, focusing on firms' ownership, sectoral-level FDIs, and other firm-specific factors such as skilled labour, the firm's age and its size. We used a confidential firm-level panel dataset from the period 2014-2016.

The study finds that foreign-owned firms are more efficient and productive in manufacturing sector, compared to domestic firms. The association between FDI in manufacturing and efficiency is positive, possibly due to the role of FDI in improving competitiveness in the domestic market and transferring managerial know-how. Furthermore, skilled labour is an important associate of efficiency in both manufacturing and construction sectors, indicating that a more competent, more skilled labour force, and better educated and better-paid staff would enhance performance, productivity and efficiency in both manufacturing and construction firms. The results also show that firm age and size do not seem to be statistically associated to efficiency among manufacturing and construction firms during the period 2014-2016.

From our results and comparing the manufacturing and construction sectors, our policy recommendations are based on the Government of Dubai's industrial strategy 2030 objectives: the manufacturing sector has the potential to achieve the desired objectives, the government should continue to focus and keep attention to the manufacturing sector to remain to gaining the successful achievement from foreign and FDI entry. While for the construction sector, the government should reconsider its objectives in order to enhance, develop and target the construction sector as a strategic sector for the emirate. From the results, we can state that the Government of Dubai has to review the laws and circulars of the manufacturing and construction sectors and study the differences between them that could cause the government to fail in the achievement of its objectives. The Dubai Government has to consider the enactment of laws for the public and private sectors that allow domestic firms to benefit from foreign firms, for example exchanging employees to transfer knowledge and know-how between the two sectors and enhance domestic firms so that they become competitive and more efficient.

4.7 Appendix

Table 4.7: Variables' definitions and expected signs

Classification	Variable	Definition	Expected sign	Source
Dependent variable	Efficiency score	1/ Efficiency score (efficiency score measured by DEA – output: total revenues, inputs: number of workers, fixed assets, raw martials)		Economic Survey (2013-2016) – Dubai statistics centre
Ownership	Foreign ownership	Dummy variable, one when the firm is foreign-owned and foreign state licensed establishment while its head office or permanent company is outside UAE and zero otherwise per it	+	Author calculation based on Dubai statistics centre Data
FDI	FDI value	Deflated value of FDI in-flows in manufacturing and construction sectors per t	+	Dubai statistics centre
Composition of labour force	Skilled labour (Average wage)	Total of workers compensations/number of worker per it	+	Author calculation based on Dubai statistics centre Data
	Non-Emirati	Ratio, Number of workers non-Emirati/number of worker *100 per it	+/-	Economic Survey (2013-2016) – Dubai statistics centre
Size	Ln number of worker $_{t\_1}$	Number of worker taken in natural logarithms per it	+	Economic Survey (2013-2016) – Dubai statistics centre
Age	Old firm	Dummy variable, one when the firm was established on and before 1989 and zero otherwise per it	+/-	Author calculation based on Dubai statistics centre Data
	Mature firm	Dummy variable, one when the firm was established on and between 1990-1999 and zero otherwise per it	+/-	Author calculation based on Dubai statistics centre Data

Table 4.8: Firms' factors and determinants of VRS efficiency scores, using a bootstrap GLS regression for Manufacturing and Construction firms

	Manufacturing		Construction	
1/ Efficiency score	8.1	8.2	8.3	8.4
Foreign ownership	-0.349***	-0.375***	1.310	1.518
	(0.0975)	(0.0832)	(1.140)	(1.094)
FDI value		-0.0000371*		0.0000500
		(0.0000178)		(0.0000747)
Skilled labour - Average wage	-0.00000241**	-0.00000208**	-0.0000177**	-0.0000191**
	(0.000000809)	(0.000000738)	(0.00000686)	(0.00000650)
Non-Emirati	-0.0195	-0.0152	0.0104	0.0110
	(0.0196)	(0.0182)	(0.313)	(0.299)
Ln number of worker $_{t-1}$	0.0658**	0.0708**	0.124	0.116
	(0.0237)	(0.0231)	(0.0677)	(0.0633)
Old firm	0.0622	0.0680	-0.307	-0.319
	(0.0712)	(0.0709)	(0.245)	(0.239)
Mature firm	-0.0241	-0.0306	-0.244	-0.250
	(0.0594)	(0.0581)	(0.282)	(0.289)
Constant	3.339	3.293	2.396	1.967
	(1.947)	(1.813)	(31.13)	(29.71)
Observations	238	238	221	221

* p<0.1, ** p<0.05, *** p<0.01
Robust standard errors in parenthesis under coefficients

Table 4.9: Firm's factors and determinants of CRS efficiency scores, using a bootstrap GLS regression for Manufacturing and Construction firms

	Manufacturing		Construction	
1/ Efficiency score	9.1	9.2	9.3	9.4
Foreign ownership	-0.444***	-0.464***	1.375	2.041
	(0.0965)	(0.0909)	(1.114)	(1.233)
FDI value		-0.0000289		0.000260**
		(0.0000194)		(0.0000810)
Skilled labour - Average wage	-0.00000297**	-0.00000271**	-0.0000193**	-0.0000234***
	(0.000000919)	(0.000000863)	(0.00000612)	(0.00000661)
Non-Emirati	-0.0172	-0.0139	0.0113	0.0156
	(0.0249)	(0.0241)	(0.364)	(0.339)
Ln number of worker $_{t-1}$	0.0362	0.0397	0.201**	0.162**
	(0.0208)	(0.0209)	(0.0656)	(0.0608)
Old firm	0.228**	0.232**	-0.266	-0.294
	(0.0809)	(0.0805)	(0.240)	(0.234)
Mature firm	-0.0384	-0.0436	-0.307	-0.317
	(0.0675)	(0.0665)	(0.278)	(0.269)
Constant	3.441	3.413	2.294	-0.147
	(2.477)	(2.404)	(36.29)	(33.77)
Observations	238	238	221	221

* p<0.1, ** p<0.05, *** p<0.01
Robust standard errors in parenthesis under coefficients

Chapter 5

An Analysis of Dubai's Banking Sector Performance: Are Foreign Banks More Efficient than Domestic Banks?

Abstract: This study uses a two-stage approach to examine the evolution of economic efficiency in the banking sector in Dubai. Our goal is to understand whether, similarly to what happens in other sectors, foreign banks are more efficient than domestic ones in Dubai. We further investigate whether FDI inflows, the composition of the labour force, the firm's size and its age affect banks' efficiency. Using a unique, confidential dataset of 50 banks during the period of 2013-2016, we are able to show that foreign-owned banks are significantly more efficient than domestic ones, that the inflow of FDI in the financial sector positively associates with banking efficiency, and that both the presence of expatriates and skilled labour is associated with higher banking efficiency.

5.1 Introduction

Financial and insurance activities, particularly banking, play a very important role in economic development and are instrumental in diversifying a country's economy and broadening its sources of economic growth (Levine, 1997; Wachtel, 2001; Petkovski and Kjosevski, 2014). Furthermore, the banking system is a key element of the modern market economy. The availability of finance for enterprises, and the potential to restructure and improve competitiveness in transition economies, critically depends on the efficiency of the banking system (Hermes and Lensink, 2000; Hasan and Marton, 2003). Dubai is no exception. The banking sector in Dubai is arguably one of the most important and major sectors in the country. In 2016, the contribution of financial and insurance

activities to Dubai's GDP was 11.1%, according to the Dubai Statistics Center. Backed by its strong banking and financial services, Dubai has retained its top ranking in the region and in the list of the world's top financial centres. According to the Global Financial Centre Index issued in 2018, Dubai was ranked number 1 in the Middle East and Africa and rated 19 globally. Dubai's improvement in the global rating can be attributed to the consistent influx of foreign banks or the strength of domestic banks in Dubai. Moreover, the future expansion within the Dubai banking sector depends on the government's demonstrated commitment to implementing its strategy, known as Vision 2021. This aims to foster and promote innovation and technology in the banking sector in Dubai, enhance and improve market efficiency, the services and solutions offered, and creates opportunities for financial inclusion.

