Foreign Direct Investment and Technology Transfer: The Case of the UAE

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L O N D O N

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By

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Dedication

This thesis is dedicated to

The father of the UAE nation

His Highness the Late Sheikh Zayed bin Sultan Al Nahyan.

And

His Highness Sheikh Khalifa bin Zayed bin Sultan Al Nahyan

The President of the United Arab Emirates

And

Lieutenant General Sheikh Mohammed bin Zayed bin Sultan Al Nahyan The Crown Prince of Abu Dhabi and Deputy Supreme Commander of the UAE Armed Forces

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In the Name of Allah, the most Gracious, the Most Merciful.

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It is with great pleasure that I can thank all those who have supported and helped me write this thesis.

Last but not least, my family – my parents, my wife and my children. This is dedicated to you, with love.

Declaration

The following publications have been produced as a direct or indirect result of the research discussed in this thesis.

Journals

Harhara, F., Al-Roubaie, A., and Al-karaghouli, W. (2013) 'Host country factors and inward FDI-induced technology transfer: The case of the UAE' accepted for publication in International Journal of Innovation and Knowledge Management in Middle East & North Africa (forthcoming).

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Abstract

Throughout the 1960s and the early 1970s, almost all developing countries pursued an import substitution policy that sought to develop a domestic manufacturing sector. At the same time, these governments carried out nationalisation programmes based on the view that foreign ownership of industry and assets was a drain on their wealth and hindered the economic development of the nation. Some developing countries saw foreign investment as a continuation of their colonial past and wanted to move away from it. As a result, there was a natural dislike and distrust of foreign investment. However, in the last three decades there has been a sea change in government opinions regarding foreign investment, and now many countries are actively encouraging it. In fact, some governments have paid financial incentives reaching as much as US$150,000 per employee to foreign companies to attract them to their country. These financial incentives are paid on the basis that governments believe that inward investment has positive effects on the economy, the most important of which is transfer of technology. Through improved technology a country can significantly enhance its competitiveness in the global marketplace leading to increased economic growth. With economic growth countries can also improve their social indicators such as education, health etc. Therefore, technology transfer from inward investment is viewed as the catalyst to change within a country.

Despite the widespread popularity of governments seeking to attract inward investment there is no conclusive evidence that it leads to positive spillover effects in the form of technology transfer. This study seeks to fill this gap in the current body of academic knowledge, using the case of a small resource abundant country with a low population, such as the UAE, using both qualitative and quantitative research methods. The primary data was obtained through a detailed questionnaire, and provides an in depth approach to understanding the issue of technology transfer for the UAE; while the secondary data, obtained from UNCTAD and the World Bank, is more macro level in nature. The macro level data indicate that certain factors in the UAE are conducive to technology transfer taking place. The primary data seek to interrogate this for the case study presented in this study. In doing so, the primary and secondary data sets are connected in so far as to provide cross reliability through the identification of commonalities and differences of results. This study aims to provide understanding on whether FDI does indeed lead to a transfer of technology from the overseas firm into the host country economy. Understanding such a link within an academic framework allows this study to arrive at relevant policy recommendations that can be taken up by policy makers in similar contexts.

The prior literature has shown that FDI both flows into countries that have proven economic growth and that FDI leads to economic growth, and therefore these factors are interrelated. This study has found that FDI can play an important role in filling domestic gaps in investment and also spur economic growth. This study develops a simultaneous regression to test the existence of a joint relationship between economic growth, which is a proxy for technology transfer, and FDI. In the case of host country factors a linear regression model is developed and tested. At a more micro level this study examined the case of Tawazun Economic Council, a high technology organisation that operates within the aerospace and defence industry

cluster, in order to understand whether its investments have led to any real impact as far as technology transfer is concerned. The Tawazun Economic Council is a project with a total investment of US$60 billion, and as such allows this research to capture the impact of technology transfer in an enhanced cluster that has aerospace and defence as its core theme. The aerospace and defence sectors have leading edge technology, and therefore a high probability of technology transfer taking place.

Through a survey of senior managers within the organisation responsible for strategy development, this study also found that technology transfer has taken place due to the very sophisticated off-take contracts that have been negotiated with buyers and technology suppliers. However, none of these technologies have been applied outside their narrow aerospace and defence usage. In addition, if capital abundant countries wish to capitalise on the technology transfer benefits from FDI then, future government policies should seek to protect intellectual property rights. The novel contribution of this study is that it has identified factors that are important for technology transfer from FDI to take place in capital abundant countries that have a small population. As such, the research has not only increased the current body of knowledge in this area, but has sought to provide policy recommendations that could help in increasing the level of FDI-based technology transfer in developing countries, with a particular emphasis on capital abundant and low population countries.

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CHAPTER 1
Introduction and Background

1.1   Introduction

Research interest in Foreign Direct Investment (FDI) has arisen as a result of a dramatic change of perspectives among global policy makers. Traditionally, policy makers, especially from developing nations, were hostile towards FDI, viewing it as parasitic and retarding the development of domestic industries for export promotion (Te Velde, 2006). However, in recent years, global policy makers have adopted a deliberate approach, aggressively attracting FDI to their countries. The rationale for these increased efforts to attract more FDI stems from the belief that FDI has several positive effects. The most important among these is technology transfer to host nation firms, which encompasses the introduction of new processes, managerial skills and know-how in the domestic market, employee training, international production networks, awareness of access to markets and productivity gains through doing things in a more efficient manner (Görg and Greenaway, 2003). As such, FDI is viewed as an important vehicle for the transfer of technology, with a greater contribution to growth than domestic investment. Prior literature shows that FDI increases the rate of technical progress in the host country through a contagion effect from the more advanced technology, management practices, etc. used by foreign firms. On the basis of these assertions, governments have often provided special incentives to attract foreign firms to set up companies in their countries. Carkovic and Levine (2002) note that the economic rationale for offering special incentives to attract FDI frequently derives from the belief that foreign investment produces positive externalities in the form of technology transfers and positive spillovers. Kok and Ersoy's (2009) investigation of the best determinants of FDI in developing countries shows that the interaction of FDI with some FDI determinants has a strong positive effect on economic progress in developing countries.

De Gregorio (2003) finds that FDI allows a country to introduce technologies and knowledge that are not readily available to domestic investors, and in this way increases productivity, consequently growth throughout the economy takes place that would not occur in the absence of the inward investment. FDI may also bring in expertise that the country does not possess,

and foreign investors may have access to global markets hence bringing in cheaper finance. De Gregorio (2003) found that increasing aggregate investment by 1 percentage point of gross domestic product (GDP) increased the economic growth of Latin American countries by 0.1 per cent to 0.2 per cent per year. However, if FDI is increased by the same amount, the growth in GDP is approximately 0.6 per cent per year during the period 1950–1985. This indicates that FDI is three times more efficient than domestic investment in terms of the impact that it has on productivity. The efficiency of FDI on economic growth is further reinforced by studies examining a more recent period, such as that by Adhikary and Mengistu (2008), who report that in developing economies a 1 per cent increase in FDI can increase GDP per capita growth rates by approximately 0.5 per cent (improvements in GDP are viewed to have taken place as a result of the technology transfer from inward investment).

Historically, FDI was dominated by major western nations, such as the USA, which between 1945 and 1960 accounted for 75 per cent of all new inward investment (UNCTAD, 2009). Since the 1960s, FDI has become a global activity, with more recipients and more investor countries. Therefore, it is no surprise to see that currently FDI is well over US$1.34 trillion or 2.8 per cent of world GDP (EIU, 2009). One reason for the growth of FDI is that many governments around the world are looking to increase their exports through encouraging firms to sell their output outside their own economy. FDI statistics show that over two-thirds of all cross-border sales were generated by enterprises established through FDI (EIU, 2007). In export intensive countries, such as China, FDI established firms account for more than half of all foreign trade. Governments have realised that FDI can have positive ripple effects into the domestic economy that not only go beyond the simple ability to facilitate economic growth, but also encourage a transfer of technology to local firms, and increase labour productivity, investment and savings. Countries eager to encourage inward investment have simplified processes, allowing foreign firms to be established; reduced or in some cases waived taxes; and provided suitable infrastructure and relaxed ownership requirements, leading to an investor friendly business climate.

FDI not only benefits the investing entity (i.e. the overseas firm) in terms of increasing its global business through exploiting new markets and marketing channels, cheaper production facilities, technology, skills and in some cases financing; but also benefits the host nation (i.e.

the country where the investment takes place). In the case of the host nation, FDI provides a valuable source of investment. Therefore, it is not surprising that almost all governments around the world have been eager to attract FDI and have established special departments or agencies to support the activity. In some cases governments have provided special incentives in order to attract FDI into the country. The increase in the importance of FDI to government policy across the globe has been matched by a corresponding increase in its activity. In 1980, global FDI inflows were a little over US$54 billion, while in 2008 they had increased to US$1.7 trillion (UNCTAD, 2009). The stock of FDI was US$705 billion in 1980, which exploded to over US$15 trillion in 2008 (UNCTAD, 2009). Of this stock of FDI, two-thirds is in the developed economies, while one-third, amounting to US$4 trillion, is in the developing economies and US$0.4 trillion in the transition economies (UNCTAD, 2009).

FDI is not without its critics, both in the parent/investor and recipient countries. In the case of the investor country, FDI is considered to be a process by which jobs and investment are transferred abroad. This argument has become extremely political in recent years, especially as a number of large firms have moved their back-office processing and production centres to India and China respectively. The critics argue that these firms seek to exploit the cheap labour costs abroad at the expense of the home country that is the buyer of their services or products. The political nature of the debate has meant that trade unions and politicians sought to boycott firms who carried out FDI. In response to these actions a number of firms have reversed the process in order to avoid negative customer sentiment. From the viewpoint of the recipient country, FDI implies that foreign firms receive a competitive advantage over domestic firms due to host country subsidies and tax waivers. It is argued that these competitive advantages displace domestic producers and allow foreign firms to gain a larger share of the domestic market without any significant improvements in exports. Although these subsidies and tax waivers are intended to increase overall welfare, there is mixed evidence of their effectiveness in doing so.

1.2   Problem Statement

The impact of FDI on economic growth during the early stages of the study was examined using the neo-classical model proposed by Solow (1957). However, the traditional neo-classical model failed to take account of technology, and hence later studies were largely based on the work by Romer (1986 and 1990) and Lucas (1988). These more recent studies

argued that FDI can have a positive impact on economic growth both directly and indirectly. In the case of the former, FDI increases the level of capital formation and employment opportunities as well as exports. In the case of indirect impact, it is argued that FDI upgrades the level of labour skills and enhances the productivity of firms through technological advancement (Johnson, 2005). Therefore, it is generally assumed that the flow of FDI into a country, leading to a higher rate of technology transfer, positively impacts economic growth. This belief also rests on the assumption that FDI itself is dependent on economic growth in that countries with higher levels of development are able to attract greater inflows of foreign capital. The importance of economic growth is two-fold in that it is firstly a requirement to attract firms into a country so that technology transfer can take place; secondly, any improvement in technology transfer manifests itself as an increase in economic rate. Therefore there is a circular relationship between FDI and economic growth, with technology transfer as a mid-point connector, as illustrated in Figure 1.1 below. It is important to note that while the relationship from FDI to technology transfer is one-way, the relationship between technology transfer and economic growth is bi-directional. The rationale for this is that greater economic growth spurs more competition between firms and hence a higher need to gain competitive advantage through innovation.

Figure 1.1   FDI, Economic Growth and Technology Transfer
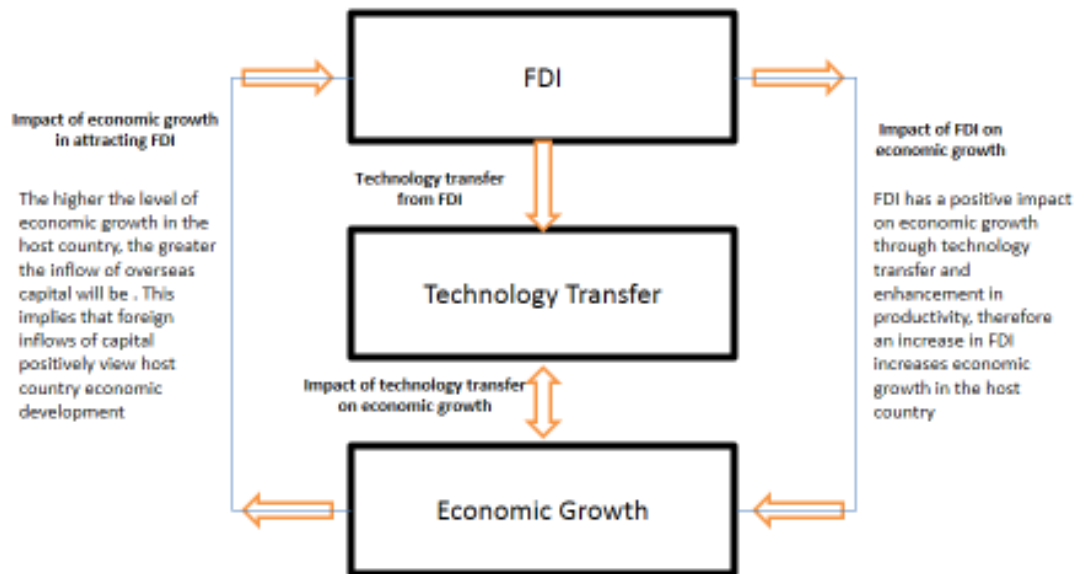
Although the assumed positive relationship between FDI and economic growth is straightforward and has a theoretical underpinning, it is nevertheless not conclusive. Prior studies have found that the relationship between FDI and economic growth is dependent on the characteristics of the host nation, such as the level of human capital and technology (Borensztein *et al.*, 1998). Borensztein *et al*. (1998) argue that FDI is an important channel for the transfer of technology and has greater impact on economic growth than domestic investment. Interestingly, Borensztein *et al*. (1998) find that FDI cannot lead to productivity gains unless human capital has reached a certain threshold. Similarly, Choe (2003) finds a joint relationship between FDI and economic growth, but appears to be more pronounced from economic growth to FDI. Li and Liu (2005) find evidence for a simultaneous relationship between GDP and FDI. Bende-Nabende and Ford (1998), Kim and Hwang (2000), Zhang (2001), Bende-Nabende *et al*. (2003), and Baharumshah and Thanoon (2006), amongst many other studies, have found positive long-run effects of FDI on economic growth. Despite the vast level of research carried out examining the role of FDI and economic growth and the role of technology transfer there appears to be little consensus. Prior studies have found that the impact of FDI on technology transfer and economic growth varies across countries, whereby positive, negative, or insignificant results have been found. Interestingly, even for the same country, prior studies tend to find mixed results. For instance,

for China, which has received one of the highest levels of FDI, studies such as Tan *et al.* (2004) and Tang (2005) found a positive relationship, while Shan (2002) found the opposite.

Countries throughout the world have made FDI a key policy target, especially since the international financial crisis, whereby it is seen as a substitute for domestic investment. At the same time, governments have identified the indirect benefits of FDI, especially in regard to technology transfer. As a result, governments are focusing on creating the appropriate infrastructure so as to enhance the level of technology transfer from the foreign firm to domestic firms. The perceived importance of FDI from a government perspective is clearly illustrated by the huge incentives that governments offer foreign inward investment. In recent years governments have relaxed regulations and provided generous incentives in order to attract foreign investment; some countries have established special economic zones or free zones that allow full foreign ownership of a business, the ability to repatriate profits, etc.; while Head (1998) and Girma and Wakelin (2001) show that on average western governments have paid from US$30,000 to as much as US$150,000 per employee to foreign companies in order to for that company to establish a presence in their country.

The problem statement of this research is to empirically examine the impact of FDI on technology transfer. In doing so, the study seeks to fill an important gap in the current body of academic literature, and allows for the development of better public policy for small developing countries that are actively seeking to attract inward investment. The vast bulk of prior studies have tended to focus on developed countries, and little work has been carried out on small resource abundant economies.

1.3   Research Aim and Objectives

The aim of this research is to develop a framework and empirically test the relationship between FDI and direct as well as indirect technology transfer on small but highly resource abundant countries, using the UAE as an example of such an economy. As a result of this study, the researcher will in the first instance be able to understand whether inward investment does lead to technology transfer taking place, and secondly the factors that are conducive for it to take place effectively. The researcher believes that this aim will allow this study to solve the problem statement as discussed in the previous section.

The more specific objectives of this research are as follows:

1. To review and research the published literature to understand whether FDI has led to technology transfer spillover effects. In doing so, the objective is to determine whether an increase in FDI leads to a greater level of technology transfer taking place.

2. To determine whether there is a joint (i.e. simultaneous) relationship between FDI and technology transfer. The rationale here is to identify whether FDI indeed leads to positive technology transfer spillover effects.

3. To examine the role of clusters in facilitating technology transfer from FDI. It has been argued that clusters lead to synergies that are not possible outside such geographical proximities, and this objective seeks to examine whether they also lead to technology transfer from FDI.

4. To understand which host country factors are conducive for technology transfer from FDI to take place effectively and efficiently. Studies to date do not find conclusive evidence of technology transfer from FDI and it may be the case that there are country specific factors that either enhance technology transfer or inhibit it from taking place. This objective seeks to understand which, if any, country specific factors are important in leading to technology transfer from FDI taking place.

5. To develop policy recommendations that are based on strong theoretical foundations and empirical evidence.

Together these five objectives individually explore each of the different aspects of the problem as stated above, through adopting both macro and micro level methodologies. At the same time, these objectives combine both a quantitative and a qualitative approach. Collectively these five objectives provide a holistic approach to understanding the research problem and going a long way towards a solution, so as to arrive at meaningful policy recommendations.

1.4   Research Design and Methods

The discussion on methodology in Chapter 4 argues that there are essentially two main techniques that researchers can employ, namely quantitative and qualitative. Both of these techniques are extremely useful in extracting powerful results; at the same time there are inherent weaknesses in each technique. Therefore, this study seeks to harness the strengths of

both techniques, and in doing so offers a unique insight into the role of FDI in technology transfer. First, this research offers a macro level understanding of FDI and technology transfer through investigating its impact on the whole economy; second, the researcher offers a micro level insight using qualitative results based on a survey instrument that is the first of its type in the region under scrutiny. It is the belief of the researcher that the combination of both qualitative and quantitative techniques will provide a richer set of results that will lead to full and well-developed policy recommendations. The research design is illustrated below in Table 1.1:

Table 1.1   The Research Design

Stage 1:	Macro level analysis
Aim:	To examine if technology transfer from FDI has taken place in the identified economies. The aim is to understand if the FDI to date has had any positive spillover effects as far as technology transfer is concerned.
Methodology:	Quantitative – Simultaneous regression.
Rationale:	The rest of the thesis relies on technology transfer to have taken place, and this part of the thesis examines its presence for the UAE.
Milestone 1:	Construction of a simultaneous model for the UAE that examines the joint relationship of FDI and economic growth.
Milestone 2:	Data collection and empirical investigation of model.
Milestone 3:	Analysis and policy implications of results.

Stage 2:	Micro level analysis
Aim:	To understand if clusters support technology transfer. The aim is to understand whether the strong linkages that are present within a cluster are more conducive to technology transfer from FDI taking place.
Methodology:	Qualitative approach using a survey instrument that seeks to provide a deep insight into technology transfer in the UAE.
Rationale:	To understand whether the various clusters that have been established in the UAE have assisted technology transfer or not.
Milestone 1:	Construction of the survey instrument.

Milestone 2:	Carrying out the survey.
Milestone 3:	Analysis of results and policy implications.

Stage 3:	Macro level analysis
Aim:	To examine the role of host country factors in technology transfer from FDI. The objective is to identify the factors that enhance or inhibit technology transfer from FDI taking place.
Methodology:	OLS regression.
Rationale:	The case country has a very small population and any FDI has to be export oriented, therefore this part of the thesis examines this aspect in leading to technology transfer.
Milestone 1:	Development of a trade related FDI model.
Milestone 2:	Data collection and testing of model.
Milestone 3:	Analysis and policy implication of results.

Stage 4:	Policy Recommendations
Aim:	To provide policy recommendations so as to shape the future direction of legislation and government actions to increase the level of technology transfer To offer advice to developing countries, in particular to small capital abundant nations, on enhancing their level of technology transfer from FDI.
Rationale:	The government needs to have a UAE based empirically supported study to shape its future direction in the area of FDI, backed with well-founded policy recommendations.
Milestone:	Assessment of economic results and conversion into policy aspects.
Stage 4:	Policy recommendations.

1.5   Structure of the Thesis

This thesis is organised into eight chapters, of which this the introductory chapter, which develops the central focus of the research. In this chapter the importance of FDI to the host nation has been discussed. The success in attracting FDI has raised the question as to whether it has actually helped small, capital abundant countries benefit from technology transfer from FDI, thus leading to economic growth. This question also forms the basis of this research.

In Chapter 2 the prior literature is reviewed by the researcher, who has tended to find that on the one hand FDI fills a local shortage of capital and technology, but conversely FDI only flows into countries that have high or increasing economic growth. Therefore, the positive impact of FDI is limited at best. Moreover, in some cases, FDI is viewed as actually leading to negative growth, especially when investment is moved from country to another.

In Chapter 3 the conceptual framework of this research is presented by the researcher along with the key economic model on which the researcher bases much of the conducted investigation. This chapter also includes the central hypothesis.

In Chapter 4 a discussion of the research philosophy and approach is provided by the researcher. The unique nature of this study is that it employs both qualitative and quantitative techniques. The chapter also examines the data collection methods for the survey instrument, the results of which are discussed in Chapter 6.

In Chapter 5 the relationship between economic growth and FDI is examined by the researcher. Unlike previous studies, which have used a uni-directional model, i.e. from FDI to economic growth, a simultaneous regression model has been employed by the researcher. This model takes into account that FDI flows into countries that are experiencing economic growth, while at the same time when FDI enters a country it leads to an economic growth. This two-way relationship is tested over the period 1980 (i.e. the year that the UAE established the Central Bank) to 2009 (one year after the international financial crisis).

Chapter 6 deals with one of the most interesting developments in the UAE, namely the creation of industry clusters. This chapter seeks to examine the proposition of whether industry-based clusters lead to technology transfer from FDI, using Tawazun as an example. Tawazun is a government initiated project to attract FDI to establish a defence cluster in the

country. The investment in the sector to date is in excess of US$60 billion, with numerous foreign partners and technology providers. Therefore, Tawazun offers an excellent opportunity through a survey instrument to gauge the impact of FDI in facilitating technology transfer in the UAE.

In Chapter 7, the issue of host country factors and the role that they play in the technology transfer process from FDI are explored by the researcher. As a result of the findings in this chapter the researcher is better able to understand how a country such as the UAE can enhance the level of its technology transfer from FDI.

Finally in Chapter 8 the conclusions to this study covering the areas discussed above is presented by the researcher. The researcher also seeks to develop feasible policy recommendation based on the findings of this study that the researcher feels the government of the UAE should adopt.

The structure of this study is summarised in Figure 1.2 below and provides an overview of the manner in which this study is carried out and presented. The arrows from one chapter to the next highlight the flow of thought and activities. For instance Chapter 1 introduces the topic, which then leads to the identification of the research issues, and so on.

Figure 1.2   Thesis Outline

| Introduction to the thesis | | Chapter 1 | • Introduction to research Problem
• Context of study
• Research objectives
• Thesis outline |
| Literature review examining prior studies | **Identification of research issues** | Chapter 2 | • Theoretical background
• Key aspects from prior studies
• Developing research questions based on prior studies |

Conceptual Framework		Chapter 3	• Conceptual framework • Development of hypotheses

Developing the research methodologies to be employed in the study		Chapter 4	• Research approach • Quantitative and qualitative research methods • Research strategy

Understanding whether FDI has led to any technology transfer for the UAE		Chapter 5	• Testing of hypotheses • Specific methodological issues • Identification of empirical model • Empirical results and discussion

Examining the role of clusters in facilitating technology transfer and using Tawazun as an example	**Critical Analysis**	Chapter 6	• Qualitative research data collection • Research data analysis • Results and discussion • Policy issues • Policy recommendations

To explore the host country factors that led to technology transfer		Chapter 7	• Testing of hypotheses • Specific methodological issues • Identification of empirical model • Empirical results and discussion • Policy recommendations

Conclusion, policy recommendations and areas for future research		Chapter 8	• Conclusions and policy recommendations

1.6   Summary

FDI is now an important component of most, if not, all government economic policy, and also the firm's desire to internationalise its business in the pursuit of greater profits and the ability to reduce costs. To a certain extent, firms develop their international strategy in response to improvements in technology, especially in the area of communications; the greater liberalisation of once closed markets, supported by a change in the regulatory framework governing investment in enterprises; the development of global capital markets, which can finance new projects and initiatives; along with the enhancements in the efficient scale of production. At the same time, governments throughout the world have made dramatic changes to their trade policy and tariff structures, thereby allowing firms to distribute their goods and services across and between countries. This has allowed companies to justify the huge capital expenditure involved in setting up foreign operations.

It is the belief of the researcher that the most important significance of this research will be to fill an academic void that currently exists with regard to FDI flows into the UAE, with its unique features. At the same time, the researcher expects the research to make a positive contribution to the current debate as to whether FDI leads to technology transfer for the host economy. At a micro level, a better understanding of the relationship between FDI and technology transfer will allow the UAE to alter the incentives that it offers and perhaps change direction in terms of the mode of entry and the industries currently being targeted into the newly established free zones. At the macro level, it is the belief of the researcher that this research will have a significant impact on the manner in which young and dynamic economies seek to encourage FDI. This is especially the case for the UAE, which has been a pioneer in creating innovative methods to encourage FDI, such as free zones, clusters, freehold property rights, and so on. In doing so the UAE has become the model state for not only other Middle East countries, but also many emerging economies around the globe. Therefore, a change in UAE policy towards FDI will impact a number of emerging nations.

Chapter 2

Literature Review and Theoretical Framework

2.1   Introduction

In Chapter 1 the study set the background of this research, and in this chapter the aim is to review the literature that deals with the issue of FDI, with particular reference to our key area of focus – technology transfer. A large number of studies have been conducted to identify the determinants of FDI but no consensus has emerged as a single set of determinants of FDI that is applicable for all countries (Kok and Ersay 2009). The prior literature on FDI (which is reviewed in this chapter) has identified a number of determinants of FDI for both developed and developing nations. For instance, there are political and economic differences between the two groups of countries. By and large, developing nations tend to be relatively new countries, created through independence struggles with former colonial powers, and hence have political structures that are still being developed, suffer from internal as well as external political insecurity, have a shortage of capital, etc. Developed countries of course do not suffer from these factors, but rely on being mature economies with a high disposable income, educated population, advanced infrastructure, etc. in order to attract FDI. In recent years there has been a renewed interest in the determinants of FDI into developing nations. One important factor is that these countries have implemented extensive programmes to liberalise their highly controlled economies and seek to integrate into the world economy. Policies that once sought to restrict the flow of capital have now been replaced with those that actively seek inward investment (Gastanaga *et al*., 1998). The liberalisation and integration of programmes have meant that there is now fierce competition between developing and developed nations for inward investment (Baird and Geortz, 2008).

In this literature review, the researcher examines country and policy factors found to be important in determining whether FDI takes places in the first instance, as well as its magnitude. The extant literature has identified a number of such factors; however, the discussion is restricted to those that are primarily relevant for small capital abundant countries, which tend to be developing nations. The literature review looks at the more specific issues facing one particular case study of a small and capital abundant country, namely the United Arab Emirates (UAE). In doing so the researcher does not focus on the firm level factors of why a particular company carries out FDI, but rather on the country level

impact. While firm level factors are very important, they are nevertheless revealed through country level data. In other words, the reasons why a firm carries out FDI are impacted by why they choose a particular location; however, the researcher would like to point out that the adjoining study (i.e. Chapter 6 of this thesis) examines FDI at a firm level.

2.2   FDI

In this section FDI is explained in detail so as to provide a better understanding for the development of the hypothesis and the policy recommendations that follow later in this study. The formal UNCTAD (2007) definition of FDI is, 'an investment involving a long-term relationship and reflecting a lasting interest and control by a resident entity in one economy (foreign direct investor or parent enterprise) in an enterprise resident in an economy other than that of the foreign direct investor'. Under this definition it is important that to qualify as FDI the investing entity must have control over the foreign operation. Of course, the level of control is very difficult to define and therefore UNCTAD (2007) states that control exists when the investing entity owns 10 per cent or more of the ordinary shares or voting power of the overseas operation. In some cases the 10 per cent shareholding may not give the investing entity any board representation or the ability to block motions supported by the other owners. However, the 10 per cent shareholding is large enough so that in most jurisdictions a forced takeover cannot take place without the investing entity's permission or acceptance of terms. More importantly, it is assumed that a 10 per cent interest in the overseas operation shows a long-term relationship between investing entity and the foreign operation. In the UNCTAD (2007) definition of FDI, some countries go beyond the 10 per cent cut-off point and look at the relationship between the investing entity and the foreign operations. Aspects of importance in refining the definition of FDI include the following:

- representation on the board of directors (which may be possible at shareholdings below the 10 per cent cut-off point);
- participation in policy-making processes;
- material inter-company transactions;
- interchange of managerial personnel;
- provision of technical information;
- provision of long-term loans at lower than existing market rates.

The investing entity can be an incorporated or unincorporated public or private enterprise, a government, a consortium of individuals, or a syndicate of private and/or public entities. In recent years, sovereign wealth funds have been very active in their overseas direct investments, hence adding a new dimension to the topic. In many respects sovereign wealth funds may not always share the motives of shareholding corporations. Just as the range of investing entities can be diverse, so can the range of foreign operations. In other words, the foreign operation can be any private or public entity at the firm level. It can also include the branch or particular level of operation. It is important to note that the legal structure of the foreign operation need not bear any resemblance to the ultimate ownership. Nor do the management responsibilities need to reflect the level of ownership.

The simplest manner of carrying out FDI is to purchase a partial shareholding in a foreign entity, which may be a private or a public entity. However, this is not the only manner, and over the years a number of variants have been developed, such as a direct full acquisition of a foreign firm, construction of a facility, or investment in a joint venture or strategic alliance with a local firm, licensing of intellectual property (IP), participation in a overseas project with a long term nature through a build operate and transfer programme and so on. In the past decade, there has been considerable innovation in the manner in which FDI is carried out, largely to overcome investment impediments such as home and foreign country rules on taxation, capital mobility, and foreign ownership restrictions, etc.

2.3   Economic Growth and FDI

The relationship between technology transfer proxied through economic growth and FDI takes time to permeate into the host economy, therefore it is difficult for researchers to measure the exact impact. Therefore, previous studies have tended to take a multi-industry approach, with the view that in some sectors the absorption of technology will be faster than in others. The general aim of these studies has been to examine the linkage between the foreign affiliate and the host country firms, as illustrated in Figure 2.1 below. These linkages take place in two ways, namely: a vertical linkage, i.e. from supplier to the foreign affiliate and then to the customer through supply chain linkages; and a horizontal linkage, whereby technology flows take place at the same level of production through labour turnover as

employees leave the foreign affiliate to join another, and take their newfound knowledge with them. Of course, host nation companies can also imitate new technology, either through witnessing its effectiveness or due to marketplace competition, where the need to survive and become more competitive induces host nation companies to adopt new technology. (Later in this chapter the factors and sub-factors of FDI are explained and the prior literature is reviewed.)

Figure 2.1   The Role of FDI in Developing Host Country Industry and Workers
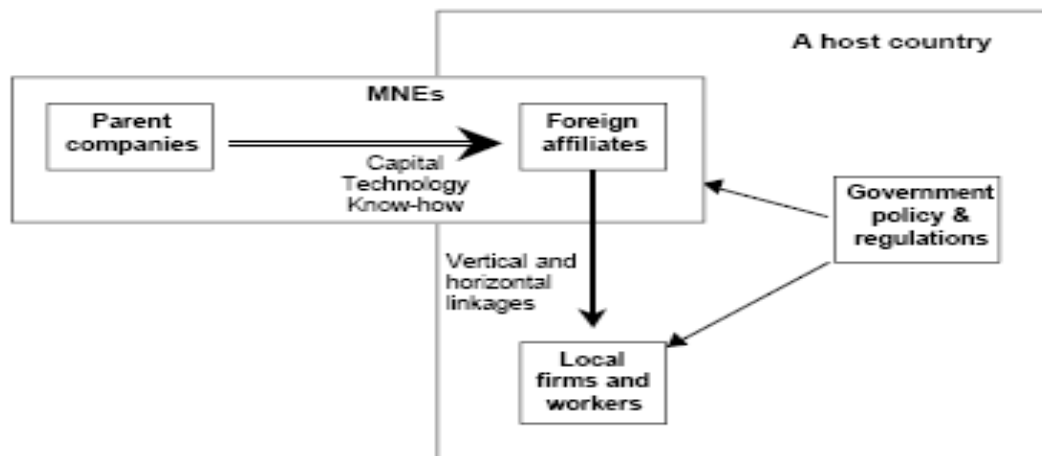
Source: JBIC 2002

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The first objective of this study is to understand whether technology transfer has taken place for a country such as the UAE. In macro level studies it is very difficult, if not impossible, to observe technology transfer directly. Therefore, past studies have tended to use a proxy measure for technology transfer. One of the best measures for the presence of technology transfer is economic growth. The argument here is that economic growth takes place because of improvements in technology.   Economic growth has fascinated economists and philosophers for many hundreds of years, and prior research or discussion surrounding this topic can be categorised into three groups, namely classical, neo-classical and modern. A discussion of each of the three types of research on economic growth in the context of FDI is provided by the researcher.

2.3.1 Classical Explanation for Economic Growth

This section explains the historical development of FDI, and hence the emphasis is not on recent research but more on explaining the philosophical background to the topic. According to the classical school of thought it is argued that economic growth is determined by the rate of physical capital accumulation. The first proponent of this argument was Smith (1776), who saw economic growth largely as an endogenous variable and the key factors leading to its change as capital accumulation and labour productivity. As such, Smith argued that changes in economic growth can be brought about through the manner in which labour is applied and ratio of those who are employed relative those who are not. Both these aspects place a special emphasis on labour productivity, which, in Smith's view, does not have an upper limit. Therefore, Smith argued that an investigation into economic growth is essentially a study into the causes of and the increase in labour productivity. Of course for enhancements in labour productivity to take place one needs improvements in the division of labour. This in turn depends on the level and increase in capital accumulation. Therefore, without capital appreciation Smith saw a limit to economic growth along with the supply of labour and natural resources. Interestingly, Smith argued that the supply of labour, which itself was important for economic growth, could be increased through capital accumulation. In other words, Smith felt that the supply of labour was determined by its demand, hence if workers were to be better paid they would be better able to provide for their children and hence increase the workforce. As such, labour is viewed as a commodity, the quantity of which is determined by its demand.

Ricardo (1821), although part of the classical school of thought, took a very different approach in that he assumed increasing returns to scale did not necessarily exist. Unlike Smith, he did not place any emphasis on the role of division of labour in order to increase economic growth. Instead, Ricardo believed that constant returns to scale exist with set methods of production. The problem then becomes how scarce natural resources, such as land, affect profitability as capital accumulates. Ricardo referred to this as the 'natural course' of events. To illustrate this, Ricardo argued that a lower rate of production would lead to a decline in profitability and hence a falling rate of capital accumulation; with this in turn leading to a stationary state, hence supporting the natural course of events argument. This argument rests on the belief that saving and investment arise from profits, while wages and rents play a small, if any, role in creating capital accumulation. Therefore, Ricardo believed that in order for economic growth to take place it should focus on the profitability of firms.

These early theories on economic growth laid the foundation of the neo-classical school of thought. Here capital accumulation is still considered to be important and one school of thought is that an inflow of capital will allow poor countries to raise their standard of living. Although the classical school also believed that inward investment was important, they reasoned that it flowed to the location that offered the best rate of profit. In neo-classical thinking, developed countries are seen to have a surplus of capital, while the opposite is true for developing nations, who are considered to be deficient in physical capital investment. The inflow capital assists the host country to increase its output. As a result, the inward foreign capital stimulates growth in the host economies by easing any shortages in capital.

2.3.2 Neo-Classical Explanation for Economic Growth

The neo-classical school of thought considered FDI to be far more stable (i.e. less volatile) than other types of capital flows, such as interest rate induced flows. Funds that seek to extract the highest interest rate tend to be very short term and move from country to country in pursuit of the greatest return. FDI is very different and is argued to exert longer term and more tangible positive effects on economic growth. Having said that, neo-classical economist did accept that with diminishing returns to capital, FDI had only a 'short-run' impact on economic growth, as countries climbed up from one level to the next. As such FDI has the same effect as domestic capital, with the added advantage that it promotes the adoption of new technologies. (The researcher studies the impact of technology transfer of FDI in Chapters 5 and 6). An important aspect of technology spillovers is that they are able to overcome the effects of diminishing returns to capital and hence allow for a continuous increase in the economy. Moreover, FDI also increases the level of managerial and operational knowledge and the skills base in the host economy through labour training, new foreign staff and the adoption of alternative management practices

In the post-Second World War period, neo-classical opinion took a new momentum as once-colonised countries sought to develop their economies. At the same time the conventional wisdom was that developing countries had (or have) underutilised factors of production: largely land and labour. These countries, due to their historical development, also exhibited very low levels of savings and hence investment. Therefore, it was argued that the developing countries offered higher marginal productivity of capital than in developed countries. The

neo-classical economist argued that the interdependence between the developed and the developing countries can benefit the latter. The reasoning behind this is that capital flows from developed to developing nations, where the returns on capital investments are higher. The inward investment allows developing nations to transform their economies. Furthermore, the neo-classical view argues that developing nations grow faster on average than developed nations due to diminishing returns on capital. At the time it was felt that through FDI developing nations would converge towards developed countries due to their higher capacity for absorbing capital. Unfortunately, the reality has been very different and the gap between the developed and developing nations has widened, with very little capital flowing from the former to the latter (Blomström *et al*., 1994 and Borenzstein *et al*., 1995).

The literature on FDI has developed a number of economic models to explain the determinants of economic growth both in the short and long run. In the short run, the classical school points to capital accumulation as the key factor affecting the level of economic growth. This viewpoint is presented in the Harrod (1939) and Domar (1946) model, which is also referred to as the capital fundamentalism model. The Harrod (1939) and Domar (1946) model was initially developed in order to explain business cycles, but was later adapted to describe economic growth. The model rests on the assumption that economic growth depends on the quantity of labour and capital; therefore, the greater the level of investment the more the capital accumulation, which in turn leads to higher economic growth. This is more relevant for developing countries with their abundant supply of labour and low levels of capital. The model argues that economic growth depends on policies that seek to raise the level of investment. In the absence of greater savings, FDI can neatly fill the vacuum, leading to economic growth. Lipsey (2002) argues that FDI is effective in leading to a growth of the host country exports as well as promoting linkages to the global market. This study argues that FDI is vital in transforming host countries from being simple exporters of raw materials to becoming producers of manufactured goods.

2.3.3   Modern Theories of FDI

In this section, the researcher provides a historical development of ideas, starting with the work of Penrose (1959) and ending with more recent research. Penrose (1959) first developed the resource based theory, which focuses on value maximisation through pooling and utilising scarce resources (see also Das *et al.*,

2000). As such, the resource based view argues that a firm needs various resources – human resources, technological and managerial practices, culture, patents, copyrights, trademarks, and so on. The theory goes on to argue that some of these resources are firm specific and not necessarily perfectly mobile or even imitable. As a result, differences in resources become a source of competitive advantage, which allows firms to earn excess profits. Therefore, FDI becomes a channel by which competitive advantage can be gained through alliances or mergers and acquisitions to obtain resources owned by overseas firms.

Vernon (1966) developed a model that takes into account the product lifecycle, that is, from start to maturity and then decline. The argument here is that a firm at the early stages of development tends to be largely home based. The reasoning behind this is that the product is young and still developing, with a relatively small demand. As the product becomes mature, demand from other countries increases, which initially may be supplied from the home country. Over time, the level of foreign demand is such that it justifies foreign production. At this point the company expands production into foreign countries, initially to serve the overseas demand; however, the foreign production may actually have a comparative advantage, and in some cases is exported back to the home country. The product life cycle is relevant in explaining why FDI took place during the period up to the end of the 1960s.