Banking efficiency is essential, particularly in developing economies because better-developed banking sectors have greater ability to increase competition among banks and promote economic growth compared to less developed banking sectors. A host country attracts FDI in the banking sector assuming its high productive, efficiency and technological more compared the domestic counterpart. Thus, it might affect the performance of the domestic banks in the host country. Moreover, the availability of foreign banks helps to exert an effect on personal banking, credit cards, and financial product innovation in the host country. Furthermore, foreign banks could improve domestic banks' efficiency and create collaborations with strategic investors, which could improve the corporate governance of domestic banks.

In this study, we investigate whether foreign-owned banks are more efficient than domestic banks, and analyze whether the FDI inflow in the banking sector and other banks determinants aspects such as: skilled labour and the bank's size and age affects banks' efficiency in Dubai. The study applies the DEA and Malmquist Productivity Index - MPI methods to the measure efficiency scores in the first-stage. We then adopt DEA Simar-Wilson double bootstrap and MPI bootstrap GLS regression methods in the second-stage. We use bank level confidential dataset obtained from a Dubai Financial Survey from 2013 – 2016. The motivations and contributions in this study differ to the previous studies on transition economies and banking efficiently in certain respects. First, the dataset is confidential, and has never been used before. The data sample covers almost all of the Dubai banking sector, which makes it the most comprehensive database on the Dubai banking system. Second, unlike other studies that focus on foreign and domestic banks' efficiency, we analysis of externalities by distinguishing FDI inflows and their relationship with banks' efficiency. Third, for Dubai, to the best of our knowledge, it is the first to look at the banking efficiency in Dubai by applying the DEA and MPI methods and focusing on the ownership of banks. Moreover, the study is multi-dimensional, which focuses on the evolution of the banks' efficiency in the banking sector and the importance of FDI. By looking at the direct relationship between FDI in such as the ownership and

the expatriates' labour, and the indirect relationship with FDI such as the knowledge and technologies that Dubai's aspires to get it from FDIs. The study finds foreign banks are more efficient than domestic banks; FDI inflows to the financial sector increase bank efficiency. Skilled labour and expatriates enhanced banking efficiency in Dubai during the period 2013-2016.

The entry of foreign banks is like a coin with two sides; it has advantages and disadvantages in the host country. Levine (1996) mentioned that allowing the entry of foreign banks might support and develop a country's access to the international capital market, enhance domestic financial development by improving and promoting financial policies, and improve domestic financial services' quality by encouraging domestic banks to implement advanced banking technology and skills. Lensink and Hermes (2004) also mentioned that the entrance of foreign banks motivates and encourages domestic banks to improve their efficiency and increase the diversity and quality of their financial services. Moreover, Claessens and Horen (2012) discussed the fact that foreign banks might have more sophisticated technologies and knowledge, giving domestic banks superior risk management skills. Jeon et al. (2011) advocate foreign bank entry, arguing that the domestic banking market would gain benefit from the foreign banks; the existence of foreign banks is supposed to enhance competition in the domestic banking market and ultimately improve the efficiency of the domestic banking system and increase the availability of credit. On the other hand, Stiglitz (1993) mentioned that the entry of foreign banks can be related to the potential costs of domestic banks, making the competition more intense and accordingly reducing the profit and financial earnings of domestic banks (Claessens et al., 2001). Consequently, investigating the efficiency of foreign and domestic banks in Dubai is important to consider in order to inform policy.

Empirical evidence on banks' efficiency finds that foreign banks are more efficient than domestic banks. In Croatia, Igor et al. (2002), using the DEA methodology, showed that foreign-owned banks were more efficient and had better performance than domestic banks. Similarly, Weill (2003) studied the Czech Republic and Poland banking sector and found that foreign banks were more efficient than domestic banks. Sturm and Williams (2004) used a DEA model and dataset from 1988-2001 to investigate the Australian banking sector, and they found that foreign banks were more efficient than domestic banks.

However, certain studies find that foreign banks operate less efficiently than domestic banks. DeYoung and Nolle (1996) used data from 1985 to 1990 on United States banks to investigate the relative efficiency of foreign-owned United States banks. They confirmed that domestic banks outperformed foreign banks. According to Berger et al. (2000), domestic banks in developed countries are more efficient than their foreign-owned counterparts. Isik and Hassan (2002) investigated input and output efficiency in the Turkish banking industry to understand the

association between ownership and efficiency measures by using the DEA method and a dataset from 1988 to 1996. They found that domestic banks outperformed foreign ones. Yildirim and Philippatos (2007) examined the efficiency of the banking sectors in twelve transition economies of Central and Eastern Europe over the period 1993-2000; they found that foreign banks were less efficient than domestically owned banks. Ong et al. (2011) used DEA approach to analyse and compare the efficiency of foreign and domestic banks in Malaysia during the period 2002-2009; they found that the domestic banks exhibited higher levels of efficiency than foreign bank. Furthermore, Sufian (2007) utilized the DEA methodology to examine the relative efficiency between the domestic and foreign banks Islamic banking operations in Malaysia during 2001-2004; this author found that the domestic Islamic banks were more efficient compared to the foreign Islamic banks albeit marginally.

Furthermore, a few studies have found that foreign banks are almost equally efficient as domestic banks. Elyasiani and Mehdian (1995) showed that, even with different technologies, foreign banks are as efficient as domestic banks. According to Vander (1996), foreign banks have almost the same efficiency as domestic banks.

Several authors have empirically reflected the importance of FDI on the banking and financial sector and its advantages for banks' performance in a host country. Goldberg (2004) stated that FDI in the banking and financial services sector is a relatively recent phenomenon, and comes in the form of financial institutions in developing and emerging countries and establishing subsidiaries and facilities in developing countries. Eller et al. (2006) examined FDI in the financial sector in Central and Eastern Europe and concluded that the quality of FDI influences the financial sector's contributions to the performance of foreign and domestic banks in emerging markets. Sghaier and Abida (2013), in their empirical study from North African countries, revealed that for a host country to obtain maximum benefits from FDI inflows, it must have a well-developed banking and financial sector. Moreover, Adeniyi et al. (2012) revealed that FDI inflows related positively and significantly on the financial sector in Nigeria.

Various studies have discussed different aspects of banks' efficiency, such as the association between the composition of the labour force, the bank's age and size, and banking efficiency. A few studies have investigated the relationship between labour skills and banking efficiency. Arvanitis (2005) explored empirically the determinants of firms' efficiency and performance and found that human capital and skilled labour as important determinants of firm efficiency and performance as they showed positive and significant relationships with firms' efficiency. Kneer (2013) studied the employment of highly skilled individuals in the banking sector and revealed that more highly skilled labour in banks improves intermediation services and banks' efficiency.