One of the most important criticisms of Vernon's 1966 model was levied by himself in a later study (see Vernon, 1979): that global circumstances had changed substantially (and rapidly) since the original study. In the 1960s, when the original study was carried out, the USA was the most significant innovator, and hence producer, of goods. However, by the 1970s the USA had become a major importer of many of the goods that it had once developed, produced and exported. One reason as to why the USA had moved from being an exporter to an importer was due to cost differentials. In other words, technology may be transferred overseas so as to exploit lower costs, so that these nations then become exporters. Also, globalisation has meant that producers now have multiple production sites so as to benefit from comparative advantage. This may mean that component parts can be manufactured in several countries and assembled in yet another nation. Therefore, a new product may be produced, not in the consumer markets of North America, but most likely in a low income country. Moreover, since the original study, per capita income

differences between the USA and other advanced countries are much reduced. Also, the major consumer markets are not limited to just the USA. As a result companies catering to high income consumers tend not to produce in low cost countries, but focus on more global markets.

Hymer (1976) argued that firms enter the overseas market due to two key motives: company specific reasons and market based factors. The company specific factors largely refer to aspects such as the ability to benefit from economies of scale, a reduction in risk through diversification, knowledge accumulation, and so on. On the other hand, market based factors arise through some type of monopolistic power due to the ownership of a particular technique or capability. Therefore, overseas expansion is a method of exploiting the company's knowledge, whether it is in the form of processes, patents, trademarks, financial resources or management abilities. The other manner in which market based factors can arise is through the cost of transacting in overseas markets. In other words, where a company wishes to have a large degree of control it will seek to enter the foreign market itself rather than through an agent or distributor. In some respects, the level of control may also be related to the life cycles of the product up to and including the stage of maturity. This is also the phase when the product is likely to generate significant cash flows and hence the company will be more willing to establish overseas operations.

An alternative view of FDI was provided by Aliber (1970), who argued that it was not the products themselves that motivated companies to establish overseas operations, but the need to manage exchange risk as well as the preference for diversifying asset holdings by currency. In the case of the latter, Aliber (1970) argued that companies preferred to hold their assets and liabilities in various selected currencies and hence the financial markets allowed them to have advantages over the host country. Therefore, the need to invest and borrow in selected currencies motivated firms to establish overseas operations. Like Vernon, this theory is based on the time period during which it was written, and is true only for the period up to the end of the 1960s. From the 1970s Japanese and European firms became active in global markets through FDI, which cannot be explained by Aliber's theory (see (Buckley and Casson, 1976). Ironically, Ragazzi (1973) found that for the UK net FDI increased substantially when sterling was weak. In a later study, Aliber (1983)

argued that it was the relative market values of assets that prompted firms to invest overseas. As a result Hennart (1982) found that capital markets were actually not relevant in a firm's FDI decision. Despite, the lack of relevance of Aliber's theory in the modern context, Cantwell (1991) has found that it can provide important insights regarding the timing of FDI.

In the case of a classic oligopolistic market, there are few firms, each selling a product that is differentiated but a close substitute. In such a situation a firm's reactions are highly dependent on those of the other firms in an industry: there are three choices available to a firm on the basis of an action by another firm, i.e. to follow, do nothing or take an opposing action. The latter makes little sense and so the real choice is between the first two options. To do nothing would mean that the firm will lose market share, and hence it is forced to follow the leader. According to Knickerbocker (1973) and Graham (1974), imitating the dominant firm in the sector can also be an important trigger for FDI. Knickerbocker (1973) focuses on 'follow-the-leader' behaviour, while Graham (1974) examines cross-investments. Knickerbocker's (1973) firms imitate the FDI decisions of the dominant firm so as to hold on to their market share or to prevent other competitors from gaining competitive advantages in new markets. On the other hand, Graham (1974) argues that FDI is a reaction to foreign competitors investing in the firm's home market. As such the cross-investments become a form of retaliation so as deter any further investment from the foreign competitor in the in the focal firm's home market. These results are supported by DiMaggio and Powell (1983), who find that the imitation is a response to mitigate risk and to acquire legitimacy. Similar, findings are also found by Henisz and Delios (2001), and Guillen (2002) amongst others. Burns and Wholey (1993) and Haveman (1993) find that the dominant or well-known firms in the sector tend to serve as role models for other firms. Interestingly, the decision to cluster around industry peers is based on the strength of their technology. Shaver and Flyer (2000) found that firms with weak technology tend to benefit from FDI clustering, while stronger firms tend to avoid spillovers and prefer separation.

The main problem with Hymer's study (1976) and the studies that followed was that they sought to answer two very different questions, namely: why does a firm enter foreign

markets, and which location does it select for its overseas operation? This aspect was addressed by Dunning (1977 and 1988), who sought to integrate the ownership and location aspects into a single unified theory. The Dunning (1977 and 1988) model is referred to as the 'eclectic paradigm', or more commonly as the OLI model. The latter arises because Dunning (1977 and 1988) identified three key factors for FDI to take place, namely ownership, location and internalisation advantages, and hence the OLI model. Dunning argued that a firm must have an ownership advantage that outweighs the inconvenience of overseas production. The precise list of advantages was not detailed by Dunning, but included aspects such as patents, trade secrets, control over production process, etc. In addition, the foreign country needs to have locational benefits that make it profitable for the company to carry out production overseas rather than in the home country. These locational advantages may include access to local and regional markets through free trade agreements (FTAs) or customs unions, etc., availability of lower priced factors of production, transportation and communications costs, as well as links, the opportunity to avoid trade protection, and attractive investment incentives. The most important aspect is the internalisation advantage, which states that there should be advantages for a firm to acquire overseas assets through FDI compared to simply selling or licensing the rights. Of course, the decision as to whether internal ownership is carried out depends on the relative costs, outweighed by the loss in ownership. One can summarise the importance of these three factors and their relevance to FDI as shown in Table 2.1 below:

Table 2.1   The Importance of OLI to FDI Inflows

		Categories of Benefits		
		Ownership	**Location**	**Internationalisation**
Forms of Market Entry	**Licensing**	Yes	No	No
	Export	Yes	Yes	No
	FDI	Yes	Yes	Yes

Source: Dunning (1981)

As Table 2.1 indicates, under the eclectic model any FDI will only take place if all three categories of benefits exist. Unfortunately, Dunning (1977 and 1988) simply states the conditions, without listing the necessary requirements for FDI to take place.

One of the more persuasive theories of FDI is one that argues that firms' decisions are based on the institutional forces that influence them, such as government institutions and regulations (Francis *et al.*, 2009). The more recent literature on economic development, such as Bénassy-Quéré *et al.* (2001) has focused on institutional quality as the main factor impacting the different levels of development between countries. These studies find that low levels of corruption associated with greater prosperity as are good institutional quality. Meon and Sekkat (2004) argued that there exists a direct link between the number and quality of institutions and FDI. The reasoning behind this is that effective organisations help FDI increase productivity growth. An increase in productivity with an associated improvement in corporate governance systems tends to attract FDI. Such systems bring transparency and clarity to foreign investors and allow them to incorporate good planning. On the other hand, weak institutions add to the corporate costs of FDI, and aspects such as corruption can make working in a country very difficult (Wei, 2000). An important aspect of FDI is that there is usually some element of sunk costs and hence FDI is sensitive to any form of uncertainty, especially that stemming from poor government administration, policy reversals or weak enforcement of IP rights.

2.3.4   Economic Growth and FDI

The assumption is that FDI has a positive impact on economic growth. However, this view is not universally held. Blomström *et al.* (1994) show that FDI may have a positive impact on economic growth, but this relationship is not linear. In other words, at income levels below a certain threshold there is little, if any, impact on economic growth, however above this point there appears to be a positive correlation. The rationale for this is that countries need to reach a certain income level before they can adequately absorb the level of technology and FDI spillovers. The common argument cited to support this non-linear relationship is that the development of human capital is important in diffusing new technology within the economy. To a certain extent this relationship may be true; Balasubramanyan *et al.* (1996) lend support to this view as they find a positive relationship between human capital and FDI. The important implication of this study is that FDI may not necessarily lead to greater economic growth.

UNCTAD (1999) argues that FDI has either a positive or negative impact on economic growth, depending on the economic variables that are studied. Some researchers argue that FDI exploits the human and natural resources within the host country. Where the host country receives some benefit from FDI, it is felt that it is unevenly shared. In other words, FDI creates an increase in the wealth for a minority, while the majority receives no real improvement. As such, FDI increases the income and wealth disparities in the host countries. In some cases FDI has been found to have no or very little impact on economic growth (see Table 2.2 below).

The role of FDI in impacting economic growth remains ambiguous. The general view is that FDI increases growth through productivity and efficiency gains by local firms. Generally, for developed countries there seems to be support for the link between FDI and economic growth, but this is less so in the case of less developed economies or even developing countries. However, there are those studies such as Smarzynska and Wei (2002) that argue that FDI has a negative impact in driving out less productive firms. The relationship between FDI and economic growth has motivated considerable empirical literature focusing on both industrial and developing countries. Table 2.2 below presents past studies that have examined the relationship between FDI and economic growth over the last 25 years or so, which have been summarised by the researcher. All these studies employ regression analysis, and their differences relate to the countries and time period. The limitations of this method are discussed in Chapter 4.

Table 2.2   Review of Studies examining FDI and Economic Growth

Study	Sample Country	Relationship between FDI and Economic Growth (Correlation between FDI and Growth)
Blomström (1986)	Mexico	Positive
Saltz (1992)	68 developing countries	Negative
De Gregorio (1992)	12 Latin American countries	Positive
Fry (1993)	16 developing countries	Positive
Kokko (1994)	Mexico	Positive
Blomström *et al.* (1994)	Uruguay	Positive
Blomström *et al.* (1994)	78 developing countries	Positive
Borensztein *et al.* (1995)	69 developing countries	Positive

Study	Sample Country	Relationship between FDI and Economic Growth (Correlation between FDI and Growth)
Balasubramanyan *et al.* (1996)	46 developing countries	Positive
Mody and Wang (1997)	7 Chinese regions	Positive
Borensztein *et al.* (1998)	Various	Positive
Oloffsdtter (1998)	50 developing countries	Positive
Nyatepe-Coo (1998)	12 developing countries	Positive
Balasubramanyan *et al.* (1999)	Various	Positive
Bosworth and Collins (1999)	58 developing countries	Positive
De Mello (1999)	32 countries	Positive for OECD countries Negative for non-OECD countries
Sjöholmn (1999)	Indonesia	Positive
Soto (2000)	44 developing countries	Positive
Bende-Nabende *et al.* (2000)	5 Asia-Pacific Region countries	Positive for three out of five countries Negative for two out of five countries
UNCTAD (2000)	100 LDCs	Positive
Bengoa (2000)	18 Latin American countries	Positive when there is a certain level of development.
Berthelemy, J.C and S, Demurger (2000)	Various	Positive
Liu *et al.* (2001)	Various	Positive
Alfaro *et al.* (2001)	Different samples Mixed – 39 countries Developed countries – 41 Developing countries – 49	Positive
Nair-Reichert and Weinhold (2001)	24 developing countries	Significant and positive
Zhang (2001)	Various	Positive
Ericsson and Irandoust (2001)	Sweden, Norway, Denmark, Finland	Positive relationship only for Sweden
Hanson (2001)		Positive but weak
Lensink and Morrissey (2001)	115 countries	Positive
Reisen and Soto (2001)	44 countries	Positive
Wang (2002)	12 Asian economies	Positive
Bazzoni *et al.* (2002)	11 Mediterranean countries	Positive
Liu *et al.* (2002)	China	Positive
Kapstein (2002)	Various	Positive but dependent on a certain level of development
Chakraborty and Basu	India	Causality runs from real GDP to

Study	Sample Country	Relationship between FDI and Economic Growth (Correlation between FDI and Growth)
(2002)		FDI
Campos and Kinoshita (2002)	25 transitional economies	Positive
Kumar and Pradhan (2002)	107 developing countries	Positive
Basu *et al.* (2003)	23 developing countries	Positive
Choe (2003)	80 countries	Positive but weak
Hermes and Lensink (2003)	67 developing countries	Positive for 37 countries (Latin America and Asia region), for all others no effect
Omran and Bolbol (2003)	17 Arab countries	Positive
Alfaro (2003)	47 countries	Ambiguous effect
Mencinger (2003)	8 transition countries	Negative
Alfaro *et al.* (2004)	Different samples Countries	Positive
Nath (2004)	10 transition economies	Positive
Hansen and Rand (2004)	31 developing countries	Positive
Akinlo (2004)	Various	Positive for certain sectors
Makki and Somwaru (2004)	Various	Positive
Durham (2004)	Various	Positive but dependent on a certain level of development
Basu and Guariglia (2005)	119 countries	Positive
Nath (2005)	13 transition countries	No effect
Li and Liu (200)	Various	Positive but dependent on a certain level of development
Kang and Du (2005)	20 OECD countries	No effect
Carkovic and Levine (2005)	72 countries	No effect
Chowdhury and Mavrotas (2005)	Chile, Malaysia, Thailand	GDP causes FDI in Chile and not vice versa
Li and Liu (2005)	84 countries	Positive
Busse and Groizard (2005)	82 countries	Depends on regulation and institutional framework
Darrat *et al.* (2005)	6 Middle East and North Africa and 17 transition countries	Generally negative
Bacic *et al.* (2005)	11 transition countries	Mixed
Karbasi *et al.* (2005)	42 countries	Positive
Driouchi *et al.* (2006)	Various	Positive but dependent on a certain level of development
Oglietti (2007)	Various	Negative

Study	Sample Country	Relationship between FDI and Economic Growth (Correlation between FDI and Growth)
Buckley *et al*. (2007)	Various	Positive
Elmawazini *et al.* (2008)	Various	Positive
Vu *et al.* (2008)	Various	Positive but dependent on a certain level of development
Herzer *et al.* (2008)	Various	Negative
Beugelsdijk *et al.* (2008)	Various	Positive for certain types FDI
Driffield *et al.* (2009)	Various	Positive for certain types FDI
Pelinescu and Radulescu (2009)	Various	Positive for certain sectors
De Vita and Kyaw (2009)	Various	Positive but dependent on a certain level of development
Ramondo (2009)	Various	Positive
Woo (2009)	Various	Positive
Smeets (2009)	Various	Positive for certain types FDI
Wang (2009)	Various	Positive for certain sectors
Wang and Wong (2009)	Various	Positive but dependent on a certain level of development
Vadlamannati and Tamazian (2009)	Various	Positive
Liu *et al.* (2009)	Various	Positive but dependent on a certain level of development
Adams (2009)	Various	Positive but dependent on a certain level of development
Blalock and Simon (2009)	Various	Positive but dependent on a certain level of development
Batten and Vo (2009)	Various	Positive but dependent on a certain level of development
Mayer-Foulkes and Nunnenkamp (2009)	Various	Positive for developed countries
Sodikum (2009)	Various	No impact
Bijsterbosch and Kolasa (2010)	Various	Positive
Alfaro *et al.* (2010)	Various	Positive but dependent on a certain level of development
Abraham *et al.* (2010)	Various	Positive for certain sectors

Study	Sample Country	Relationship between FDI and Economic Growth (Correlation between FDI and Growth)
Zhao and Zhang (2010)	Various	Negative

Source: The author

The success of FDI has raised the question as to whether it has actually helped the recipient countries achieve growth. This is more so in the case of developing nations, which in recent years have been large recipients of FDI while also witnessing high economic growth. As a result, researchers such as Waldkirch (2011) amongst others have been questioning whether the increase in FDI has played any role at all in the economic growth of the recipient nations. On the one hand, there is the argument that FDI fills a local shortage of capital and technology. On the other hand, there is the argument that FDI only flows into countries that have high or increasing economic growth. Therefore, the positive impact of FDI is limited at best. Moreover, in some cases, FDI is viewed as actually leading to negative growth, especially when investment is moved from one country to another due to differences in profitability, rates of return, trade protection, etc. Therefore, research to date has not conclusively answered the question as to whether FDI is a prerequisite for economic growth and vice versa.

2.4   Associated Factors

The examination into the determinants of FDI has not been without debate, largely due to the complicated and dynamic nature of a modern firm and its resulting decision making process (see Leiblein and Miller, 2003). This is even more the case where business decisions involve overseas markets, which in many cases are unfamiliar with their own socio-political factors (see Kuo and Li, 2003). From a control and monitoring viewpoint, FDI is far more complicated because it requires additional systems, and in some cases internal organisational changes. So the natural question that has puzzled academics is: why is such an activity carried out? More importantly, governments who are eager to attract FDI into their countries have given this topic greater importance, leading to a dimension in the research area focusing on policy initiatives.

2.4.1 Tariffs

The classical view of international trade supports the argument that countries should not restrict the flow of goods and services. As a result, economic welfare for both the exporting and importing countries increases. However, in reality countries impose trade restrictions, which are an implementation of their macroeconomic policy, either in the form of tariffs, which are simply a charge on the quantity or product imported. Or alternatively, countries can place non-tariff barriers such as quotas or some form of administrative control. The usual reason for trade protection (i.e. the imposition of tariffs or non-tariff barriers) is to protect the domestic industry (Gamberoni and Newfarmer, 2009). As such, the secondary reasons tend to be to safeguard employment, support strategic industries, and allow infant industries to develop or to absorb the impact from declining sectors. Regardless of the reasons, tariffs and non-tariff barriers increase the cost of the product or service to the final consumer. Having said that, it is important to note that with a tariff the increase in cost is known, or at least one is able to calculate it, while with non-tariff barriers the increase in cost is more difficult, if not impossible, to determine. In either case, trade protection makes exporting more expensive and hence firms are inclined to establish operations overseas. In order to bypass the trade protection policies imposed by the foreign country, firms are motivated to establish an overseas presence and hence comply with the certificate of origin rules. This type of overseas expansion is commonly referred to as tariff jumping FDI. For instance, under the Greater Arab FTA, a company needs to have a 40 per cent local value added component in order to obtain a domestic certificate of origin so as to export to the 21 member countries without import tariffs.

It is often argued that FDI is a strategic manner by which a company can avoid foreign country trade tariffs. Unfortunately, due to the political nature of tariff jumping FDI it is often difficult to conduct studies on the impact of tariffs on inward investment. Blonigen (2002) finds evidence to support tariff jumping FDI through the use of proxy measures. However, the results show that this type of FDI is only relevant for multinational firms in developed countries. Another proxy measure that examines the same hypothesis is to take the angle of imposition of trade protection after inward investment has taken place. In other words, inward investment is attracted to a particular location with the knowledge that some form of trade protection will be applied. Blonigen and Figlio (1998) examine inward investment into the various states in the United States and the voting behaviour of the respective senators or

representatives. Their study also finds that an increase in FDI leads to an increase in the likelihood of the state politician voting for further trade protection.

2.4.2 Exchange Rate

Macroeconomic policies are best illustrated in a country's exchange rate because it is the current value of the nation's currency with a built in expectation of the near term forecasts. If market players view the country's macroeconomic policies positively, particularly in relation to economic growth, then this will have a positive impact on the rate of the currency and vice versa. Any form of FDI involves the process of converting currency from the home country if retained earnings are used, or a third country in the case of external finance to the host country. The rate of conversion impacts first the decision to carry out FDI in the country and second its allocation. There are two ways in which the impact of exchange rates on FDI can be studied, namely: whether the change in prices leads to greater FDI; and whether excessive fluctuations have any impact. In the case of changes in price, depreciation will reduce the value of the host country currency and allow the firm to acquire a larger level of FDI with the same quantity of investment. In theory, depreciation should actually encourage greater investment into the host country. Froot and Stein (1991), Stevens (1993) and Blonigen (1997) tested this hypothesis and found that depreciation in the host country exchange rate tends to increase level of FDI into that country. However, more recent studies find quite the opposite result and that depreciation in the exchange rate tends to actually reduce the level of FDI into the host country (Campa, 1993; Tomlin, 2000; and Chakrabarti and Scholnick, 2002). Cushman (1985), amongst others, found the impact of the exchange rate on FDI to be ambiguous.

2.4.3 Economic Stability

Under the ownership–location–internationalisation (OLI) framework (Dunning 1979, 1980) host country location benefits are very important in inward foreign investment seeking to benefit from the advantages offered; this can be considered one of the pull factors that seeks to attract FDI to a particular location. Conversely, one can have push factors whereby, unfavourable location factors in the home country can push investment overseas. Kogut (1983) argues that when the firm has the required capability and the home country environment is not conducive to its operations it will invest overseas. A non-conducive business environment in the home country can broadly be described as unstable economic

and political environmental conditions. Lecraw (1977) claims that companies in such locations seek to minimise their operating risks by establishing overseas operations and hence their increasing their chances of survival.

There are various ways in which the importance of economic stability can be understood in the context of the firm's location decision, and numerous factors that impact the firm's decision to locate in a particular area. One method that seeks to identify the importance of these factors is the Delphi method, developed in the 1950s as a means of expert-supported decision making process (MacCarthy and Atthirawong, 2003). Using the Delphi method, MacCarthy and Atthirawong (2003) were able to identify a number of key factors, one of which was economic stability. It is important to note that economic stability does not exist in isolation and requires political stability. As such the two are interconnected, whereby political instability leads to economic woes and vice versa.

Studies that have sought to examine the impact of home country economic and political factors on outward FDI have tended to use the United States as an example of a safe economy. These studies cannot measure political or economic uncertainty with a great deal of accuracy and hence tend to use proxy measures. Such studies use macroeconomic indicators as a proxy for the level of political and economic certainty. There is sufficient evidence in economic indicators to lend support to the argument that macroeconomic variables that are a product of the economic policies of the country are at least a good proxy for the level of economic uncertainty. Then by default political uncertainty impacts on the economic performance of a country. Talman (1988) examined the impact of political risks in a sample of industrialised countries and their level of outward investment into the United States. The results showed that there was a positive correlation between inward investment flows into the United States and the home country's political risk measured through macroeconomic variables. Similar results were found by Grosse and Trevino (1996), who examined a larger sample of both developed and developing countries. Bulatov (1998) took a slightly different approach to previous studies and examined the level of excessive taxation crime and bureaucratisation for Russian firms; the study found that all of these factors were relevant in leading outward investment.

While the home country's business conditions tend to impact the level of outward investment, so do business conditions in the host country: business conditions in the host country in terms

of economic and political stability have been found to be an important determinant to inward FDI. One of the aspects studied in this area of FDI is the relative difference between democracies and authoritarian governments. One early study that examined the difference in the performance of these two political systems was Huntington's 1968 study, which found that a democracy tends to have higher demand for current consumption. The reason for such a result could be that at the time most authoritarian governments were those of developing countries. More recent evidence is somewhat less clear as to whether authoritarian governments do actually lag behind those of democracies. Przeworski *et al*. (2000) find no significant difference between the growth rates of democracies and authoritarian governments. Not only are the growth rates and stability of democracies and authoritarian governments not clear, but neither is the preference of FDI.

It is often argued that from an FDI perspective authoritarian governments are preferred because they tend to be faster at making decisions as they do not have to go through the various decision making processes. More importantly, the concentration of power implies that these governments can provide the multinational firm with greater inducements, including in some cases the repression of labour unions to drive down wages. In contrast, Jensen (2003) argues that the democratic nature of a government implies that it has more favourable policies towards multinationals. Moreover Jensen feels that democracies add credibility to the FDI. The problem with FDI is that once it is invested the firm is largely held hostage to the policies of the host country. Policy changes are more likely with authoritarian governments; evidence from the 1960s onwards shows that on average authoritarian governments tended to effect policies of nationalisation and expropriation, capital controls, devaluations, or other macroeconomic decisions, which although not aimed at foreign firms nevertheless affect their operations and hence profits. It is felt that democracies are less likely to suffer from such risks because the foreign firm can lobby governments both formally and informally. Furthermore, democracies tend to have various checks and balances within their system to limit any abuse of power. One such check and balance is the presence of opposition parties or institutions such as courts, which may have a power to veto government policies and actions. Tsebelis (1995) argues that the presence of individuals, institutions or political parties that can veto the actions of the government tends to increase the level of political stability. Henisz (2000) found that firms tend to change their FDI strategies based on the number of individuals, institutions and political parties with veto power within the country. The rationale for this was that such veto power makes a policy reversal more difficult, at least

in the short to medium term. As such it provides firms the assurance that the policies in place when it entered the country will continue to benefit their FDI for the foreseeable future.

Democracies are argued to be more accountable for their actions, which include reneging on commitments made to foreign firms. The reason for this is that these promises or commitments impact on employment in the host country, which is a very important determinant of electoral success. Therefore any commitments that are not kept by democratic governments may result in an electoral cost. Of course, the government will need to weigh the cost before reneging on such commitments. McGillivray and Smith (2000) argue that foreign firms can hold individual leaders politically accountable for policy reversals through the refusal to cooperate with them in the future. More importantly, foreign firms in some cases have sufficient ability to tarnish the reputation of leaders with unfriendly market policies. At the same time political leaders who require funds to contest elections may implement business friendly policies to obtain financial support. There are a number of examples of reputation both tarnishing, as well as buying, support. For instance, in the United Kingdom, Rupert Murdock has on a number of occasions tarnished the reputation of political leaders who sought to bring in policies that would negatively impact on his FDI in the country. In the case of buying support, one such example is that of Mittal, which contributed millions to the Labour Party under Tony Blair to support the company's purchase of steel plants (source: BBC News 18th February 2002, online, available at: http://news.bbc.co.uk/2/hi/uk_news/politics/1826756.stm).

2.4.4 Ownership Structure of Foreign Affiliate

The rate or even the level of technology transfer from FDI to the domestic affiliates may be impacted by the ownership structure. There are two reasons as to why this may be the case. First, as Mansfield and Romeo (1980) argue, a foreign firm is more likely to pass on up-to-date technology to wholly owned affiliates in the domestic country rather than to joint ventures. More recently, Takii (2004) shows that wholly owned domestic affiliates tend to be the most productive; this may also explain why foreign companies that have high levels of technology tend to enter foreign countries in the form of wholly owned affiliates (Asiedu and Efahani, 2001; Javorcik and Saggi, 2010). Second, foreign companies that carry out takeovers tend to do so on the basis of identifying strong and well performing companies that have little, if any, need

for technology transfer. In fact, in some cases the technology transfer may actually flow in the opposite direction – from the domestic recently acquired affiliate to the host company. The opposite argument also exists, whereby the foreign firm with wholly owned domestic affiliates is more likely to integrate its global production processes and strip the domestic affiliate from its research activities. Therefore, the head office will continuously upgrade the equipment, leading to technology transfer taking place.

Empirical studies such as that of Javorcik and Spatareanu (2008) show that where the domestic affiliate is partially owned by the foreign company no technology transfer takes place for horizontal FDI. The same study does find evidence of backward spillovers for domestic affiliates partially owned by foreign firms. Support for partial ownership of the domestic affiliate in facilitating technology transfer is also found by Dimelis and Louri (2002), however the results show a strong bias towards the foreign company owing the majority. Aitken and Harrison (1999) argue that a non-linear relationship may exist between foreign ownership and the level of technology transfer proxied by productivity gain in the domestic affiliate. Ramstetter and Narjoko (2013) find that at both low and high levels of foreign ownership, technology transfer as proxied by productivity gains was low. The rationale for this is that at low ownership levels the foreign firm has little incentive to transfer technology. At the same time, at high levels of ownership the production process is integrated with the head office and technology is upgraded at discrete intervals. At a medium level of foreign ownership the domestic affiliate is important enough to invest in, while not being totally controlled by the multinational firm.

2.4.5 Mode of FDI

Multinational firms have a range of different routes by which they can enter a foreign market, from a minimal cooperation level to extensive integration of activities. The entry choices available to multinational firms typically range from using joint production sites or distribution networks, to complete ownership of the domestic firm. The mode of entry of FDI has been argued to impact the level of technology transfer

(see Javorcika and Spatareanub, 2008). The argument is that where the FDI is through some loose cooperation the multinational is not willing to share its competitive technology. The multinational values its technology and fears that it may either leak into the domestic market or sees that there is little need to share such knowledge in view of the loose relationship. Tomiura (2007), uses a slightly different argument whereby the mode of FDI entry is reflective of the level of sophistication of the multinational; in other words, firms that simply outsource production overseas through a loose arrange with the domestic firm. More importantly, the simple outsourcers are on average less capital intensive than other globalised firms. The higher the level of the multinational firm's involvement with the domestic firm, the higher the degree of technology that it owns; and greater its rate of productivity. The rationale for this is that the more technology advanced and productive firms can create synergy through an arrangement with the domestic affiliate. On the other hand, less productive multinational firms create synergy through working with more able domestic firms.

From a broader perspective the mode of entry is impacted by factors in the multinational firm's home, as well as the host country. For instance, Porter (1986) argues that a multinational firm's competitive position in one country is impacted by competition in the other country and hence an interdependent relationship exists. Barkema and Vermeulen (1998) find that a merger entry route is more likely where a multinational needs to gain legitimacy in the host country. Similarly, where there is a strong cultural and economic relationship between the multinational firm and the host country then mergers or acquisitions are more likely (Shimizu et al, 2004; Globerman and Shapiro, 2002). The opposite is also true, whereby a stark cultural difference between the multinational firm and the host country will lead to greenfield ventures (Xu and Shenkar, 2002). Bertrand *et al.* (2007) find that on average affiliates that are wholly or partially acquired tend to carry out more research and development compared to greenfield ventures. As a result, the level of technology transfer will be lower compared to a greenfield site, where the multinational has greater control as well as the ability to instil its own technology. Mattooa *et al.* (2004) find that the ultimate trade-off between sharing knowledge with the domestic affiliate and market competition determines the extent to which technology is transferred. This is also

consistent with the idea that greenfield sites are more likely where there is less competition, while mergers and acquisitions take place in a more congested market.

2.4.6 Infrastructure Factors and FDI

Countries that have good physical infrastructure such as bridges, ports, highways and other utilities are likely to attract greater inward investment than those that do not have such facilities. Infrastructure is a very broad aspect and it has been separated by Fung *et al.* (2005) into hard and soft, whereby the former relates to highways and railroads, ports, etc., while soft infrastructure refers to transparent institutions and deeper reforms in country's political system, which includes the institutional and legal environment, aspects of legislation, regulation and legal systems, freedom of transacting, security of property rights, and transparency of government and legal processes (Globerman and Shapiro, 2003). Fung *et al.* (2005) find that soft infrastructure is a more important determinant of FDI than hard infrastructure. Large hard infrastructure tends to impact the goods sector and does not really affect services. The rationale for this is rather simple in that soft infrastructure is required by all firms, while hard infrastructure is required only by the goods sector. Interestingly, the study also finds that there are diminishing returns into hard infrastructure in that the first bridge is more important than the second and so on. As a result, Fung *et al.* (2005) conclude that investing in improvements in infrastructure is important in attracting inward investment.

Globerman and Shapiro (2003) examine the impact of improvements in one particular type of soft infrastructure, namely that relating to the government. The study finds that countries that do not achieve a certain minimum level of effective governance tend not to receive any FDI. From this they conclude that governments that fail to develop transparent markets and whose legal systems are not rooted in English law tend to be excluded from FDI. (The study only looked at US outward infrastructure and hence English based law was important to these companies.) Globerman and Shapiro (2003) also found that the amount of FDI was directly related to strength of the legal system.

In the case of hard infrastructure Coughlin *et al.* (1991) find a very strong relationship between logistics infrastructure and increased FDI. Although logistics may be important it is not the only infrastructure aspect that firms consider when selecting a location. Goodspeed *et al.* (2006) found that the availability of electric power, the number of mainline telephone connections and a composite infrastructure measure have a statistically significant and positive impact on inward FDI. A variation of this study is that by Mollick *et al.* (2006), who examined the impact of both telecommunications and the transport infrastructure on FDI for Mexico. This study again finds a positive relationship between infrastructure and inward investment. Wheeler and Mody (1992), by using a comprehensive indicator, find that it is not the availability of infrastructure that is important, but that it is the infrastructure quality that determines FDI.

2.5   Cluster Theory

Porter (2000: p. 15) defines a cluster as, 'a geographical concentration of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions'. In many respects the economic development in Europe or the United States has undergone the same type of geographical concentration. For instance, the cotton mills and textile industries in Lancashire, the car and metal industries in the Midlands, the carpet industry in Kidderminster are typical examples in the United Kingdom. In the United States one commonly refers to the car industry in Detroit and Silicon Valley on the west coast. Therefore, it is not surprising to see that the concept of a cluster actually predates the work of Porter (1998c), who is usually attributed to identifying this industrial behaviour. In fact, the actual theory dates back to the nineteenth century, and the first reference to such a geographical concentration of industry dates back to Marshall (1890). However, Marshall's analysis was very much taken from an economic perspective and in the context of externalities from firms in the same industry locating in close proximity to each other. Marshall (1961 [1890]) referred to the benefits from such industrial concentrations as 'agglomeration effects'. In other words, locating supply and producer companies in the same industry was argued to reduce transportation and production costs. The latter was possible

because firms were not required to keep large inventories as the suppliers tended to be located nearby.

In recent years, clusters have been extensively studied as governments have sought to create competitive advantage for their domestic firms. As a result alternative definitions have been proposed to Porter's standard one. A broader definition of a cluster is provided by Rosenfield (1997) who refers to it as 'concentration of firms that are able to produce synergy because of their geographical proximity and interdependence'. Roelandt and den Hertog (1999) view clusters largely along the lines of interdependence, and define them as 'networks of producers of strongly interdependent firms linked to each other in a value-adding production chain'. A more detailed definition of clusters is provided by Feser (1998), who argues that 'economic clusters are not just related and supporting industries, but rather related and supporting institutions that are more competitive by virtue of their relationships'. These definitions highlight three key aspects of a cluster, namely relatedness, proximity and competitiveness. Relatedness implies that the cluster needs to have firms that are associated to each other vertically and/or horizontally. The relatedness can be in the form of having common aspects, such as two firms producing an identical product or service. Alternatively, relatedness can also take place through complementary industries such as support services. Secondly, clusters need to have firms that are in close geographical proximity to each other, which creates and enhances additional value to their operations through their interaction. Thirdly, for real value benefits to take place there have to be improvements in innovation, productivity, growth and so on.

The literature does not provide a clear definition of the border of a cluster, except to state that the firms within it are connected through 'linkages and complementariness across industries and institutions' that enhance competition (Porter 1998c). This implies that there is no reason to assume that a cluster cannot cross national boundaries. In this respect Porter (1998c) provides a case, where the 'pharmaceutical cluster straddles through New Jersey and Pennsylvania in the US. Similarly, a chemical cluster in Germany crosses over into the German-speaking part of Switzerland'. Interestingly, Porter (1998c) argues that the composition of a cluster does not conform to the standard industrial classification (SIC) systems, as such a classification tends to ignore the important relationships and partnership that may naturally exist. Porter (1998c) describes clusters as, 'a kind of new spatial organisation form in between that of arm's length markets and vertical integration systems'.

As such, a cluster contains a range of linked industries and entities that enhance competition. This, as stated above, may include manufacturers of complementary products and services as well as the technologies. In order to describe a typical cluster, Porter (1998c) provides the example of the Californian wine cluster. Porter (1998c) states that, 'the California wine cluster is a good example. It includes 680 commercial wineries as well as several thousand independent wine grape growers'. The cluster also has an array of complementary industries that support the industry, including suppliers of grape stock, irrigation and harvesting equipment suppliers, wooden barrel manufacturers, specialised label printers, public relations and advertising firms with experience in the wine industry, media companies producing content for consumers, and trade buyers. Interestingly, the cluster also has linkages to the University of California at Davis, the Wine Institute, to carry out research into the industry and hence increases in innovation. In the wider sense the cluster is also linked to restaurants and regional tourism.

The central question is: why should a firm within a cluster have greater competitiveness and become successful? One explanation is the positive feedback argument, which states that the positive externalities from clusters are higher than operating in isolation and hence enable greater growth. Once the market players realise this and see the impact, they too seek to enter the cluster, thereby further increasing the benefits of the cluster. As more and more firms seek to enter the cluster, productivity tends to increase, as does the level of innovation. Of course for the initial impact to take place, the cluster needs to reach the critical mass (Pandit *et al.*, 2001; Baptista and Swann, 1998; Oakey, 1985). As in the traditional economics case, there are increasing returns from companies entering the cluster, followed by constant returns, and then beyond a certain point there are actually decreasing returns from the cluster. Porter (1998c) argues that this is consistent with the life cycle theory of a cluster. The cluster benefits are limited if not supported by national advantages. To a large extent, these factors, although increasing the attractiveness of a cluster, are not determined by it. For instance, a politically and economy stable country supports the clusters but is quite independent of it. Kuah (1998) argues that national factors that create strategic fit with the cluster can increase the impact of the positive feedback argument. Kuah's (1998) model of strategic fit is illustrated in Figure 2.2 below, which shows the importance of cluster strategic fit from the viewpoint of a nation's competitiveness and the firm's industry strategies. :

Figure 2.2   Strategic Fit Model
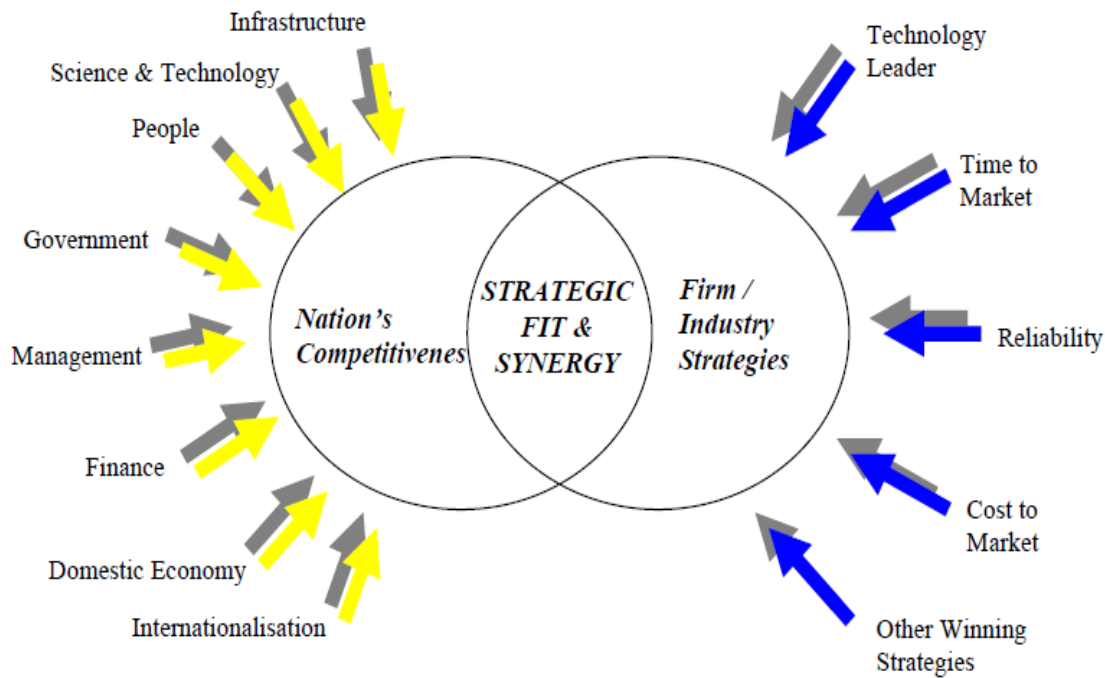
Source: Kuah (1998)

Porter (1998c) argued that rapid firm growth and new firm entry are two signs of a successful cluster. Swann (1998) sought to test the positive feedback theory, and in particular the growth of new firms. The study found that firms in clusters grow much faster than average only if grouped with companies in their own sub-sector. Clusters also tend to attract far greater number of new firms, especially of a complementary nature. Firms in clusters were found to be more innovative, measured through the number of patent submissions. Finally, firms in complementary areas of activity do not tend to grow as quickly as the main industry, nor do they have the same level of innovation.

In a formal representation of a cluster, Porter (1990) argued that a country's internationally competitive industries are also likely to be 'geographically clustered' due to four factors. These four factors were represented as a diamond and hence referred to as the competitive diamond, the basis of which is to show how an economy, firm or cluster can create a competitive advantage. Porter (1990) argues that competitive advantage arises from the interaction of the factors in the diamond.