Regarding bank size relationship with bank efficiency, Hasan and Marton (2003) showed that larger banks were more efficient than smaller banks in Hungary. Drake et al. (2006) studied banks in Hong Kong by using a DEA approach and they found a strong positive size efficiency relationship. Kwan (2006) also studied Hong Kong's banking efficiency and the results showed a positive association between bank size and efficiency. Ariff and Can (2008) studied the efficiency of Chinese banks using a DEA approach, and they found that medium-sized banks were the most efficient. By contrast, Isik and Hassan (2002) found a negative relationship between bank size and efficiency for Turkish banks. Furthermore, Leightner and Lovell (1998) found that size was insignificantly associated with productive efficiency for both domestic and foreign banks in Thailand.

The relationship between a bank's age and its efficiency has been assessed as positive in some studies and negative in others. Ayadi et al. (1998) applied the DEA methodology in Nigeria to measure the efficiency of banks and concluded that long-existing banks were the most efficient. Jemric and Vujcic (2002) estimated the efficiency of banks in Croatia by using data from 1995-2000 and applying the DEA approach; they found that new banks founded in 1990 and later were more efficient than old ones founded before 1990. Moyo (2018) examined the relationship between efficiency and bank's age in the South African banking sector using a data set of 17 domestic and foreign banks for the period of 2004-2015. The author found that bank age was negatively related to the efficiency and not statistically significant.

We would like to contribute to the above literature by providing evidence on the efficiency of Dubai's banking sector with an emphasis on the foreign versus domestic banks debate. To achieve our objectives, the remainder of this study is as follows: the following section explains the UAE banking sector and the structure of the Dubai banking system. The conceptual framework is discussed next, followed by the empirical specification, empirical results and conclusion. An appendix for the study is provided at the end of this chapter.

5.2 UAE banking sector and the structure of the Dubai banking system

The UAE and Dubai especially are playing an important role in promoting and developing the finance sector, by developing an ambitious and realistic plan to become the financial and service sector leader in the Middle East. The banking sector is well moderated and managed by the UAE Central Bank.

The principal governmental and regulatory policies that govern the UAE banking sector, including Islamic banks (except Dubai International Financial Centre - DIFC), are the UAE Federal Law No. 10 of 1980 concerning the UAE Central Bank. Islamic banking is a modern financial scheme, which is based on the Muslim faith's legal framework known as Sharia law. Its essence is risk sharing and

the finance of each operation happens with fixed and predetermined rates of return. The UAE is one of the largest Islamic banking markets in the world, after KSA and Malaysia. According to the Central Bank UAE (2017), 22.4% of all banking assets in the UAE, which is around USD 149.73 billion, are Sharia compliant, which represents a far steeper growth rate for Islamic finance than that of conventional bank loans.

The Central Bank of the UAE performs key functions in the economy of the country and is a well-established financial structure. It provides consultations and financial support to the UAE Government and keeps control over activities of the UAE foreign and domestic banks. This is a positive factor for the country's growth, development and globalisation efforts because the country's banking sector has grown dramatically and is in a good position for international competition. In general, the Central Bank plays a role in monitoring credit policy and supervising the financial sector. In fact, all banks in the UAE are licensed by the Central Bank, and furthermore are subject to the Central Bank's requirements, laws and regulations.

The UAE Central Bank imposes quite strict requirements for the licensing of foreign and domestic banks, as well as for the scope of their services. Based on the law, the market access for foreign banks was limited and very restricted as foreign banks were not allowed to open more than eight branches in the country (1980-2003). In 2003, however, laws were modified, and nowadays foreign banks are allowed to open more than eight branches in the country, but special permission is required.

There are a number of advantages of the banking system in the UAE as perceived by policy makers, in particular: a stable economy and stable public policy; the guaranteed confidentiality of banking information; an absence of currency exchange control; and a modern and reliable banking system. In the whole history of the banking institutions there have been no cases where a domestic bank has gone bankrupt, and it is a highly competitive market as the UAE is operating 50 banks in the country currently.

The UAE's government created a global financial centre called DIFC. DIFC is an offshore model, a financial free zone and an initial move towards the complete liberalisation of the UAE banking sector, where foreign banks can enjoy 100% ownership without any restrictions on capital repatriation, with a zero tax rate. DIFC supports the country in becoming a hub of financial service innovations in the region. Thus, Dubai has become an important financial centre in the UAE because of its significant financial services sector.

Furthermore, the main player in the financial institutions is the banks, since they are the largest and most significant in this financial sector in terms of the activities, revenues, and assets, etc. Banks are

encouraging the accumulation of savings and enabling their allocation to the most productive investments and activities. Banks in Dubai offer the full range of banking services, monetary intermediation, financial leasing and other credit grants. As of 2016, according to the UAE Central Bank, there was a total of 50 banks in Dubai, 25 domestic banks with 354 branches and 25 foreign banks with 48 branches.

5.3 Conceptual framework

In this study we employ DEA and MPI methods in the first-stage to measure the efficiency of both foreign and domestic banks and in the second-stage we consider the DEA Simar-Wilson bootstrap truncated regression and MPI GLS bootstrap regression approaches to analyse the relationship between foreign banks and FDI and its relationship with banks' efficiency. Furthermore, this section describes the foundations of the MPI[6] approach and some recent developments in the two-stage bootstrapping technique of Simar-Wilson.

DEA was explained in the previous chapter and we utilize MPI approach as is an index that measures changes in productivity relative to a base year[7], in other words, it uses distance functions to measure productivity change (Caves et al., 1982). Furthermore, Malmquist is the most popular index method to assess changes in productivity; these can be decomposed into components due to changes in efficiency (catching up) and movements due to changes in technology (technological change). Changes in a firm's efficiency can be decomposed into changes due to efficiency technical change, scale of efficiency technical change and technical change (Mukharjee et al., 2001; Sufian, 2009).

5.3.1 The first-stage (MPI estimator)

The MPI estimates the total productivity index of the units analyzed, allowing for changes in productivity to be broken down into changes in technical efficiency and changes in technological efficiency (Price and Weyman-Jones, 1996; Hjalmarsson and Veiderpass, 1992; Bsrro, 2008; Ahin and Min, 2014).

Basically, the MPI is based on the output distance function defined as below:

$$d^T(x^t, y^t) = \inf\left[\theta: \left(x^t, \frac{1}{\theta} y^t\right) \in S^t\right] \quad (1)$$

[6] The conceptual framework of DEA model has been provided in the previous chapter.
[7] Relevant studies include Berg et al. (1992) and Fare et al. (1994).

Where x denotes a for inputs, y is outputs, S is the technology set, T superscript denote the technology reference period as usually is $T = t$ or $T = t + 1$, and $\frac{1}{\theta}$ defines the amount by which outputs in year t could have been increased by giving the inputs used, if technology of year T had been utilized fully.