Figure 2.3   Porter's Competitive Diamond
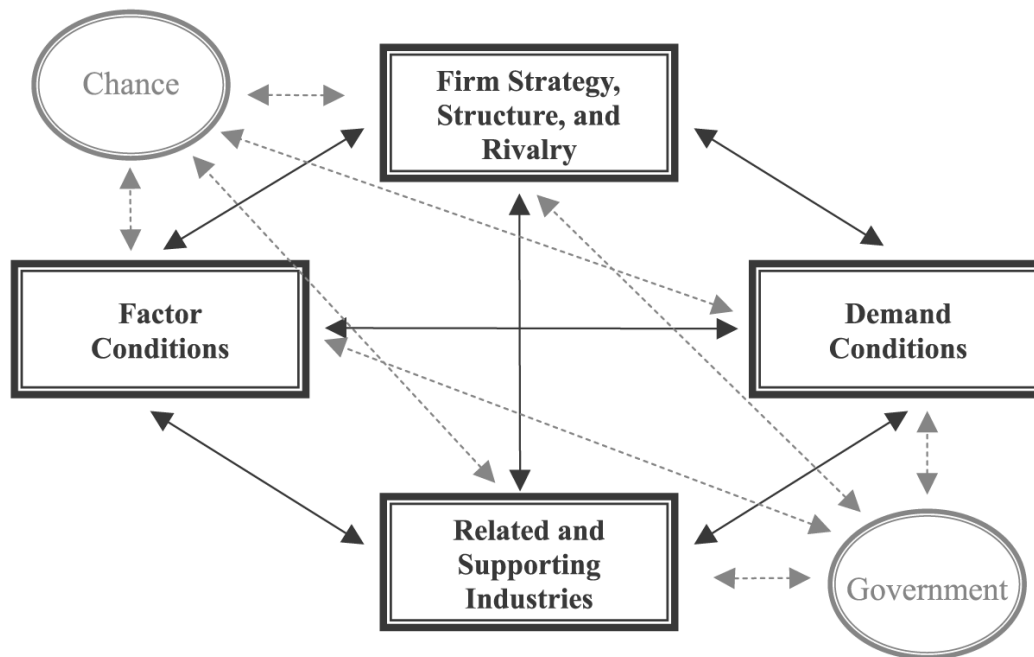
Source: Porter (1990)

It is generally agreed that clusters bring about benefits to firms, such as improvements in communication and relationships with the suppliers. The natural question that arises is whether there should be a positive policy intervention to encourage new clusters as well as to enhance the benefits of existing ones. Martin, Mayer and Mayneris (2008) argue that when firms make a decision regarding a particular location the cluster benefits tend to be factored in. When firms make locational decisions they already take into account the benefits of being in a cluster. Martin *et al*. (2008) point out that in France expensive public interventions to promote clusters are not warranted. In fact, the study implies that it is difficult if not impossible for public policy to intentionally create clusters where they do not already exist.

2.6   Critique of the Literature

The consensus in the literature seems to be that FDI increases growth through productivity and efficiency gains by local firms. The empirical evidence is not unanimous, and studies such as Imbriani and Reganeti (1997) for developed countries seem to support the idea that the productivity of domestic firms is positively related to the presence of foreign firms. The results for developing countries are not so clear, with some finding positive spillovers

(Kokko, 1994; Blomström and Sjöholm, 1999), and others such as Aitken *et al*. (1997) reporting limited evidence at best of positive short-run spillover from foreign firms. Some of the reasons put forward for these mixed results are that the envisaged forward and backward linkages may not necessarily be present (Aitken *et al*., 1997) and those arguments of multi-national corporations (MNC)s encouraging increased productivity due to competition may not be true in practice (Aitken *et al.,* 1999). Other reasons include the fact that MNCs tend to locate in high productivity industries and, therefore, could force less productive firms to exit (Smarzynska and Wei, 2002). Cobham (2001) also postulates the crowding out of domestic firms and possible contraction in total industry size and/or employment. However, crowding out is a rare event and the benefit of FDI tends to be prevalent (Cotton and Ramachandran, 2001). Further, the role of FDI in export promotion remains controversial and depends crucially on the motive for such investment (World Bank, 1998). Obwona (2004) argues that FDI spillovers depend on the host country's capacity to absorb the foreign technology and the type of investment climate.

The researcher seeks to readdress the imbalance in the current body of knowledge, which is largely based on findings from western or Asian countries and not really relevant for small and capital abundant countries such as the UAE. Therefore, this study intends to help fill this gap in the literature through using the UAE as a case study for a young nation that is resource abundant with a small population. The UAE is also well placed to be a test country for this study because it is export-oriented, has developed a number of clusters and has been a major recipient of FDI. The researcher believes that the lessons learnt from the UAE through this study will be relevant to all resource abundant countries seeking to attract FDI, as well as adding to the current body of knowledge with regard to technology transfer from FDI.

2.7   Summary

This chapter has examined the role of FDI in stimulating growth using a uni-directional model. The evidence as stated above is not conclusive, with some studies finding a positive and statistically significant relationship. Conversely, other studies using a different sample of countries and time period have found at best a small relationship, if any. The chapter also examines the literature dealing with the reverse relationship, namely that of economic growth on FDI. There is sufficient evidence to suggest that FDI does indeed increase the growth of the country as it raises the output potential. Associated with these two variables, the chapter

looked at supplementary factors linked to Dunning's (1979, 1980) OLI model. Although Dunning (1979 and 1980) does not list any of the associated factors, the role of tariff jumping FDI, availability of host, home country as well as multinational institutional finance, exchange rates, host and home country taxation and business conditions have been examined by the researcher. In the following chapters the researcher hopes to test the associated factors as control variables in the empirical study of the simultaneous relationship between FDI and economic growth and then look at the role of clusters and how they seek to create enhanced business environments, which in theory should attract greater FDI.

CHAPTER 3
The Conceptual Framework

3.1 Introduction

Chapter 2 of the study reviewed the literature dealing with technology transfer from FDI and the component factors impacting on its rate and level. In this chapter the study seeks to formalise the research agenda through developing the conceptual framework and the hypothesis to be investigated in this thesis. An academically rigorous investigation of any topic requires that the researcher formalises the area of study to identify the main issues. As a result the researcher is able to set boundaries regarding what will and what will not be investigated. At the same time the formalisation process allows the researcher to understand the inter-relatedness of the different aspects to the key area of study. The literature review undertaken in Chapter 2 showed that there are numerous prior studies that have examined FDI and its impact on various aspects of the economy. In this section, the researcher has sought to bring together these various studies in a coherent and structured manner. In the first instance, this allows a rigorous examination of the research questions to be carried out. Secondly, the researcher may access these prior studies to develop an initial model, which the researcher then hopes to extend to investigate the Arab world, and the UAE in particular. It is the belief of the researcher that the conceptual model will be appropriate for studying the impact of FDI on the unique aspects of the UAE economy and hence to formulate comprehensive policy recommendations. The starting point for the research question is the notion that for economic growth to take place there needs to be investment, and this itself is dependent on the level of savings. This idea is derived from the standard Keynesian model of the economy where I (i.e. investment) = S (i.e. saving), and can be illustrated as shown in Figure 3.1 (Keynes, 1936)

Figure 3.1   The Role of Savings and Investment in Economic Growth

Investment leads to an increase in economic growth which in turn increases income, thereby allowing for greater future savings

Economic Growth

Savings

This is the surplus of income and expenses

Investment (Capital Accumulation)

Savings is translated into investment
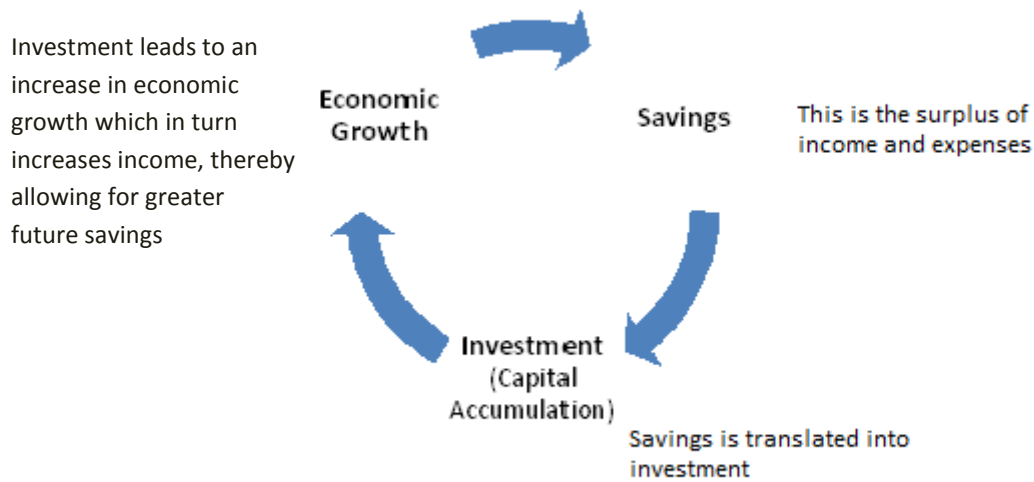
Adapted from Keynes (1936)

In a closed economy investment is limited to only domestic savings, however in an open economy one can have foreign capital inflows. Therefore, in the more realistic case, investment is a combination of both domestic and foreign savings. The latter is important from the perspective of this research because the issue is whether investment has any impact on technology transfer and economic growth. To understand this, one must look at FDI in a wider context and examine its relationship to growth. Figure 3.2 illustrates the relationship of FDI to investment and economic growth. At the basic level, FDI is linked to the level of investment in the economy in accordance with the standard Keynesian model; however, at a deeper level, FDI is also linked to the type and degree of research and development that is carried out. The reason for this is that FDI is able to sustain the initial investment along with the ability to share the risk that research and development will not yield any return. Similarly, in recent years there has been a move towards public–private initiatives, especially in the area of infrastructure financing.

Figure 3.2   The Relationship between FDI and Economic Growth
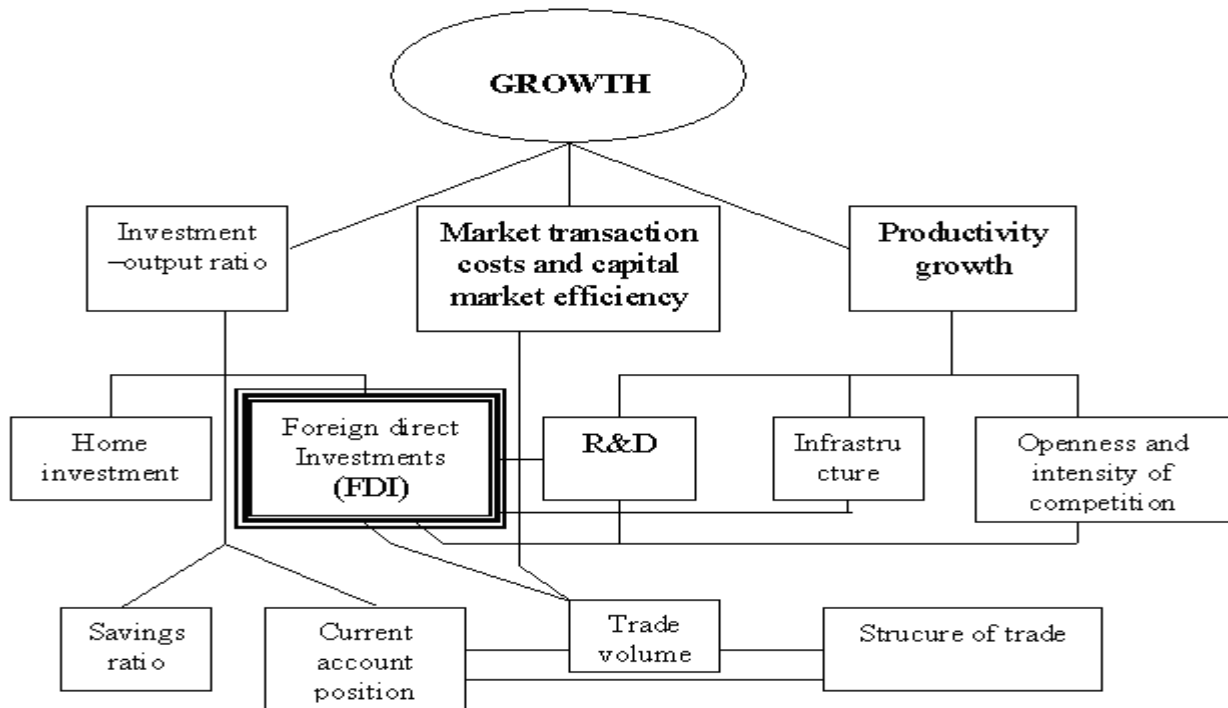
Source: Soltes (2004)

3.2   The Conceptual Framework of This Research

In Figure 3.2 it was largely assumed that FDI takes places in an endogenous manner and is linked to the volume of trade. However, the discussion of the literature review shows that this is just one of the dependent variables. Also, Figure 3.2 assumes that FDI is neutral in its impact, and again the literature review shows that this is not the case. In Figure 3.3 the researcher extends this graphical representation to take into account these shortcomings, and, more importantly, to arrive at the conceptual model.

Figure 3.3   The Conceptual Framework of this Research
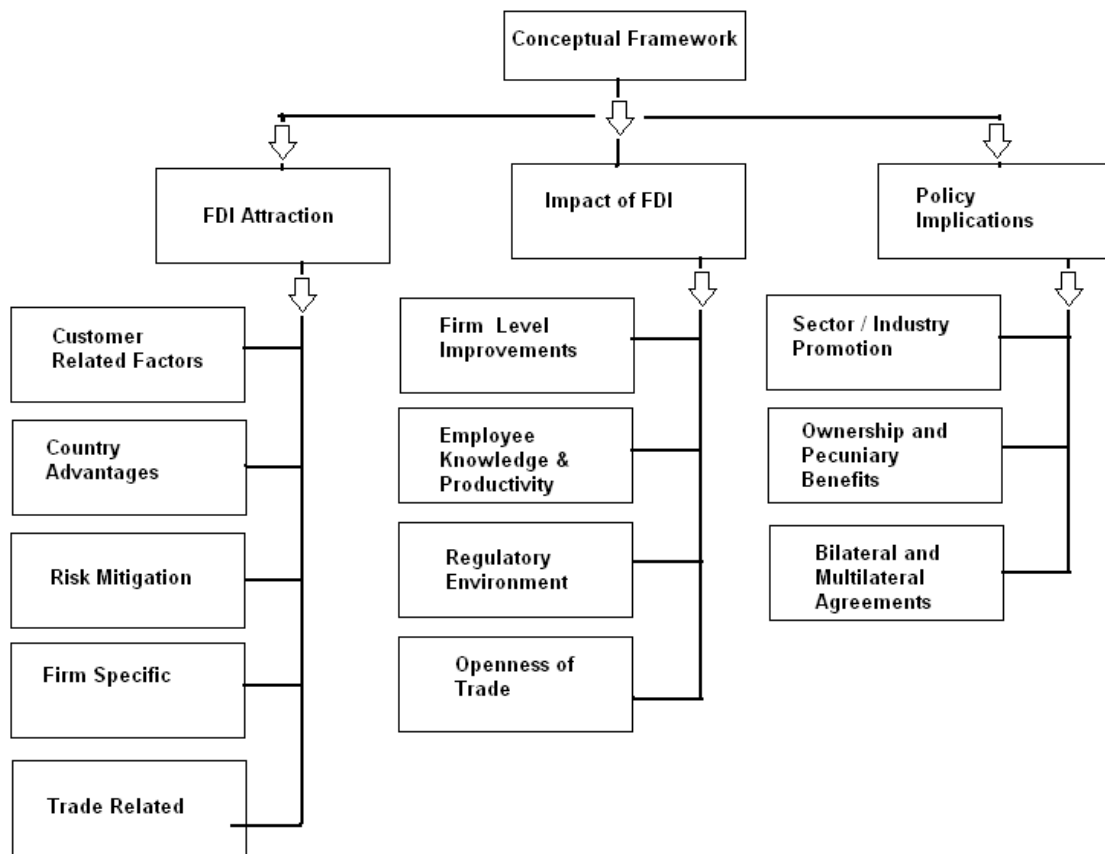
Three key aspects of FDI have been identified by the researcher. Firstly, there are factors that induce foreign investment to enter a particular country. Secondly, as the researcher has identified from previous studies, FDI has positive and negative spillover effects. The approach chosen within this research is to look at one particular strand of the spillover effect, namely technology: it has also been identified by the researcher that technology-related spillover effects have a broad impact on the economy. Thirdly, any policy recommendation seeks to enhance the positive aspects of an activity, while mitigating any negative aspects. The policy recommendations are based around three core areas: the sectors or industries that the UAE government should prioritise for FDI promotion; the ownership and pecuniary benefits that should be offered; and the bilateral and multilateral agreements that can be entered into in order to enhance FDI inflows into the country. These three areas are sub-divided into core component parts and discussed below.

3.2.1 FDI Attraction

There are five main groups of FDI determinants or factors that increase the attraction of a particular country as far as inflows are concerned, which are illustrated in Figure 3.4 below:

Figure 3.4   Determinants of FDI Attraction
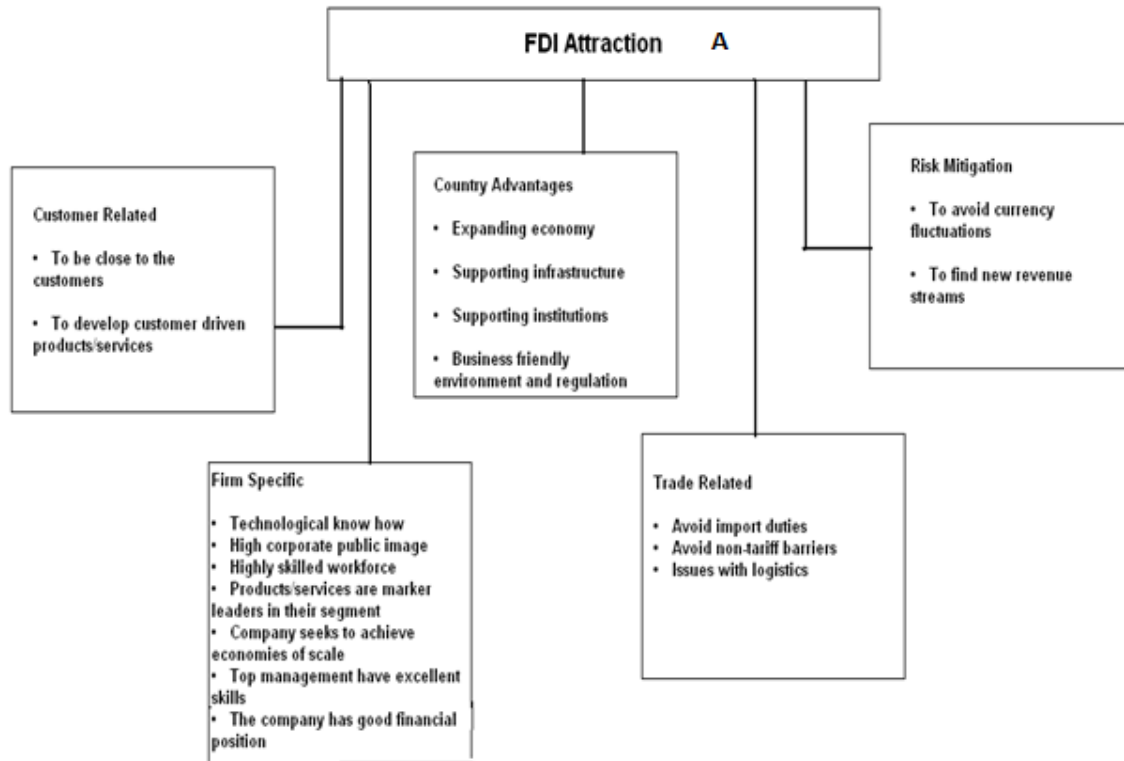
Figure 3.4 above is based on Dunning's (1998 and 1993) electric paradigm, but focusses on the first two aspects, namely organisational and location factors. The level of attraction for a particular location to an organisation can be categorised into five groups of factors, the first of which is 'customer related' issues. The basis of the customer related issues is that a supplier needs to be close to its clients in order to build and maintain loyalty and hence reduce the level of defections. Also the closeness of a customer–supplier relationship can assist the supplier in developing products that meet the specific needs of the customer. Secondly, there are 'firm specific' factors that induce foreign expansion; these include factors such as the ability to capitalise on technological knowledge. In most cases, technological knowledge is arrived at through a long and expensive research and development process, the returns of which are dependent on the ability to deploy it as widely as possible. In many ways, this is also linked to the need to achieve economies of scale in production. Other

factors in this category include the maintenance of public image, whereby some companies seek to have widespread coverage as a part of the corporate image building process. In most cases this is related to the financial soundness of the firm. A firm may be motivated to expand overseas due to its superior workforce and management ability.

Customer and firm factors may induce foreign expansion; however the choice of the location depends on specific factors. As stated above, FDI is related to the economic growth of the country (Türkcan *et al*., 2008). In other words, countries with above average economic growth tend to have higher FDI. In addition to this, the academic literature has found that supporting institutions – both governmental and private sector – play an important role in differentiating the benefits of countries. A good infrastructure has been shown to increase the level of FDI (Castro *et al*., 2007). Foreign firms tend to be risk-averse and hence prefer to establish overseas operations in countries that have a good infrastructure. Another important factor in this category is the business friendly nature of a country, which tends to be measured by the World Bank Ease of Doing Business rankings. Blanchet (2006), amongst others, has found a positive relationship between the business rankings and the probability of inward FDI.

Trade-related aspects are based on the notion that in modern trade firms seek to gain a competitive advantage through cost efficiencies which can be eroded by import duties (Blonigen *et al*., 2002). The establishment of overseas operations can reduce if not eliminate import duties. One way for a company to reduce its import duty liability is to base its operations in a country with a FTA. Cuevas (2005), for instance, has found that FTAs have a significant positive effect on FDI flows. The study argues that in the case of Mexico the North American FTA generated almost 60 per cent higher FDI inflows than would have taken place without the agreement. Import duties are a financial form of trade barrier that seeks to make the foreign good or service more expensive to the benefit of the domestic producer. Non-financial import restrictions take place in the form of non-tariff barriers, which are usually administrative constraints. Countries that have low trade barriers or are part of FTAs that remove such restriction for trade between these countries tend to have a higher level of FDI. The third factor in this category is logistics, and here the concern is not only the physical distance, but the difficulty of ensuring that the goods arrive at the time and date required by the customer. The typical examples in this tend to be suppliers to the car industry,

who need to establish operations close to customers that operate on a 'just in time' production system.

The largest risk for firms is exchange rates, which have the ability to considerably alter prices. In most cases firms seek to mitigate this risk through exchange rate hedging, but this is a short-term technique with most hedging instruments having a maximum duration of a year. A number of previous studies have found a positive relationship between exchange rate volatility and the level of FDI (Froot and Stein, 1991; Dewenter, 1995) Depreciations in exchange rates are also more likely to lead to increased foreign mergers or joint ventures (Caves, 1998; Pan, 2002). Exchange rates tend to change the relative price of a good or service and hence at times can be beneficial for an exporter, while at other times they tend to make their products more expensive. Therefore firms tend to remove this level of uncertainty from the business by establishing foreign operations. This is especially so where the currency is important, such as the euro, which applies to all of the 27 European Union countries. At the most basic level, overseas expansion is an important form of diversifying the revenue stream of a company. This implies that if for any reason revenues are badly affected in one country, the sales from another location can compensate for this fall. Of course, foreign revenues can be obtained through simple exporting, however, for the reasons mentioned above this may not always be possible, hence necessitating a foreign presence.

3.2.2   The Impact of FDI

There are four main groups of impacts of FDI, which are illustrated in Figure 3.5 below:

Figure 3.5   The Impact of FDI
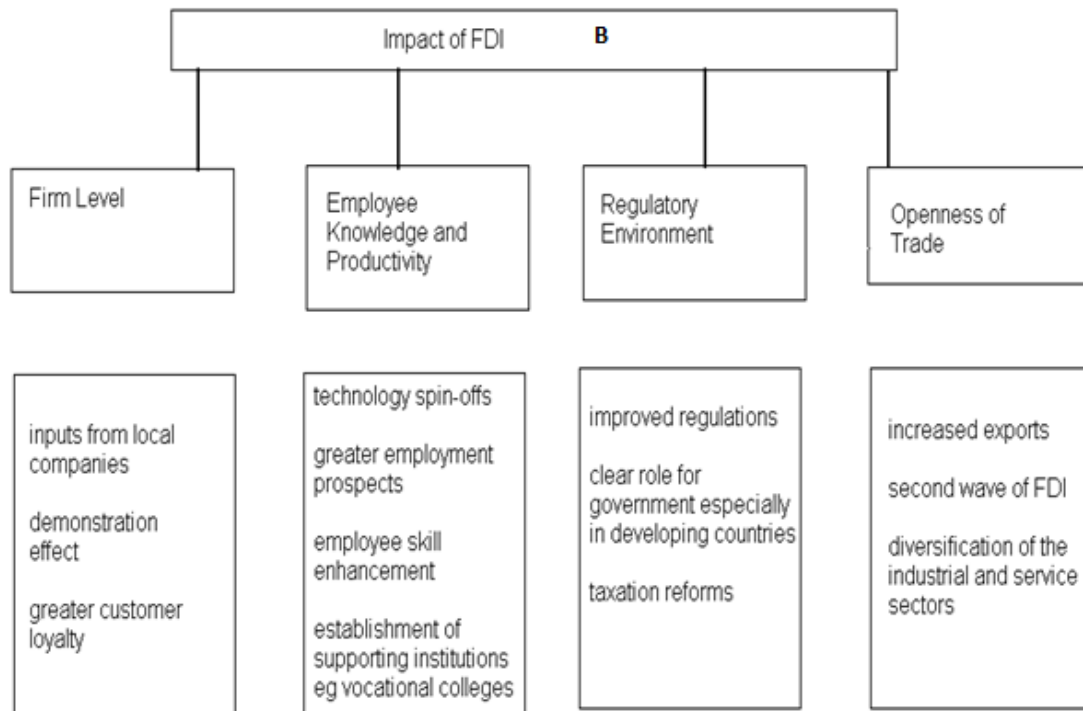
3.2.2.1 Sector and Firm Level Differences

The real impact largely depends on the size of the FDI and the sectors that it takes in, hence in the following section some of the policy implications are discussed by the researcher. Nevertheless, the primary impact of FDI is obviously on the firm carrying out the foreign investment. A foreign presence allows the firm to source its supplies from local firms and hence gain from any price differentials. At the same time the domestic firms are able to treat the foreign firm as local within its own country and avoid the regulations relating to imports. Secondly, both domestic and foreign firms can acquire knowledge to improve their production processes through imitation. Cheung (2004) argues that FDI brings along with it a demonstration effect, whereby domestic firms acquire knowledge that they would not ordinarily receive. However, there is now increased evidence to show that the demonstration effect can be bi-directional in that some knowledge is passed on from domestic firms to foreign ones. This is certainly true where foreign firms need to understand the prevailing market practices of the country in question. As discussed above, there tends to be greater customer loyalty for firms who are based in the country of consumption. This is more so the case where the firm can bid for tenders and contracts that require an overseas presence.

A large bulk of prior literature examining the impact of technology spillovers from FDI focuses on the manufacturing sector, despite it being about a third or so of the economy in most developed countries. More importantly, service sectors such as IT, communications and so on act as inputs to the manufacturing sector and any technological spillover impact on FDI can be passed on to the latter. Arnold *et al.* (2006), as well as Fernandes and Paunov (2008), examined the impact of liberalising the services sector in the Czech Republic and Chile, respectively. The authors found that such liberalisation had a positive impact on the average productivity of downstream manufacturing firms. In other words liberalisation in the services sector improved the efficiency of manufacturing firms. As such the authors conclude that it is beneficial to attract foreign investors in the services sector due to the positive impact on other sectors. The rationale for this is that as the services sector is used as inputs for production, any technological spillover effects are reflected through lower cost, higher quality and so on, which improve the performance in downstream sectors. Ben-Hamida (2011) finds that high technology sectors, which tend to be in areas such as communication etc., are most likely to benefit from FDI induced technology spillovers. On the other hand, the medium to low technology firms benefit from the demonstration effects that arise.

3.2.2.2 Employee Knowledge and Productivity

One of the most important impacts of FDI is the technology and know-how spin off, which forms the basis of this research and is discussed in greater detail in Chapters 5 to 7. In essence, the prior literature argues that technology transfer takes place in one of four ways. The first is by purchasing the foreign technology. Of course, the presence of the foreign company in the domestic market alerts the local firms to the existence of this technology. Also, there is a natural transfer of employees from one firm to another: these employees are trained and may take with them their skills and knowledge to the advantage of the new employer who may be a domestic company. Technology transfer can also take place as a combination of both of these factors (Fosturi *et al.*, 2001). The second is the interaction of domestic firms with the foreign firm through supply relationships that create vertical linkages, which transfers knowledge (Marcin, 2007; Smeets, 2008). Thirdly, in most cases the foreign firms compete with domestic firms, which induces the latter to improve their

production technique so as to maintain their market share. Fourthly, in the process of transferring knowledge and technology from the parent to the foreign affiliate, leakages in information can take place that benefit domestic firms (Sjöholm, 1999a). The transfer of technology then has supplementary benefits, the first of which is the creation of employment opportunities. The example of outsourcing firms in India is a typical example that created employment not only in the call centres, but in telephony, secretarial support, etc. Similarly, these new technologies give rise to the establishment of vocational and technical colleges so that the knowledge can be more widespread.

3.2.2.3 Regulatory Environment

The risk averse nature of FDI implies that it tends to gravitate towards countries that have a clear regulatory environment that is stable and well defined. In other words, foreign firms prefer the security of knowing the regulations that they face and dislike countries where these regulations can change at will. This also implies that if the regulatory environment is obstructive or tiresome, then it tends to divert FDI to other locations. The need to attract FDI implies that more business-friendly regulation is applied. Associated with regulations is the fact that in some developing countries the role between government and the private sector is not very clear. To a large part this has to do with the evolutionary nature of the countries involved. A case in point is that in October 2009, Nakheel, which was assumed to be a government company at the time of the debt financing, was declared to be a private sector concern when it was close to default. This meant that investment that was assumed to be taking place with a government entity with sovereign backing, overnight turned out to be with private sector firm with no government security.

3.2.2.4 Openness of Trade

FDI has been shown to have a positive impact on the level of exports, largely because foreign firms have a higher experience level as far as trade is concerned. Also, the level of FDI that takes place implies that in order to benefit from economies of scale a certain level of exports to the host country region is necessary. A positive externality of FDI is that it leads to a diversified economy. This is not only true for the highly concentrated oil abundant countries, but also in developed economies. Empirical studies show that once a certain level of initial FDI takes place it spurs additional or second wave FDI.

3.2.3 The Policy Implications of FDI

There are three main groups of policy implications for FDI, which are illustrated in Figure 3.6 below

Figure 3.6   **The Policy Implications for FDI**
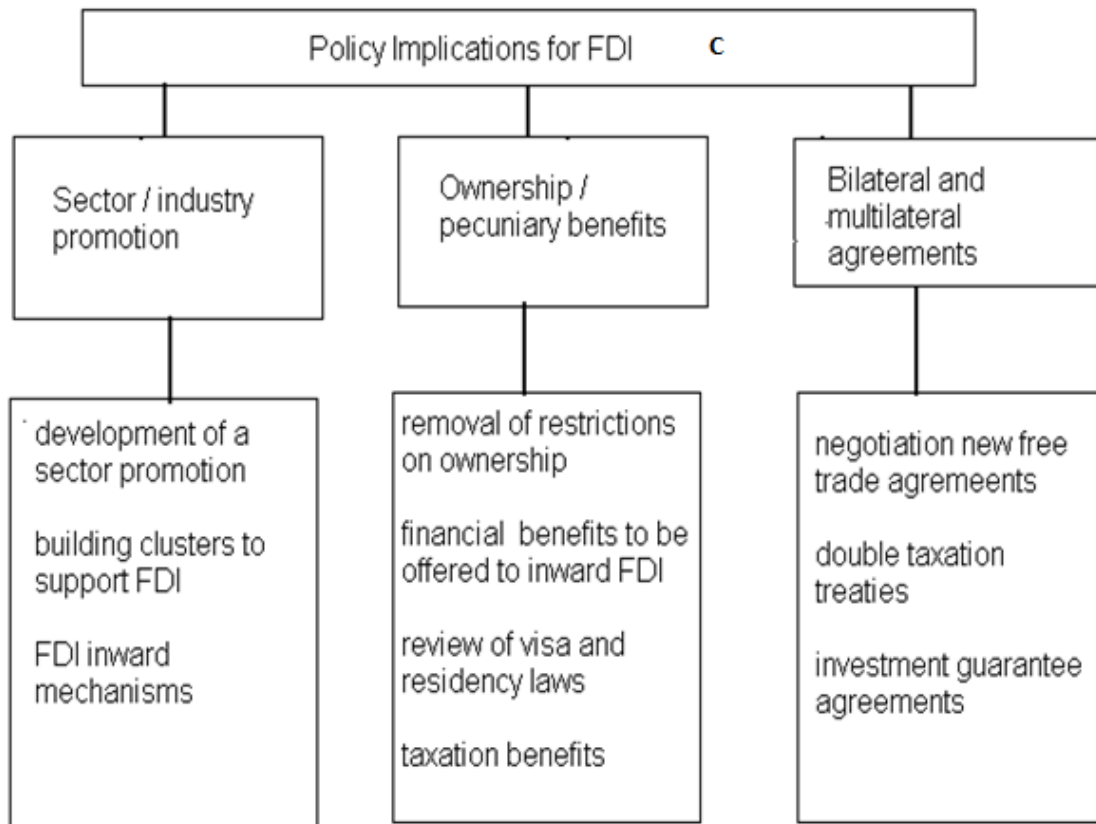
3.2.3.1 Sector/Industry Promotion

The first of the three main types of policy implications, as identified by the researcher, is to select the sectors or industries for FDI prioritisation. Country experiences show that they cannot prioritise all the sectors for inward FDI and should select those that are the best short-, medium- and long-term targets. However, in most cases the sector prioritisation is built around a cluster that can provide a complete eco-system for the industry or sector concerned (Porter, 1998c). In addition to this, according to Harding and Javorcik (2011), one needs to have appropriate FDI promotion mechanisms in place. In some countries this is carried out through the export promotion agency, e.g. UK Trade and Invest for the UK and AUS Trade in the case of Australia. These agencies seek to promote the country in overseas markets so as to channel inward FDI. It is felt by the researcher that this mechanism and other mechanisms

to attract inward investment constitute an important component of this research (Holmes *et al*., 2013).

3.2.3.2 Ownership Benefits

Tao *et al*. (2013) show that ownership restrictions are an important consideration for inward FDI. This is especially the case for the UAE, which outside the free zones limits foreign ownership to 49 per cent of a venture. In recent years there has been a review of the foreign ownership rules in the UAE. The researcher believes that the research will shed light on this area and help define the issue with empirical results. An important reason for FDI is as a taxation planning mechanism. The well-publicised announcement of McDonalds to relocate its European headquarters from the UK to Switzerland to save on taxation is one such example. It is believed by the researcher that as the UAE is considering implementing a taxation system in the country, its impact on FDI needs to be considered. It has been found by the researcher that there are considerable examples of FDI moving to countries that offer the largest or most lucrative financial and non-financial inducements.

3.2.3.3 Bilateral and Multilateral Agreements

The discussion above shows that firms seek to avoid import tariffs as well as non-tariff barriers. The framework under which import tariffs and non-tariffs are removed or, at worst, reduced is through FTAs. An FTA is an arrangement between two or more countries to open their respective markets to imports from the counter-signatory country. The extent to which each market is open is dependent on the negotiations that take place. Lee (2005) argues that FTAs are an important mechanism for inducing inward FDI. In addition to FTAs, one has double taxation treaties that help companies avoid two sets of taxation for the same revenue stream. This has a major impact on the net profit of the company as it can substantially lower the company's taxation liability. Finally, companies need a government level assurance through treaties to cover their investment in overseas markets. The mechanism to deal with this is an investment guarantee agreement.

3.3   Development of Testable Hypotheses

For a small and highly resource abundant country such as the UAE, FDI is seen as complementary to domestic investment. In other words where, or when, domestic finance is unable to support a particular project it is hoped that FDI will fill the gap. Also, FDI with its

different set of technologies and know-how will be able to identify new opportunities in the host country that are not available to domestic firms. In this manner FDI becomes an important tool for economic growth in the host country. However, the problem that has faced almost all countries is how to attract FDI into their country, and many countries have re-examined their value proposition so as to enhance FDI flow. Chapter 2 has examined the factors that impact on a country's ability to attract and, more importantly, retain FDI. In this section, the researcher lists the hypotheses that this study seeks to empirically investigate.

3.3.1   Joint Relationship between Economic Growth and FDI

In the literature review in Chapter 2 we have seen that one very important contributory factor for FDI inflows is argued to be economic growth (Bijsterbosch, and Kolasa, 2010). However, economic growth itself is reliant on the levels of FDI. Although the rationale for such a simultaneous or bi-directional relationship may make economic sense, it is far from being empirically conclusive. This study seeks to examine whether, in the first instance, FDI does impact on economic growth, and, in the second instance, whether the opposite is also true for the UAE. In doing so, the study seeks to answer a much more important question, namely: does a simultaneous relationship between FDI and economic growth exist?

The relationship between FDI and economic growth is important for this study because if technology transfer does take place due to foreign inflows of capital then it should lead to an increase in economic output. The existence of technology transfer from FDI was first tested by the researcher before examining the other aspects such as the importance of clusters, exports or host country factors. This first set of questions can be developed into testable hypotheses for the UAE in the following manner (the subscript refers to the hypothesis number while the superscript relates to the null and alternative hypothesis):

These hypotheses, which are tested in Chapter 5, seek to empirically test the second objective of this study, as stated in Chapter 1, which is to understand whether technology transfer from FDI has taken place proxied by economic growth.

H^0_1:   FDI flows have a positive impact on the level of economic growth
H^1_1:   FDI flows do not have a positive impact on the level of economic growth

In the case of economic growth the following hypotheses are developed:

H^0_2:   Economic growth has a positive impact on the flows of FDI

H^1_2:   Economic growth does not have a positive impact on the flows of FDI

Under the traditional Keynesian framework, economic output is impacted by investment, which itself can be divided into domestic investment and foreign investment. This implies there is most probably a joint or simultaneous relationship between FDI and economic output. Prior studies, such as Dritsaki (2004) and Metawally (2004) show the existence of a joint relationship between FDI and economic growth. The following hypotheses were developed by the researcher and seeks to test the joint relationship between economic growth and FDI for the UAE.

H^0_3:   Economic growth and FDI are interrelated endogenous variables in the case of the UAE for the period 1980 to 2010.

H^1_3:   Economic growth and FDI are not interrelated endogenous variables in the case of the UAE for the period 1980 to 2010.

This can be restated as shown below, where F and G in the hypothesis refer to the FDI and economic growth equations respectively.

F1:   Higher levels of economic output in a country will attract greater stocks of FDI.

G1:   Higher stock of foreign inward investment will lead to greater economic output.

An individual or supplementary hypothesis has been developed by the researcher to test the validity of each of these additional factors or control variables, which are listed in Table 3.1 below. The supplementary hypotheses are structured in the positive context (i.e. as H^0). For simplicity in representation the researcher has not stated the alternative hypotheses in these results, although they are discussed in the results section. Table 3.1 indicates the expected sign or direction between the variable and FDI, which is based on prior research. In the cases where prior research shows situations where both a positive and negative impact to have taken place, the impact felt by the researcher to be more relevant for the UAE has been listed. (The definition and data sources for the variables are provided later in this chapter.)

Table 3.1   Hypotheses Relating to Economic Growth and FDI Characteristics

Label	Hypothesis	Expected Direction or Sign based on prior Studies as Discussed in Chapter 2
F1	Higher levels of economic output in a country will attract greater stocks of FDI	+
F2	Greater trade openness will lead to higher levels of FDI stock	+
F3	A low inflation rate will induce greater FDI stock	-
F4	An increase in domestic savings ratio will lead to a higher level of FDI stock	+
F5	Greater public sector expenditure leads to higher levels of FDI stock	+
F6	Increases in domestic capital formation encourages a higher level of FDI stock	+
F7	Better skilled workforce encourages a higher level of FDI stock	+
F8	Increases in manufacturing value added leads to higher levels of FDI stock	+
G1	Higher stock of foreign inward investment will lead to greater economic output	+
G2	Greater domestic savings leads to greater economic output	+
G3	Exchange rate depreciation will higher levels of economic output	-
G4	An increase in the size of the labour force will increase economic output	+
G5	The more open an economy the greater the level of FDI stock	+
G6	Higher oil rents allow for an increase in economic output	+
G7	An increase in domestic investment will leader to greater economic output	+
G8	Higher levels of government sector expenditure will leader to greater economic output	+

3.3.2   Enhanced Technology Transfer and Clusters

Thompson (2002) finds that FDI within a geographical industry cluster tends to be more effective in transferring technology than FDI that is geographically dispersed. Technology transfer within a cluster is an exploratory study, and one of the unique features of this study is that it seeks to study perhaps the only such type of business grouping, namely Tawazun. This is a collection of companies in the aerospace and military sector, with the government as a

partner alongside foreign entities. Almost all of these companies are engaged in high technology areas such as advanced composites used in the production of wings for Boeing and Airbus planes. The highly sophisticated nature of the cluster implies that it will have advanced technology, which is more likely to be transferred to domestic firms in such an environment. As an exploratory study it does not have a central hypothesis but rather a research focus, which is essentially:

H^0_4: Does the combination of enhanced technology and cluster facilitate greater technology transfer?

A priori belief is that one should see a high level of technology transfer taking place. However, the infancy of the project may bring up interesting issues along with the fact that the major customers of the individual companies are also its stakeholders through off-take agreements.

3.3.3 Host Country Factors and Technology Transfer from FDI

In Chapter 2 the vast body of literature that has sought to understand why one firm would wish to set up operations in another country and hence become a multi-national enterprise (MNE) has been examined by the researcher. One of the key theories in this area is Dunning's (1986) OLI paradigm (i.e. ownership, location and internationalisation factors). Within the ownership factors there is the situation where a firm chooses to establish an overseas presence as opposed to exporting directly or even licensing the product or technology. One reason for this could be that the firm has some type of ownership over technology or knowledge that it seeks to protect in the face of market failures (see Caves, 1996 and Markusen, 1995). In developing the hypotheses the analysis is not to examine why a firm may wish to establish an overseas presence or even their choice of location, as this has been covered in Chapter 2. In developing the hypotheses the focus is on first understanding how technology can be transferred to the host country, and second to ascertain the location factors that lead to technology transfer from FDI. Doing so answers the important policy question that has been sought by the researcher as to what characteristics of the host nation can enhance the technology transfer process. The importance of this question is underpinned by the governmental bidding war for FDI that was discussed by Head (1998) and Girma and

Wakelin (2001). The development of the hypotheses examines the prior literature relating to the various host country factors and how they may impact the technology transfer process from inward FDI to domestic firms. Table 3.2 below illustrates the three channels of technology transfer along with the source of productivity gain that takes place within the domestic firm.

Table 3.2   Technology Transfer Channels

Technology Transfer Channel	Manner in which Productivity is Impacted
Imitation	Domestic firm changes its production process to the more enhanced version after seeing the benefits derived by the foreign MNE
	Domestic firm improves or even changes its management practices after seeing the benefits derived by the foreign MNE
Human capital	Transfer of labour and the knowledge embodied with them from the foreign MNE to the domestic firm
	Enhanced productivity of complementary labour as a result of learning in the capacity of supplier/customer or from normal business interactions.
Trade	Exposure to the international marketplace and advances in the technology frontier
	Ability to benefit from economies of scale and scope

Based on the discussion in Chapter 2, the researcher can derive the following hypotheses which are empirically tested in Chapter 7:

Table 3.3   Hypotheses Relating to Factors Impacting Technology Transfer

Type of Effect	Hypothesis	Expected Direction or Sign based on prior Studies as Discussed in Chapter 2
FDI Stock	The FDI stock positively impacts on the level of technology transfer due to host country factors.	+
Imitation	The ability to imitate inward FDI has a positive impact on the level of technology transfer to host country firms.	+
Human Capital	The host country's level of human capital has a positive impact on the level of technology transfer by host country firms.	+
Trade Openness	The more open a trade regime in the host country the more likely it is to experience technology transfer to its firms from	+

Type of Effect	Hypothesis	Expected Direction or Sign based on prior Studies as Discussed in Chapter 2
	inward FDI.	
Absorptive Capacity	The greater the absorption capacity of the host country firms the more likely it is to experience technology transfer to its firms.	+
Economic Development	The greater the level of economic development in the host country, which is a product of the macroeconomic policy of the country, the more likely it is to experience technology transfer to its firms from inward FDI.	+
Competition and Crowding Out	A greater level of competition from inward FDI leads to a higher level of technology transfer to host country firms.	+
Institutional Development	The more open the host country the more likely it is to experience technology transfer to host country firms.	+

3.4 Summary

This chapter has dealt with the conceptual framework and the background to FDI in the region as well as the UAE. The GCC has been a late entrant into the world of FDI and early inflows were largely limited to the hydrocarbon sector. However, the liberalisation of once bureaucratic and difficult business environments has attracted considerable inflows. The two main recipients of FDI in the GCC have been Saudi Arabia and the UAE. The latter is more interesting because it was the first to see the potential of FDI through establishing free zones. Until the international financial crisis, the UAE was the second largest recipient of FDI in the Middle East North Africa region after Egypt. Since the international financial crisis, inflows have slowed down considerably. Nevertheless, the inflows beg the question as to whether the FDI played any part in advancing the level of technology of the country. This question has yet to be researched for the UAE, and hence this study is timely.

This chapter has been a bridge between the first two parts of the thesis, namely the purpose and literature review. As such this chapter has taken the gaps identified in the exhaustive literature review in Chapter 2 and formalised them into testable hypotheses. The development of testable hypotheses is an important step towards designing the most appropriate research approach and methodology. In the next chapter the study discusses the research design that will be employed, along with the methodology based on the hypotheses developed and the

relative merits of each technique. What is unique and important about this study is that the hypotheses developed take on a macro as well as a micro examination of the research question. This implies that the outcome of this study will provide a more comprehensive understanding and hence lead to better policy recommendations. From a research design and methodology viewpoint, as discussed in the next chapter, the study calls for the usage of two very different techniques, namely quantitative and qualitative. As such, this study seeks to arrive at robust results and conclusions that will be the backbone of future research in this area.

CHAPTER 4

Research Design and Methodology

4.1   Introduction

In Chapter 3 the study developed the hypotheses that will be empirically investigated in this research based on the current body of knowledge and the gaps identified in the research literature and discussed in chapter 2. In this chapter the study seeks to discuss the issue of the research methodology that underpins the results and their validity. This chapter intends to contextualise the research and in doing so, it seeks to discuss the overall methodological framework of the study. The chapter will discuss the range of tools that are available for researchers looking to study the relationship between FDI and technology transfer. With each research method there are advantages and disadvantages that will be assessed. In order to confirm the relevant methodological approach, the choice of the most suitable technique is defended while highlighting its weaknesses or limitations. In doing so the chapter seeks to illustrate the methodological rigor of this study and the depth of the analysis that has been undertaken.

It is important to point out that this study is unique in that it seeks to combine micro and macro level approaches so as to provide a comprehensive understanding and answer the research question. Micro based studies have tended to examine the relationship between FDI and technology transfer to a firm, industry or companies within a small geographical area. In contrast, macro based studies have tended to use large samples across various sectors and geographical areas. This research demands that both a cross sectional and intra-industry or firm level understanding of the impact of FDI is obtained. Therefore, this study has sought to employ two different types of research techniques in order to allow for the breadth and depth that is required in this thesis. In the first instance, the research techniques have sought to discover what happened and how or if any benefit or transfer was achieved. In doing so, the research sought to look at which components of the FDI work well and which require policy enhancements or improvement as far as technology transfer is concerned. As a result of this investigation this particular type of research technique allowed the researcher to understand the interactions that might exist between the different FDI components and technology transfer. On the other hand, one cannot really argue for policy recommendations based on

individual case studies and hence a cross sectional analytical approach is required. The use of both research techniques is also a novel feature of this research.

This chapter is organised as follows: in the next section, the research design is discussed. The discussion allowed the researcher to obtain a better understanding of the quantitative and qualitative research methods and assess their relative merits. An important component of this section is to highlight the limitations of each research approach so that the results are put into perspective. Then a discussion of the steps that this research will undertake is presented.

4.2   Research Design

The research design is an important factor in determining the results of the research, and in this section the basis behind the selected research design is explained. There are two approaches to research, namely deductive and inductive, and each has its own technique of investigation. In the case of deductive research one tends to employ quantitative methods that develop and employ statistical or mathematical models relating to a particular hypothesis. In other words, the relationship between the variables in a hypothesis is expressed mathematically and its relationship is measured using statistical techniques. Quantitative techniques are contrasted with qualitative ones whereby the latter seeks to understand meanings, patterns or relationships between the variables. In doing so, qualitative techniques tend not to use mathematical models to express the relationship between the variables. Qualitative and quantitative research techniques are not mutually exclusive, according to Bryman and Bell (2011). There is no reason why a particular research cannot use qualitative techniques to obtain an overall sense of the event or situation. Once a general idea has been obtained one can formulate a theory and then test the data using quantitative techniques. In this way a particular research can use both methods. This study applies a similar approach in that it seeks to obtain both an understanding of the magnitude of the relationship along with its underlying meaning.

4.3   Research Methodology Options

The complex and in depth nature of this research implies that both qualitative and quantitative research techniques are required. At the same time the largely non-researched area of FDI and technology transfer for a young resource abundant country such as the UAE implies that this study needs to look at these observations to arrive at the theory. Within each group of research approaches, i.e. deductive and inductive or qualitative and quantitative techniques, one has a whole host of methods that can be used. A robust study cannot select a

research method at random or one that at the superficial level seems to be appropriate. As such, this study examines each of the research methods and assesses their relative benefits and disadvantages so that it can opt for the one that best fits the purpose of this thesis. More importantly, this study seeks to provide a thorough assessment of the research methods that will allow for a better understanding of the results in light of their limitations. Also, it provides a channel by which to improve the robustness of the results.

4.4   Qualitative Research Methods

In the remainder of this section a discussion of each of the qualitative research methods and their relative merits as far as the research objectives and conceptual framework is concerned is presented.

4.4.1   Case Study Research

In recent years one of the most popular forms of methods in business research has been the use of case studies. A case study is best be described by Schramm (1971) as an attempt 'to illuminate a decision or set of decisions: why they were taken, how they were implemented, and with what result'. As such, a case study tends to be an empirical real life study but within certain boundaries. In the absence of these boundaries the case study will have no real theme and the analysis will be rather weak. A case study is useful where a particular situation or event can be used to arrive at a general pattern. The key benefits of using a case study are that it allows the researcher to see into a 'glass bowl' of reality. This is very different from quantitative research, which is mathematical in nature and removed from reality as the calculations tend to be carried out in a framework defined by the researcher. For instance, the researcher sets out the model and its assumptions, which may not have any bearing to the actual case. In fact, this move away from setting out the assumptions or defining the situation is the second advantage of case studies. Third, the emphasis of a case is to answer 'how' and 'what' questions, so that causes and outputs of the situation or event can be analysed. Although case studies have the advantages discussed above, they have been criticised for assuming that a single incident or a very small sample at best can be used to represent the population. In other words, a single situation is more likely to be an outlier (i.e. a remote observation) rather than the basis to formulate a generalisation. In terms of the researcher, there may be criticism stating that the researcher's direct involvement may bias the decisions and hence the outcome.

4.4.2 Causal Mapping for Analysis

Mapping is an effective and convenient manner of understanding the relationships among the observations. Mapping consists of a number of similar techniques that seek to identify the cause and effect relationship between variables. However, the relationships are not always evident and in some cases need to be inferred from observable cues (Steyvers *et al*., 2003). An interesting feature of mapping is that it has the ability to incorporate time into the relationships. The reason for including time is that it can play an important role in inferring relationships (Buehner and May, 2003). One commonly used example of mapping is that of mind mapping (Buzan, 1982), which seeks to build a single diagram around a key issue using keywords and images. In production management, engineering and quality management a commonly used form of mapping is the fishbone diagram. This type of mapping is useful for understanding the cause and effect relationships of a situation or process. A third type of mapping is the 'Why/Why' diagram which asks a series of why questions to determine a hierarchy of causes and sub causes. Finally, influence diagrams and cognitive mapping both show causality and direction. The key difference between both of these mapping procedures is that cognitive mapping uses only text to build relationships, while influence diagrams uses causal relationships. Table 4.1 summarises the different mapping procedures. Of course, not all the mapping methods are relevant for this study but they are included for completeness and to show how the researcher selected the methodology from the available choices.

Table 4.1   Mapping Techniques

Mapping Technique	Characteristics	Strengths	Weaknesses
Mind Maps	Images and texts are used to create relationships	Intuitive use of diagrams	Not related to theory
Fishbone	Breaking down a situation into its roots and causes	Analysis of a narrow problem using engineering based techniques	No inter-relatedness between the roots in different branches and the causes between different roots
Why/Why	Generates a hierarchy of causes and sub-causes by constantly asking 'why?'	Simple to apply	De-multiplexing
Cognitive Mapping	Uses texts to build complex networks;	Qualitative analysis; network	No limits for complexity

	focuses on outcomes, analysis of sub-streams and has multi-foci	building from any focus	
Influence Diagrams	Represents all causal relationships of a phenomenon in a manner that is non-ambiguous	Quantitative analysis	Analysis of a complex situation with qualitative means

Source: Tan and Platts (2003)

4.4.3　Survey

Surveys are a method of collecting data or information from a small number of respondents in order to make generalisations regarding the entire population. The data or information can be collected in a number of ways, the most popular being a written questionnaire that the respondent is required to complete. A second data collection method is via interviews, which tend to be face-to-face or conducted via telephone. The problem with telephone interviews is that the researcher is never certain that any external disturbance will not take place while asking the questions. Third, researchers looking to obtain a large sample of data may use electronic or online surveys. These surveys are especially popular where the questions are straightforward and the target audiences are somewhat IT literate. The questions can be closed or open-ended depending on the nature of the survey and its intended outcome.

Schuman and Presser (1981) state that surveys can be divided into two basic types: namely cross sectional and longitudinal. Cross sectional surveys are used to collect data from a sample at a particular point in time. On the other hand, a longitudinal survey seeks to obtain data over a period of time. In doing so the researcher is able to understand the changes in the data during the period of observation. Essentially, there are three types of longitudinal surveys, namely trend studies, cohort studies, and panel studies. Although trend studies seek to collect data over a period of time for the population concerned, the samples may change. As a result the researcher may change, and it is possible to incorporate previous studies into a trend analysis as long as the questions are broadly similar. Cohort studies seek to obtain data from the sample type over a period of time. In other words, if the initial sample was first time foreign investors in the UAE, then it would be the same cohort the second time but not the same firms. Finally, panel studies obtain data from the same sample over a period of time. The major disadvantage of panel studies is that no new additions can be made to the sample yet drop-outs can take place. As a result panel studies suffer from high attrition rates.

4.4.4 Active Interviewing

Active interviewing is essentially about the manner in which the questioning is carried out as opposed to the type of research method. The basis behind active interviewing is that information is conveyed in two ways, firstly by what is said and secondly by how it is communicated. Hence it is argued that the all interviews are an opportunity for constructing and not only for conveying information (Holstein and Gubrium, 1995). Under active interviewing, the interviewer looks to construe aspects of reality from the comments made by the respondent. In doing so, the technique provides a deeper level of information. However, active interviewing does have the problem that it can bias the behaviour as well as the information provided by the respondent.

4.5 Respondent Validation

An important part of the data collection process is to verify the responses so as to establish credibility in the findings as well as ensuring that research is carried out in a robust manner. The process of respondent validation starts with setting out a framework so as to limit the probability of non-credible respondents participating in the study. The second step is to verify the response through a process of triangulation or cross-checking the findings from the respondent. Although the validation may seek to ensure that the response is accurate it assumes that there is a fixed interpretation of the truth of reality that is understood by the respondent and confirmed by the researcher. However, this is not always the case and there can be many forms of the truth depending on the interpretation and understanding of the situation by the respondent. To deal with this, preventative methods can be used, such as an interview style that can promote trust. Secondly, the researcher can regularly check their understanding of what is said through paraphrasing or summarising. A midway approach is to carry out selective validation, whereby responses that are broadly similar between respondents are not verified and only the outliers are checked.

4.6 Qualitative Research Design and Data Collection

Research methodology can vary between cross sectional and longitudinal, whereby the former seeks to obtain data at a single point in time while the latter collects data over a period of time. The more common method used is cross sectional data collection, largely due to the time and cost involved. Also, longitudinal data collection implies that the respondents'

answers may change over a period of time and hence there is value in using that technique. This study does not discount the value of longitudinal studies, but believes that a cross sectional approach will add greater value. More importantly, the aim of the study is to obtain a better understanding of technology transfer and hence a viewpoint from a large and diverse group is more beneficial. The data collection for this study started in May 2012 and completed in September 2012.

This chapter discusses at length the different methods by which a qualitative research can be carried out along with their relative merits. This study has understood that the ideal method by which to carry out a qualitative research is through face-to-face interviews. However, it has to be appreciated that the sample group of this study – 20 persons – were the most senior members within Tawazun Economic Council, and as such it was not always possible to meet them on a face-to-face basis. Nevertheless, half the samples were interviewed on a face-to-face basis. Of the remaining, 35 per cent were sent the questionnaire and their replies were received by email. A further 15 per cent were interviewed by telephone, which in many cases with very senior staff is a practical means of communication. The average time for the face to face interview was 120 minutes, and the questionnaires were returned within three days. Both the interviews and the questionnaires were conducted in English and there was no need for any translation, despite the Arabic native tongue of most of the senior officials. The sample size in this study is 20 senior individuals.

4.6.1   Questionnaire Design

The key to a good qualitative study is to have an excellent questionnaire that is well written and organised (Schuman and Presser, 1981). Also, it is important to note that in an environment where the respondents tend not to be native English speakers, the questionnaire also has to be unambiguous. At the same time, the questions included in the questionnaire need to be based on academic background. In this study the basis of the questions were developed from the empirical literature that was discussed in Chapter 2 and the gaps that were identified as a result. In addition, the researcher also carried out informal discussions with government officials, members of the business community and academics to identify their concerns as far as technology transfer from FDI was concerned. The cross-disciplinary discussions supplemented the gaps in the academic literature and allowed for practical issues also to be raised.

A questionnaire has the key problem of the type of question and the manner in which to phrase it. Essentially, there are two types of questions, namely open-ended or closed, and they are differentiated only by the level of freedom they award the respondent in answering the question. By and large, open-ended questions pose some issues in terms of generalising the responses, but they do have the benefit of allowing the respondent to provide an answer that suits their needs. On the other hand, closed or fixed-alternative question are easier to compile and offer the researcher the ability to generalise and, to some extent, understand the commonality in answers. Zikmund (2003) argues that open-ended response questions are beneficial when the research is exploratory and where the researcher may not be aware of the responses. Despite the additional costs involved in coding open-ended questions, they do offer greater insights. In this study the questionnaire uses a blend of open and closed questions so as to obtain the best from both techniques. Also, it has to be appreciated that to a certain extent such a research has not been carried out for the UAE and hence it is exploratory to a certain extent. At the same time the need to compare the results from this study with those for other countries implies that there is a need to quantify the responses and hence requires closed questions.

In terms of writing the actual questions there are no real rules that the researcher has come across. There are, however, a number of guidelines that could be followed. First among these guidelines is the need to keep the language simple and avoid using complex terms. Secondly, in order for the respondents to answer accurately, there has to be no ambiguity in the questions and they need to be as specific as possible. Thirdly, the questions have to be logically deduced to assist the respondent. In this study, these guidelines have been followed as closely as possible to ensure a robust and well developed questionnaire.

The questionnaire was divided into 5 sections detailed as follows:

Section A	General Data Set
Section B	Organisational Strategy
Section C	Technology Transfer Systems and Processes
Section D	Technology Transfer and Organisational Culture
Section E	Technology Transfer Impact and Resources

(A copy of the survey instrument is in Appendix A)

4.6.2 Selection of Sample

A number of studies have the luxury of having access to a large pool of potential respondents and hence the sample size does not appear to be an issue. In the case of this study it was felt that high-level strategic insights could only be obtained from senior management at Tawazun Economic Council. As such, the sample size itself became limited to the pool of senior staff. It has to be appreciated that surveying the second or even the third level of their staff would diminish the strategic viewpoint. More importantly, due to the highly confidential nature of some of the aspects of the research the second and third tier of staff are not fully informed and their responses would simply dilute the results. This study has a small sample comprising of 20 very senior staff with an average experience of 16 years. In terms of sample breakdown, the entire sample consists of males and this is not very different from other countries in the aerospace and armaments sector. The age distribution is shown below (table headings appear as per the questionnaire):

A.2 Interviewee's Age

18–25	3
26–35	8
36–45	6
46–55	3
56–65	0
Above 65	0
Total	20

The respondents' work experience is shown below:

A.3 Interviewee's Work Experience (in years)

0–3	2
4–10	1
11–15	9
16–20	8
Above 20	0
Total	20

4.6.3 Pilot Study

Before embarking on the main study, a pilot or test questionnaire was carried out to determine how it was received and whether changes would be required. In particular, the pilot study sought to ensure that the questions were understood by the target audience and the scales used were meaningful. As such, the pilot study allowed the researcher to identify any ambiguity and confusion in the questionnaire that had the potential of misleading the respondent. As the sample in the pilot study was not part of the main study, the researcher was able to ask them what they understood by each question. This sought to ensure that the intention behind the question was the same as what the reader had interpreted. This is an important issue where language may be a barrier and the use of certain terms may confuse the respondent. Based on the feedback received from the pilot study, the questionnaire was amended and a second pilot study was carried out using a different sample, which again did not form part of the main study. This second check allowed the study to ensure that the changes made to the questionnaire were relevant and clearly understood by the target audience.

4.7   Quantitative Research Methods

An alternative to qualitative research methods is to use quantitative techniques, which overcome many if not all of the limitations outlined in Section 4.6 above. The section below compares the quantitative and qualitative techniques and outlines the two variants of the former method that are used in prior studies and form the basis of the macro level analysis that is carried out in this study.

4.7.1   Linear Regression Models

One of the most common quantitative techniques used is a linear regression, which seeks to model the relationship between two or more variables by producing a linear equation to explain the observations (Cohen *et al*., 2003). Under a linear regression one variable is always considered to be the dependent variable, which is affected by one or more independent variables. Although the standard linear regression seeks to produce a straight line through the observations, the methodology accepts that this type of relationship need not exist in all cases. In other words, one can have non-linear relationships. In order to deal with this, statisticians have developed regressions that can determine the type of non-linear

relationship, i.e. quadratic, etc. through the use of the Box–Cox regression methodology (Box and Cox, 1964 and 1982).

In addition to non-linear relationships, one has the situation whereby the dependent variable is related to the independent one. This is commonly referred to as a simultaneous equation, whereby the independent variable y_1 is related to another independent variable y_2 and vice-versa. Such a simultaneous relationship can be explained as follows:

$$y_1 = y_2 + x_1$$
$$y_2 = y_1 + x_2$$

In order to deal with this situation one has to use a simultaneous regression. A simultaneous regression is essentially the equivalent of testing two inter-related regressions, as illustrated in Figure 4.1

Figure 4.1   A Simultaneous Regression
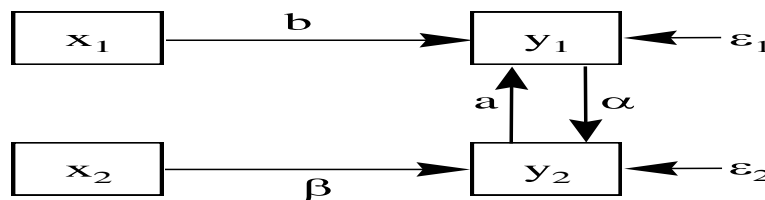
In this study, the macro level analysis uses both linear and simultaneous regressions after checking that a non-linear relationship does not exist, as recommended by Greene (2002). In the next section, the study illustrates how the simultaneous model is employed in this research.

4.7.2   Empirical Model Development to Test the Impact of FDI on Technology Transfer

The basis of this study is the impact of FDI on technology transfer, the latter being proxied by economic growth using the conventional Keynesian growth accounting framework, whereby savings are translated into investment (Keynes, 1936). The capital stock is assumed to consist of two components, namely domestic capital and foreign owned capital. This can be written as:

$$K_{total} = K_{foreign} + K_{domestic} \qquad (4.1)$$

This study adopts the standard Cobb–Douglas production function (Cobb and Douglas, 1928) that shows the relationship between inputs and outputs. The standard Cobb–Douglas production function is shown as follows:

$$Y = AL^{\alpha}K^{\beta} \qquad (4.2)$$

where:

Y = total production or output (this is essentially the monetary value of all goods produced in a year)

L = the level of labour (input)

K = the level of capital (input)

A = is the total factor productivity

α and β are the output elasticities of labour and capital, respectively. These values are assumed to be constant and determined by the level of technology at the time.

The Cobb–Douglas production function allows us to measure the output elasticity as a result of a change in the inputs (i.e. labour or capital) ceteris paribus. In other words, if α is equal to 0.15 then a 1 per cent increase in labour is assumed to lead to approximately a 0.15 per cent increase in output. The model, of course, assumes that $\alpha + \beta = 1$ and the production function has constant returns to scale. Therefore, to yield a 20 per cent growth in Y, both L and K need to increase by 20 per cent. If $\alpha + \beta < 1$ it implies returns to scale that are decreasing. Similarly if $\alpha + \beta > 1$ the opposite is true, i.e. returns to scale that are increasing.

A differentiation between domestic and foreign investment is made so that the Cobb–Douglas production function is written as:

$$Y = AL^{\alpha}Kd^{\beta 1}Kf^{\beta 2} \qquad (4.3)$$

Where:

Kd = domestic capital

Kf = foreign capital

An augmented Cobb–Douglas production function is developed so that output is a function of the stock of capital, labour, human capital and productivity in a similar manner to Mankiw *et al.* (1992) and is written as:

$$Y = A_{it}K^{\alpha}_{dit},\ K^{\lambda}_{fit,}L^{\beta}_{it},\ H^{\gamma}_{it} \qquad (4.4)$$

In Equation 4.4, output (i.e. Y) is a flow, while the other terms, namely domestic and foreign owned capital (i.e. K^{α}_{dit}, K^{λ}_{dit}), labour (i.e. L^{β}_{it}), and human skills (i.e. H^{γ}_{it}), are stocks, and A is the total factor productivity.

Taking logs and differentiating Equation 4.4 with respect to time, one obtains the more standard economic growth model, which can be written as:

$$y = a_{it} + \alpha k_{dit} + \lambda k_{fit} + \beta l_{it} + \gamma h_{it} \qquad (4.5)$$

The lower case letters imply growth rates in output, domestic and foreign capital, labour and human capital. Due to the problems that are normally associated with the measurement of capital stock, the ratio of domestic investment to GDP is used as a proxy for Kd, and the FDI to GDP ratio is used as a proxy for Kf. As a result, investment (i.e. I) is substituted for capital stock, to arrive at the final form of the economic growth equation that is basis of the research in this chapter.

$$y_{it} = a_{it} + \alpha I_{dit} + \lambda I_{fit} + \beta l_{it} + \gamma h_{it} + \varepsilon_{it} \qquad (4.6)$$

In order to study the impact of FDI on economic growth and to arrive at the investment model, the starting point is with the standard relationship as shown in Equation 4.7

$$K_{it} = f\ (\ Y_{it},\ R_{it}) \qquad (4.7)$$

Where K_{it} is the capital stock (it can also be thought of as the desired stock) while Y_{it} is the output of the country and R_{it} is the real cost of capital. Under this relationship the capital stock can increase if the output of the economy rises or there is a reduction in the real cost of capital (of course the converse is also true). Interestingly, for foreign firms, additional factors such as pool of labour, market potential, infrastructure, trade openness, etc. also become important, as they are not the same in all countries. With these additional factors one can arrive at the augmented investment function, which is shown in Equation 4.8 and employs the same logic as that previously discussed in arriving at the economic growth model.

$$I_{fit} = a_{it} + \alpha y_{dit} + \lambda r_{dit} + \beta C_{it} + \varepsilon_{it} \qquad (4.8)$$

C in the above equation refers to a series of factors that have impact on the overseas investment (i.e. I_{fit}) taking place in the domestic economy. The exact nature of these factors depends on the type of investment as well as the benefits that the investors seek to derive from the domestic economy.

Equations 4.6 and 4.8 highlight the dependent or simultaneous relationship between FDI and economic growth. FDI in Equation 4.6 has an impact on the level of economic growth. At the same time, from Equation 4.8 it can be seen that the economic growth determines the level of FDI that takes place in the domestic economy. The simultaneous relationship between economic growth and FDI implies that a standard ordinary least squares estimation process may be of limited use.

4.7.3 Two-stage Least Squares Estimates.

Given that the model consists of two mutually dependent endogenous variables, namely FDI and economic growth, both of which are dichotomous, the study uses a two-stage least squares (2SLS) model (see Maddala, 1983, p. 246). As a further check to the 2SLS model results, this study also carries out a single-stage equation model (i.e. OLS). The single-stage equation model allows us to compare the results with previous studies as well as providing a test of robustness. The latter is carried out through the Wu–Hausman test (Hausman, 1978), which checks for the existence for any possible exogeneity between FDI and economic growth. If any exogeneity bias is found, then it gives support to the use of the simultaneous

equation model. Essentially, the Wu–Hausman test verifies the null hypothesis that the ordinary least squares regression model is consistent and differences between it and the instrumental variable regression model are random. The alternative hypothesis under the Wu–Hausman test is that the instrumental variable regression model is consistent. Of course if the alternative hypothesis is accepted than one can argue that FDI and economic growth are not interrelated endogenous variables.

Some previous studies, such as Aggarwal and Jacques (1997), that have examined simultaneous relationships have used three-stage least squares method (3SLS), but argue that their findings do not significantly change when compared to 2SLS. The 2SLS method, which is employed in this chapter, has a number of advantages over the maximum likelihood method most important of which is that one does not need to make any distributional assumptions regarding the right hand side independent variables and they can be non-normal or even binomial. As the study uses economic information it is possible that some, if not all, of the independent variables are non-normal. Other benefits of using the 2SLS is that it is computationally simple compared to the 3SLS method and according to Bollen (1996a) produces far superior results

4.7.4 Empirical Model Development to Identify Host Country Factors Leading to Technology Transfer

The key restriction to the development of a testable model to measure the impact of host country factors on the level of technology transfer from inward FDI for the UAE is the availability of data. As explained in Chapter 1, the UAE is a relatively young country, established in 1971, and until 1980 did not even have a central bank. Therefore, many of the institutional developments are new in nature. This is very different from prior studies that examine transition countries, such as Djankov & Hoekman (2000), Kinoshita (2001), Damijan *et al*. (2001), Smarzynska and Wei (2002), Zukowska-Gagelmann (2002), Lutz and Talavera (2004), amongst others where institutions did exist but underwent a change from a socialist or Soviet type system to a market based economy. Despite this restriction, this study develops a testable model that is robust in nature and akin to prior research so as to allow us to compare the results with those of earlier studies.

In accord with studies such as Kokko (1994), Gorg and Strobl (2002), Barrios *et al*. (2004), Ruane and Ugur (2005), amongst others, this study estimates a model whereby labour productivity is the dependent variable. In doing so this study explicitly assumes the presence of MNEs to the domestic output per employee. As discussed above, the alternative assumption is to use total factor productivity whereby both labour and capital productivity is measured (Egger and Pfaffermayr, 2001; Barry *et al*., 2005; Driffield and Love 2007; Liu, 2008). A labour productivity measure as opposed to combined labour and capital total factor productivity has the key advantage of isolating the effects of increased capital intensity on labour productivity. More importantly, a labour productivity model is consistent with the development of hypothesis whereby it is argued that the presence of MNEs leads to a transfer of technology through various channels and, in doing so, raises their productivity (Walz, 1997).

The model of production function that is estimated in this study is as follows:

LP = f (stock of FDI, technology transfer channels, host country factors)   (4.9)

where LP refers to the level of labour productivity, the technology transfer channels and host country factors are those as listed in Table 7.1, where they are empirically examined and the results discussed thereafter.

This can be written as:

$$LP = \alpha + \beta_{1,l}\ FDISTOCK + \beta_{2,l}\ IMITATE + \beta_{3,l}\ LABOUR + \beta_{4,l}\ OPEN + \beta_{5,l}\ ABSORP + \beta_{6,l}$$
$$ECDEV + \beta_{7,l}\ COMPETE + \beta_{8,l}\ INSTIDEV + \varepsilon \qquad (4.10)$$

This implies that labour productivity is dependent on the stock of FDI, imitation, labour mobility, trade openness, absorption capacity, economic development, competition and institutional development. In this equation the impact of technology transfer isolated only to domestic firms through the subscript 'l', which implies local. However, the actual model that estimated in this study is shown in Equation 4.11 below.

$$LP = \alpha + \beta_1\ FDISTOCK + \beta_2\ IMITATE + \beta_3\ LABOUR + \beta_4\ OPEN + \beta_5\ ABSORP + \beta_6$$
$$ECDEV + \beta_7\ COMPETE + \beta_8\ INSTIDEV + \varepsilon \qquad (4.11)$$

The difference between Equation 4.10 and Equation 4.11 is that the latter does not distinguish between local and foreign firms. As such, Equation 4.11 examines both the direct and indirect effects of MNEs on the overall labour productivity in the UAE. From an economic viewpoint, this manner of estimating technology transfer is more complete as it includes improvement in labour productivity that takes place within the MNE and may translate into a transfer at a later point in time. From a practical viewpoint, this study is forced to estimate the total impact because the UAE does not collect detailed data relating to foreign owned firms and industry. Although the inability to assess the impact on local and foreign own industry is a limitation of this research, it has sought to overcome it through a sector based qualitative study which is presented in Chapter 5.

4.7.5 A Comparison between Quantitative and Qualitative Research Methods

Quantitative research seeks to test hypotheses in a systematic predefined manner through the collection of data (Bryman, 1984). As such, the enquiry is carried out within set boundaries, usually examining a single question at a time. In most cases quantitative research methods involve the use of samples to represent the population. Quantitative and qualitative research methods differ largely in the manner that they pose the research question and the use of inputs. In the case of the quantitative research the input tends to be numerical data. Bryman (1984) argues that another key difference between quantitative and qualitative research methods is that the latter is flexible whereas the former is inflexible. The inflexible nature of quantitative questioning allows researchers to compare the responses across different participants. Table 4.2 provides a comparison of qualitative and quantitative research methods.

Table 4.2   A Comparison between Quantitative and Qualitative Methods

Characteristic	Quantitative Approach	Qualitative Approach
Overall	• Primary objective is to test a hypothesis • Data is rigid in nature • Structured data collection methods	• Seeks to explore and 'dig' into a situation or event • Flexible style of data collection • Data collection can be unstructured such as observation to semi-structured
Analytical objectives	• To assess the magnitude of variation	• To describe the variation • To describe and explain

		relationships
	• To forecast relationships • To describe the population using a sample	• To describe individual experiences or group norms
Data format	• Numerical	• Open-ended
Question format	• Closed	• Open
Flexibility	• Researcher does not influence the response • Research is based on statistical foundations	• Researcher may/can influence the response • Study design is flexible and not necessarily based on statistical grounds

4.8   Planning the Study

The research can be carried out in a variety of ways, and the process is largely determined by the approach that one adopts, namely deductive and/or inductive. This study has sought to benefit from the advantages of both approaches and hence the research plan is inclusive rather than exclusive. As such, this study uses both approaches at different stages of the research. For instance, the next chapter employs a very deductive approach in examining the relationship between economic growth and FDI. However, in the chapter following this, the experiences of a company (i.e. a case study approach) are used to arrive at a generalisation for the emirate of Abu Dhabi. This study assumes that the adoption of both deductive and inductive approaches to be an important feature of this research. Figure 4.2 below illustrates the choices that have been arrived at in planning this research along with the sequence that is assumed to follow. It is important to note that although some of the steps may be shown sequentially, in practice they can be carried out in tandem with other steps. This study has shown them in this manner for clarity and to ensure that the steps were coherent and rational. In Figure 4.2 below, the rationale for the choices and their implications on this research has been explained by the researcher. (This discussion is very different from that in Chapter 1 because here the focus is on how the actual research methodology was carried out as well as listing the data sources. The research plan in Chapter 1 is very much an overview of what this study intends to carry out.)

Figure 4.2   The Research Methodology
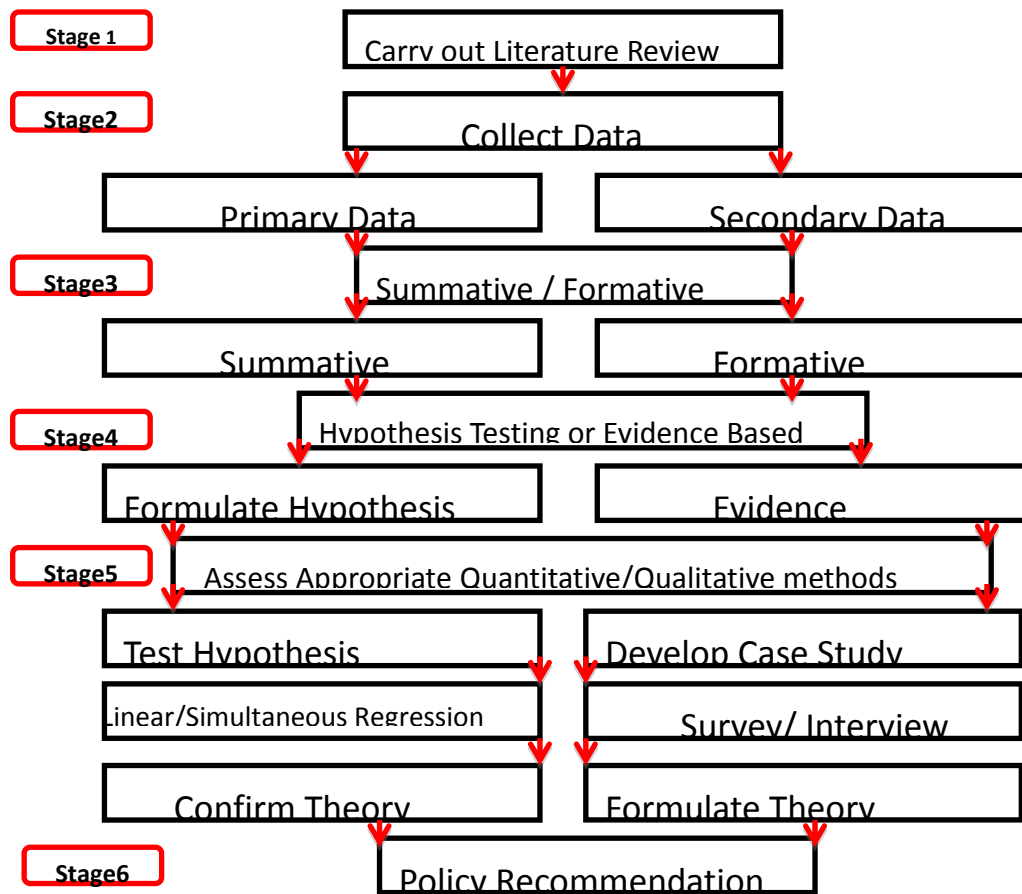
4.8.1   Stage 1: Literature Review

According to the research plan as illustrated in Figure 4.2 the first step is to conduct an extensive literature review in order to understand the current body of literature. This would also allow the researcher to understand the issues that prior research has raised and the areas that are in dispute. As a result, this study is able to identify gaps in the knowledge and the contribution that this research could make to knowledge in this area. An important aspect of the literature review would be to develop the methodological techniques to be used in this research.

4.8.2   Stage 2: Collect Data

The fact that this research is comprehensive in its nature through the use of inductive and deductive research approaches requires it to collect both primary and secondary data. The quantitative models discussed above need a sufficiently long length of data of at least 30 annual data points. For mature countries this is not really a problem as they have developed well-established data collection mechanisms. For the UAE, the length of data (i.e. 30 years or

so) along with the list of variables was rather difficult. Given the nature of the research it was felt that the lack of domestic data could be supplemented through secondary sources from international organisations such as the World Bank. This research uses the following:

- Official statistics from the UAE government, and those of the emirates such as Dubai Statistics Centre, Statistics Centre Abu Dhabi, UAE National Bureau of Statistics;

- International organisations such as UNCTAD, IMF, World Bank;

- Published articles;

- Unpublished reports from UAE ministries, and other international organisations.