Caves et al. (1983) argued that in MPI, the productivity movements can be measured by multi inputs and multi outputs when inputs and outputs data are available in physical units.

$$d^T(x^{t+1}, y^{t+1})/d^T(x^t, y^t) \tag{2}$$

Later on, Fare et al. (1994) discussed that to measure the MPI as the geometric mean of such indices and calculated both for year t and year $t + 1$ reference technologies as the follow:

$$M(x^{t+1}, y^{t+1}, x^t, y^t) = \left[\frac{d^t(x^{t+1},y^{t+1})}{d^t(x^t,y^t)} \times \frac{d^{t+1}(x^{t+1},y^{t+1})}{d^{t+1}(x^t,y^t)}\right]^{\frac{1}{2}} \tag{3}$$

Fare et al. (1994) used it into the product of technological change and technical efficiency change as the following:

$$M(x^{t+1}, y^{t+1}, x^t, y^t) = \underbrace{\frac{d^{t+1}(x^{t+1},y^{t+1})}{d^t(x^t,y^t)}}_{\text{(Change in technical efficiency)}} \times \underbrace{\left[\frac{d^t(x^{t+1},y^{t+1})}{d^{t+1}(x^t,y^t)} \cdot \frac{d^t(x^t,y^t)}{d^{t+1}(x^t,y^t)}\right]^{\frac{1}{2}}}_{\text{(Change in technology)}} \tag{4}$$

MPI can be calculated as the product of catch up (Change in technical efficiency) and frontier shift (Change in technology) as shown below:

$$M = (catchingup) \times (frontiershift) \tag{5}$$

MPI is measured either with the distance function or any alternatives with the reciprocal of the input distance function $\theta\,(x, y) = [1/d(x, y)]$. The reciprocal of the input distance function $\theta\,(x, y)$ is the smallest ratio by which an input can be multiplied and able to achieve a given level of output. The distance function is equal to the measure of technical efficiency that had been proposed by Farrell (1957) and is the basis of the efficiency distance ratios. Farrell measurement of technical efficiency as it's used in constructing MPI, index $M > 1$ indicates progress (improving) in relative efficiency, $M < 1$ indicates a regress (reduction) in efficiency and $M = 1$ indicates the status quo (constant).

Moreover, MPI has important components to measure scale of efficiency; the pure efficiency technical change which is indicate by the change in technical efficiency between two periods. The scale of efficiency technical change which measures the scale of operation. And the technical change index (technological change) which is the frontier shift. These components can be distinguished based on the VRS (Fare et al., 1994) and CRS assumption. The VRS scores measure pure technical efficiency only, while the index of CRS is a non-additive combination of pure technical and scale efficiencies.

$$M(x^{t+1}, y^{t+1}, x^t, y^t) = \underbrace{\frac{d_{VRS}^{t+1}(x^{t+1}, y^{t+1})}{d_{VRS}^{t}(x^t, y^t)}}_{\text{(Pure efficiency technical change)}} \times \underbrace{\left[\frac{d_{CRS}^{t+1}(x^{t+1}, y^{t+1})}{d_{VRS}^{t+1}(x^{t+1}, y^{t+1})} \div \frac{d_{CRS}^{t}(x^t, y^t)}{d_{VRS}^{t}(x^t, y^t)}\right]}_{\text{(Scale efficiency technical change)}} \times \underbrace{\left[\frac{d_{CRS}^{t}(x^{t+1}, y^{t+1})}{d_{CRS}^{t+1}(x^{t+1}, y^{t+1})} \times \frac{d_{CRS}^{t}(x^t, y^t)}{d_{CRS}^{t+1}(x^t, y^t)}\right]^{\frac{1}{2}}}_{\text{(Technical change index)}} \quad (6)$$

(Total change in technical efficiency)

MPI offers a different rate of technological change for each firm and analyses of technological change by firms. Furthermore, MPI needs neither to impose any functional form on data nor to make any distributional assumptions for the inefficiency term.

5.3.2 The second-stage

After estimating the efficient scores for Dubai's bank in the first-stage by employing two difference models: DEA and MPI, then we use the efficiency scores from DEA approach in order to assess the relationship between the efficiency scores and the specific determinants of banks in a second-stage DEA by using the Simar-Wilson's (2007) bootstrap truncated regression approach. This method has been widely used in the empirical literature (Pestana et al., 2010; Wijesiri et al., 2015; Chowdhury and Zelenyuk, 2016). While efficiency change scores from the MPI method have been used in the second-stage as well by employing GLS bootstrap regression, also this method has been widely used empirically (Perrigot and Barro, 2008; Barro, 2008; Halim, 2010).

5.4 Empirical specification

In order to assess the magnitude of the relationship between banks' efficiency and the specific determinants of banks in Dubai in the second-stage, we utilize the following equations:

$$\ddot{\Theta}_{it} = B_0 + B_1 OWN_{it} + B_2 FDI_t + B_3 SKILL_{it} + B_4 SIZE_{it} + B_5 AGE_{it} + \varepsilon_{it} \quad (7)$$

Where $\ddot{\Theta}_i$are = (1 / $\widehat{\Theta}_j$), the logistic transformation to make the efficiency continuous (Ramanathan, 1998). OWN_{it} is foreign ownership, which is measured as a dummy variable, one when the bank is

foreign-owned and foreign state licensed establishment while its head office or permanent bank is outside UAE and zero otherwise. FDI_t is the value of FDI in the financial sector. $SKILL_{it}$ represents the composition of the labour force which includes two variables: the average wage, which is calculated by the total compensations divided by the number of workers, and the ratio of non-Emirati workers, which is measured as number of non-Emirati workers/number of workers multiplied by 100. $SIZE_{it}$ represents the number of workers. AGE_{it} represents bank age, which includes two dummy variables, old bank, one when the bank was established on and before 1989 and zero otherwise. And mature bank is one when the bank was established on and between 1990-1999 and zero otherwise. Finally, ε_{it} represents the statistical noise, and the subscripts i and t denote the firm and year.

5.4.1 Data

This empirical study covers data of the Dubai banking from 2013-2016 in order to analyze whether foreign banks are more efficient than domestic banks in Dubai, and whether the FDI inflow and other selected banks' determinants aspects affect banks' efficiency. A unique, confidential database was constructed using firm-level data from the Annual Financial Survey operated and managed by the Dubai Statistics Center. The data enclosed a total of 50 banks in Dubai, 25 domestics (24 private banks established in the country, owned by an individual or group of individuals and 1 public bank owned by local or federal government), and 25 foreign banks, defined as financial institutions whose capital is owned by foreign nationals, be they individuals, institutions or governments. In regards the size of the banking sector in Dubai, 89% of the workers are non-Emirati workers work in foreign bank in Dubai during the period 2013-2016. By looking at the age of the banks, the sample contents 19 old banks (12 are foreign and 7 banks are domestic) and 18 mature banks (5 banks are foreign and 13 are domestic banks). Although the sample contents foreign and domestic banks in Dubai; but the sample does not illustrate the banking system in each bank such as Islamic banking or the sharia-compliant finance due to the limitation of information.

In this study, the DEA and MPI calculations are based on three inputs and two outputs. We follow the approach adopted by a number of other studies, such as Miller and Noulas (1996), Seiford and Zhu (1999), Hasan and Marton (2003), Luo (2003), Bonin et al. (2005), Matthews and Mahadzir (2006), Beccalli et al. (2006), Rezitis (2006), Chiu and Chen (2009), and Sufian (2009)and use the number of workers, the total deposits and the fixed assets (non-financial assets)as inputs, whereas our outputs are the banks' revenue and the loans erogated.

The descriptive statistics reported in Table 5.1 show that, over the period of our study (2013-2016), domestic banks dominated the foreign banks in terms of size. This holds for both the input and output

variables by looking at the percentage differences. This is given due to the government regulation on the size of foreign banks and most of the domestic banks are under Sharia law. For instance, revenue and loans as output variables are higher by 41% and 73% in domestic banks compared to foreign banks respectively. In terms of input variables, total deposits, total number of workers and fixed assets are higher by 68%, 20% and 84% respectively in domestic banks compared to foreign banks in the period mentioned above. For domestic banks, 2015 had the greatest value of total deposits, fixed assets, loans and revenues. In regards foreign banks, 2015 has the greatest value of total deposits, loans and revenues, while 2016 has the greatest value of fixed assets. Variables' definitions and expected sings are showing in Table 5.2.

Table 5.1: Descriptive statistics

		Variable	Observations	Mean	Standard Deviation
First-stage	Input	Number of workers	200	321.8551	706.6528
		Deposits	200	15500000000	32000000000
		Fixed assets	200	100000000	273000000
	Output	Revenues	200	627000000	1410000000
		Loans	200	15600000000	35100000000
Second-stage		Foreign ownership	200	0.3378378	0.4737739
		Finance FDI value	200	54000000000	10700000000
		Composition of labour force - Skilled labour (average wage)	200	89392.6	2692191
		Composition of labour force – non-Emirati	200	272.3131	1291.392
		Bank's size – workers	200	321.8551	706.6528
		Bank's age – old	200	0.4459459	0.4979113
		Bank's age – mature	200	0.2331081	0.4235265

Table 5.3 shows the t-tests for the input and output variables. Foreign banks have a higher number of workers on average compared to domestic banks, the standard deviation is greater in foreign compared to domestic banks and the p-value shows no difference between foreign and domestic banks. There is a significant difference in the deposits in foreign and domestic banks, domestic banks have higher deposits on average and domestic banks have a greater standard deviation. Moreover, a partial significance was seen in fixed assets, domestic banks have higher fixed assets on average and greater standard deviation compared to foreign banks. By looking at the output variables, we can see that foreign banks have a higher mean revenues on average with partial significance of p-value 0.083. For loans, there is a significant difference between foreign and domestic banks of p-value 0.0005 and domestic banks' loans are higher on average, with greater standard deviation.

Table 5.3: Two-sample t test with equal variances for inputs and outputs variables

		Foreign banks	Domestic banks
	Inputs		
Number of workers	Mean	162.7958	133.8082
	Standard deviation	431.5579	390.8616
	t	0.9031	
	P-value	0.3667	
Deposits	Mean	7670000000	23300000000
	Standard deviation	13100000000	42100000000
	t	-3.4016	
	P-value	0.0008	
Fixed assets (non financial assets)	Mean	14700000	36500000
	Standard deviation	27200000	168000000
	t	-1.6822	
	P-value	0.0929	
	Outputs		
Revenues	Mean	295000000	185000000
	Standard deviation	680000000	812000000
	t	1.7305	
	P-value	0.0838	
Loans	Mean	6740000000	24500000000
	Standard deviation	12900000000	46500000000
	t	-3.5360	
	P-value	0.0005	

5.5 Empirical results

In this section we present our empirical results from the first-stage where we employed DEA and MPI. In addition, we discuss the results from the second-stage as we used two different regression models.

5.5.1 First-stage

Firstly, we measured the efficiency scores by using input-oriented DEA in both scales for the VRS and CRS approaches. As has been mentioned in the previous chapter, CRS means that the outputs change in the same proportion as the input amounts change and VRS means that the outputs do not change in proportion to the inputs. We used both of these to compare the results and see the magnitude of the differences in values in each model.

Figure 5.1: Mean of efficiency scores by returns to scales assumption, bank ownership and year

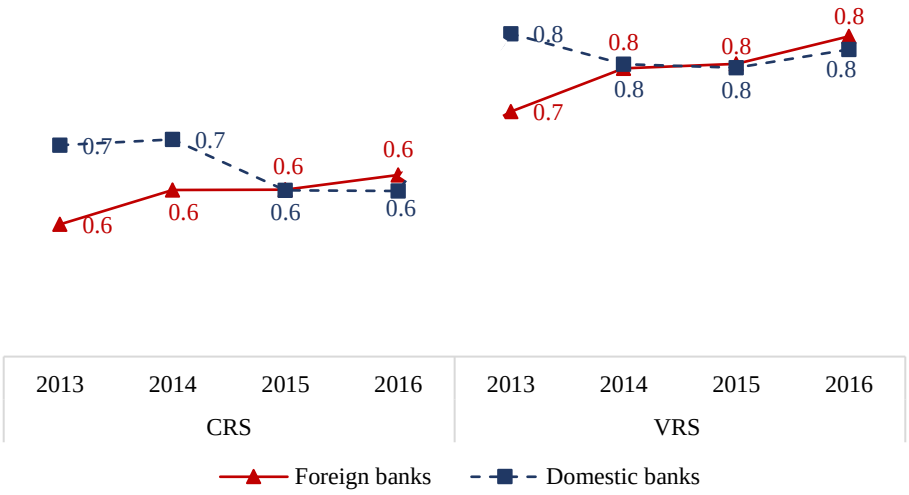
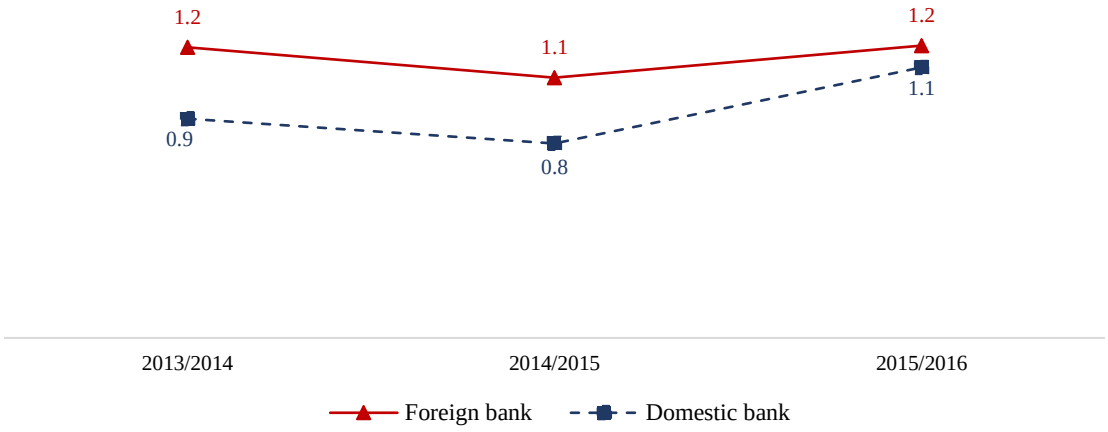


Figure 5.1 presents the efficiency scores in both scale assumptions per bank ownership and year. In general, there is an evolution, changing over time. On VRS, the average banking efficiency level for the 25 foreign banks under examination is 78.8%. This suggests that, on average, about 21.2% of bank resources are wasted during the provision of banking services. On the other hand, the average banking efficiency level for the 25 domestic banks is 75.8%. This implies that on average 24.2% of the resources are wasted. The estimates for foreign banks are slightly higher than for domestic banks (78.8% against 75.8%) and there is a yearly evolution is showing in VRS and CRS for foreign and domestic banks during the selected years. The mean in VRS is higher than in the CRS assumption and these inefficiencies could also be due to the constraints faced by foreign banks, such as opening new branches and offering diversified products.