For the qualitative aspects of this research primary data collection is carried out using three very distinct but related techniques, namely questionnaires, face-to-face interviews and case study. It is believed that these three methods along with the triangulation process ensured that the responses were accurate and the conclusion robust. An interesting aspect of the qualitative approach was that it was limited to Tawazun. Limiting the qualitative approach to one entity allowed this study to use this experience to draw lessons for future such initiatives. More importantly, this one case study represents over US$60 billion of investment and the development of a new defence industry cluster in Abu Dhabi. As such, this case study is important as far as future policy is concerned for the country.

4.8.3   Stage 3: The Use of Summative and Formative Evaluation

The terms summative and formative first arose from the field of education, whereby the former refers to an 'outcome evaluation of an intermediate stage in the development of the teaching instrument' (Scriven, 1967, p. 51). In designing the research instrument one needs to decide whether summative or formative evaluation will be used. In the case of the latter the researcher seeks to obtain qualitative feedback from the respondent. As such the quality of feedback is considered important for the understanding of the problem rather than a score that may be meaningless. Such an evaluation is used where the researcher is not seeking to generalise a particular outcome, but rather to understand it in greater depth. In contrast, summative evaluation requires the respondent to provide a particular score that can be empirically analysed across the sample group or even time. Each of these evaluation systems has their own particular advantages and disadvantages (see the section on the comparison between qualitative and quantitative methods), and their use depends largely on the problem that is being examined. This study uses both summative and formative evaluation in different

stages of the research. This provides a more holistic approach to the understanding of FDI and its impact on the economy.

4.8.4   Stage 4: Hypothesis-based or Evidence-based

As non-oil FDI is relatively new in the UAE, this study is faced with a challenging question, namely whether to use hypothesis-based research or to examine the evidence. This study understands the unique nature of the UAE economy and the fact that traditional western-oriented research may not fit this mould. More importantly, the hypothesis that has been tested to date may be limited and hence this study uses an exploratory method that does not start with a hypothesis. In other words, this research uses case study, interview and questionnaire techniques to understand why FDI takes place and how it leads to technology transfer. In this stage of the research no prior hypotheses are developed, and instead the exploration into the experiences set the tone of the outcomes. The limitation of this method is that there may be few avenues to compare the results with those of other countries. To overcome the need to compare the results with those of other countries this study also employs a hypothesis-based approach. The main reason for such an approach is to allow for comparison as well as to determine the magnitude of the impact using a large sample study.

4.8.5   Stage 5: Which Quantitative Approaches?

One of the most important steps in the research process is to assess the most appropriate research techniques to employ at each stage of the research. As stated earlier, this study seeks to obtain an in depth as well as a broad understanding of the topic. At the same time, the research technique has to take into consideration the unique nature of the UAE with its data limitations, especially at the micro level. Based on these considerations, this research has selected two robust and well-regarded streams of research techniques, namely regression aggressions for the large sample time series based aspects. For instance, the following chapter uses a simultaneous regression model, while in Chapter 7 a standard regression model is used. Similarly, in Chapter 7 the analysis of the impact of business clusters on enhanced technology transfer uses well-established qualitative techniques. In this way this study has sought to look at the particular requirements of each research aspect and apply the best research technique, which is consistent with prior research

4.8.6   Stage 6: Policy Recommendations

The final stage of this research is to develop conclusions and practical policy recommendations, which are to be found in the penultimate section of each of the chapter of the thesis.

4.9   Summary

This chapter has dealt with the research approach as well as the methods that are available. As such, this study has examined the philosophical nature of research and then sought to use this to place this study within a strong foundation that is backed with empirical support. The chapter has also described the merits of the different research methods. The broad range of research methods has considerable implications on the validity of the results and hence this study has sought to place them within the framework of the research approach that this research seeks to employ. In doing so, this chapter has also sought to outline the broad research methodology plan. The researcher feels that this is important in that it allows the study to assess each of the choices in a wider context. In other words, each stage of the research builds onto the next and hence this research makes certain that the choices are made with theoretical foundations that take into account the unique nature of the UAE.

CHAPTER 5

Joint Estimation of Economic Growth and FDI

5.1   Introduction

In Chapter 4, the study discussed the two strands of research techniques that will be employed in this thesis. In this chapter the study empirically investigates the presence of technology transfer through FDI. The presence of technology transfer is proxied using economic growth, based on the assumption that any improvement in technology will increase economic output. This study has singled out technology transfer as the key factor because of its importance to the government of the UAE. Various strategic plans in the UAE such as the Dubai Strategic Plan 2015, Abu Dhabi Strategic Plan 2020, Al Ain Strategic Plan 2030 and the UAE Strategic Plan 2031 all call for an increase in economic growth as well as to improve the welfare of the population through an enhance of technology. (The UAE Strategic Plan 2031 is by far the longest and is designed to achieve core social and economic goals 70 years from the date of independence and 20 years from public release.) These strategic plans appreciate the importance of economic growth through technological improvement in being able to deliver greater economic prosperity and well-being for the country and its people. Of course, economic prosperity also has the supplementary benefits of greater human happiness. FDI is seen as one route to achieving the goal of economic growth because it can positively impact on the host country's production capacity, income, exports, human capital development and so on.

This chapter is structured as follows: in Section 5.2 the particular methodological issues relevant to the empirical tests conducted in this chapter are discussed and the variables used in the study are defined. In order to better understand the data, in Section 5.3 various descriptive statistics are provided including skewness, kurtosis and correlation coefficient matrices. Section 5.4 provides the results from the OLS regression so that this study can examine the impact of GDP and FDI individually on each other, as well as the impact of the control variables. This study then conducts the simultaneous regression and reports the results. In Section 5.5 a discussion of the results in the context of prior studies that have been reviewed in Chapter 2 as well as the unique aspects of the UAE so as to arrive at appropriate policy actions for the country is presented before the chapter summary in Section 5.6.

This chapter empirically examines the assertion that economic growth impacts the level of FDI. At the same time the chapter tests the corresponding relationship in FDI impacts on economic growth in the host country. The analysis appreciates that a concurrent relationship may exist between these two variables and hence this study uses a simultaneous regression to examine the possible bi-directional impact. The findings from this chapter form the basis of the later studies, namely the impact of exports due to FDI and host country factors with regard to technology transfer, which are discussed in Chapters 7 and 8 respectively. The results from this chapter also go a long way to support the examination of enhanced technology transfer and clusters that is discussed in Chapter 6.

5.2   Methodological Issues

In this section the researcher discusses the specific aspects that relate to the methodological issues that are important in examining the joint relationship between economic growth and FDI.

5.2.1   Choice of Methodology

Chapter 3 stated a very clear set of hypotheses, which form the basis of the research in this section of the study. The hypotheses have been developed based on the body of prior knowledge as well as economic theory. In developing the central hypothesis (and the supplementary hypotheses) this study has been very mindful of the availability of data. This is a major issue for any empirical study; however for a new country such as the UAE it is a particular area of concern. More importantly, this research has sought to follow an established methodology that prior studies have identified and employed in examining this question. This allows the study to compare its results with those from past research, as discussed in Chapter 2. The empirical model development and the 2SLS procedure are explained in full in Sections 4.6.2 and 4.6.3.

5.2.2   Description of the Variables

In developing the simultaneous relationship this research takes into account the unique features of the UAE. Firstly, the UAE is a highly resource abundant economy, where receipts

from the hydrocarbon sector make up over 80 per cent of the federal government's income. This implies that when oil prices are low, so are oil receipts and hence this tends to have a direct impact on the economy. Therefore, oil rents are an important contributory factor for economic growth. Secondly, the UAE is highly dependent on expatriate labour. In fact, recent statistics show that 90 per cent of the population is expatriate. It is important to point out that the population of the UAE is 8.3 million, of which the bulk are manual workers on a salary of less than US$1,000 per month. Moreover, this segment of the population is comprised entirely of expatriate workers who come from relatively poor countries. Therefore, this segment of the population tends to be pure savers, who then remit their salary, or at least a large proportion of it, to their dependents in their home country. This implies that of the 8.3 million population in the country the actual proportion who have any effective disposal income, that is the ability to spend their income within the country, is less than four million people. The direct implication of this is that market-seeking investment tends to be limited. In other words, investment that largely seeks to service the domestic market is limited to certain sectors such as retail, healthcare, etc. due to the low market size. However, the UAE has an excellent location and superior logistics connectivity, which implies that it is ideally suited for non-market seeking foreign investment. This type of investment is largely focused on servicing the needs of the export market. In this case the overseas investment is largely concerned with trade openness, international competitiveness, etc. Also, 50 per cent of FDI into the UAE in 2009 went into the hospitality and real estate sectors and domestic renewal energy, while the remaining 50 per cent was invested in the other sectors. This mix of investment across the different sectors shows that FDI into the UAE was for both market seeking and non-market seeking purposes.

As the UAE is the recipient of both types of FDI, the control variables that form part of the augmented FDI and economic growth relationships have been selected, taking into account the extreme limitation as far as data is concerned within the country. At the same time, this study has sought to align the expanded FDI and economic growth relations with prior research as well as seeking to incorporate the unique nature of the UAE. With these considerations the study arrives at an augmented FDI and economic growth model specifications as follows:

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$$FDI_{it} = a_0 + a_1 GDP_{it} + a_2 EXPORTS_{it} + a_3 INF_{it} + a_4 DSR_{it} + a_5 PUBEXP_{it} + a_6 CAPFORM_{it} + a_7 SKILL_{it} + a_8 MFGADD_{it} + \varepsilon_{it} \quad (9)$$

$$GDP_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 GDS_{it} + \beta_3 RER_{it} + \beta_4 LABOUR_{it} + \beta_5 OPEN_{it} + \beta_6 OILRENT_{it} + \beta_7 DOMINVR_{it} + \beta_8 GOVEXPR_{it} + u_{it} \quad (10)$$

Based on the development of the augmented FDI and economic growth relationships their formal definition is provided below (these definitions have been adapted from the World Bank Development Indicators publications).

GDP: Gross domestic product (GDP)

GDP at purchasers' prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current US dollars. Dollar figures for GDP are converted from domestic currencies using single-year official exchange rates.

FDI Stock: Stock value of FDI

FDI is calculated as the purchase/investment of 10 per cent or more of the voting shares or voting power, which is the level of ownership necessary for a direct investment interest to exist. This is calculated as the position at the end of the beginning of the period + FDI flows + exchange rate changes + other adjustments (such as reclassifications, etc.). FDI values are in US dollars at current prices and current exchange rates in millions

EXPORTS: Exports of goods and services as a percentage of GDP

Exports of goods and services represent the value of all goods and other market services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal and government services. They exclude compensation of employees and investment income (formerly called factor services) and

transfer payments. The figure is calculated as a percentage of GDP.

INF: Inflation

Inflation as measured by the annual growth rate of the GDP implicit deflator, which is how the rate of price changes in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.

DSR: Domestic savings ratio

Gross domestic savings are calculated as GDP less final consumption expenditure (total consumption). The ratio is calculated as a percentage of GDP.

PUBEXP: Public expenditure

General government final consumption expenditure includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditure on national defence and security, but excludes government military expenditures that are part of government capital formation. Data are in current US dollars.

CAPFORM: Domestic capital formation

Gross fixed capital formation includes land improvements (fences, ditches, drains and so on); plant, machinery and equipment purchases; and the construction of roads, railways and the like, including schools, offices, hospitals, private residential dwellings and commercial and industrial buildings. Data are in current US dollars.

SKILL: Level of skill

Skill level is proxied by the gross secondary school enrolment ratio. Secondary education completes the provision of basic education that began at the primary level, and aims at laying the foundations for lifelong learning and human development, by offering more subject- or skill-oriented instruction using more specialised teachers.

MFGADD: Manufacturing value added

Manufacturing refers to industries belonging to ISIC divisions 15–37. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural

resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3. Data are in current US dollars.

GDS: Gross domestic savings

Gross domestic savings are calculated as GDP less final consumption expenditure (total consumption). Data are in current US dollars.

RER: Real exchange rate

The purchasing power parity (PPP) conversion factor is the number of units of a country's currency required to buy the same amount of goods and services in the domestic market as a US dollar would buy in the United States. The ratio of PPP conversion factor to market exchange rate is the result obtained by dividing the PPP conversion factor by the market exchange rate. The ratio, also referred to as the national price level, makes it possible to compare the cost of the bundle of goods that make up GDP across countries. The PPP conversion factor states the number of US dollars required to buy a dollar's worth of goods in the country as compared to the United States.

LABOUR: Labour force

Total labour force comprises people aged 15 and older who meet the International Labour Organization definition of the economically active population: all people who supply labour for the production of goods and services during a specified period. It includes both the employed and the unemployed. While national practices vary in the treatment of such groups as the armed forces and seasonal or part-time workers, in general the labour force includes the armed forces, the unemployed and first-time job-seekers, but excludes homemakers and other unpaid caregivers and workers in the informal sector. This is a quantity measure and not one that focuses on quality.

OPEN: Openness

Trade is the sum of exports and imports of goods and services measured as a share of GDP.

OILRENT: Oil rent

Oil rents are the difference between the value of crude oil production at

world prices and total costs of production. Oil rent is measured as a percentage of GDP.

DOMINVR: Domestic investment

Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains and so on); plant, machinery and equipment purchases; and the construction of roads, railways and the like, including schools, offices, hospitals, private residential dwellings and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and 'work in progress'. According to the 1993 SNA, net acquisitions of valuables are also considered capital formation. Gross capital formation is calculated as a percentage of GDP.

GOVEXPR: Government expenditure

General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defence and security, but excludes government military expenditures that are part of government capital formation. General government final consumption expenditure is calculated as a percentage of GDP.

The source of the data is the World Bank World Development Indicators (2011), except for FDI and trade balance data, which are from the United Nations Committee on Trade and Development Statistics Centre (UNCTADstat, 2011).

5.3   Data

This study examines the joint relationship between FDI and economic growth using the 2SLS method and data that is obtained from UNCTADstat, and the World Development Indicators (2011).The time frame for the data is from 1980 to 2010, i.e. 30 years of data. (Due to the size of the data set we do not reproduce it in the appendix, but provide summary statistics). It is believed that as the country was established in 1971 without any real statistics-collecting authority, any attempt to study the period 1971 to 1979 will be of limited use. For instance, until

1972 the UAE did not have its own currency and used the notes and coins from its neighbours, namely Qatar and Bahrain. Furthermore, during the early period each individual emirate controlled its own economy with very little interference from the federal authorities. However, with the establishment of the Central Bank in 1980, the federal authorities had greater power at least as far as monetary supervision and reporting was concerned (UAE Central Bank, 1980). The Central Bank has been instrumental in the collection and reporting of the economic and monetary data that forms the basis of this study. Therefore, this study has limited its examination to the period after the establishment of the UAE Central Bank.

Tables 5.1 and 5.2 provide the summary statistics for economic output, FDI and the control variables. Of particular importance is the fact that economic output of the country increased from US$29.6 billion in 1980 to the current value of US$230.2 billion. Like most economies around the world, the UAE has suffered from the international financial crisis in 2008, when economic output for the country was US$260 billion. During the last 30 years, the economy has undergone four stages, commencing with a downward trend from 1980 to 1986. In fact, 1986 was the lowest point for economic output. From 1986 the economy underwent a phase of rapid growth, with an average economic growth rate of 15 per cent until 2001; economic output increased from US$21.6 billion to US$68.7 billion in 2011. The third phase was what this study refers to as 'super-normal' growth, at an average of 28 per cent per year until 2008. The current phase is a general decline in economic output to US$230 billion from the heights of 2008 (source of data: IMF).

FDI has had only two phases during the period 1980 to 2010 according to the UNCTAD data (UNCTAD, 2012). The first phase was from 1980 to 2001, where there was very little increase in FDI stock. The data shows that in 1980 the FDI stock was US$409 million, while 21 years later, in 2001, it had increased to US$2.3 billion. This represents an annual increase in FDI stock of only US$90 million. However, from 2011 the pace of FDI inflows increased considerably and the current value stands at US$76.2 billion. This implies that in the nine years from 2001 the FDI stock increased by an annual average of US$8.2 billion. For both economic output and FDI stock the turning point for the economy was 2001.

Exports as a percentage of GDP has tended to be around 71 per cent, but has fallen to as low a figure as 41 per cent and as a high a value as 92 per cent. It appears that exports from the country, with its very high dependence on the hydrocarbon sector, are heavily impacted by oil

prices. The lowest point in the export percentage was in 1986, after which it started to increase until 1998. From 1999, when oil prices started rising the export percentage increased exponentially. The inflation data in the UAE has been rather erratic largely due to cost–push factors as a result of changes in exchange rates. However, from 2001 there has been considerable pressure in demand–pull factors leading to annual price increases of 19 per cent in 2007 and 2008. The UAE domestic savings ratio has a mean value of 42 per cent; however it peaked at 71.8 per cent in 1980. From its height, the domestic savings ratio has tended to decline until 1998, with a value of 28 per cent. As from 1998 the domestic savings ratio has climbed at a slow space to its current level of 44 per cent.

Over the 30-year period 1980 to 2010, annual public expenditure increased from US$3.2 billion to US$21 billion. This represents a seven-fold increase in public expenditure in nominal terms, or a little over five-and-a-half times in real terms. Such a huge expansion in public expenditure is not atypical for a small and young economy. It is important to note that at the time of independence in 1973 the country had less than 100 miles of tarmac roads. Today, the country boasts one of the best road systems in the world. Over the same period, domestic capital formation increased five-fold or three-and-a-half times in real terms. The rise in domestic capital formation began in 1986 and stopped in 2008. A similar pattern is also observed with manufacturing value added, with a gradual rise from 1986 to date. Over the 30-year period 1980 to 2011 manufacturing value added rose from US$1.1 billion to US$25 billion in 2010. Skill level is proxied by the proportion of students enrolled into secondary education. In 1980, the proportion of students enrolled in secondary education was 48 per cent and 30 years later this had doubled to about 96 per cent (source: World Bank data).

The trend in gross domestic savings of the UAE shows that it has undergone three distinct phases, the first starting in 1980 and ending in 1986, where it generally fell. In 1980 the gross domestic savings was US$21.3 billion, falling to US$8.3 billion in 1986. Between 1986 and 1998, gross domestic savings rose by an average of US$0.8 billion, per year. From 1998, the gross domestic savings started to rise rather rapidly. In fact, until 2008 the annual increase in gross domestic savings was US$8 billion, which is ten-fold higher compared to the previous phase. In 2008, the gross domestic value was over US$90 billion. This figure is six-and-a-half times higher than at the start of the growth phase in 1998. In real terms, gross domestic savings increased a little over five-fold from 1998 to 2008 (source: World Bank data).

The real exchange rate has generally tended to decline during the period 1980 to 1998, from a value of 0.64 to 0.42. From 1998 to 2009 the value increased to 0.99 and then fell to 0.87 in 2010. It is interesting that the real exchange rate corresponds to the general turning points in the economy, namely 1986, 1998 and 2008. In 1986 the labour force was a little above half a million and 30 years later the figure was three million. This implies that the labour force has increased by an annual average of 83,333 workers per year. Although, the increase in the labour force has been gradual it has nevertheless grown at a slower pace between the period 1980 to 1990. During the 1980s the labour force increased by half a million workers. However, in the next decade (i.e. 1990 to 1999) the rise in the labour force was about 900,000 workers. In the last decade (i.e. 2000 to 2010) the rise in the labour force was one million workers (source: World Bank data).

The openness of the economy as measured by the sum of exports and imports over GDP has tended to follow the same pattern as the core economic indicators discussed above. In the first phase, from 1980 to 1986, openness generally declined from 112 per cent to 87 per cent. Then, from 1986 to 1997, openness rose to 148 per cent, falling then again till 2000. As from 2001 the level of openness generally increased until 2008, after which it began to fall. Although oil prices have increased quite considerably over the last 30 years, both in nominal and real terms, its proportion of GDP has tended to decline. The main reason for this is that the UAE, like many other oil abundant countries, has aggressively pursued a diversification policy. As a result, in 1980 oil rents represented 70 per cent of GDP, while 30 years later the figure was only 17 per cent. This implies that the UAE has reduced the proportion of oil rents by 1.8 per cent per year. The average value over the 30-year period is 30 per cent (source: World Bank data).

Table 5.1   Descriptive Statistics for Economic Growth and FDI Characteristics

	N	Minimum	Maximum	Mean	Std. Deviation
GDP	30	2.167E10	2.613E11	6.992E10	6.487E10
FDI Stock	31	392.29	76174.83	12553.425	23454.174
EXPORTS	28	47.63	92.64	71.04	11.56
INF	30	-11.27	21.82	4.437	8.113
DSR	28	27.99	71.81	42.45	10.02
PUBEXP	28	32.34E9	2.074E10	8.372E9	4.185E9
CAPFORM	28	5.531E9	4.043E10	1.331E10	8.479E9

	N	Minimum	Maximum	Mean	Std. Deviation
SKILL	28	48.300	95.200	71.470	12.370
MFGADD	30	7.222E4	2.464E10	6.087E9	6.029E9
GDS	28	8.111E9	9.083E10	2.371E10	1.941E10
RER	30	0.427	0.991	0.567	0.133
LABOUR	30	5.480E5	2.884E6	1.478E6	7.669E5
OPEN	28	87.13	165.4	125.4	25.07
OILRENT	30	15.83	71.14	29.90	11.13
DOMINVR	28	19.20	30.97	24.78	3.535
GOVEXPR	28	9.996	22.09	16.58	3.301

Source: World Bank data.

Domestic investment has tended to fluctuate; nevertheless three general trends are apparent. The first trend is a decline in domestic investment during the period 1980 to 1990. Then there is a general rise in domestic investment over the period 1990 to 1998. However, during this period this study finds twin peaks in 1995 and 1998 (source: World Bank data). From 1998 there has been a general decline in domestic investment. Government expenditure has tended to fluctuate over the 30-year period and this is largely to do with a clear strategic or policy objective until five years or so ago. Until recently, public expenditure has been reactive to oil prices, which determined government revenues and domestic concerns. In some cases the government has produced its expenditure plans well after the start of the fiscal year. There has not really been a clear strategic policy or plan that has sought to achieve well-defined objectives and targets. Certain emirates, such as Dubai, did produce a strategic plan in the late 1990s, but it was limited in nature. More comprehensive and well-defined public government plans have only been developed in the last five years or so. Despite the lack of planning, government expenditure has witnessed three stages, starting with a rise from 1980 to 1987, followed by a decline until 1996 and then a very short-lived rise till 1998. As from 1998 the proportion of government expenditure in the economy has declined to its current level of 10 per cent. In some respects this is also indicative of a mature economy, where investment in public infrastructure is more or less complete.

5.3.1   Skewness and Kurtosis Tests

In the descriptive analysis of the data, this study conducted skewness and kurtosis tests. A test of skewness shows the level of asymmetry of the probability distribution. The skewness value can be positive or negative, or even undefined (Greene, 2002). In statistical terms a negative skew implies that a greater number of observations are skewed to the right of the mean. A positive skew implies the opposite: namely that a greater number of observations lie to the left of the mean. A zero value implies that the values are more or less evenly distributed on both sides of the mean, and in most cases this indicates a symmetric distribution (Greene, 2002).

With the exception of openness, domestic investment and government expenditure (i.e. OPEN, DOMINVR, GOVEXPR) the variables have a positive skewness. Also, the standard error is generally at 0.4. In the case of openness and government expenditure this study finds a negative skewness. This result is consistent with the discussion of the variables above. In the case of domestic investment, this study finds a value that is very close to zero, implying an almost equal proportion of observations on either side of the mean.

In statistical terms, kurtosis is a measure of the distribution of observations around the mean (Greene, 2002). A number of different representations are possible, but three of the most common are (a) observations with a high kurtosis, which tend to have a distinct peak near the mean, decline rather rapidly, and have heavy tails, this type of distribution is called leptokurtic; (b) observations with low kurtosis value, which tend to have a flat top near the mean rather than a sharp peak, this distribution is called platykurtic; and (c) the normal distribution, which has zero kurtosis, and is said to be mesokurtic. A kurtosis coefficient of 3 indicates a normal or mesokurtic distribution. A kurtosis value of less than 3 implies a platykurtic distribution, while a kurtosis of greater than 3 indicates tends to be leptokurtic (Greene, 2002). This study finds that only CAPFORM, GDS, RER and OILRENT have a leptokurtic distribution. The rest of the variables tend to have a platykurtic distribution.

Table 5.2   Skewness and Kurtosis Statistics

	Skewness		Kurtosis	
	Statistic	Std. Error	Statistic	Std. Error
GDP	1.869	.427	2.647	.833
FDI Stock	1.952	.421	2.435	.821

	Skewness		Kurtosis	
	Statistic	Std. Error	Statistic	Std. Error
EXPORTS	.098	.441	-.406	.858
INF	.487	.427	.238	.833
DSR	1.336	.441	1.529	.858
PUBEXP	1.344	.441	1.511	.858
CAPFORM	1.774	.441	3.272	.858
SKILL	.101	.441	-.745	.858
MFGADD	1.653	.427	2.400	.833
GDS	2.391	.441	5.661	.858
RER	1.841	.427	3.087	.833
LABOUR	.527	.427	-1.134	.833
OPEN	-.035	.441	-1.368	.858
OILRENT	2.029	.427	5.879	.833
DOMINVR	.001	.441	-1.257	.858
GOVEXPR	-.556	.441	-.267	.858

5.3.2 Correlation Coefficient Matrices

This study calculates the Pearson correlation coefficients for the data, which is essentially a test to determine how well each pair of variables is related to each other. The Pearson correlation coefficients tend to range from −1.0 to +1.0 and the closer the value is to +/−1 the more related are the pair of variables to each other. A Pearson correlation coefficient value of 0 implies no relationship between the variables. A positive Pearson correlation coefficient value indicates that both variables move in the same direction, while a negative value indicates an inverse relationship. It is important to note that the Pearson correlation coefficient only indicates the movement of the variables, and not whether a change in one impacts the other.

From the obtained data, it was noted that there are key turning points in the UAE economy, namely in 1986, 1998 and 2001. This discussion has also highlighted the fact that most of the variables discussed are impacted by the economic or business cycle and hence it is no

surprise that this study finds a high level of correlation in the data set. A high level of correlation between the explanatory variables is usually associated with multicolinearity. It is important to note that multicolinearity does not necessarily reduce the predictive power or reliability of the model as a whole (Gujarati, 2009). Moreover, if the purpose of modelling is prediction, then multicolinearity does not really matter. Statisticians have proposed that multicolinearity can be dealt with through increasing the number of observations. However, this research is not in a position to do this due to the time period under consideration, i.e. 1980 to 2010. Also, explanatory variables can be combined into one variable. However, this is not relevant for the purposes of this study as it will distort the outcome. Moreover, one can remove variables from the model but this will move the relationship away from its theoretical base. Fourthly, one can code the variables and but again this will be of little use. Finally, the study can do nothing but use the predictive power of the model, which is what is done in this study (Gujarati, 2009).

Table 5.3   Correlation Coefficient Matrix for the FDI Model

		GDP	EXPORTS	INF	DSR	PUBEXP	CAPFORM	SKILL	MFGADD
GDP	Pearson Correlation	1	.764**	.408*	-.146	.968**	.988**	.812**	.668**
	Sig. (2-tailed)		.000	.025	.458	.000	.000	.000	.000
	N		28	30	28	28	28	28	29
EXPORTS	Pearson Correlation		1	.536**	-.109	.750**	.789**	.732**	.756**
	Sig. (2-tailed)			.003	.580	.000	.000	.000	.000
	N			28	28	28	28	27	28
INF	Pearson Correlation			1	.113	.589**	.604**	.175	.642**
	Sig. (2-tailed)				.568	.001	.001	.374	.000
	N				28	28	28	28	29
DSR	Pearson Correlation				1	-.306	-.183	-.612**	-.229
	Sig. (2-tailed)					.114	.351	.001	.241
	N					28	28	27	28
PUBEXP	Pearson Correlation					1	.976**	.851**	.989**
	Sig. (2-tailed)						.000	.000	.000
	N						28	27	28
CAPFORM	Pearson Correlation						1	.826**	.988**
	Sig. (2-tailed)							.000	.000
	N							27	28
SKILL	Pearson Correlation							1	.672**
	Sig. (2-tailed)								.000
	N								28
MFGADD	Pearson Correlation								1
	Sig. (2-tailed)								
	N								

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 5.4   Correlation Coefficient Matrix for the Economic Growth Model

		FDI Stock	GDS	RER	LABOUR	OPEN	OILRENT	DOMINVR	GOVEXPR
FDI Stock	Pearson Correlation	1	.967**	.916**	.772**	.531**	-.170	-.536**	-.710**
	Sig. (2-tailed)		.000	.000	.000	.004	.368	.003	.000
	N		28	30	30	28	30	28	28
GDS	Pearson Correlation		1	.870**	.786**	.575**	-.029	-.565**	-.811**
	Sig. (2-tailed)			.000	.000	.001	.885	.002	.000
	N			28	28	28	28	28	28
RER	Pearson Correlation			1	.615**	.217	.143	-.421*	-.686**
	Sig. (2-tailed)				.000	.267	.452	.026	.000
	N				30	28	30	28	28
LABOUR	Pearson Correlation				1	.843**	-.486**	-.550**	-.702**
	Sig. (2-tailed)					.000	.006	.002	.000
	N					28	30	28	28
OPEN	Pearson Correlation					1	-.353	-.313	-.689**
	Sig. (2-tailed)						.065	.105	.000
	N						28	28	28
OILRENT	Pearson Correlation						1	.062	-.220
	Sig. (2-tailed)							.755	.260
	N							28	28
DOMINVR	Pearson Correlation							1	.516**
	Sig. (2-tailed)								.005
	N								28
GOVEXPR	Pearson Correlation								1
	Sig. (2-tailed)								
	N								

**. Correlation is significant at the 0.01 level (2-tailed).

		FDI Stock	GDS	RER	LABOUR	OPEN	OILRENT	DOMINVR	GOVEXPR
FDI Stock	Pearson Correlation	1	.967**	.916**	.772**	.531**	-.170	-.536**	-.710**
	Sig. (2-tailed)		.000	.000	.000	.004	.368	.003	.000
	N		28	30	30	28	30	28	28
GDS	Pearson Correlation		1	.870**	.786**	.575**	-.029	-.565**	-.811**
	Sig. (2-tailed)			.000	.000	.001	.885	.002	.000
	N			28	28	28	28	28	28
RER	Pearson Correlation			1	.615**	.217	.143	-.421*	-.686**
	Sig. (2-tailed)				.000	.267	.452	.026	.000
	N				30	28	30	28	28
LABOUR	Pearson Correlation				1	.843**	-.486**	-.550**	-.702**
	Sig. (2-tailed)					.000	.006	.002	.000
	N					28	30	28	28
OPEN	Pearson Correlation					1	-.353	-.313	-.689**
	Sig. (2-tailed)						.065	.105	.000
	N						28	28	28
OILRENT	Pearson Correlation						1	.062	-.220
	Sig. (2-tailed)							.755	.260
	N							28	28
DOMINVR	Pearson Correlation							1	.516**
	Sig. (2-tailed)								.005
	N								28
GOVEXPR	Pearson Correlation								1
	Sig. (2-tailed)								
	N								

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

5.4   Results

This study carried out individual OLS regressions for each of the models, the results of which are shown in Tables 5.5 and 5.6 below. The results in general show that both the FDI and economic output models are well specified and explain the dependent variables. In the case of the FDI model, the study obtained an adjusted R squared of 0.98, implying that 98 per cent of the change in the dependent variable (i.e. FDI) can be explained by changes in the independent variables (i.e. the factors that are used in the model to determine FDI). In the case of the economic output model, the R squared value was 0.99. The F statistics for both models are statistically significant at the 1 per cent level and hence validate the assertion of a well specified relationship.

5.4.1   The FDI Model

The study found that GDP is statistically significant at the 1 per cent level, implying that it impacts the stock of FDI. The researcher finds that the higher the level of GDP the greater will be the FDI stock. From an investment perspective, greater economic growth increases the profitability of the project. Therefore, the parent firm is less likely to withdraw the funds. In situations where the economic output is the same or even declines (i.e. no economic growth takes place or there is a decline in economic growth) then overseas investors become anxious regarding their investment and hence seek to remove it before it falls in value.

The studies reviewed in Chapter 2 have shown that an increase in exports leads to greater FDI and, in turn, the host country becomes more export focused. Although FDI may seek to service domestic customers, the overseas market allows it to benefit from economies of scale as well as scope. Also in cases such as the UAE, the domestic market is only a little over eight million people, while the neighbouring export market is over one billion people. High level of exports also implies that the country has the necessary infrastructure and logistics in place to support such an activity. From a firm level, pre-existing infrastructure and logistics reduces the costs of investment and allows it to implement modern inventory management systems. Also, export intensive countries tend to negotiate far more FTAs, which support their firms to enter and become successful in foreign markets. The study finds that the EXPORTS are statistically significant at the 5 per cent level.

The prior hypothesis assumed a negative relationship between inflation and FDI based on the assumption that increasing prices act as a deterrent to investment inflows. The rationale for this is that increasing prices have a higher probability of leading to inflation spirals and with them increases in wage costs. Higher wage costs reduce the competitiveness of the firm in global markets. Past evidence suggests that investors prefer host countries with low and steady inflation as it makes planning much easier. The results support this belief, as the study finds that INF is statistically significant at the 5 per cent level and with the prior expected sign.

Public expenditure plays an important role in many countries, and this is especially so the case for the UAE, where it is the largest component of spending. The literature in economics argues that public expenditure has two main roles, namely as fiscal policy tool – here, public expenditure can be increased in order to stimulate the economy through the multiplier effect; on the other hand public expenditure can be reduced if the economy is over-heating; and the second purpose of public expenditure is to provide essential services and to skill the working population – this implies that inward investment can be assured that a sufficiently large pool of talents exist with the appropriate skills, also, public expenditure ensures that the host country has appropriate infrastructure in place thus reducing the cost of doing business. In the absence of sufficient public expenditure the inward investment needs to invest its own funds thus reducing the profitability of the project. The results show that public expenditure has a positive and statistically significant impact on FDI at the 1 per cent level.

There is evidence from previous studies to support the argument that investment has behavioural tendencies and in particular the 'herd' effect (Araujo, 2009). That is to say that one firm (or even set of firms, usually MNCs) begin to invest in a particular country and others follow. In this way a proportion of the investment inflows take place simply because of 'copying' the actions of others. As the herd effect becomes larger and more potent it also attracts additional inward flows because of greater opportunities to service the initial investment. Both of these effects are captured by the level of manufacturing value added in a country. The study finds a positive and statistically significant relationship with FDI at the 10 per cent level. This shows that public expenditure does, at least for the sample, impact positively on FDI.

Table 5.5   OLS Estimates for FDI Model

FDI Model			
Label	**Variable**	**Estimate**	**Std. Error**
	(Constant)	16973.917	11292.829
F1	GDP	7.488E-7[a]	0.000
F2	EXPORTS	166.235[b]	68.492
F3	INF	−175.931[b]	82.935
F4	DSR	−134.131	103.238
F5	PUBEXP	2.803E-6[a]	0.000
F6	CAPFORM	2.441E-7	0.000
F7	SKILL	69.719	137.489
F8	MFGADD	1.578E-6[c]	0.000
Adjusted R squared			0.984
F-statistic			136.777[a]
Durbin Watson statistic			1.297

[a,b,c] refers to 1 per cent, 5 per cent and 10 per cent significance levels.

Note: negative estimates imply an inverse relationship.

Domestic savings ratio was found not to be a statistically significant factor in impacting FDI. The possible reasons for this are that under the standard Keynesian framework, savings is equal to investment. However, in reality investment needs not be solely reliant on domestic investment. It is the belief that inward investment tends to source funds from outside the host country. One reason for this is that the investing company will have better banking (or financial) relationships in its own country. Therefore, the cost of finance will be lower in the home as opposed to the host country. The study also does not find that domestic capital formation to be important in determining the level of FDI. One reason for this could be that the type of FDI that takes place is export focused and hence the level of domestic capital formation is not important. Finally, as mentioned above, 90 per cent of the working population in the UAE is expatriate and hence the level of labour skill is not important as firms can bring this into the country.

5.4.2 Results from the OLS Model

The results for the economic output model are shown in Table 5.6 below. The literature review in Chapter 2 and the summary above argued that the level of FDI positively impacts the level of economic output. In essence, inward investment increases the level of output of the host country and hence economic output. From a longer term basis, inward investment also raises the production capacity of the host country, thereby allowing it to capitalise on any increase in demand. From an economic viewpoint inward investment acts as a positive multiplier. In other words the inward investment spurs the economy and leads to additional output.

The study finds the gross domestic savings to be positively related to economic output and statistically significant at the 1 per cent level. In the case of economic growth, savings are translated into investment. Therefore, the higher the level of savings the higher the probability that domestic investment will take place. With investment one has an increase in economic output. Of course, too high a level of savings reduces the marginal propensity to consume and the multiplier effect from any fiscal stimulus.

Economic theory argues that price fluctuations in the foreign market take place due to two reasons, namely an increase in the rate charged by the supplier and exchange rate movements. The price changes by the manufacturer are not considered in this study because this is not normally the first course of action and is carried out when no alternative is available. The study does, however, examine the impact of exchange rates and finds a negative and statistically significant relationship. This tells us that as the real exchange rate falls, the economic level increases. The reason for this is that a reduction in the real exchange rate makes exports cheaper and imports more expensive. As a result domestic products are substituted for the more expensive foreign ones. At the same time domestic products become more competitive in overseas markets.

The standard Cobb Douglas production function (Cobb and Douglas, 1928) that is discussed above shows that economic output is a function of capital and labour. That means any increase in either one of these two variables will increase economic output. The study finds that an increase in labour has a positive and statistically significant impact on economic output.

For a resource abundant country such as the UAE, oil rents are extremely important as they make up a substantial proportion of government revenue. Therefore, one can assume that higher the oil rents the greater the financial resources available to government in order to investment in public sector programmes. This is especially the case for the UAE, which, at the federal level, has no government borrowing. Furthermore, the UAE does not have any form of income or personal taxation (except for the banking sector) and hence sources of government revenue are limited. This implies that oil rents play an important role in the economy. Therefore, it is not a surprise to find that oil rents have a positive and statistically significant relationship with economic output.

The results do not show a statistically significant relationship between trade openness and economic output. Although the traditional Keynesian model argues that exports are a positive flow to the economy trade, openness itself may not impact economic output. The reason for this is that trade openness by itself is not sufficient to impact the level of economic output. The study does not find the ratio of domestic investment to GDP to be statistically significant. It is felt that the lack of a statistically significant relationship in this case is indicative of the structure of the UAE economy. In other words on average the manufacturing sector, which is the largest component in the domestic investment measure, represents only 14 per cent of the economy. Therefore, growth rates in domestic investment ratios will tend to have a limited impact on economic output. Finally, this study does not find the government expenditure ratio to be statistically significant. One possible explanation for the lack of a relationship between the government expenditure ratio and economic output is that until recently the UAE did not have a formulated strategic plan. Therefore, government expenditure was based on ad hoc policies and not linked to specific growth outcomes.

Table 5.6   OLS Estimates for Economic Growth

Economic Growth Model			
Label	**Variable**	**Estimate**	**Std. Error**
	(Constant)	-1.361E10	1.183E10
G1	FDI Stock	557,403.723[a]	164,055.922
G2	GDS	1.211[a]	.189
G3	RER	-3.904E10[b]	1.925E10

G4	LABOUR	16,570.566[a]	3,393.586
G5	OPEN	6.409E7	4.399E7
G6	OILRENT	2.727E8[b]	1.321E8
G7	DOMINVR	1.462E8	1.492E8
G8	GOVEXPR	8.047E7	4.007E8
Adjusted R squared			0.999
F-statistic			2,304.024[a]
Durbin Watson statistic			1.812

[a,b,c] refers to 1 per cent, 5 per cent and 10 per cent significance levels.

5.4.3   Results from the Simultaneous Equation Model

The OLS results showed that both FDI and economic output impact each other. However, the OLS models failed in that they could not deal with the simultaneous relationship that is believed to exist. In order to deal with this weakness the study conducted simultaneous or two-stage least squares regressions (2SLS). As a check on the 2SLS results, the study also conducted General Method of Movements (GMM) regressions. The results from the 2SLS and GMM models are shown in Table 5.7 below. The first observation that this research makes is that the 2SLS results are consistent in terms of statistical significance with the OLS estimates. In some cases the level of statistical significance has improved, implying that the superior 2SLS results are better able to identify the importance of these variables. In a couple of cases the study finds that the independent variables for the GDP equation are not statistically significant when it comes to the OLS regression but are statistically significant in the 2SLS model. Each result is discussed with its comparison to the OLS model below.