The DEA assigns weights to the inputs and outputs of a DMU that give it the best possible efficiency. The approach taken was to consider banks efficient if their relative efficiency ratios = 1 and to regard them as inefficient if they obtained a relative efficiency ratio <1. From the results of the efficiency scores using the DEA approach for CRS and VRS techniques in the first-stage of our analysis we can see that the mean efficiency for banking firms under the CRS to scale assumption is 0.621 and for the VRS assumption it is 0.768. The VRS model is essentially the CRS with an additional constraint added to the linear programming problem. The VRS DEA model results are analysed below. The CRS results are kept as a robustness check and are shown in the appendix of this chapter.

Since the efficiency scores are based on input orientation (the linear programming model is configured so as to determine how much the input of a bank could contract if used efficiently in order to achieve the same output level), the signs of the coefficients must be reversed during interpretation for clarity in interpretation. This means that any positive coefficient represents a negative relationship between efficiency and vice versa, since the efficiency $\ddot{\theta}_{it}$ is a dependent variable after applying $(1 / \hat{\theta}_j)$ which is > or = to 1.

Figure 5.2: MPI average efficiency change scores – input-oriented VRS model



In the MPI approach, the model is based on input-oriented VRS, addressing the issue of reducing the input quantities proportionally while keeping the output quantities unchanged. The meaning of catching-up effect > 1 is that the efficiency score is increasing compared to the previous year. If the score = 1, it means that there is no difference between the current and previous year. If the score is < 1, then the efficiency is decreasing from the previous to the current year. An increasing catching-up score can be interpreted as the bank's effectiveness approaching perfect. The average efficiency scores of each bank type can be seen in Figure 5.2. According to this figure, foreign banks' average efficiency scores are > 1 from the period 2013-2016, are high and show a productivity improvement in foreign banks during the mentioned period. On the other hand, domestic banks' efficiency scores are < 1 from 2013-2015, indicating lower average efficiency, except for 2016 when it improved to be > 1, showing a productivity improvement in domestic banks in this year, according to UEA Central Bank, 2016, the capital adequacy ratio of the UAE banking system increased further during 2015/2016 to 18.9%. The 2015/2016 productivity improvement based on average efficiency scores is the highest during the periods among both foreign and domestic banks. The results were obtained using the VRS input-oriented DEA, which allows us to employ both the input and output variables in order to test whether the expected results are confirmed under every efficiency and production assumption (Siriopoulos and Tziogkidis, 2010).

5.5.2 Second-stage

The results in the second-stage are presented in Tables 5.4 and 5.5, based on two different methods (DEA Simar-Wilson and MPI GLS bootstrap regression). Both are under the input-oriented VRS model. Since our efficiency scores from the first-stage in DEA and MPI were inverted ($1/\widehat{\theta}_{it}$) and used as our dependent variable $\ddot{\theta}_{it}$, which is larger or equal to 1 in the second-stage model, our results mean that any positive coefficients represent a negative relationship with efficiency and vice versa.

The dependent variable in Table 5.4 is based on the DEA approach and then we regressed the Simar-Wilson model. The coefficients are loop bootstrapped 1000 times. Table 5.4 presents two specifications, which include the explanatory variables associated with foreign ownership: FDI inflows, the composition of the labour force, bank size and bank age. In order to test the hypothesis on banks' efficiency, we add these variables so as to be consistent with most other emerging market studies (Isik and Hasan, 2000; Leightner and Lovell, 1998; Hasan and Marton, 2003).

In specifications 4.1 and 4.2, foreign-owned banks have a negative partially significant relationship with banks' efficiency with coefficient magnitude of -1.067 and -1.053 respectively. This means that the association between foreign banks and banks' efficiency is a positive, as we expected. Foreign banks have a higher banks' efficiency on average. The foreign banks, the average of banks' efficiency by 1.067 and 1.053 compared to domestic bank in specification 4.1 and 4.2 respectively. These results indicate that foreign-owned banks are more efficient than domestic banks. The higher efficiency of foreign-owned banks might be attributed to their better risk management techniques or to success in reliance on advanced modern banking techniques or to upgraded information technologies and expertise, which have offset the potential disadvantages of not knowing the domestic market. These results are in line with Weill (2003), who focused on banks in Czech Republic and Poland; Igor et al. (2002) who analysed bank efficiency in Croatia between 1995 and 2000 using the DEA; and Sturm and Williams (2004), who focused on Australian banks from 1988 to 2001 using DEA, SFA and MPI. All of these studies concluded that foreign-owned banks were more efficient than domestic banks. Our finding contradicts with those Al-Tamimi (2004), who analysed banks' efficiency in UAE during the period 1997-2001 using the DEA approach and considered expense and non-interest expense as input variables and interest revenue and non-interest revenue as outputs variables. That author had found that the domestic banks were relatively more efficient than the foreign banks in UAE. These different findings occur for several reasons: the location of the banks varies; the selection of input and output variables is sensitive, which might give different results; and the selection of the years is important as Al-Tamimi selected years before the financial crisis in 2008, which affected the whole financial sector of the country. From our

finding, although the foreign banks are more efficient than domestic banks, domestic banks are close to reaching the foreign banks' evolution efficiency level, in 2018 the UAE Government held tentative discussions over a possible merger between three domestic banks, in order to create a giant bank capable of regional and global competition. According to financial and economic analysts (Abu Dhabi Securities Exchange, Financial times; Global Banking News) the merger will strengthen the country's economic diversification and economy in the global market. The integration of UAE's banks would raise efficiency levels and save costs.

When we added the FDI value in the finance sector to the regression in specification 4.2, the results show that FDI is negative and not significant (coefficient -0.235) and foreign ownership relationship remains positive and significant on banks' efficiency. This takes into account the FDI value variable, which represents FDI inflows into financial service activities, insurance, reinsurance and pension funding, auxiliary activities in the financial service and insurance activities. Our FDI finding is in line with Bhatnagar et al. (2013), who examined the association between FDI and firm profitability in India and found no significant relationship.

With regard to the composition of the labour force, skilled labour in specifications 4.1 and 4.2 has a negative and significant related on banks' efficiency, although the coefficients are small -0.000001 in both specifications, indicating that it is an important associate of banks' efficiency as we expected. Highly skilled labour helps to increase banks' efficiency; the more skilled and qualified advanced labour that banks have, the more efficient they become. Our finding is in line with Isik and Hassan (2002), who investigated Turkish banks' efficiency using the DEA approach during the period 1988-1996. They found that the association between skilled labour and banks' efficiency is positive and they also argued that inefficient managers might be "passive in assuming higher risks and higher profits". Foreign banks normally hire highly skilled labour to attract better clients, and reach a higher level of efficiency.

The ratio of non-Emirati among the banks' workers is negative and partially significant in both specifications, with small coefficient magnitudes: -0.00710 in specification 4.1 and -0.00695 in specification 4.2. These suggest that expatriate labour has a positive association with banks' efficiency, which indicates that expatriate workers with high levels of skills, knowledge and experience might increase bank efficiency in Dubai. The larger the number of skilled expatriates, the higher the banks' efficiency.

The banks' size, as measured by the number of workers, has negative coefficients: -0.252 and -2.245 in specifications 4.1 and 4.2 respectively. These two positive results suggest that this number of workers does not have a systematic relationship with (in)efficiency in this context. Our findings are in line with Leightner and Lovell (1998), who constructed an MPI model to examine the relationship

between Thai bank size and their efficiency during the period 1989–1994 and found that bank size is insignificantly associated with bank efficiency in Thailand.