The study finds that GDP has an important impact on the level of FDI into a country. This result is consistent with the OLS regression, and in the case of the 2SLS model the coefficient is statistically significant at the 1 per cent level. In this sense the study finds that the greater the levels of economic growth of a country, the greater will be the FDI level to the nation. In this respect the results tend to support both the neoclassical and Dunning's (1986) eclectic or OLI theory. As discussed in Chapter 2, the neo-classical school argues that FDI is an efficient mechanism by which to fill the savings–investment gap. This is more so the case for developing

countries, but is also relevant for developed countries in particular during periods of economic recession. The results show the importance of FDI on economic growth, in at least assisting in filling the savings–investment gap, if not dramatically enhancing it. Chakrabarti (2001), Asiedu (2002) and Zhao (2003) have all argued that higher economic growth positively impacts on FDI inflows and is a good measure of the level of attractiveness of the host country. Other studies, such as Moore (1993), Lucas (1993), and Cernat and Vranceanu (2002) claim that once economic growth takes place, FDI inflows into the host country begin. The rationale for this is rather simple in that as economic growth takes place, economic analysts and commentators increase the frequency of their reporting regarding the country. In doing so, the country receives a greater focus and it encourages corporations as well as investment houses to investigate possibilities in the nation. This in itself leads to greater publicity for the host country and a greater flow of funds. The opposite is also true, whereby negative news from a country can lead to a mass exodus of funds.

The study finds exports to be an important factor in leading to greater FDI and this is consistent with the earlier discussion in Chapter 3, which argued that FDI into the UAE is largely for the motive of export. The UAE, with a population of eight million according to the last census, is not sufficiently large to warrant large-scale investment. More importantly, of the eight million a little over half are on a salary of less than US$500 per month. This implies that the effective population is only four million at best. In addition to this the investment that the government has made to turn such emirates as Dubai into regional logistics hubs and the world's third-largest re-export port is supportive of the idea that FDI for export seems to be the order of the day. The importance of exports in attracting FDI is also consistent with prior studies, which, on the one hand, argue that exports will increase as FDI seeks to capitalise on economies of scale through exports, and secondly, local firms will observe the actions of new firms and imitate them in exporting (see Haddad and Harrison, 1993). Hsiao and Hsiao (2006) also find that FDI has indirect benefits on exports and vice versa. In that FDI seeks to be attracted to locations that are export intensive. The study also finds that trade openness has a statistically significant and positive impact on GDP. This result highlights the importance of a trade related growth theory.

Economic stability is a necessary prerequisite for FDI to flow into a host country. From a simple risk premium argument the greater the level of economic instability, the higher the required returns. In a globalised economy a greater inflation may have higher economic

instability but it is difficult for it to provide considerably greater returns. Therefore, given the choice of two locations, the eclectic (and finance) theory argues that FDI flows to the more economically stable location. This chapter measures economic stability using inflation. Therefore economic instability is argued to discourage inward FDI into the host country (Prüfer and Tondl, 2008, Jallab *et al* (2008). As argued above, inflation is incorporated into the risk premium of the country as well as near term economic expectations. The results show there to be a negative and statistically significant relationship between inflation and FDI. This result shows that FDI positively favours economic stability.

The traditional argument is that FDI can readdress the issue of a low domestic savings ratio. As argued in Chapter 2, under the Keynesian model, savings is equal to investment. If domestic savings are not available for some reason, then FDI can fill this vacuum. The results show that there is a negative relationship between the domestic savings ratio and FDI. However, the result is not statistically significant. Nevertheless, it does show that the government has been attempting to supplement a low domestic savings ratio with FDI. Interestingly, when domestic savings are high, banks will naturally have a high level of liquidity and there less of a focus on FDI. The study does, however, find a statistically significant and positive relationship between the gross domestic savings and GDP. This is consistent with the argument of a savings led growth.

Public or government expenditure is important in not only attracting FDI, but also in leading to economic growth. In the case of the UAE, government expenditure forms over a half of total consumption. This is not unusual for an oil abundant developing country, which needs to invest in building social as well as economic infrastructure. The Keynesian model demonstrates the importance of government expenditure in creating a government led multiplier. The study finds a negative relationship between government expenditure and economic growth, which is contrary to economic theory. This result is not totally perverse and a similar result was obtained by Sinha (1998) for Malaysia. One reason for this result could be that an increase in government expenditure can have a crowding out effect in that prices increase and the private sector cannot justify the investment. Also, government expenditure in some emirates such as Dubai has been carried out through borrowing, which can have a debt overhang. This argument is similar to Russek (1997) who found that for a cross sectional sample of countries, debt-financed government expenditure negatively impacted on economic growth, while the opposite was true for tax-financed consumption. Thirdly, government expenditure in the UAE is not

transparent and it is believed that a large proportion may have been utilised by government-related enterprises. Studies such as Bose *et al.* (2007) show that government expenditure and investment in education is the only factor that increases economic growth. The study also finds a negative and statistically significant impact of public expenditure on FDI inflows. It is believed that a large public sector may compete with the private sector. In some cases this may create special privileges for the public sector organisations, which may put private sector competitors at a substantial disadvantage.

The chapter finds that capital formation is not statistically significant in leading to greater FDI. Nevertheless the direction is positive, in that higher domestic capital formation will spur greater FDI to take place. This result is in accordance with our expected sign as well as prior research. The study does, however, find that manufacturing value addition actually has a statistically significant but negative impact on FDI. This may be reflective of the fact that any increase in manufacturing value by domestic firms reduces the probability of FDI in the same area. It is believed that FDI may not wish to compete with domestic producers in the area of manufacturing products. Although the study does not empirically test this, it is believed that in the service sector, where there is greater ability to differentiate the output, FDI may not be as restricted.

This study finds the level of skills of the population to have a positive impact on FDI, however it is not statistically significant. However, the UAE is rather unusual in that 90 per cent of the population is expatriate. This implies that if a particular firm requires an employee with particular skills they tend to recruit them overseas. In fact, the cost of the employee can also be controlled, as the firm can recruit employees from low cost countries. Although this study does not test this, the researcher nevertheless felt that most FDI does not consider labour recruitment as an issue as they are not reliant on the domestic population. In the case of labour force, this study finds that as the working population has increased largely through an increase in expatriates, it has had a positive impact on economic growth. The result shows a statistically significant and positive relationship with economic growth. This is consistent with the traditional Keynesian model, which shows that an increase in personal sector consumption has a positive multiplier on the economy. Finally, this study finds that oil rents have a positive but not statistically significant impact on economic growth. It is more likely the case that in the early period oil was important in spurring economic growth. More importantly, oil rents are observed through government expenditure.

Table 5.7   Simultaneous Model Estimates

FDI and GDP Models			
Label	**Variable**	**2SLS**	**T - stat**
Intercept	Constant	17,106.41	1.51
F1	GDP	7.43e-07 [a]	7.43
F2	EXPORTS	−166.3879 [b]	−2.43
F3	INF	−174.2618 [b]	−2.09
F4	DSR	−134.1032	−1.30
F5	PUBEXP	−2.82e-06 [a]	−3.22
F6	CAPFORM	2.60e-07	0.51
F7	SKILL	−70.63741	−0.51
F8	MFGADD	−1.54e-06 [c]	−1.75
G1	FDI Stock	1951042 [a]	25.02
G2	GDS	3.84e+08 [b]	2.34
G3	LABOUR	36,334.72 [a]	12.12
G4	OPEN	−1.22e+08 [b]	−2.28
G5	OILRENT	3.12e+07	0.17
G6	GOVEXPR	−4.10e+08 [c]	−1.79

[a,b,c] refers to 1 per cent, 5 per cent and 10 per cent significance levels.

The results between the OLS and the simultaneous equation are broadly similar in terms of the direction (i.e. signs) as well as statistical significance, with the exception of three variables. These three variables, relevant only to the FDI model, are PUBEXP, SKILL and MFGADD. In the case of PUBEXP, i.e. public expenditure, the direction changes from a positive sign in the OLS model to a negative one in the simultaneous regression. The researcher's prior expectation was of a positive relationship in both cases implying that any increase in public expenditure increases the attraction of the location. However, it appears

from a more complete analysis that PUBEXP actually crowds out FDI in terms of accessing host country finance. A similar picture emerges with SKILL, which is the level of skills and knowledge. The researcher's prior assumption was that an increase in skills makes the location more attractive for FDI. The simultaneous model results show that SKILL is negative, implying that perhaps overseas firms may wish to enter a particular country to exploit the low labour costs associated with a low skills level. Alternatively, overseas firms may wish to implement their own technology and hence wish to train the staff themselves. The third variable is MFGADD, which is the addition in manufacturing capital. The researcher's prior assumption was of a positive relationship between MFGADD and FDI and this was the case in the OLS but not the simultaneous regression. The reason as to why MFGADD may not be positive in the simultaneous regression is that the focus of government FDI policy has been on the service sector as opposed to the manufacturing sector.

5.4.4 Structural Equation Modelling

The researcher carried out a simultaneous regression, which sought to examine the joint relationship between FDI and economic growth as a proxy for technology transfer. The simultaneous regression approach is a form of a general linear model (GLM) that extends beyond the normal ordinary least stage regression through permitting linear transformations of multiple dependent variables. Therefore, this study used both the ordinary least squares and GLM methods. In order to ensure that the results of this study are robust the researcher has used an extension of the GLM approach, namely structural equation modelling (SEM). In a similar manner to simultaneous regressions; SEM allows to test a set of regression equations simultaneously. However, the key difference between a simultaneous regression and SEM is that in the case of the latter; the observed variables are used to represent latent constructs that cannot be directly measured, only inferred from the observed measured variables (Schumacker and Lomax, 2010). As such the structural equations are meant to represent causal relationships among the variables in the model.

From the perspective of this study, a SEM has a number of advantages, most notably that it allows to ensure that the analysis is able to observe variables that may

ordinarily be left out from the analysis. Second, SEM provides a graphical representation of the relationships so as to better understand the linkages if any. Third, SEM provides overall tests of model fit and individual parameter estimate tests. Fourth, SEM allows to examine non-standard models as well as data sets that may suffer from autocorrelation. Fifth, although SEM assumes normal distribution it can deal with non-normally distributed data sets (Schumacker and Lomax, 2010). It is important to note that SEM does not accept a particular relationship; it simply provides coefficients that help the researcher to reject that relationship. Therefore, the fact that a particular relationship has not been discarded does not imply that it exists; it shows that there isn't sufficient evidence to reject its existence. In this research two other forms of analysis are also carried out; namely OLS and simultaneous regressions and hence the SEM adds merit to the existing results.

Based on the literature review in Chapter 2 and the formulation of hypotheses in Chapter 3, the structural relationship is formulated as illustrated in Figure 5.1. The key aspect of Figure 5.1 is that it illustrates first the joint relationship between economic growth, which is the proxy for technology transfer and FDI. In addition to this it shows the inter-relationships between the dependent variables.

Figure 5.1   The Structural Equation Modelling Representation
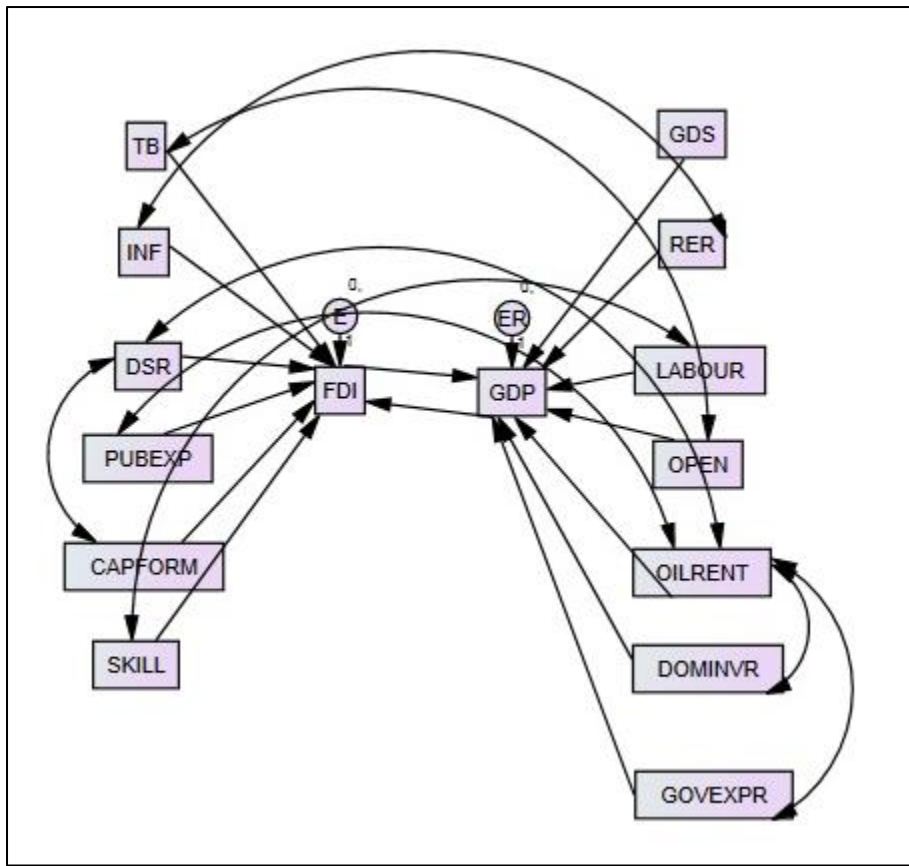
(Source: Author)

The researcher used AMOS, which is a software addition to SPSS, in order to calculate the coefficients of the variables illustrated in Figure 5.2. It is important to note that the output of analysis using SEM software such as AMOS produces the same statistics as those that are obtained from OLS regressions, the only difference being that it is generated for multiple equations rather than for a single equation. The predictors are allowed to co-vary based on the relationships that have been modelled and illustrated in Figure 5.1 and the predictors' co-variances are shown in Figure 5.2.

The results as illustrated in Figure 5.2 are consistent with the researcher's a priori expectations. The most notable result is that there is a joint and positive relationship between FDI and GDP. Interestingly, the AMOS output shows that the relationship is much stronger for GDP to attract FDI then the other way round. It is believed by the

researcher that the reason for a low impact of FDI on GDP could be due to the sectors in which the former has taken place to date in the UAE.

The AMOS results also show signs between variables that are consistent with the simultaneous equation model. In the OLS or simultaneous model the researcher was not able to examine crossover variables such as the relationship between inflation (INF) and the real exchange rate (RER), which AMOS finds to be negative. This is normal as any increase in inflation would depreciate the value of the currency. Similarly there is a positive relationship between exports (EXPORTS) and the level of openness in an economy (OPEN). This relationship is consistent with prior expectations as the more open an economy the greater the level of exports that will take place. A positive relationship is found between the domestic savings ratio (DSR) and the level of oil rents (OILRENT) received by the country. This is an important result that shows that the level of saving is positively impacted in the country by oil and hence this is also an important contributory factor to the level of investment in the economy. Interestingly, the results show a negative result between public expenditure (PUBEXP) and oil rents. The reason for such a result may be that public expenditure is determined irrespective of the level of oil rents. In the FDI equation a positive relationship is found for economic stability, which is proxied using inflation (INF) implying that this is valued by inward investment. Similarly, the level of domestic skills (SKILL) is positively viewed by inward investment. Although, according to the National Bureau of Statistics, approximately 90 per cent of the residents in the UAE are expatriate, implying that while inward investment relies on foreign workers, the domestic skill base is very important. The reason for this is that the country has initiated a localisation, programme and in certain sectors such as banking there are quotas for UAE national employment. This implies that even though there is a heavy reliance on foreign workers, inward investment requires a domestic skill base. In the case of the GDP equation, a positive relationship is found for the level of gross domestic savings (GDS), quantity of labour (LABOUR) and trade openness (OPEN). The reasoning for this is that GDS can be translated into investment and trade openness leads to an increase in exports. The results for the joint relationship along with the GDP and FDI equation are shown below in Figure 5.2.

Figure 5.2   The Structural Equation Model Coefficients
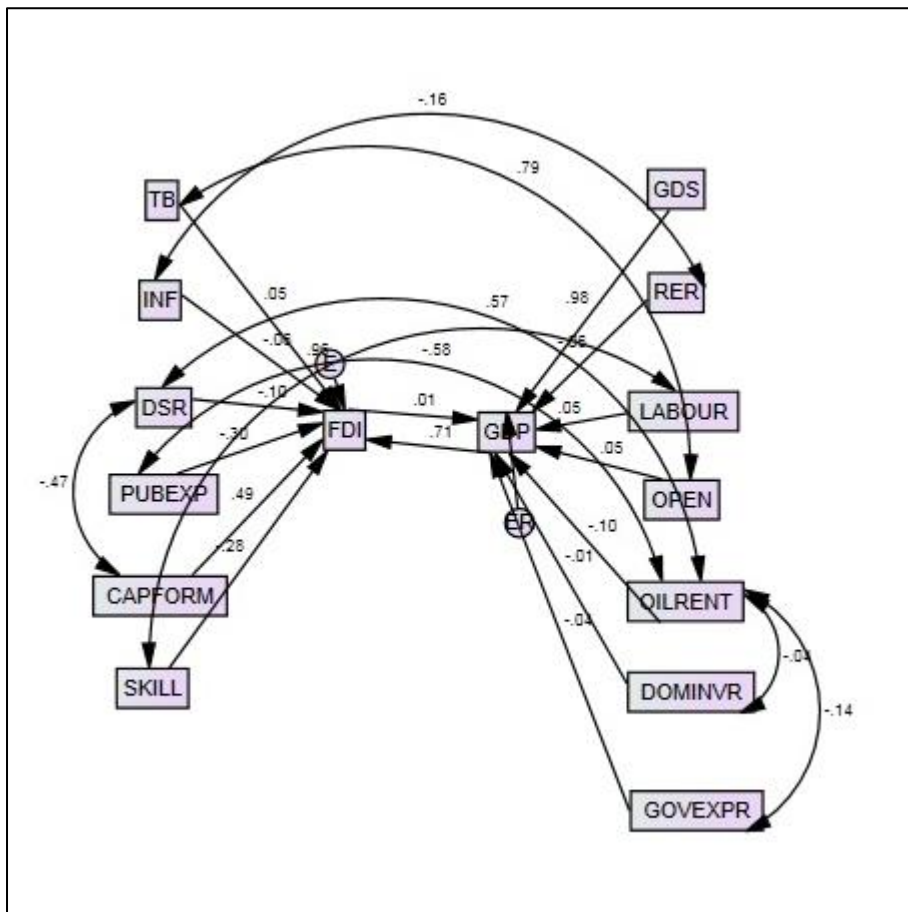
(Source: Author)

The output in Table 5.8 shows a chi-square value of 1,075.18 with 82 degrees of freedom. This test statistic tests the overall fit of the model to the data. The null hypothesis under test is that the model fits the data. It is important to note that the chi-square test of absolute model fit is sensitive to sample size and non-normality in the underlying distribution of the input variables. Some of the variables that have been used in the SEM are known not to be normally distributed and have been discussed above. Therefore, despite the overall result to reject the null hypothesis there is still merit in analysing the statistics. The reasoning for this is that even though a model may be rejected on an absolute basis, there may be evidence for important relationships that are given by the model.

Table 5.8   Coefficients for the Structural Equation Model

Chi-square	1,075.180
Degrees of freedom	82
Probability level	0.000

The researcher used AMOS to obtain output that provides the unstandardised and standardised regression coefficients. The unstandardised coefficients and associated test statistics appear below in Table 5.9. Each unstandardised regression coefficient represents the amount of change in the dependent or mediating variable for each 1 unit change in the variable predicting it. For example, in Table 5.9 GDP increases 2.1 for each 1.00 increase in GDS. Table 5.9, in addition to showing the unstandardised estimate, also provides the standard error (SE), the estimate divided by the standard error namely the critical ratio (CR). The column marked P is the probability value associated with the null hypothesis. The researcher finds all except for DOMINVR, DSR, INF and EXPORTS regression coefficients in the models are significantly different from zero beyond the 0.01 level. Interestingly, the AMOS results find a statistically significant relationship between GDP to FDI, but not the other way round.

Table 5.9   Model Coefficients

			Estimate	S.E.	C.R.	P	Label
GDP	<---	GDS	2.100	0.029	71.777	***	
GDP	<---	RER	-24635533035.247	4035904555.582	-6.104	***	
GDP	<---	LABOUR	2519.918	527.117	4.781	***	
GDP	<---	OPEN	128100394.090	23845729.680	5.372	***	
GDP	<---	OILRENT	-369216831.175	34762314.930	-10.621	***	
GDP	<---	DOMINVR	-62147768.438	106974770.788	-0.581	.561	
GDP	<---	GOVEXPR	-592414480.005	146280875.017	-4.050	***	
FDI	<---	SKILL	-80.959	12.120	-6.680	***	
FDI	<---	CAPFORM	0.000	0.000	10.157	***	
FDI	<---	PUBEXP	0.000	0.000	-7.159	***	
FDI	<---	DSR	-37.123	17.807	-2.085	.037	
FDI	<---	INF	-14.432	10.563	-1.366	.172	
FDI	<---	EXPORTS	24.479	22.082	1.109	.268	
GDP	<---	FDI	91462.603	143803.975	0.636	.525	
FDI	<---	GDP	0.000	0.000	16.616	***	

The standardised estimates, which allow for the evaluation of the relative contributions of each predictor variable to each outcome variable, are shown below in Table 5.10.

Table 5.10   Standardised Regression Weights

			Estimate
GDP	<---	GDS	0.983
GDP	<---	RER	-0.058
GDP	<---	LABOUR	0.048
GDP	<---	OPEN	0.051
GDP	<---	OILRENT	-0.102
GDP	<---	DOMINVR	-0.006
GDP	<---	GOVEXPR	-0.039
FDI	<---	SKILL	-0.283
FDI	<---	CAPFORM	0.485
FDI	<---	PUBEXP	-0.304
FDI	<---	DSR	-0.100
FDI	<---	INF	-0.058
FDI	<---	EXPORTS	0.047
GDP	<---	FDI	0.009
FDI	<---	GDP	0.706

5.5   Policy Aspects

The purpose in studying the relationship between FDI and economic growth was to determine if technology transfer took place from the foreign firms to those in the UAE. If technology transfer did take place then it would lead to an increase in economic growth. It is important to note that this test does not state the extent of technology transfer that has taken place, but

simply its existence. In the following chapters the researcher tests for the extent as well as the factors that enhance the level of technology transfer. The results show that there is a very strong relationship between FDI and economic growth. More interesting is that this study finds the presence of a joint or simultaneous relationship between FDI and economic growth. As such the study believes that future UAE economic policy should be focused on exploiting this relationship. The UAE has been extremely successful in increasing economic growth in its short history. However, this economic growth has been funded through public expenditure and not through FDI. This study believes that public expenditure although useful, especially for a young country such as the UAE, cannot lead to effective growth of the private sector. If the UAE wants to build a large and growing private sector, then it needs to develop initiatives to encourage FDI into the economy.

The results also lead us to believe that if economic growth is to be sustained so as to ensure long-term economic growth then it needs to focus on the export sector. As explained above the traditional Keynesian model has four key growth factors, namely government, consumption, investment and the external sector (i.e. net of exports over imports). Of these, government and domestic consumption have natural limits due to the acceptable size of the public sector and size of the population respectively. Investment is very important, however, for it to achieve the desired rates of return it needs to be export focused. Therefore, it is strongly believed that the government policy should be directed at creating an open economy that allows firms in the UAE to be able to benefit from the regional markets.

For a truly effective export oriented strategy the UAE needs to negotiate and conclude a comprehensive set of FTAs with key trading partners. An FTA allows for preferential trading between member countries so that they do not incur import duties, non-tariff barriers and administrative difficulties. Currently, the UAE has only two FTAs, which include 25 countries and a further 22 under discussion. The problem is that some of the FTAs under discussion have been at the negotiation stage for 22 years, as is the case with the European Union. Furthermore, a further two FTAs that have been agreed have not been ratified. This implies that FDI has not been able to exploit the benefits of these FTAs with a corresponding impact on technology transfer. It is strongly believed that the UAE should seek to finalise the 22 FTAs under discussion, which will imply that 22 per cent of trade will be covered by preferential agreements. It is strongly believed that once these FTAs have been finalised trade from the UAE will increase substantially and as a result so will economic growth.

This study finds that that economic stability is extremely important for FDI inflows as well as economic growth and it is believed that this should be a key economic priority. In terms of economic policy, the key aspects that this study has found to be important include inflation and relative exchange rate. It is believed that in both cases the current pegged exchange rate with the US dollar implies that the country is exposed to inflation and exchange rate risk. In recent years there has been evidence of imported inflation as a result of the pegged currency. More importantly, this study believes that the pegged exchange rate gives the UAE little control over its monetary policy and ties the country to economic actions that are determined by the state of the US economy. It is believed that economic stability can be maintained through a policy of portfolio exchange rates, whereby the rate of the currency is determined by a basket of currencies based on the country's trading partners. This study believes that such a policy will allow the country to maintain a level of control over the economy and not over-expose the exporters to currency fluctuations.

The results show that public expenditure is important in the form of the provision of infrastructure spending. Under Dunning's OLI paradigm, the locational benefits are increased where a country has a higher level of infrastructure. This study argues that public expenditure can play a pivotal role in this area so as to ensure that FDI continually flows into the country. Also, public expenditure in infrastructure helps in retaining FDI. Prior studies in FDI show that FDI is not permanent in that it can flow out of a country into another that has a better set of features. As such, this study believes that the country should regularly review its OLI features, using Dunning's paradigm, to ensure that FDI that has flowed into the country does not then leave. Finally, this study calls for the country to have a comprehensive policy to attract manufacturing FDI as this increases the level of manufacturing value added in the country. The results show that this has a positive impact on FDI stock as manufacturing investment is long term. More importantly, manufacturing investment attracts allied industries to establish close to the anchor investment. As such it is believed that manufacturing FDI has a higher impact on economic growth and FDI stock.

5.6   Summary

One clear conclusion that is evinced from this chapter is that economic growth and FDI are interrelated factors. Economic growth leads to positive news regarding the country, which

prompts firms and investment houses to investigate opportunities in the host country. The chapter found that FDI can play an important role in filling the domestic gap in investment and can spur economic growth. The results, although very important, need to be extended in future research to look at the types of FDI that lead to the greatest impact on economic growth. The chapter finds a positive relationship between FDI and exports in that the greater the level of FDI the higher the exports of the host country. This study argues (although it does not test it empirically) that the opposite relationship also exists, in that FDI flows to locations that are export-intensive. The rationale for this is that export intensive locations will have invested in the infrastructure to support exports as well as being active in signing FTAs that seek to reduce tariffs.

Economic instability is argued to discourage FDI into the host country, while the positive is true in that it increases the attractiveness of a location. This chapter finds a negative relationship between FDI and the domestic savings ratio. This leads us to believe that if a country has a high domestic savings ratio it has a greater probability to carry out either independent investment or through private equity, venture capital, etc. This study finds that domestic capital formation has a positive but not a statistically significant relationship with FDI. At the same time this study finds that manufacturing value added has a negative and statistically significant impact on FDI. It is believed that FDI does not wish to compete with domestic firms in the manufacturing sector where the investment is higher and risks greater. In summary, this chapter has identified an interrelated association between FDI and economic growth for the UAE for the period 1980 to 2010. In doing so it has found a number of factors that are important in enhancing both economic growth and FDI. In terms of government policy there needs to be a more holistic approach towards attracting FDI and spurring economic growth rather than ad hoc and unrelated initiatives.

CHAPTER 6

Technology Transfer from FDI within Clusters

6.1   Introduction

Chapter 5 investigated the presence of technology transfer through FDI for the UAE. The results of the previous chapter show that FDI does indeed have an impact on the level of technology transfer proxied through economic growth. The results also show that there is a reverse relationship from economic growth to FDI and as such the two variables are interlinked. In this chapter the study continues the investigation of technology transfer from FDI to understand the impact of clusters. The main rationale for this is that in today's business climate clusters are not only an important but a dominant feature. For instance, in the UAE there are more than 22 clusters of various sizes and levels of sophistication. The perceived importance of clusters has also meant that they are the object of attention from academic as well as policy makers (Saxenian, 1994; Porter, 1998a, 1998b, 1998c; Swann, 1998). The question facing academics and policy makers is whether there is still room for clusters in the modern highly connected world with widespread usage of the internet. Technology has certainly changed the manner in which business is carried out and challenges the wisdom on conventional business practices. Therefore, the question arises that with easy access to information and faster as well as cheaper logistics, is there a need for the geographic proximity of businesses? More importantly, if aspects such as geographical location are important, then this raises a further question, namely to what extent the cluster promotes technology transfer especially from FDI.

Firms establish in business clusters in order to gain a competitive advantage, which Porter (1990) argues is manifested by the prevalence of clustering. Porter (1990) also addresses that the greatest competitive advantages are those from clusters that are geographically localised. More importantly, clusters are also argued to increase productivity and the innovation of products. From a macro point of view, by firms being located near their suppliers and customers they are more likely to benefit from organisational improvement and technological innovation (Baptista and Swann, 1998). One reason for this is that a concentration and accumulation of knowledge in the cluster tends to attract not only a greater number of

workers but also attracts the most able workers to the cluster. With a bringing together of able human capital in a concentrated area there will be a greater probability of more productive information exchange leading to a spread of knowledge outside the firm. This transfer of knowledge is not restricted to domestic firms and will include foreign ones. In fact, if foreign firms have particular technology then it is more likely that through informal exchanges this knowledge will flow to domestic firms when located close by. Baptista and Swann (1998) argue that technological innovation is the core of the growth of clusters and the reason as to why firms wish to locate within it. In fact, if a cluster is shown to have a good historical performance as far as innovation is concerned then it is more likely to attract a greater number of firms (Arthur, 1990). There is a general view among studies such as Baptista and Swann's (1998) that innovative activity and output are positively correlated with new firm entry and productivity growth within a cluster. As far as innovation within a cluster is concerned, Porter (1998c) argues that the cluster drives the innovation's direction and pace. This in turn determines the future productivity and growth. The key to setting the pace and direction of innovation is the positive and immediate feedback that is available within a cluster (Baptista and Swann, 1998; Beaudry *et al*., 1998; Baptista and Swann., 1998; Swann and Prevezer, 1996).

6.2   The Case of Tawazun Economic Council as a Technology Cluster

This study uses Tawazun Economic Council as a case study because it was created to initiate and build ventures through industrial partnerships and strategic investments with foreign entities that have a proven technology in much focused areas of defence and aerospace, automotive, munitions, metals and technology. All of these sectors are important to the long-term strategy of the Emirate of Abu Dhabi. In particular, the aerospace sector is an important part of the Abu Dhabi 2030 Strategy Plan, which seeks to develop an economically diversified high-tech, knowledge driven economy. As a result of this ambitious plan, Tawazun has developed a huge aerospace cluster that seeks to develop industries that will become tier one suppliers to major aircraft manufacturers. The company has already received FDI inflows from companies such as Boeing, Airbus/EADS and Alenia Aeronautica, amongst others (Tawazun Economic Council, 2012). Each partnership is complex structure involving capital outlay (i.e. FDI inflow) as well as technology, and in many cases an off-take agreement to purchase the output. As such, Tawazun is a very interesting and unique case of

a cluster with a strong involvement of FDI in each of the ventures. Also, the cluster has been developed with technology transfer being a key aspect of each of the ventures.

6.2.1 The Background to the Tawazun Economic Council Initiative

The UAE Offset Program Bureau was first established in 1992 to develop economic and commercial value from the country's wide defence procurement program, in line with UAE's continuous modernisation and acquisition of advanced defence systems. Its mandate was to oversee the establishment of joint ventures between international contractors and members of the local private sector. To date, Offset has resulted in the creation of several multi-million dollar joint ventures in various economic and industrial sectors – including shipping, district cooling, aircraft leasing, fish farming, healthcare, agriculture, banking and education – which created over 40 commercially viable, profitable and sustainable joint ventures, attracting foreign investment in excess of AED 8 billion, including four public joint stock companies listed on the UAE stock market. More than 300,000 UAE nationals are shareholders in these public joint stock companies, along with thousands of job opportunities for UAE nationals in knowledge-intensive and value-added projects. In this way, Offset; a programme which was established in 1992 by the government of Abu Dhabi, with the purpose of reinvesting a portion of defence procurement projects total values back into the UAE economy through joint ventures with defence contractors, has consistently achieved its key objective of adding value to the country's economy, whilst ensuring that all projects developed are in line with the UAE's overall strategic master plan and have been consistent with national priorities (Tawazun Economic Council, 2012).

In early 2008, an initiative to restructure the existing policy into a more interactive one was launched. This initiative is aimed at further enhancing the Offset programme's role within the UAE, improving the options for defence contractors' involvements, and maintaining its edge of creating strategic and sustainable projects within the country. The enhanced Offset programme became the Tawazun Economic Programme (discussed below) and is overseen by the Tawazun Economic Council. The central aim of this programme is to generate an economic and commercial value arising from the country's defence related purchases. As such the programme is closely co-ordinated with the UAE Armed Forces so that solutions to common problems are developed.

6.2.2 The Tawazun Programme

All supply contracts of a cumulative value exceeding US$10 million in any five-year period are subject to Tawazun Economic Council involvement. This implies that the supply contract can become subject to the Tawazun Economic Program Agreement. Being part of this programme implies that the supplier is required to add economic and commercial value to the UAE's economy equivalent to at least 60 per cent of the supply contract value. The programme does not require the supplier to actually invest this sum but instead shows that over a defined period of time such a return will be made. This implies that the supplier can contribute a mixture of capital and IP in its various forms. While not a pre-set requirement, the government uses a seven-year period of returns to assess whether the 60 per cent requirement has been met. For projects that are more sophisticated or have a greater technological benefit, a longer period is given to the supplier (Tawazun Economic Council, 2012)

Due to the strong involvement of the UAE Armed Forces in the programme it has a very narrow and well defined set of project areas which can be considered. The areas of focus for the programme are as follows:

1. Aerospace systems
2. Munitions and weapon systems
3. Land systems
4. Naval systems
5. Autonomous system
6. Metals and advanced materials
7. Radars, communication, command & control
8. Electronics.

The programme defines the skills and knowledge that it seeks to acquire with a strategy of being competent in the following areas of activity:

1. Designing
2. Engineering
3. System integration
4. Manufacturing

5. Testing and qualifications
6. Program management
7. MRO (maintenance repairs & overhaul).

An interesting aspect of this programme is the strong belief that the aerospace and armament industries tend to have the most advanced technology and knowledge. As such being part of these industries will allow the emirate to 'leap-frog' into becoming a developed nation. In other words it avoids the less technologically sophisticated sectors such as car production that many countries have followed so as to acquire technology. Also, there is a strong belief that innovations in aerospace and armaments can be transferred to civilian use. Therefore, the cluster will in time develop ventures that are capable of utilising technology from aerospace and military for civilian use (Tawazun Economic Council, 2012).

6.2.3   The Long term Strategy of Tawazun

In 2002, Mubadala – the Arabic word for 'exchange' – was established by the government of Abu Dhabi, with a mandate to facilitate the diversification of Abu Dhabi's economy. Their focus is on managing long-term investments that deliver strong financial returns and tangible social benefits for the emirate. Mubadala is commercially viable, generating sustainable profits over the long term and Mubadala deliver strong social returns to Abu Dhabi and the UAE. The partnerships with world-class industry leaders underpin Mubadala's principles by bringing the knowledge, expertise and technical skills that the emirate needs to build a balanced and sustainable economy. New, knowledge-based industries are also bringing high value employment opportunities to the country, encouraging FDI and providing them with access to new global markets, both now and in the future (Mubadala Development Company, 2011).

Aerospace:

Mubadala Aerospace is helping to establish Abu Dhabi as a global aerospace hub, a cornerstone of the emirate's economic diversification strategy, through long-term, capital-intensive investments. Mubadala Aerospace's integrated approach to the aerospace sector includes comprehensive manufacturing through to MRO services. Mubadala Aerospace entered into collaboration agreements with world-class aerospace and aviation companies to

leverage the expertise necessary for a high tech end-to-end technology and manufacturing base that offers both state-of-the-art facilities and a global reach. Furthermore, the integrated pilot training academy, underpinned by education, training, and R&D, is helping Mubadala Aerospace to develop the human capital and home-grown talent needed to ensure that a growing number of high-tech employment roles are filled by UAE nationals. Mubadala Aerospace have around eight subsidiaries, which are as follows:

- **Piaggio Aero SpA**

Mubadala Development Company became a shareholder of Piaggio Aero Industries SpA. in 2006 and currently holds a 31.5 per cent shareholding in the company, which is managed by Mubadala Aerospace. Piaggio is a leading aeronautics firm specialising in the production of executive aircraft, engine parts and structural components, has key production plants in Northwest Italy with service centres in Genoa and Rome. It is the only company in the world that is active in the design, construction and maintenance of both aircraft and aircraft engines and is one of the oldest global airplane manufacturers. (Mubadala Development Company, 2011)

- **SR Technics**

SR Technics is a total solutions provider of aircraft, component, engine and technical services based at Zurich Airport. Following an increase in their shareholding from 40 per cent to 70 per cent in 2009, they have comprehensively restructured the company. Recent developments include SR Technics' announcement of a new low cost MRO facility in Malta and an 11-year maintenance contract with EasyJet, the low cost European carrier. SR Technics was named 'Leading Independent MRO Provider' in the 2010 Aviation Week MRO of the Year Awards (Mubadala Development Company, 2011).

- **Horizon Flight Academy**

A wholly-owned Mubadala affiliate company is a leading commercial and military pilot training academy, based in Al-Ain International Airport. Horizon is the first academy in the Middle East to earn the coveted Joint Aviation Requirements (JAR) certificate, and is also the region's first training organisation for helicopter pilots with European Joint Aviation (JAA) standards. It is also the academy of choice for Etihad Airways' international cadet programme (Mubadala Development Company, 2012).

- **Abu Dhabi Aircraft Technologies (ADAT)**

A wholly-owned Mubadala affiliate company is a technical and maintenance services provider to commercial and military aviation industries. Under the agreement with GE, ADAT has become the world's first MRO network provider for GEnx engines covering the Middle East and North Africa. ADAT is also a member of GE's MRO network for on-wing support services. GE and its affiliates have also granted ADAT licenses to service certain GE engines and are providing technical support and comprehensive training as part of the agreement (Mubadala Development Company, 2012).

- **Advanced Military Maintenance Repair and Overhaul Centre (AMMROC)**

AMMROC is aiming to become a centre of excellence for military MRO by providing a broad range of aviation capabilities from first line, second line and depot level MRO services to meet the growing demands of the UAE Armed Forces and regional military forces by working with local military logistic providers in UAE (Mubadala Development Company, 2011).

- **STRATA**

STRATA is a composite aero structures manufacturing facility wholly-owned by Mubadala, which has formed partnerships with a number of leading aerospace companies to establish manufacturing programmes at a new plant in Al Ain. Initial contracts, worth more than AED 4.8 billion (US$1.3 billion) have been signed with partners, including STRATA's first direct work package from Airbus. By supplying highly competitive products and services to the global aerospace industry, STRATA is supporting the development of a thriving global aerospace hub in Abu Dhabi (Mubadala Development Company, 2011).

- **Sanad**

Mubadala Aerospace launched Sanad in early 2010 to provide leasing and management of spare components and engines to the global airline industry. The company provides innovative opportunities for airlines to monetise existing assets, secure scalable inventory solutions and access the full spectrum of world class MRO and technical services offered by Mubadala's global MRO network, which includes ADAT and SR Technics. Sanad has a

growing base of customers in Europe and the Middle East, including Air Berlin and Etihad Airways (Mubadala Development Company, 2012).

6.3   Results

Prior research, such as Lado (1996), shows that for an organisation to become successful in technology transfer, all the stakeholders have to have the same intentions and motivations. Within the organisation all the key staff need to be focused on leading the organisation towards technology and innovation. It is interesting to note that all the senior staff interviewed in the research had a different view with regard to organisation aim. (The responses are in Appendices C–F). The senior staff were either focused on their level of activity within the cluster and felt that was where it ended, or assumed that the technology transfer was simply an umbrella for initiating projects. Only a small minority of respondents saw the organisation as an initiator of projects with the view of technology transfer.

The study sought to understand the dynamism with which technology evolves, and with it the firm. The survey found that a little over half of the respondents felt that the organisation was following the initial strategy when it was first established. Interestingly, only three respondents could state the exact development of the organisation's strategy and where it was at the present point. In reality, the original strategy was developed and refined with the assistance of external consultants to deal with environmental issues, most notably due to the international financial crisis. It appears from the first two responses that internal communication is a key problem within the organisation. Also, the responses from senior staff imply that they seem detached from the development and actual implementation of the strategy. This may be one reason as to why there is little in terms of commonality when the respondents were asked to list their top three objectives. The results show, by and large, a very mixed bag of responses. It seems that a tiny minority appears to provide answers that are similar. This means that the organisation's strategy at the top end is shared by a very few people. Of course, the highly confidential nature of aerospace and armament development does imply that there has to be a certain level of secrecy, but nevertheless top management need to be made aware of and to feel part of the development process.

The survey asked whether technology transfer was a key issue for the organisation, and all the respondents replied that it was. This illustrates that even though technology transfer aspects may not be communicated within the organisation, top management see it as a critical issue. Even though technology transfer may be critical to the organisation, 35 per cent of the respondents in the survey stated that it was not part of the business strategy. A further 25 per cent felt that it was part of the business strategy but to a limited extent. The importance of technology transfer being part of the organisational strategy implies that resources will be deployed in this area. Also, as part of the business strategy, the level of technology transfer will be measured and regularly assessed.

The survey sought to find out how the respondents felt technology transfer was taking place in the organisation. 30 per cent felt that the process of technology transfer was not clear or well defined. The remaining responses indicated a mixture of contractual obligations through specialist staff and by bringing in the correct partners. Interestingly, all the respondents were very clear as to where the technology was currently situated. This implies that the respondents know the source but cannot map out the transfer process. Glass and Saggi (2008) have shown that technology transfer is a process that needs a clear direction and route. In other words, for technology transfer to be effective it has to be codified. It is true that technology transfer can take place informally, but then it tends to be unstructured and very rarely codified. It appears from the responses in the survey that the organisation lacks a formal strategy and process by which to ensure that technology is effectively being transferred to the organisation from the foreign entity.

The 20 respondents were asked how the technology transfer process could be formalised and made more efficient. The overall response was to establish an 'Office of Technology Transfer' supplemented with appropriate procedures and educational awareness programmes. It appears in general that the respondents are unaware of how to adequately facilitate technology transfer. It may be the case that the organisation may, in addition to establishing an Office of Technology, also need to educate and up skill senior managers. The respondents also felt that there should be clear measurement that regularly assesses the level of technology transfer. The survey also showed that the goals of technology transfer need to be clearly stated so that adequate resources can be deployed. The survey showed that senior

managers currently have very different views as far as the goals of technology transfer are concerned. The inability of senior managers to measure the level of technology transfer may also explain why there is such a wide disparity with regard to the amount of technology transfer initiated and completed.

As far business strategy alignment with technology transfer is concerned, only three respondents felt that this was the case, while 85 per cent of the respondents stated that the business strategy was not aligned to the aim of technology transfer. This may explain why none of the respondents were able to state the same three technology transfer initiatives. The lack of understanding of the connection between technology transfer and business strategy may explain why none of the respondents felt that the organisation had sought to assess the value of its IP. This implies that valuable technology may actually go unnoticed and not be utilised to its full potential. The absence of valuing and assessing technology may also imply that its ability to make the leap to civilian uses may not be realised. The survey also highlighted a corresponding problem, which is that senior managers do not really know who to turn to when dealing with issues relating to technology transfer. When it comes to agreement with partners the senior managers are fully aware and hence the survey indicates the problem is more to do with a lack of a central coordinating function rather than a lack of skills. This lack of coordination and knowledge may explain why senior staff's awareness of the process of obtaining a patent is not as good as their awareness of the areas of business that generate the greatest number of patents.

The organisational culture is very important in facilitating technology and 90 per cent of respondents stated that top management view technology transfer as important. However, when it comes to actual involvement in the technology transfer process, top management seem to be absent. As such it appears that the organisation is simply providing lip service to the goal of technology transfer. To a certain extent this assertion is supported by the survey, in which the majority of respondents state that the organisation is not committed to technology transfer taking place. From a practical viewpoint this is illustrated through the absence of staff rotation across the different units of the organisation. Interestingly, the organisation does not have any form of cross functional meetings to facilitate an exchange of knowledge and ideas.

The survey shows that not only is the process of technology transfer limited within the organisation, but so is its future planning. The consensus view in the survey is that the organisation does not adequately plan for future technology transfer needs. This implies that technology acquisition may be motivated by non-transfer factors such as profitability, needs of the armed forces, etc. In part, the lack of planning may be due to the lack of clear measurement for technology transfer as well as lack of resources. All the respondents stated that insufficient resources are devoted towards transferring technology and that this was an area of future concern.

6.4   Policy Aspects

The Tawazun project is an important example of a government led high technology cluster focused in the area of aerospace and armaments. In many respects this is perhaps the only example of such a type of a cluster in the world and serves as an excellent study case. The survey carried out in this research has shown that although there has been over US$60 billion spent on developing the cluster and there are a number of different companies located in close geographic locations, it suffers from a number of weaknesses. The most important appears to be a clear direction with regard to technology transfer. What this study has shown is that a cluster is simply a geographical location that provides certain benefits. However, the firm needs to have a clear direction to actively exploit these benefits for the purpose of technology transfer. The direction should also be communicated to all parts of the organisation so that technology transfer is seen not only as an important aspect but that everyone is clear with regard to the organisation's goals in this respect.

Technology transfer can happen by accident in informal ways such as staff exchanges or conversations. However, this is an unstructured manner and for technology transfer to take place and generate value it needs to have clear processes along with clear measurement. The presence of a measurement process ensures that technology transfer becomes aligned to the business strategy. The reason for this is that any measure that is at odds with the business strategy will be immediately highlighted. Secondly, the fact that measurement systems have been developed becomes part of the organisational monitoring process and hence adequate resources begin to be deployed to ensuring that it takes place. From a staff awareness

standpoint the development of measurement and monitoring systems also ensures that adequate training sessions are provided as top management strive to achieve the goals.

IP is a valuable asset that many organisations tend to ignore. The ability to understand the value of IP implies that the organisation can derive greater return from it. In the case of Tawazun this could be the crossover from aerospace and military to civilian use. This can, however, only take place if there are adequate linkages in the cluster. To date, the Tawazun cluster is focused entirely on military usage and hence there has been no opportunity for the crossover to take place. It may be the case that the cluster needs to expand to include companies focused on the civilian use of technology. Another interesting aspect of the Tawazun cluster is that local linkages tend to be weaker than those at the global level. In other words, individual units have a closer contact with the aerospace centres in Europe, USA, etc. than they do with counterparts a few metres away. This implies that the cluster has been effective in creating global linkages but not at a local level. This is another inhibitor of technology transfer outside the unit.

For real technology transfer to take place within the cluster there has to be joint initiatives that seek to utilise the skills and knowledge of individual units. This type of hard linkage can be developed through government-backed projects or simply through developing an environment that allows units to exchange knowledge of the activities in which they are working. A commonly used technique for this level of technology transfer is to have staff rotation across the units or the establishment of multi-disciplinary working groups.

6.5   Summary

This chapter developed an extensive survey instrument to understand the role of clusters in facilitating technology transfer. The study analysed perhaps the only example of such a government backed high technology cluster focused in the aerospace and military sector, namely Tawazun. The cluster is a grouping of a number of companies with part ownership by foreign entities who provide capital as well as technology. The aerospace and military industries are prime examples of the most sophisticated technology with uses outside the

sector. Also, the fact that there is government backing makes it more likely that the goal of technology transfer from FDI will be realised.

The findings from this study show that the units within the cluster lack a clear direction with regard to technology transfer. In part this may be due to the organisational goals, which are largely focused on generating a financial return. The goal of technology transfer does not appear to be a formal part of the business strategy. This is clearly illustrated by the lack of measurement systems and regular monitoring of performance in this area. More importantly, none of the units have an 'Office of Technology Transfer' that coordinates the process of technology transfer and codes the knowledge. Also, such an office may also conduct the necessary awareness and skill upgrading programmes, which are important in ensuring that technology transfer takes place effectively.

From a policy perspective it appears that the sole focus on the military may itself hamper the technology transfer process from taking place: the crossover from military to civilian uses cannot take place as the cluster does not have such firms. It may be the case that the presence of high technology civilian firms may allow the flow of knowledge from Tawazun to domestic firms. Also, the cluster does not appear to have developed adequate local linkages. The importance of linkages is that they facilitate knowledge transfer to take place between suppliers and customers. In addition to assisting in building local linkages Tawazun also needs to ensure adequate incentives are provided for technology transfer to take place. Currently the Tawazun programme is focused on financial returns, without placing the same value on technology transfer.

CHAPTER 7

Host Country Factors and Technology Transfer from FDI

7.1   Introduction

In Chapter 6 the study investigated the impact of clusters on the level of technology transfer from FDI. In this chapter the study seeks to look at the role that host country factors play in facilitating technology transfer. Globalisation has impacted national economies in a number of significant ways, most prominently through the presence of MNCs. Lipsey *et al.* (1998) found that 15 per cent of world production was carried out by affiliates of foreign firms. The perceived belief in many nations is that MNCs have a positive impact on the national economy through positive spillover benefits (Head, 1998). The positive spillover effects are argued to be most pronounced in changes in the country's productivity. As a result, governments across the world have been eager to attract FDI and are no longer neutral as far as their policy in this regard is concerned. Governments have actively pursued policy changes as well as developing bespoke initiatives to meet the needs of the inward FDI. It is often argued that the modern FDI environment is heavily distorted and this seems to be supported by a UN study (UN, 1999) which found that of a sample of 60 countries that carried out 145 regulatory changes, 94 per cent were to create a more favourable FDI environment.

Governments have not only created a more liberalised regulatory system in order to attract FDI, but have also carried out direct market interventions. These market interventions are carried out by federal as well as regional or state governments. Although it is almost impossible to determine the extent of the direct intervention because more often than not they are confidential, as well as very complex, agreements that seek to hide the true cost to the government. Despite their secretive nature, certain examples are in the public domain and highlight the scale and extent of the activity. Head (1998) found that the state government of Alabama in the USA paid US$230 million or the equivalent of US$150,000 per employee to the German car company Mercedes Benz to locate their plant in the state in 1994. Girma and Wakelin (2001) report that the UK government paid the Korean company Samsung the equivalent of US$30,000 per employee, while Siemens was paid US$50,000 per employee to locate in an economically deprived area of the north east of England (Girma and Wakelin,

2001). Other governments such as Ireland offer a blanket incentive in the form of a taxation rate of only 10 per cent for all inward manufacturing investment.

The inducements paid to inward investment have intensified the competition between governments. In 2007, Intel the US semi-conductor manufacturer, chose to open the largest semi-conductor plant in Vietnam rather than Dubai because the former offered far greater inducements compared to the latter. Obviously the competition among governments to attract FDI does have a negative impact. One such negative impact is that it leads to bidding wars between countries, as witnessed in the case of Vietnam and Dubai. The end result of these bidding wars is that they spiral up the cost of attracting inward investment. More importantly, it implies that economically viable locations are excluded because their governments may not have the financial resources to induce MNCs. Similarly, labour rights or even environmental abuse may be overlooked in an effort to attract and retain inward investment.

The obvious question that arises is: why do governments participate in these bidding wars in order to attract inward investment? Such inducements are justifiable as long as the total benefit is greater than the cost. Such a justification assumes a utilitarian measure of a society's welfare that is calculated as the sum of all utilitarian benefits. The usual list of benefits that are argued to take place with inward investment have been discussed in the literature review in Chapter 2. From a social policy viewpoint, the benefit from inward investment is that they have the potential to encourage governments to improve or strengthen their infrastructure and business operating environment. For instance, the World Bank Ease of Doing Business and the World Economic Forum Global Competitiveness surveys annually publish the key attributes of countries and then rank them accordingly. The importance of this ranking in some countries is actually part of government policy. A typical example is Saudi Arabia, which publicly declared its intention to be one of the top ten countries in the World Bank Ease of Doing Business rankings (Finance Asia, Aug, 2010). As a result of such policy objectives, countries tend to pursue policies that increase the supply of educated and trained manpower, infrastructure, economic stability and transparency, trade openness etc.

Inward FDI is also argued to improve the productivity of domestic firms through technology transfer (Blomström and Kokko, 2003). The argument here is that when new knowledge enters the host country it becomes a public good and hence this spillover effect has a positive impact on the economy (Haskel *et al*., 2004). If such an argument is in fact true, then one can

claim that foreign firms do make a positive contribution to the host economy. As such, foreign firms can be considered not only to make an economic contribution to the economy, but also to create secondary spillover effects such as an increase in productivity via technology transfer.

Despite the large volume of empirical work that has been carried out examining the positive spillover effects from FDI, there appears to be little in the way of a conclusive result. The prior literature has found very mixed results even as far as the same inward investment is concerned. For instance, Larrain *et al.* (2000) find evidence of positive spillover effects from Intel's investment in Costa Rica. However, Hanson (2001) argues that no positive spillover effect took place as a result of Intel's investment in Costa Rica. The lack of a clear result along with the large inducements that are paid to inward investment raises policy issues as to whether governments should participate in such an activity. In other words, if no positive spillovers take place and the economic contribution of foreign firms is limited, then why should government pay the level and scale of incentives that they currently do? Secondly, it also challenges the argument that inward FDI leads to technology transfer, which manifests itself in the form of productivity gains for domestic firms.

The literature review does not find any prior study that has examined the positive spillover effects from inward FDI for a small but highly resource abundant country such as the UAE. As such this study seeks to fill this gap in the knowledge and to assist government decision makers in developing appropriate policy to enhance the technology transfer process so that FDI that leads not only to an economic contribution but also has positive spillover effects is attracted into the country. This chapter is structured as follows: the next section discusses the theory of productivity spillovers and the channels by which technology transfer can take place from the foreign to the domestic firm. Section 3 of this chapter discusses the data and methodology along with the estimation issues. Section 4 presents the empirical findings, Section 5 of this chapter discusses their government policy issues and finally Section 6 concludes the chapter.

7.2   Methodological Issues

Prior studies such as Meyer and Sinani (2008) amongst others, which are discussed in the literature review in Chapter 2, by and large are carried out in a framework whereby they employ either labour productivity or total factor productivity of firms as the outcome of

technology transfer. This outcome of technology transfer is regressed on a range of independent variables, i.e. host country factors, which are considered to impact the level and speed of the technology transfer. However, the host country factors are not always measureable and hence the studies tend to employ proxy variables (Blomström et al., 2000; Görg and Strobl, 2001). In the case of employing proxy variables due to a lack of measurable host country factors, the results are based on obtaining a statistically significant relationship between the proxy host country factor and the measure for productivity. As discussed in Chapter 3 for the hypotheses development, technology transfer is not instantaneous from the MNE to domestic firms but requires a period of time. To deal with this, one can use a short lag period in the regressional analysis. There appears to be no rule as to the length of the lag used, but typically it tends to be one year. The remainder of this section explains the model that is derived to statistically test the relationship between host country factors and the level of technology transfer for the UAE. The section also explains the proxy measures that are employed in the study along with their source and the rationale for their use. The development of the empirical model is discussed in detail in Chapter 4.

7.2.1   Description of the Variables

Based on the development of the hypotheses as discussed in Chapter 3, provided below is a formal definition of the dependent and independent variables used in this research (the methodology employed in this section of the study is explained in Chapter 4). These definitions have been adapted from the World Bank Development Indicators publications.

LP   **Labour Productivity**

This is measured as the GDP in nominal terms divided by the number of people in full time employment above the legal working age in the country. The source of the data is the World Bank World Development Indicators (2011).

FDISTOCK   **Stock Value of FDI**

FDI is calculated as the purchase of 10 per cent or more of the voting shares; voting power is the level of ownership necessary for a direct investment interest to exist. This is calculated as the position at the end of the beginning of the period + FDI flows + exchange rate changes + other adjustments

(such as reclassifications, etc.). FDI values are in US dollars at current prices and current exchange rates in millions. We use stock rather than flows because the latter is volatile and sensitive to short term inflows. Stocks allow us to measure the permanent component of FDI. This data is obtained from the United Nations Committee on Trade And Development.

IMITATE   **Imitation**

The levels of imitation of host country firms are seldom obvious, and even in survey studies companies tend not to state that new fixed investment was carried out in response to inward FDI. Nevertheless, imitation invariably leads to new fixed investment. Therefore, this study measures imitation as the increase or change in domestic capital formation. The source of the data is the World Bank Development Indicators (2011)

LABOUR   **Labour Mobility**

At a practical level it is almost impossible to obtain the level of labour mobility data as it would involve tracking employees working in foreign owned companies (Saggi, 2002). A proxy measure for labour mobility is the level of secondary school education as it allows employees the freedom to move from one employer to another due to their qualifications. Kokko and Blomström (1995) argue that MNEs tend to introduce more sophisticated technology in countries where there is a high proportion of skilled labour. We use a quantity measure, i.e. the quantity of labour available above the age of 15 as opposed to a quality measure such as number of high school graduates. The reason for this is that the vast majority of UAE nationals are high school graduates and the country has a 96 per cent literacy rate. The source of the data is the World Bank World Development Indicators (2011)

OPEN   **Trade Openness**

Although from a theoretical framework there may be causality from trade openness to technology transfer, there has however been some disagreement in terms of measuring the former. The revealed measure of trade openness tends to be measured as the ratio of exports and imports as a proportion of

the country's GDP. Due to the considerable importance of re-exports in the economy, the researcher includes this in the measure of trade openness. The rationale for this is that re-exports have the ability to introduce if not encourage companies to adopt new technology to gain a competitive advantage over their rivals. This is more so the case for re-exporters who are selling a third party product. The second measure of trade openness is policy based and seeks to examine the level of a country's tariff and non-tariff barriers. Although technically this is a good measure, it is fraught with difficulties. While tariff data is available through organisations such as the World Customs Association or the International Trade Center, the real difficulty is with non-tariff barriers. In many cases these barriers are opaque and implemented with little, if any, public disclosure. Therefore it is extremely difficult to determine a true measure of a policy-based approach. This study uses the revealed measure because it is clearly defined and used more often than policy-based measures. Despite its popularity, there is a disagreement regarding whether domestic or international prices should be used in determining the ratio (see Rodrik *et al*., 2002). For a country such as the UAE it may not be possible to obtain data on policy measures for the time period under consideration. This study appreciates that the revealed measure of trade openness may be impacted by factors other than government initiatives. For instance, greater accessibility to foreign markets through better logistics can increase trade without any involvement from the government. Trade is the sum of exports and imports of goods and services measured as a share of GDP. The source of this data is the UAE Ministry of Foreign Trade.

ABSORB   **Absorptive Capacity**

As discussed above, absorptive capacity relates to the level of prior knowledge that allows a host country to make effective use of new information. Ideally, the measurement of research and development spending by domestic capital would determine the level of absorptive capacity. However, in the UAE non-listed companies are not required to make their financial statements public and hence it is not possible to obtain

this data. Similarly, the level of patent registrations in the country has been very small, and very recent. Therefore, this study has sought to use the level of capital intensity. Egger and Pfaffermayr (2001) point out that inward FDI leads to an increase in domestic capital formation and hence an increase in production capacity. The new investment tends to alter the capital intensity of the industry, and only if domestic firms are close to the new level are they able to fully capitalise on the new information. In other words, the more machinery used by domestic firms the more easily they are able to make a shift to the new, even more capital intensive, processes brought in by inward FDI. This study calculates capital intensity as the ratio of the net value of fixed assets to the annual average number of workers in the country.

ECDEV   **The Level of Economic Development**

Economic development is a rather abstract concept and includes a diverse range of factors. The difficulty in deriving a single comprehensive definition of economic development has led researchers to focus on the country's level of income, which tends to ignore the human development aspects. However, prior literature such as Borensztein *et al.* (1998) does argue that economic development including human development is associated with higher levels of per capita income. As such the level of income is the outcome of the human development in the country (North, 1990). Also, the level of income determines the human development in the country. Therefore, keeping with prior literature this study uses the per capita GDP at nominal prices as the measure for economic development. The source of the data is the World Bank World Development Indicators (2011).

COMPETE   **The Degree of Domestic Competition**

The ideal measure for the level of competition in a particular industry is the market share by foreign companies. However, this type of information is not available for the UAE and hence this study uses a proxy measure that is consistent with prior literature. Nickell (1996) uses the level of import to domestic production to proxy for the level of competition as a result of inward FDI. If imports are high then it is assumed that the level of domestic

competition is low and vice versa. This study calculates this measure of domestic competition as gross imports minus re-exports, which is then divided by domestic manufacturing output. The import and re-export data is obtained from the UAE Ministry of Foreign Trade, while the manufacturing output data is taken from the World Bank World Development Indicators (2011)

INSTIDEV   **The Level of Institutional Development**

There is no clear variable that can fully explain the level of institutional development in a country. However, international groups such as Transparency International and the Heritage Foundation have sought to attempt to use various indicators to proxy for the level of institutional development in a country. The method of measurement produced by Transparency International is almost wholly focused on the aspect of corruption and hence is limited for the use in this study. The Heritage Foundation produces a much broader definition of institutional development using ten indicators, which range from business to monetary freedom. In keeping with prior literature such as Meyer and Sinani (2008) this study uses the Heritage Foundation Economic Freedom Index. This study uses the overall measure that includes all ten aspects of institutional development including corruption. High values indicate high levels of institutional development and vice versa.

7.2.2 Data

This study carries out a descriptive statistical analysis of the data as listed in the previous section so as to better understand their distribution. The output of the descriptive statistics is shown in Table 7.1 below.

Table 7.1   Descriptive Statistics for Trade, FDI and Technology Transfer Characteristics

	N	Minimum	Maximum	Mean	Std. Deviation
LP	30	2.7965E4	9.2879E4	4.2571E4	1.6381E4

	N	Minimum	Maximum	Mean	Std. Deviation
FDISTOCK	30	392.29	72,226.53	10,432.7124	20,611.63298
IMITATE	29	−4.0435E10	7.4883E9	−2.5703E8	7.9802E9
LABOUR	28	48.3002	95.2003	71.4701	12.3709
OPEN	28	8.7134E1	1.65474E2	1.2541E2	2.50745E1
ABSORB	28	6.7107E3	1.4841E4	9.6493E3	2.5692E3
ECDEV	30	1.4172E4	5.8272E4	2.4051E4	1.1139E4
COMPETE	27	2.1221E0	5.0629E0	3.0438E0	0.8049
INSTIDEV	15	57.1	60.2	58.787	1.1544

In the case of the dependent variable, namely labour productivity, this study finds that over the 30-year period ending 2010 the mean value is AED 42,571 with a standard deviation of 16,381. However, labour productivity has changed greatly over the period under consideration, as shown in Figure 7.1. The study finds that from 1980 to the late 1980s labour productivity was on a downward path. From a macroeconomic viewpoint this was a very difficult time for the whole region, as the first Gulf War between Iraq and Iran was taking place. During this period investment and stability in the region was not very high, which has seemed to have impacted negatively on labour productivity. At the end of the Gulf War labour productivity seems to have risen a little. However, this period of improvement was followed by the second Gulf War, which again affected the whole region. Although the second Gulf War was short-term in nature and led to the freedom of Kuwait on 27th February 1990, it nevertheless brought considerable uncertainty to the region. Between February 1990 and the removal of the then president of Iraq, Saddam Hussein, the region was under constant fear of war. As a result, investment was limited in the hydrocarbon extraction and processing sectors. The low points in labour productivity in the late 1990s seem to have been impacted by the low oil price. During this period the Brent crude oil price had reached US$9.75 per barrel. From 1999, labour productivity seems to have increased right up until the international financial crisis in 2008, with the collapse of Lehman Brothers Bank in September 2008. The increase in labour productivity in 1999 was initiated by large-scale fiscal stimulus focused in the area of construction. For instance, the emirate of Dubai initiated the Dubai Marina project at about this time, which led to the start of the sale of lease and freehold property in the country. Also, at about this time emirates such as Dubai started the Dubai Quality Award, which sought to improve the quality level of the processes and in turn the productivity of labour. However, the greatest change in labour productivity was brought about

through the establishment of service sector free zones, such as Dubai Internet City and Dubai Media City in October 2000. These new free zones allowed foreign investors to establish fully owned operations in the country. Until 2000, foreign investors could only establish fully owned operations in Jebel Ali, which catered primarily to manufactured goods for overseas markets. From 2000 to 2008 labour productivity seems to have tripled, as shown in Figure 7.1.

Figure 7.1   UAE Labour Productivity 1980 to 2010
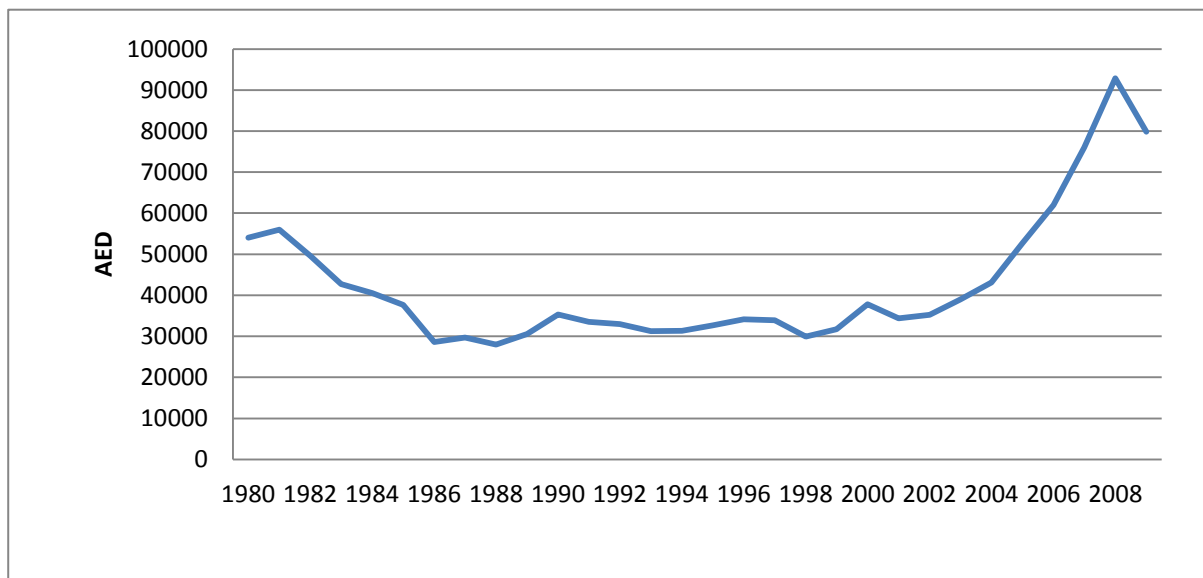
Source: Calculated from data obtained from WDI Database (2011).

As discussed earlier, until 2000 the growth in inward investment into the UAE was fairly constant. At the end of 1999 the stock of inward investment stood at US$1.5 billion. Over the next decade the figure had increased to US$72.2 billion (UNCTAD, 2001). Without repeating the discussion in earlier chapters, the key reasons for the change in FDI stock was a more receptive business environment that allowed foreign investors to establish fully owned businesses; greater opportunities due to the initiatives that took place in the country especially in the real estate, hospitality and retailing sectors; the country becoming aggressive in attracting inward investment; the lowering of rates of return in other countries and hence investments in the UAE becoming more attractive; the improvement of regional stability, especially with the removal of Saddam Hussein; the aftermath of September 2011 and the attack on the World Trade Center in the USA, which meant that regional wealth that was invested in the US and Europe was returning; and the higher oil revenues, which meant that the country was able to invest in joint venture projects with overseas investors.

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IMITATE, which is proxied through the use of annual increase in domestic capital formation, has a mean value that is negative. The main reason for this is that there are a number of years when the domestic capital formation fell. Typical examples include the period from 1980 to the mid-1980s, early 1990s and after the international financial crisis in 2008. It appears that the low points in IMITATE and LP are similar, and for the same reasons. Improvements in labour productivity are dependent on increased automation, which itself requires an increase in domestic capital formation. We use IMITATE as it allows us to capture the differing impact of the services and manufacturing sectors.

LABOUR represents the percentage of the population above the age of 15 who have completed secondary school education. At the start of the observation period about 50 per cent of the population had completed secondary school education, which 30 years later had increased to 95 per cent. The rise in secondary school education has been one of the key government policies. As such it has had to deal with educating women, who represent a little over half the population. The success of the government in its education policy is illustrated in the achievement that the country has made. The remaining 5 per cent of the population who have not received secondary education and constitute part of the data set are those from the early period and who are largely approaching retirement age.

Trade has been an important aspect of the UAE economy and therefore it is no surprise that the economy is extremely open. At the start of the observation period in 1980, trade represented 100 per cent of GDP, which over the 30-year period increased to 160 per cent just before the international financial crisis and then came down slightly. Throughout the observation period, trade has been greater than the value of GDP. This study uses capital intensity to proxy for prior knowledge, with the implication that a country with a higher level of capital intensity is more able to absorb new technology. The data shows that, on average, capital intensity was US$9,600 during the observation period. During the 1980s capital intensity fell from US$14,841 in 1980 to US$6,710 in 1988. The lack of investment during this period as a result of regional uncertainty due to the Gulf war seems to have had a negative impact. After the Gulf war there was a period of investment and this is reflected in an increase in capital intensity to the mid-1990s. The lower oil prices in the period from the mid-1990s to the end of the millennium were witnessed by a 20 per cent or so drop in capital intensity. The lower revenues imply that government expenditure fell considerably in an economy where it accounts for almost 40 per cent of total expenditure.

From the turn of the current millennium capital intensity has increased each year, and the value just before the international financial crisis was equal to the 1980 figure. Since the start of the international financial crisis the level of capital intensity has fallen a little.

Since the establishment of the UAE the country has wisely employed its oil revenues to achieve one of the most impressive economic growth rates. However, during this period the population has increased considerably. The end result has been that GDP per capita has varied greatly over the last 30 years. Between 1980 and 1988 GDP per capita halved in the country. As discussed above, a primary reason for the huge reduction in GDP per capita during this period was the regional uncertainty as a result of the Gulf War. GDP per capital increased from the end of the Gulf war to the invasion of Kuwait, after which it fell, reaching a low point in 1994. Therefore were three years or so during which GDP per capita increased before declining again till the end of the millennium. From the start of the millennium, GDP per capita increased each year, up until 2008 when it reached US$58,000, before falling to about US$50,000 in 2010. The mean value of GDP per capita over the 30-year observation period is US$24,000.

The level of competition in the economy, i.e. COMPETE, is proxied through import intensity. The level of import intensity in the economy has varied considerably, reflecting the level of domestic production and the opportunities that firms have had within the region. Between the start and end of the 1980s the level of import intensity fell and one can argue that the domestic firms became aggressive. The response of the domestic firms was in part due to limited regional opportunities to export as a result of the Gulf war. Therefore domestic firms needed to hold on to their domestic market during this period. After the Gulf War, considerable opportunities opened up for domestic firms allowing them to export. As a result, this study finds the level of domestic competition to be low during this period. Again from 1992 to the end of the millennium the level of domestic competition increased as firms sought to hold on their home market. From the start of the current millennium import intensity has increased. The average value for import intensity over the 30-year period has been three times domestic production.

The data for institutional development is a comprehensive composite of ten factors compiled by the Heritage Foundation. According to the measure, higher values imply a higher level of institutional development. The mean value over the observation period has been 58.8, with a low value of 57.1 in 1996 and a high point of 60.2 in 2008. Consistent with most of the indicators discussed above, there appears to be a significant decline in institutional development during the

1990s. From the start of the current millennium institutional development has increased each year. However, the improvements made in institutional development have been very small.

7.2.3   Skewness and Kurtosis Tests

In order to understand the shape of the dataset, this study must calculate the skewness and kurtosis. Through these two statistical tests this study is able to understand if the dataset has single peak or multiple peaks, is skewed to one side or the other, i.e. positively or negatively, or is even symmetrical in nature. Table 7.2 shows the skewness and kurtosis statistics for the sample data. The general rule in interpreting skewness is that: if skewness is less than −1 or greater than +1, the distribution is highly skewed. If skewness is between −1 and −½ or between +½ and +1, the distribution is moderately skewed. If skewness is between −½ and +½, the distribution is approximately symmetric. The general rule in interpreting kurtosis is that: if the kurtosis value is less than −2, the population very likely has negative excess kurtosis, i.e. a flat top but the extent of the flatness is not known. If the kurtosis value is between −2 and +2, it is difficult to reach a conclusion about the kurtosis and it can be positive, negative, or zero. If the kurtosis value is greater than +2, the population very likely has positive excess kurtosis, i.e. a peak. If the kurtosis value is equal to 3 the population is symmetrical in nature (Kohler, 2010).

This study finds OPEN to be between points −0.5 and +0.5 implying some level of symmetrical behaviour in the data. There is no economic rationale as to why OPEN should be symmetrical in nature except that trade behaviour takes place in cycles and this is reflected in the data. ABSORB seems to be moderately skewed, while all other variables are highly skewed as their value falls below −1 or above +1. As far as the kurtosis is concerned, this study finds that INSTIDEV has a flat shape and this is consistent with the discussion in the earlier section. All the other variables seem to have at least one peak. This study does not find evidence to support the earlier finding that OPEN may be symmetrical in nature. The estimates for skewness and kurtosis are presented in Table 7.2 below.
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Table 7.2   Skewness and Kurtosis Statistics

	N	Skewness		Kurtosis	
		Statistic	Std. Error	Statistic	Std. Error
LP	30	1.746	0.427	2.576	0.833
FDISTOCK	30	2.227	0.427	3.846	0.833
IMITATE	29	−4.818	0.434	25.171	0.845
LABOUR	28	0.101	0.441	−0.745	0.858
OPEN	28	−0.035	0.441	−1.368	0.858
ABSORB	28	0.972	0.441	−0.249	0.858
ECDEV	30	1.827	0.427	2.828	0.833
COMPETE	27	1.057	0.448	0.438	0.872
INSTIDEV	15	−0.383	0.580	−1.688	1.121

7.2.4   Correlation Coefficient Matrices

As explained in Chapter 5, Section 3.2, the correlation coefficient between each pair of variables describes its nature and the strength of the relationship. Accordingly, the correlation analysis shows that labour productivity is highly dependent on all the variables used in the empirical model, except OPEN and COMPETE. It is important to note that the Pearson correlation coefficient, which is used in this study, only indicates the movement of the variables and not whether a change in one impacts the other. The latter is determined in the next section, where a regressional analysis is carried out. Table 7.3 also presents the level of correlation between the explanatory variables, which is usually associated with multicolinearity. (In Chapter 4 the researcher discussed the five methods of dealing with multicolinearity and its impact on empirical models.) There is no real level of correlation that can be considered to lead to multicolinearity in the empirical analysis. However, Gujarati (2009) argues that 0.8 as an arbitrary value is used, and using this figure this study does do not find a problem with multicolinearity.

7.2.5   Other Statistical Issues

In statistics there are some aspects that are extremely important for the reliability of the results. One such concept is that of the degrees of freedom (commonly abbreviated as df) which is central to estimating the statistics of populations from samples of them. In many cases degrees of freedom is considered as a mathematical restriction that is placed when estimating one statistic from an estimate of another. For instance, in the case of a normal distribution, which has a mean of 0 and standard deviation (sd) of 1. The values for the mean and standard deviation for a population are referred to as *mu* (or μ) and sigma (or Σ) respectively, while those for a sample are *x-bar* and *s*. In order to calculate the standard deviation, i.e. sigma, one uses the following equation:

$$\sigma = \sqrt{\frac{\sum (x-\mu)^2}{n}}$$

(7.1)

In order to estimate sigma, *mu* needs to be estimated, which in the case of a sample is substituted by *x-bar* as shown in Equation 7.2. Equation 7.2 estimates deviations from *mu* from *x-bar*, and hence the restriction that the divergences must sum to zero is placed. Thus, degrees of freedom are (n−1) in Equation 7.2 below:

$$s = \sqrt{\frac{\sum (x-\bar{x})^2}{n-1}}$$

(7.2)

It is important to note that *x* is an observation from the sample, *x-bar* is the sample mean, *n* is the sample size, *s* is the standard deviation of the sample. When the same type of restriction is applied to a regression and analysis of variance as the type used in this study the result is one degree of freedom is lost for each parameter estimated. The concept of degrees of freedom can be shown using an example whereby one has four numbers that must sum to a predefined total. If the first three numbers are selected randomly then the fourth must be chosen so as to arrive at the predefined total. As a result, the degrees of freedom in this case are only three, while the fourth parameter is restricted. In the case of a regression with *n* observations with (*p+1*) parameters to be estimated, it implies one regression coefficient for each of the

predictors plus the intercept. This leaves ($n-p-1$) degrees of freedom for error, which accounts for the error degrees of freedom in the ANOVA table. The null hypothesis tested in the ANOVA table is that all of coefficients of the predictors are 0, which accounts for the regression degrees of freedom in the ANOVA table. It is important to note that the greater the number of parameters, the larger the degrees of freedom, and of course the corresponding likelihood of errors.

Another statistical aspect that is important in regression analysis is that of omitted variables, which occurs when a model is incorrectly developed because it leaves out one or more important causal factors. As a result of the omission the model leads to a bias created through compensating for the missing factor by overestimating or underestimating the impact of one of the independent parameters. From a statistical viewpoint, omitted variable bias requires two conditions to hold for it to exist. The first condition is that the omitted variable needs to be an independent variable that determines the dependent variable. Second, the omitted variable needs to be correlated with one or more of the independent variables that have been included in the model. The second condition exists because it implies that the covariance of the omitted variable and the independent variable is not equal to zero. In the case of a regression, one of the assumptions is that the error term is uncorrelated with the regressors. However, the presence of omitted variable bias violates this particular assumption and leads the regression estimates to be biased and inconsistent.

Table 7.3   Pearson Correlation Coefficient Matrix for the Dependent and Independent Variables

		LP	FDISTOCK	IMITATE	LABOUR	OPEN	ABSORB	ECDEV	COMPETE	INSTIDEV
LP	Pearson Correlation	1	0.895**	−0.504**	0.384*	0.232	0.833**	0.992**	−0.157	0.722**
	Sig. (2-tailed)		0.000	0.005	0.044	0.234	0.000	0.000	0.434	0.002
FDISTOCK	Pearson Correlation		1	−0.472**	0.708**	0.531**	0.411*	0.932**	−0.181	0.693**
	Sig. (2-tailed)			0.010	0.000	0.004	0.030	0.000	0.367	0.004
IMITATE	Pearson Correlation			1	0.741**	0.661**	0.364	−0.492**	−0.006	−0.211
	Sig. (2-tailed)				0.000	0.000	0.057	0.007	0.976	0.468
LABOUR	Pearson Correlation				1	0.883**	−0.084	0.510**	−0.076	0.551
	Sig. (2-tailed)					0.000	0.678	0.006	0.713	0.051
OPEN	Pearson Correlation					1	−0.008	0.378*	0.051	0.319
	Sig. (2-tailed)						0.967	0.047	0.801	0.287
ABSORB	Pearson Correlation						1	0.753**	−0.055	0.504
	Sig. (2-tailed)							0.000	0.786	0.079
ECDEV	Pearson Correlation							1	−0.210	0.748**
	Sig. (2-tailed)								0.293	0.001
COMPETE	Pearson Correlation								1	−0.501
	Sig. (2-tailed)									0.081
INSTIDEV	Pearson Correlation									1
	Sig. (2-tailed)									

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

7.3 Results

This study carried out a standard OLS regression, which this research argues to be sufficient and consistent with much of previous literature, such as Blomström and Sjöholm (1999), in order to test this relationship. This study finds ECDEV to be statistically significant at the 1 per cent level, implying that the level of economic development has a positive impact on the level of technology transfer from the MNE to domestic firms. As such this study finds the level of host country economic development to be an important contributory factor to technology transfer. For instance, Romer (1993) found that capital was not the problem for developing countries, but rather their ability to apply the new information. This is relevant for the UAE, which is one of the top five producers of hydrocarbons in the world and has no external federal government debt of any kind. In fact, the government has over US$800 billion in assets through its sovereign wealth fund. Therefore, it is relevant that the ability to apply new information is an important aspect of its ability to extract knowledge from MNEs. The statistically significant and positive relationship between ECDEV and labour productivity also supports the findings of Blomström *et al.* (1994), Borensztein *et al.* (1998a, 1998b), de Mello (1999), Campos and Kinoshita (2002), Tu and Tan (2012), amongst others, which showed that inward FDI had a positive impact in the higher income developing countries than in the lower incomes group.