Bank age includes two variables: old and mature banks. Both age categories have a negative and insignificant association with bank efficiency. This indicates a positive and insignificant related to banks' efficiency in Dubai during 2013-2016. The results are in line with Moyo (2018), who focused on South African banking during the period of 2004-2015 to examine the relationship between bank age and bank efficiency. The author found that bank age is insignificantly associated with bank efficiency. The results also show that the magnitudes of mature banks (-0.206 and -0.204) are larger than old banks (-0.109 and -0.136) in specifications 4.1 and 4.2. Overall, the association magnitudes of mature banks are larger than those of old banks, and this might be due to the knowledge accumulation and innovation persistence experienced by old or mature banks.

The results of the second method used in the second-stage are shown in Table 5.5. We employed the GLS bootstrap regression by considering ($1/\widehat{\Theta}_{it}$) from the MPI model as a dependent variable to estimate the relationship between foreign ownership, FDI inflows and other determinants of bank efficiency, the same as in the previous model. The coefficients were loop bootstrapped 1000 times. Table 5.5 includes two specifications, 5.1 and 5.2. We can compare the results with Table 5.4. We find that FDI becomes positive and statistically significant with regard to banks' efficiency in Dubai during the period 2013-2016, as we expected. This result suggests that the banking sector benefits from FDI inflows in Dubai. This result is in line with Abida (2013), who stated that FDI inflows improve the financial sector and enhance banking efficiency. It is also in line with the views expressed by Sghaier and Abida (2013), who suggested that FDI will have a spillover relationship with the change of performance of the banking sector. Furthermore, this finding contradicts our previous finding in Table 5.4 in terms of the significance due to the different methodology technique used. Overall, the main result from Table 5.5, which is different to that of Table 5.4, suggests that FDI inflows improve the business climate in Dubai's banking sector as a host country, which leads to enhanced efficiency in banks.

In general from Tables 5.4 and 5.5, we see almost similar results but the differences are in the significance of the coefficients because of the different dependent variable. In Table 5.4, we find the ratio of non-Emirati is a slight significant and in Table 5.5, FDI is highly significant; these differences are due to the different methods used and different dependent variable in each method.

5.6 Conclusion

This study examine the evolution of banking efficiency in Dubai by investigating whether foreign-owned banks are becoming more efficient and productive than domestic banks and whether FDI

inflow in the financial sector, skilled labour, bank age and size affect banks' efficiency in Dubai. The study uses a confidential dataset from a financial survey from 2013-2016 moderated by the Dubai Statistics Center and a two-stage approach. In the first-stage, two methods have been applied (DEA and MPI) to measure banks' efficiency scores and in the second-stage we adopted the Simar-Wilson double bootstrap and GLS bootstrap regression respectively.

Despite domestic banks in Dubai enjoying strong government support and implicit guarantees that allow them to attract funds and operate with solvent clients, foreign-owned banks have proven their efficiency. Thus, this study reveals that the foreign banks exhibited a higher level of efficiency than domestic banks in Dubai, consistent with other studies for transition and developing economies. FDI inflows significantly enhance sectoral-level banking efficiency in Dubai. In addition, the composition of the labour force, having skilled labour and skilled expatriates with high qualifications, is associated with higher bank efficiency.

From our results, our tentative policy recommendations for Dubai's government might be: based on the UAE Government's discussion on the possible merger between three selected domestic banks to strengthen the domestic banks, enhance competitiveness and raise the levels of banking efficiency, we encourage the merging solution of the selected domestic banks. We further suggest accelerating the implementation of this solution to promote and enhance the banking sector so that it becomes more competitive and diversified, with the ability to perform on an efficient global frontier. In other words, domestic banks should strive to compete with foreign bank counterparts to make Dubai a financial hub market with high levels of efficiency in its foreign and domestic banks. Furthermore, the government has to consider the enactment of laws that allow domestic banks to benefit from foreign banks, such as exchanging employees and increasing the percentage of Emiratization in foreign banks, in order to transfer knowledge, enhance competitiveness, and improve the levels of efficiency. The government should monitor the extent of benefiting from foreign investments in accordance with national strategies and their suitability with economic directives and should emphasize effective partnership between the public and private sectors.

5.7 Appendix

Table 5.2: Variables' definitions and expected signs

Classification	Variable	Definition	Expected sign	Source
Dependent variable	Efficiency score	1/ Efficiency score (efficiency scores measured by DEA and MPI– outputs: revenues and loans, inputs: total deposits, number of workers and non financial assets)		Financial Survey (2013-2016) – Dubai Statistics Center
Ownership	Foreign ownership	Dummy variable, one when the bank is foreign-owned and foreign state licensed establishment while its head office or permanent bank is outside UAE and zero otherwise per it	+	Author calculation based on Financial Survey (2013-2016) -Dubai Statistics Center
FDI	FDI value	Deflated value of FDI in-flowed in finance sector (included Financial service activities, Insurance, reinsurance and pension funding, and Activities auxiliary to financial service and insurance activities) taken in natural logarithms per t	+	Dubai Statistics Center
Composition of the labour force	Skilled labour (Average wage)	Total of workers' compensations /number of workers taken in natural logarithms per it	+	Author calculation based on Financial Survey (2013-2016) -Dubai Statistics Center
	Non-Emirati	Ratio, number of workers non-Emirati/number of workers *100 per it	+/-	Financial Survey (2013-2016) – Dubai Statistics Center
Size	Number of workers	Number of workers per in bank it	+	Financial Survey (2013-2016) – Dubai Statistics Center
Age	Old bank	Dummy variable, one when the bank was established on and before 1989 and zero otherwise per it	+/-	Author calculation based on Financial Survey (2013-2016) -Dubai Statistics Center
	Mature bank	Dummy variable, one when the bank was established on and between 1990 -1999 and zero otherwise per it	+/-	Author calculation based on Financial Survey (2013-2016) -Dubai Statistics Center

Table 5.4: Simar-Wilson double bootstrap model in a two-stage DEA VRS

1/ Efficiency score	4.1	4.2
Foreign ownership	-1.067* (0.470)	-1.053* (0.439)
FDI value		-0.253 (0.716)
Skilled labour - Average wage	-0.00000100*** (0.000000296)	-0.00000100*** (0.000000289)
Non-Emirati	-0.00710* (0.00310)	-0.00695* (0.00281)
Number of workers	-0.252 (0.202)	-0.245 (0.204)
Old bank	-0.109 (0.462)	-0.136 (0.464)
Mature bank	-0.206 (0.561)	-0.204 (0.560)
Constant	2.439* (1.222)	8.644* (17.67)
Observations	53	53

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table 5.5: GLS bootstrap model in a two-stage MPI VRS

1/ Efficiency score	5.1	5.2
Foreign ownership	-0.423* (0.509)	-0.355* (0.509)
FDI value		-0.708*** (0.902)
Skilled labour - Average wage	-0.00000000686* (0.0000000504)	-0.00000000275* (0.0000000643)
Non-Emirati	-0.0000269 (0.0000760)	-0.0000136 (0.0000703)
Number of workers	-0.000143 (0.0412)	-0. 000168 (0.0464)
Old firm	-0.0574 (0.0840)	-0.0129 (0.0105)
Mature firm	0.0731 (0.0869)	0. 0847 (0. 0865)
Constant	1.314*** (0.170)	3.101*** (0.221)
Observations	52	52

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table 5.6: Simar-Wilson double bootstrap model in a two-stage DEA CRS

1/ Efficiency score	6.1	6.2
Foreign ownership	-0.909* (0.607)	-0.911* (0.593)
FDI value		-0.437 (0.986)
Skilled labour - Average wage	-0.000000855** (0.000000314)	-0.000000834* (0.000000330)
Non-Emirati	-0.00248 (0.00251)	-0.00253 (0.00265)
Number of workers	-0.118 (0.221)	-0.123 (0.221)
Old bank	0.542 (0.785)	0.570 (0.801)
Mature bank	2.086 (0.990)	2.070 (0.942)
Constant	2.607* (1.652)	10.10* (24.30)
Observations	69	69

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Chapter 6

Conclusion

FDI inflows have been viewed as a main engine for economic development in the world economy. The benefits of FDI inflows are increasingly being accepted as evidence for that; we see that the majority of countries have set up an advanced system to increase their prospects of attracting FDI inflows.

There is a growing body of literature investigating the role played by FDI inflows in economic growth. Our study expanded the scale of previous research to focus on the interrelationship between FDI inflows, economic performance, determinants of FDI, firm ownership and firm efficiencies, which have received little attention in the economic literature on resource-rich countries. This thesis has attempted to fill this gap in the literature by studying different aspects of these relationships together with the availability of FDIs. We identify empirically the importance of the determinants of FDI and their relationship with FDI inflows. We also illustrate empirically the differences in efficiency of firms, by looking at firm ownership and sectoral FDI in a host country in different economic sectors.

This chapter is the last chapter of the thesis. It provides a brief review of the main empirical findings in Chapters 2-5, including policy considerations, followed by the limitations of the study and suggestions for further research.

6.1 Main empirical findings

The empirical results throughout our analyses provided answers to the questions initially asked in the introduction chapter (Chapter 1).

In Chapter 2, we examined empirically the relationships between FDI and economic performance in the UAE's emirates, illustrated how FDI's related varies by sector and investigated the geographical and sectoral extent of FDI technology spillover and its associated spatial diffusion in the UAE as a host country. We used sectoral-level panel data over the period 2006-2014 and three destinations among the UAE. We employed a production function model. The results showed that the relationship between FDI and economic performance depends on the location and sector. FDI has a higher relationship on the economic performance of both Abu Dhabi and Dubai compared to the North Emirates and attracting FDI to the primary sector appears to matter and improve the economic performance more than in other sectors. Furthermore, the technological distance study revealed that FDI flows from far technological distance of source countries, bringing higher quality technology to the UAE. Moreover, the geographical spillovers from FDI influence economic performance positively. The sectoral spillover are higher in the primary sector, which indicates that in the mining and quarrying sector FDI affects the value added of the UAE more than other sector spillovers. In sum, there is a positive relationship of FDI, depending on the absorptive capacity of the destination. Attracting FDI in all sectors will lead to greater technological spillovers (geographical and sectoral spillovers) from FDI inflows, all of which will contribute to enhancing economic performance in the country.

Chapter 3 examined empirically the importance of various determinants of FDI in GCC countries and assessed whether our selected host countries' strategic plan had been effective by looking at the strategic plan; this entailed identifying the priority sector and the priority source country. By using a panel dataset of FDI flows from 66 source countries to 14 specific economic sectors of three

developing GCC countries (UAE, KSA and Qatar) during the period 2006-2014, we utilised a gravity model approach. Empirically, the chapter supports 9 categories of FDI determinants and the results found that government business strategy, market size, openness and infrastructure are the main and most important determinants of FDI in our selected host countries. The results revealed that the host countries' government business strategies i.e. identifying priority sectors to attract FDI to and priority source countries to attract FDI from, and allowing 100% ownership by foreign investors, are effective.

Chapters 4 and 5 empirically considered different firm sectors and methodology techniques, while focusing on the efficiency distance between foreign-owned and domestic firms in a number of priority sectors in Dubai.

Chapter 4 examined the efficiency distance between foreign-owned and domestic firms in the manufacturing and construction sectors. These sectors are considered to have great potential for promoting economic growth and competitiveness in Dubai. The study used a firm-level panel dataset from 2014-2016 within a two-stage analysis with a DEA framework. We estimated each firm's relative efficiency score in the first stage and in the second stage, and truncated GLS regression to investigate the determinants of differences in efficiency by focusing on firms' ownership, sectoral-level FDIs, and other firm-specific factors such as composition of the labour force, the firm's size and its age. The results indicate that foreign-owned firms are more productive in both the manufacturing and construction sectors, compared to domestic firms. The association between FDIs in manufacturing firms' efficiency is positive. Skilled labour is an important associate of efficiency in the manufacturing and construction sectors. Firm size and age do not seem to be statistically associated with efficiency among manufacturing and construction firms.

In Chapter 5, we investigated the evolution of economic efficiency in the banking sector in Dubai to understand whether foreign-owned banks are more efficient and productive than domestic banks. We examined whether FDI inflows, the availability and composition of the labour force, the firm's size and its age affected banks' efficiency during the period of 2013-2016 and were associated with changes in efficiency scores. A two-stage approach using DEA and MPI models was used to measure banks' efficiency scores in the first stage and in the second stage the DEA Simar-Wilson bootstrap

truncated regression and the MPI bootstrap GLS regression were used. The results showed that foreign-owned banks are significantly more efficient than domestic ones. The inflow of FDI into the financial sector positively associates with banking efficiency, and the presence of both expatriates and skilled labour is associated with higher banking efficiency.

6.2 Further research

The four empirical chapters have been turned into papers. The four papers will be submitted to UAE's local government stakeholders, which are: the Abu Dhabi Executive Council, the Abu Dhabi Council for Economic Development and the Abu Dhabi Department of Economic Development. The papers from Chapter 4 and 5 were specifically requested to be sent to the Dubai Executive Council and the Dubai Statistics Center. Moreover, the four papers will be submitted to journals for publication soon.

This thesis expands the scale of research on FDI. However, there are still some limitations in the thesis. One notable aspect is data availability. In Chapters 2 and 3 the sample size was restricted to the period 2006-2014 and for Chapters 4 and 5 the sample was unique, but only between 2013 and 2016, which constrains the degrees of freedom in the estimations when considering the number of variables and lags.

With regard to new research based on this thesis, the following topics might be considered as noteworthy in the area of attracting FDI to a developing country.

This thesis considered the relationship between FDI and economic performance, the importance of determinants of FDI and the efficiency of foreign-owned firms and FDI inflow, as well as highlighting the nationality of employees. Further research could be applied to labour market structures, in other words, highlighting gender in the labour market, which has not yet been considered in the UAE and the Gulf region. The research question might be centred on: Has FDI in fact expanded women's employment? Does FDI increase women's wages? Does FDI affect women's autonomy, women's rights or their bargaining power and does it allow them to reach top-level management positions? The firm-level data on employment and wages according to gender make

this research possible. Moreover, similar methodologies to those that have been employed in this thesis might be used for the research.

Another interesting research topic could be related to the environment, CO_2 emissions and FDI. At the end of 2018, the Abu Dhabi government established a new government entity to moderate energy usage. The government has implemented several measures to limit energy use and reduce harmful emissions. The research needs to measure CO_2 emission efficiency and to illustrate the impact of FDI value, trade, technological innovation, free zone locations and environmental regulations on CO_2 emission efficiency. It is possible to link all of these related areas by using firm-level panel data and employing the DEA-Tobit model.

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