Past knowledge that allows a host country to make effective use of new information, which is normally referred to as the absorptive capacity of the host country, is found to have a positive impact on the level and speed of technology transfer from the MNE to domestic firms. The results similarly find that the absorptive capacity of the UAE has had a positive impact on the level of technology transfer. Although, the results are consistent with prior literature such as Borensztein *et al*. (1998a, 1998b), the level of statistical significance is only at the 10 per cent level. This study argues that the lower statistical significance is due to the fact that, as explained in Chapter 1, a large proportion of inward FDI into the UAE is into the hydrocarbon sector. This is a rather unique sector, in that the operators of the hydrocarbon plants or rigs are international consortiums of MNEs. As such these international consortiums of firms operate similar plants or rigs throughout the world and hence have their own level of absorptive capacity, which is independent from the host country. In other words, the unique nature of agreements that have been signed by the government in the hydrocarbon sector give operational control to consortiums of MNEs who do not rely on the skills or knowledge available in the host country. However, the positive impact of ABSORB in the model does

implies that outside the hydrocarbon sector the level of absorptive capacity is an important factor in technology transfer from MNEs to domestic firms. Overall the result is consistent with prior literature (Keller, 1996; Konings, 2001; Bjorvatn et al., 2002; Blomström and Kokko, 2003; Spencer, 2008).

In the hypotheses development this study argues that the level of competition in the host country tends to encourage domestic firms to apply the new knowledge learnt from MNEs. In the absence of competition, domestic firms lack the incentive and will be content to use older technology. The results shows that COMPETE is positive and statistically significant at the 1 per cent level. As such the results show the level of competition brought about from the presence of MNEs to encourage domestic firms to reassess their production processes and innovate in order to remain competitive. The results are consistent with prior studies such as Blomström (1992) and Glass and Saggi (1998). Taking the OLS results along with the correlation coefficients, this study argues that COMPETE appears to be motivated by the need for survival as opposed to the two motivations listed by Aghion and Howitt (1998) and discussed in the hypotheses development section above. The reason for this is that COMPETE becomes relevant when the economic indicators are falling and the domestic market conditions are difficult. In some sense this is similar to the finding by Nickell (1996) that financial pressures impact on the domestic firms' acquisition of technology.

Saggi (2002) argues that trade openness leads to greater technology transfer from the MNE to the domestic firms. The argument is that domestic firms learn from foreign MNEs as well as developing a strategy to deal with the increased level of competition. Therefore, trade openness is assumed to have a positive relationship with technology transfer (Aitken *et al.*, 1997; Barrios *et al.*, 2003; Greenaway *et al.*, 2004). The results do find a statistically significant relationship between labour productivity and trade openness (i.e. TRADE) at the 1 per cent level. This study finds a negative relationship, which begs the questions as to why greater trade openness would lead to a lower level of technology transfer. This study argues that to answer this question one has to examine the trade activity in the UAE. The most important segment is re-exports, and as such the UAE is the worlds' third largest re-export centre after Hong Kong and Singapore. As such the re-exporter adds little to the GDP of a country and even less as far as technology transfer is concerned. Therefore any improvement in trade openness tends to make a greater difference to the re-export sector.

Secondly, gold and jewellery exports constitute approximately 60 per cent of the export value (UAE Ministry of Foreign Trade). In the case of gold, the UAE imports scrap gold and refines it for export, while in the case of jewellery, gold items are produced using largely cheap expatriate labour. As such the gold and jewellery sector has a limited level of technology in the country and any increase in exports does not change the production process. The very nature of gold refining implies that UAE companies are not exposed to new technology because similar processes are used in developed countries. Thirdly, the countries to which the UAE exports tend to be regional and price elastic in nature, whereby quality is of secondary importance. For instance, India accounts for about 40 per cent of exports, followed by Iran, Saudi Arabia and Pakistan. In fact, about 80 per cent of the country's non-oil exports are accounted for by ten regional countries. The results lead us to believe that the emphasis for UAE firms has been to lower prices rather than acquire new technology when trade openness increases. However, when regional countries reduce their imports then UAE firms are more likely to acquire new technology in order to survive or target countries where quality is more important than price.

The hypotheses development of this study discussed the various studies that show that the level of institutional development can increase the level of inward FDI and hence the opportunity for technology transfer (Alemu, 2012) as well as those that show that it makes no difference because countries with low levels of institutional development are not disadvantaged when it comes to inward FDI (Henisz, 2000). The results show INSTIDEV to be statistical significant at the 5 per cent level, implying that it does impact the level of technology transfer. However, contrary to prior expectations, this study finds a negative relationship between INSTIDEV and labour productivity. This study argues that any improvement in institutional development alters the balance of power from domestic firms to MNEs. In other words, domestic firms feel more comfortable in an environment whereby social networks allow them to obtain the necessary permissions and permits, i.e. less developed institutional structures. In a more transparent system it appears that domestic firms become less likely to invest in new technology.

Qualified and skilled labour is the backbone of any country's economic growth and technological progress. In the hypotheses development, this study argues that the presence of MNEs improves the productivity of labour (Noorbakhsh *et al.*, 2001). On the other hand, there are studies such as Enderwick (1985), which reports that there is considerable

disagreement in the literature as to whether the presence of a MNE in the host country has a positive impact on labour productivity. The results show a statistically significant relationship between the proportion of labour with secondary level of education and labour productivity at the 5 per cent level. However, contrary to prior expectations, this study finds a negative relationship between labour productivity and LABOUR. This study argues that the UAE is unique globally in that 90 per cent of the population is foreign and expatriate in nature. As such the decision of MNEs to locate in the UAE is not determined by their ability to recruit from the local population but the ease to which they can employ from the wider region. This study also argues that the fact that MNEs can employ foreign labour has a negative impact on the level of technology transfer that can take place in the country. The reason being that foreign labour are usually tied to the company through various factors such as the need to obtain 'a letter of no objection' from the current employer before they can move to another firm, which is rarely provided, and employment clauses that restrict their ability to join other firms in the same sector, and so on.

This study does not find any statistically significant relationship for FDISTOCK and IMITATE with labour productivity. This study finds that in the case of FDISTOCK it is not the stock of inward investment that determines the level of technology transfer but the sectors in which it takes place, such as aerospace and ammunitions. This study argues that certain sectors have a greater probability of leading to technology transfer while others do not. Chapter 3 illustrated the various sectors that have tended to attract inward investment into the UAE. The most important sector since 2002 has been the property and real estate sector. This particular sector is not characterised by a high level of technology and, particularly in the UAE, low paid workers from the region are used. This implies that for inward FDI to make a significant impact it needs to target key sectors with new technology that can be transferred to domestic firms and used across different sectors. Similarly, this study does not find that UAE companies imitate foreign MNEs. To a certain extent these results are contrary to those of Ben-Hamida (2011), whereby medium to low technology sectors benefit from FDI induced technology transfer. The reason for the differences in results is that FDI into the UAE has largely been in the labour concentrated services sector. Therefore, this study finds that a simple distinction between services and manufacturing is not sufficient, but also their connection to the level of capital.

Another reason as to why the results do not show any statistical significance for IMITATE is the fact that MNEs tend to locate themselves in free zones so that they can have sole ownership. In the UAE sole ownership is only possible in the free zone, and in the mainland a company needs a UAE national as partner. In contrast, domestic or UAE owned firms do not have the problem of ownership and locate outside free zones. Therefore, it is felt that that there is not much in terms of communication or linkages between the firms in free zones and those outside. Therefore, there is little opportunity for domestic firms to learn from MNEs. However, where such information does pass into the mainstream industry it is imitated. For instance, the ISO 9000 standard is a typical example, which was introduced to the country by MNEs and now almost all firms that are classified medium sized and larger have this certification.

Table 7.4   OLS Estimates for FDI, Technology Transfer and Labour Productivity Model

Model		Unstandardised Coefficients		Standardised Coefficients		
		B	Std. Error	Beta	t	Sig.
LP	(Constant)	40,127.147	13,348.657		3.006[a]	0.007
	FDISTOCK	−0.033	0.035	−0.041	−0.925	0.366
	IMITATE	3.669E-8	0.000	0.018	1.275	0.216
	LABOUR	−72.904	32.378	−0.053[b]	−2.252[b]	0.035
	OPEN	−43.791	10.954	−0.065[a]	−3.998[a]	0.001
	ABSORB	0.205	0.115	0.031[c]	1.789[c]	0.088
	ECDEV	1.590	0.073	1.081[a]	21.793[a]	0.000
	COMPETE	852.065	170.302	0.040[a]	5.003[a]	0.000
	INSTIDEV	−498.654	219.956	−0.024[b]	−2.267[b]	0.034

[a,b,c] refers to 1 per cent, 5 per cent and 10 per cent significance levels.

The predicted relationship has a very good R squared and adjusted R squared of 0.998. This implies that the model is able to explain 99.8 per cent of the variation in labour productivity.

Table 7.5   OLS Model Summary

Model	R	R Squared	Adjusted R Squared	Std. Error of the Estimate
1	0.999[a]	0.999	0.998	6.5768E2

This study finds the whole model to be statistically significant at the 1 per cent level with an F statistic of 2,246. This study argues that this test statistic confirms the validity of the model and its ability to predict changes in labour productivity, which is the proxy for technology transfer.

Table 7.6   OLS Model ANOVA Estimates

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	7.773E9	8	9.716E8	2,246.253	0.000[a]
Residual	9,083,429.551	21	432,544.264		
Total	7.782E9	29			

7.3.1   Modified Model using Dummy Variables

This study sought to carry out variations on the model, the results of which have been presented in Section 7.3 above. The variation that the researcher has used is to develop dummy variables for some of the determinants. According to Gujarati (2009) a dummy variable is one that is created by the researcher in order to represent a factor that can have two levels (it is possible for a dummy variable to have more than two levels). As such, a dummy variable is a numerical representation of a particular state, and the common technique is to use a binary variable. For instance, one can use a variable for data relating to the years before a critical year and 1 for the period following this. Dummy variables are used in order to stress test a particular model, but also to overcome the key weaknesses of the standard OLS regression, which is that it accommodates only quantitative response and explanatory variables. Through the use of dummy variables qualitative explanatory variables can be incorporated into a standard OLS regression model. In this respect dummy variables can deal with say data relating to males and females and hence provide an understanding of the impact of gender.

In this study, of the eight determinants the researcher believes that the one that lends itself to be developed onto a dummy variable is one that captures the level of FDI Stock before and after the establishment of the new special or free zones. Until

the establishment of the Dubai Technology and Media Authority (Tecom) in 2000, the emirate had just one free zone, namely Jabel Ali. Tecom changed the manner in which FDI flowed into the UAE through opening the market for services, relaxing company registrations, allowing previously tightly controlled sectors such as media to have foreign ownership. Since 2000 Tecom has become responsible for over a dozen free zones and has been the inspiration for many others to be established throughout the UAE under the same principle. The researcher carried out the same regression model as that discussed in Section 7.3 but excluded the FDISTOCK and replaced it with a new term namely EASEDIC, which is 0 for the period prior to 2000 and 1 thereafter. The researcher believes that EASEDIC may provide a better facility by which to capture the erratic flows of capital into a country and make it more stable through a binary variable. Table 7.7 illustrates the results of the model with a dummy variable.

Table 7.7   OLS Model with Dummy Variable Estimates of Coefficients

Model	Unstandardised Coefficients	Standardised Coefficients	t	Sig.	Model
(Constant)	50,232.706	26,465.830		1.898	0.154
IMITATE	−1.704E-007	0.000	−0.031	−0.666	0.553
LABOUR	374.657	239.699	0.156	1.563	0.216
OPEN	−38.426	24.037	−0.036	−1.599	0.208
ABSORB	0.087	0.580	0.012	0.150	0.890
ECDEV	1.370	0.129	0.929	10.630	0.002
COMPETE	−571.686	1,013.484	−0.018	−0.564	0.612
INSTIDEV	−1,141.949	446.520	−0.089	−2.557	0.083
EASEDIC	1,549.059	1,057.595	0.054	1.465	0.239

[a,b,c] refers to 1 per cent, 5 per cent and 10 per cent significance levels.

The results from the modified model with dummy variable EASEDIC are not too different from the original regression. Although, the general pattern of statistical significance is similar, the results do indicate a lower level of statistical significance. In other words, the research finds that the original model produces much higher levels of statistical significance. Interestingly, this research finds that the establishment of Tecom has increased the level of technology transfer proxied through labour productivity. This is an important result, because it implies that FDI took place that was diffused into the wider economy. There are very good reasons for this in that the Tecom project was focused on the services sector and primarily on technology. The results show that this policy has been effective in achieving its aim.

Table 7.8   OLS Model with Dummy Variable Summary

Model Summary

Model	R	R Squared	Adjusted R Squared	Std. Error of the Estimate
1	1.000	1.000	0.999	433.08908

The results show that the adjusted R squared is 0.999, implying that the independent variables explain almost all of the variation in the dependent variable.

The difference in results between the model with and without dummy variables is very small indeed and does not change the conclusions as discussed in Section 7.2.

7.4   Policy Implications

The study highlights very important results, which necessitate a change in the UAE's FDI policy and, to some extent, industrial structure. This study finds the ECDEV to be an important contributory factor to technology transfer. This study argues that the government needs to enhance the level of economic growth, which the study shows tends to lead to a higher level of technology transfer. This also supports the findings in Chapter 5 Section 5.6, whereby high levels of economic growth are associated with greater inward FDI. In addition to this, the country needs to reassess its trade policy. This study does not find a relationship between trade openness and technology transfer to exist in the case of the UAE because trade is heavily biased towards the re-export sector as well as in low technology sectors such as gold and jewellery. This study does not argue for a trade policy that disadvantages these sectors because they are important for the country's non-oil economy. Instead the country should implement a trade policy that seeks to develop new sectors that are capable of being globally competitive. In doing so the country should seek to place a lower emphasis on re-exports and the gold and jewellery sector. More importantly, the new sectors should be capable of absorbing new technology and transferring it to different industries within the country.

Overall the evidence seems to suggest that, in general, intervention should be targeted largely at providing a supportive economic environment. More specifically, this flags up a role for the effective use of trade related investment measures (TRIMs). The TRIM Agreement is part of the World Trade Organisation treaties and allows countries to impose certain restrictions. In the past countries have imposed some of the following restrictions on inward FDI: use of locally-produced goods; domestic manufacturing of certain components; trade balancing; domestic sales; technology transfer requirements, export of a specified percentage of production volume; local ownership rules; foreign exchange and remittance restrictions; licensing and employment restrictions. Although some of these measures, such as use of locally produced goods, are now banned, nevertheless the government should develop measures that are permitted by the WTO and assist local firms in acquiring technology from MNEs. For instance, the government can play a facilitating role in creating effective and

tangible linkages between MNEs and domestic firms, especially SMEs. This study argues that the development of linkages will lead to the flow of technology transfer. This is an important issue for MNEs located in free zones and without any contact with local firms who are outside free zones. This study also argues that part of the incentives provided to MNEs should require them to mentor and work with local firms so that a flow of knowledge can take place and to stimulate inter-industry spillovers.

This study does not find evidence to support that labour mobility takes place from MNEs to domestic firms, and hence the flow of knowledge from the former to the latter does not take place. The heart of this problem is the structure of the local labour force and the educational system in the country. In the case of the latter, this study finds that, from a listing of all accredited universities by the UAE Ministry of Higher Education and Research, only a handful of universities offer courses in subjects other than Business Studies and Information Technology. As a result, this study argues that UAE nationals are being educated, but primarily in areas of business studies and information technology. Such a narrow and highly concentrated educational focus is not conducive to the acquisition of technology, especially scientific or production based. Therefore the government has to reassess its educational system and structure so that the foundation of technology is part of the school curriculum. In other words, there needs to be an emphasis on developing a nation of people who have skills that are broader than business studies and IT. Similarly, universities have to be encouraged to offer a broad range of courses as a part of their accreditation and licence.

This study argues that the highly concentrated nature of skills among the UAE nationals creates the first problem, namely the structure of the labour force. Data from the national Bureau of Statistics shows that about 40 per cent of the UAE labour force is employed in government departments. As such this segment of the labour force has little opportunity to benefit from the knowledge flows from MNEs. More importantly, the UAE labour force that is employed in the private sectors tends to be in sectors where there are quotas and requirements, such as the oil and gas as well as banking sectors. This study argues that UAE national labour needs to be re-skilled and retrained so that they can take a more effective role in the private sector. At the same time, incentives need to be provided to UAE nationals to enter the private sector as well as to firms to recruit them. However, this study appreciates that this will not happen unless the benefits in the government sector are brought down to the levels where they are comparable to the private sector.

This study believes that the government needs a well thought out inward FDI strategy that seeks to meet the objectives of its industrial and labour policies. In particular, the government needs to attract inward FDI that stimulates domestic firms in terms of start-ups, supply chains and acquisition of technology. This study argues that the recent emphasis on property and real estate sectors has not had any impact on the flow of knowledge to domestic firms. This study argues that, in addition to selecting sectors that can assist the domestic industrial sector, inward FDI needs to be encouraged to actually conduct the bulk of their manufacturing in the host country. In recent years there has been an influx of FDI, but largely for the set-up of representative or sales offices, with little in the way of actual production. Also, this inward investment needs to be encouraged to conduct R&D within the country. The actual process of R&D tends to spur two important spillover effects. Firstly, the setting up of R&D in the country encourages domestic firms to establish similar facilities and develop technology. Secondly, R&D creates linkages with universities through joint projects, or even natural interaction among researchers. As such this encourages universities to conduct more applied research with market-based outcomes. Also, the registering of patents in the country has a positive impact on the protection of knowledge as well as encouraging an innovation-based culture in the country.

7.5   Summary

This chapter has examined the very important issue of host country factors and their impact on the level and speed of technology transfer from MNEs to domestic firms. Prior literature (Romer, 1990, Grossman and Helpman, 1991; Rivera-Batiz and Romer, 1991; Aghion and Howitt, 1992) has found that there are three key transmission mechanisms by which MNEs can transfer knowledge to domestic firms, namely through imitation, labour mobility and trade openness. This study examined these three transmission mechanisms along with host country factors that have been deemed to impact technology transfer, namely the level of host country economic development; competition amongst firms in the host country; prior knowledge that allows them to apply new information, which is termed as the absorption capacity; and institutional development, which includes the regulation, corruption etc. These factors were empirically tested against labour productivity, which is argued is a good proxy for technology transfer. In other words, if firms acquire new technology it will lead to an improvement in labour productivity.

The results show that the level of economic development to positively impact on labour productivity. This study finds evidence that absorptive capacity has a positive impact on the level and speed of technology transfer from the MNE to domestic firms. The results show that the level of competition brought about from the presence of MNEs encourages domestic firms to reassess their production processes and innovate in order to remain competitive.

The results do find a statistically significant relationship between labour productivity and trade openness (i.e. TRADE) at the 1 per cent level. The answer to this may be the fact that the most important segment in the UAE is re-exports. As such re-exports add little to the GDP of a country and even less as far as technology transfer is concerned. Therefore any improvement in trade openness tends to make a greater difference to the re-export sector. The results show that institutional development negatively impacts the level of technology transfer, which is contrary to prior expectations. It may be the case that any improvement in institutional development alters the balance of power from domestic firms to MNEs.

The results show a statistically significant relationship between the proportion of labour with secondary level education and labour productivity. However, contrary to expectations this study finds a negative relationship between labour productivity and LABOUR. The UAE is unique globally in that 90 per cent of the population is foreign and expatriate in nature. As such the decision of MNEs to locate in the UAE is not determined by their ability to recruit from the local population but the ease to which they can employ from the wider region. This study does not find any statistically significant relationship for FDISTOCK and IMITATE with labour productivity. It may be the case for FDISTOCK it is not the stock of inward investment that determines the level of technology transfer, but the sectors in which it takes place. This implies that for inward FDI to make a significant impact, it needs to target key sectors with new technology that can be transferred to domestic firms and used across different sectors. Similarly, this study does not find that UAE companies imitate foreign MNEs. Therefore, this study argues that there is not much in terms of communication or linkages between the firms in free zones and those outside.

CHAPTER 8

Conclusion

8.1 Introduction

This research has sought to examine whether technology transfer takes place through FDI for a capital abundant country with a small population. This research has sought to obtain both a macro (in Chapters 5 and 7) and as well as micro level (in Chapter 6) understanding of the relationship between FDI and technology transfer. The basis of the research is a framework that begins with testing for the presence of technology transfer through the joint relationship between FDI and economic development. The study then examines the role of clusters for the UAE that has an indigenous population of 1.4 million people; and it has over 22 clusters of different sizes and levels of development. The study then explores the role of trade in facilitating technology. Finally, the study identifies the host country factors that are important in enhancing the effectiveness of FDI leading to technology transfer. The approach in this study employs both qualitative and quantitative research methodologies. The research opens doors to new questions that future studies can answer. This chapter looks at the findings, which lead us to suggest new avenues for future studies. The chapter also presents the research in the light of the limitations as well revisiting the research contribution of the thesis. Finally, the study presents its concluding remarks.

8.2 Research Contributions

The first and perhaps one of the most important contributions of this study is that it has added to the limited body of current literature that has examined technology transfer as a result of FDI. In doing so it has provided a greater understanding of the connection between technology transfer and FDI for countries that are resource abundant, such as the members of the 'Gulf Corporation Council', otherwise known as the GCC. These countries have unique aspects that are not generally shared by the more mature and developed countries, such as a high degree of dependence on expatriate workers, very high focus on a single sector such as hydrocarbons, etc. Therefore, a regional specific focus not only adds to our body of knowledge, but allows for more appropriate development of government policy. This is

important for the UAE, which like all countries, has been active in pursuing policies to attract FDI into the country with a direct impact on government expenditures and budgets.

The second major contribution of this study is to review and research the published literature so as to synthesise the knowledge to date regarding the technology transfer aspects of FDI. In doing so this study has highlighted the key debates and controversies so as to open the door for this and future research to examine them further.

The third major contribution of this study is determining the joint relationship between FDI and technology transfer. This research supports the view of a joint relationship between technology transfer proxied through economic growth and FDI. There have been few studies that have analysed such a joint relationship and this research is consistent with prior findings such as Bijsterbosch and Kolasa (2010), Vadlamannati and Tamazian (2009), Woo (2009), Ramondo (2009) amongst others.

The fourth contribution of this study is that it has highlighted the role of clusters in facilitating technology transfer from FDI. To date there has been no study that has examined clusters for a capital abundant country such as the UAE. This is despite the fact that the UAE has over 22 different types of clusters in a host of different areas, all seeking inward investment. This study has examined data at the firm level within the aerospace and defence sector cluster to understand if technology transfer from FDI has taken place, and if so how. Also, the survey instrument that has been developed has allowed the researcher to obtain an intra-firm level understanding of the technology transfer process. The researcher believes that this is one of just a few firm level studies of this type and as such it enhances the understanding at the micro level.

The literature review in this study highlights the differences in results and it is argued that this may be due to host country factors that impact the level of technology transfer from FDI. The fifth contribution of this study is that it has identified a number of key host country factors that facilitate technology transfer to take place for the case of a resource abundant country such as the UAE. By and large, these factors tend to be consistent with past studies.

The researcher believes that the contributions made by this study allow the governments of developing countries to develop policy recommendations that are based on strong theoretical

foundations and empirical evidence. This study has developed policy recommendations based on empirical investigation that, if followed, will lead to more effective transfer of technology from FDI. As such the thesis has managed to achieve all the objectives that it set out. The research contribution of this study is summarised in Figure 8.1 below:

Figure 8.1   Research Contributions of this Study
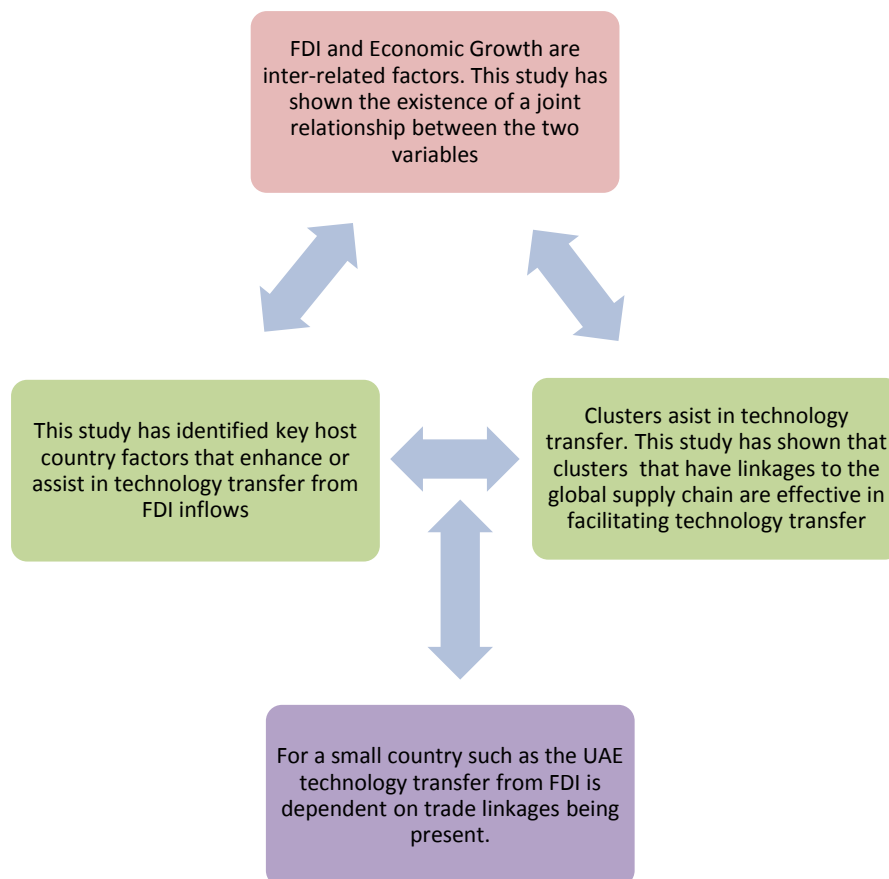
8.3   Chapter Summaries

In this section a summary of each of the empirical and policy chapters is provided.

8.3.1   The Joint Relationship between FDI and Economic Growth

One clear conclusion that is borne from this research is that economic growth and FDI are interrelated factors. Economic growth leads to the formation of positive views regarding the country which prompts firms and investment houses to investigate opportunities in the host country. The study finds that FDI can play an important role in filling the domestic gap in investment and spur economic growth. The research has found support for the argument that

economic instability discourages FDI into the host country while the positive is true in that it increases the attractiveness of a location. It is felt that in the service sector there are fewer barriers to technology transfer taking place and also FDI views it with lower risk. This research finds that economic growth and FDI are inter-related variables which is consistent with prior literature such as Balasubramanyan et al. (1999), Berthelemy and (2000), Obwona (2001), Reisen and Soto(2001), Zhang and Ram(2002), Massoud (2003), Bengoa and Sanchez–Robles (2003), Basu et al. (2003), Saha (2005), Li and Liu (2005), Hansen and Rand (2006), Hyun (2006), Johnson (2006), Güner and Yılmaz (2007), Basu and Guariglia (2007). This study makes a valuable contribution in the light of previous studies by confirming a similar result for a small resource rich country which relies on foreign workers.

8.3.2   Clusters and Technology Transfer from FDI

The study has found that clusters are important in transmitting knowledge between the various players that exist in such an environment. However, this study finds that it is more important to have linkages and being part of a cluster is not sufficient. At the same time these linkages need to be part of the global value chain. In the modern world this study argues that open innovation is important and firms seek to enhance their own knowledge through the innovations and inventions of other firms. As such this study finds that global linkages need to be promoted if effective technology transfer is to take place. More importantly, being part of a global value chain allows the firm to reduce the cost of through economies of scale and more importantly reduce the risk of technological adoption. The case study of Strata uses a proven methodology and provides a valuation contribution to the current body of academic literature on the role of clusters and the diffusion of technology from overseas firms. In this regard the results of this study are consistent with Visser (1999), Altenburg and Meyer-Stamer (1999) and Thompson (2002).

8.3.3   Host Country Factors and Technology Transfer

The results show that the level of economic development has a positive impact on labour productivity. This study finds evidence that absorptive capacity has a positive impact on the level and speed of technology transfer from the MNE to domestic firms. This study finds that the level of competition brought about from the presence of MNEs encourages domestic firms to reassess their production processes and innovate in order to remain competitive. This study argues that any improvement in institutional development alters the balance of power

from domestic firms to MNEs. In other words, domestic firms feel more comfortable in an environment whereby social networks allow them to obtain the necessary permissions and permits, i.e. less developed institutional structures. In a more transparent system it appears that domestic firms become less likely to invest in new technology. This study argues that the UAE is unique globally in that 90 per cent of the population is foreign and expatriate in nature. As such it is felt that the decision of MNEs to locate in the UAE is not determined by their ability to recruit from the local population but the ease with which they can employ from the wider region. This study develops a model that includes the unique aspects of small resource rich countries, and in doing so makes an important contribution to the current body of literature. The results of this study are consistent with prior studies such as Blomström and Kokko (1998), Görg and Greenaway (2001), Barrios *et al*. (2003), Barrios, Görg and Strobl, (2003), Sinani and Meyer (2004), Greenaway *et al.* (2004), Yao (2006), Campos and Kinoshita (2002), and Tu and Tan (2012).

8.3.4   Policy Implications

This study argues that future economic policy should be focused on exploiting the joint relationship between FDI and economic growth. However, if economic growth is to be sustained then it needs to focus on the export sector. This study argues that government policy should be directed at creating an open economy that allows firms to benefit from the regional markets. For a truly effective export oriented strategy, a country needs to negotiate and conclude a comprehensive set of FTAs with key trading partners. In the opinion of this research the UAE should seek to finalise the 22 FTAs under discussion, which will imply that 78 per cent of trade will be covered by preferential agreements. This study strongly believes that once these FTAs have been finalised, trade from the UAE will increase substantially and as a result FDI inflows into the UAE will enhance economic growth.

The results lead us to believe that economic stability is an important requirement for economic growth, and hence FDI inflows. In terms of economic policy, the key aspects that are found to be important include inflation and relative exchange rate. It is felt that in both cases the current pegged exchange rate with the US dollar implies that the country is exposed to inflation and exchange rate risk. In the opinion of this research the pegged exchange rate to the American dollar gives the UAE little control over its monetary policy and ties the country to economic actions that are determined by the state of the US economy. It is felt that

economic stability can be maintained through a policy of portfolio exchange rates, whereby the rate of the currency is determined by a basket of currencies based on the country's trading partners. It may be the case that such a policy will allow the country to maintain a level of control over the economy and not over-expose the exporters to currency fluctuations.

This research highlights that public expenditure is important in providing infrastructure spending. Under Dunning's OLI paradigm the locational benefits are increased where a country has a higher level of infrastructure. It can be argued that public expenditure can play a pivotal role in this area so as to ensure that FDI continually flows into the country. Also, public expenditure in infrastructure helps in retaining FDI. As such, the continual improvement in infrastructure will help to ensure that FDI that has flowed into the country does not then leave. Finally, it is felt that the country needs to have a comprehensive policy to attract manufacturing FDI, as this increases the level of manufacturing value added in the country. More importantly, manufacturing investment attracts allied industries to establish close to the anchor investment. As such, it is felt that manufacturing FDI has a higher impact on economic growth and FDI stock.

The results highlight the importance of trade in facilitating technology transfer from foreign MNCs to domestic firms. This study argues that the UAE, as the world's third largest re-exporter, plays an important role in this area. From a technology transfer viewpoint, re-exports may not add as much to the economy as exports. However, re-exports do have the key advantage of allowing domestic firms to acquire valuable knowledge regarding the products being traded. At the same time trading allows the firms in the country to obtain customer relationships. It may be the case that over time the trading firms will invest in order to increase their profit margins and exploit their knowledge. It is the belief of the researcher that government policy should be directed at converting traders into manufacturing exporters. In this way the firms will have greater exposure to technological advancements in their sector. This will allow for a diffusion of technology into the economy.

This study argues that technology transfer can truly take place once the country has established and displayed its commitment to securing IP rights. This commitment has to be displayed through a crackdown on high levels of piracy and abuse of IP. As a result of the high level of piracy and IP abuse, foreign firms are more reluctant to transfer leading edge

knowledge and technology. This study argues that future government policy should continue to drive out piracy and abuse of IP. More importantly, the protection of IP needs to be made faster and simpler so that firms understand the value of knowledge. At the same time the process of penalising violators should also be made easier so that this activity is reduced, if not eliminated.

8.4   Limitations of the Research

At the outset it is important to point out that although this study has some limitations, which are listed below, they are largely to do with the manner in which the research data were collected and the sample industry, as outlined below:

1. The first limitation of this study is that it examines a 30-year period ending 2010; this is largely due to the availability of data for a young country such as the UAE. Also, as stated earlier in this thesis, this dataset started with the establishment of the UAE central bank in 1980.

2. The qualitative examination uses only one cluster, namely Tawazun. However, it has to be pointed out that this is by far the largest industrial cluster in the country, with a total investment of over US$60 billion. With over 22 clusters, it may be argued that Tawazun may not be representative; however the lessons learnt here will be of benefit to the rest of the economy.

3. The sample of interviews only consists of 20 individuals at Tawazun. Although, the sample may be small, it is important to point out that half of them are at CEO level, while the rest are very senior officials. As such, for the purposes of this research, the interviews were with relevant decision makers and it is important to understand their views and experiences.

4. The focus of this research has been on manufacturing sector technology transfer as opposed to the service sector. The reason for this is that the variables examined relate to the manufacturing sector. More importantly, a young country such as the UAE does not collect an extensive set of long-term data regarding the service sector. Therefore, to a large extent, the lack of appropriate data has forced us to focus largely on the

goods and not the service sector. However, the results for the manufacturing sector are relevant also for the service sector without being tested explicitly.

8.5   Directions for Further Research

This research has been extremely important in highlighting the importance of economic growth to FDI and vice-versa. However, this research has not examined the efficiency of this relationship in terms of the sectors that lead to the greatest level of economic growth. This study argues that future research should examine the sectors where the relationship between economic growth and FDI is the strongest. Understanding the relationship between the industrial sectors and economic growth will give future government policy an important indicator to select the focus industries. It will also ensure that government policy follows a targeted approach of encouraging FDI. An important aspect of the linkage between FDI and economic growth is the influence of labour and capital productivity. Future research should seek to understand the relationship between FDI into the country into the different sectors and the impact that it has made to productivity in the sector. It may be the case that long run sustained economic growth, which is a precursor for increased FDI into the country, relies on increasing both labour and capital productivity. At the same time, future research will need to examine the level of ownership and the mode of entry, i.e. in terms of a joint venture, wholly owned affiliate etc.

This research has shown that clusters are an important avenue by which to transfer knowledge between member firms. Future research can extend this theme of study by investigating the linkages within the clusters between the suppliers, customers, etc. Porter's model of clusters is most effective when there are effective and long-term linkages between the different parties within a cluster. This research has shown that in the modern world, where open innovation is important, linkages are not only domestic. This research has shown that with open innovation the cluster itself has to be linked to global clusters, and the firms within it have to be connected to the global value chain. This research has shown that if the firms within Tawazun had not been linked to global clusters they would not have benefitted from the level of technology acquired or the sales achieved in order to harness the economies of scale. Similarly, future research needs to investigate the firm level linkages with the global value chain. This research has shown that the government as the promoter of a cluster can

play an important role in creating avenues and opportunities for global linkages. This study argues that future research should also seek to understand how firms in the UAE can effectively be linked to the global value chain and clusters.

This research has made an important contribution to the current body of knowledge by highlighting the importance of trade as a conduit by which technology can be transferred from the foreign MNC to the domestic firm. This is extremely important for the UAE where trade forms a large part of the economy. This study believes to further understand the role of trade; future research needs to examine the role of preferential trade agreements and the flow of technology between signatory countries. Most, if not all, FTAs have articles and clauses relating to the flow of investment as well as the precursors to technology transfer such as acceptance of qualified individuals, qualification, etc. However, there is little in the current literature that has examined the role that FTAs play in facilitating technology transfer. This study believes that the UAE as a member of the GCC has 22 FTAs under discussion and if it intends to harness their power to facilitate technology transfer then it needs to understand the role they can play.

This study of trade technology transfer from FDI has shown the importance of host country firms acquiring knowledge through exports. The fact that firms export technology implies that it brings them closer to the leading firms in the sector and the technology that they are currently using. However, this study has not directly examined the role between the level of IP protection and technology transfer. This study argues that future research needs to empirically understand the importance of IP protection in facilitating technology transfer. It is felt that this is especially important for a young country such as the UAE, which seeks to diversify its economy but is faced with a high level of IP abuse.

Finally, this study has been significant in highlighting the host country factors that increase or at least assist in facilitating technology transfer. Future research can extend the work that this research has carried out by linking the host country factors to the types and method of FDI. As stated in Chapter 1, FDI can flow into a country through various methods such as joint ventures, direct full ownership, equity stakes, and so on. At the same time, the types of FDI

can be horizontal or vertical in nature. This research has not differentiated between the types and methods of FDI, and future research can add to this body of knowledge. Through understanding the types and methods of FDI, future government policy can be more targeted and focused in the FDI that it attracts. More importantly, this research has highlighted the cost that governments incur in attracting FDI into their countries. It may be the case that in order to increase the efficiency of this expenditure the relationship between host country factors and methods/types of FDI will be very important.

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Appendix A

Technology Transfer Interview Questions:

Interview Agenda

The interview questionnaire is divided into five sections. The questionnaire aims to address the following sections:

SECTIONS

Section A General Interviewee Information

Section B: Organisational Strategy.

Section C: Technology Transfer Systems and Processes.

Section D: Technology Transfer and Organisational Culture.

Section E: Technology Transfer Impact and Resources

Survey Background (TEC: Tawazun Economic Council)

The purpose of this survey is to understand the process of technology transfer in the UAE using TEC as a case study. The survey intends to obtain information from a cross sectional group of individuals who have been instrumental in developing and/or implementing the current strategy within TEC. As such this survey will focus only on TEC and will seek to examine your perception regarding the manner and level of technology transfer that has taken place.

The survey is designed so that it can be conducted in writing or through face to face interviews depending on the preference of the respondent.

Section A – General Interviewee Information

A.1 Interviewee's Name and Contact Details.

Forename(s):   **Surname:**
....

Telephone Number:
....

E-mail address:

Interview Format:

☐Face to face
☐Email
☐Telephone
☐Fax
☐Written Letter

Date of Interview : _____

A.2 Interviewee's Age	A.3 Interviewee's Work Experience (in years)
☐18 – 25 ☐26 – 35 ☐36 – 45 ☐46 – 55 ☐56 – 65 ☐66 – 75 ☐76 or more	☐0 – 3 ☐4 – 10 ☐11 – 15 ☐16 – 20 ☐21 – 25 ☐25 – 30 ☐30 or more

A.4 Interviewee's Gender

☐Female
☐Male

A.5 Interviewee's Position/Role

....

....

Section B –Organisational Strategy

B.1 Can you tell us what you think was the aim of TEC as an organisation at the time of its establishment?

B.2 Do you feel that the aim of TEC has changed and if so how?

B.3 How frequently is the strategy reviewed and what is the process?

B.4 How was the strategy for TEC developed and who were the key players?

B.5 Can you list what you feel are the current top three objectives of TEC as an organisation

i) _____

ii) _____

iii)_____

B.6 Has the transfer of technology been a key issue for TEC and if so how?

B.7 Is the management of technology/knowledge a part of the business strategy?

B.8 What steps has TEC taken to ensure that there is a transfer of technology?

B.9 Who are the key providers of technology / knowledge / know-how to TEC?

B.10 How are the technology partners incorporated into the development of the business strategy of the company?

B.11 What can be done to enhance the firm's strategy development process to improve technology transfer?

B.12 Why have the suggestions provided above (in Question B.11) not been implemented in improving the strategy development process within the company?

Section C –Technology Transfer Systems and Processes

C.1   Do TEC have an office of technology transfer measurement?   Yes / No

C.2   Are there any pre-agreed goals as far as technology transfer is concerned? Yes / No

C.3   What are the top three technology transfer goals for TEC (in your opinion)?

i) _____

ii) _____

iii)_____

C.4　　How many technology transfer projects are initiated and completed each year respectively (on average)? Initiated _____　　　　　　Completed _____

C.5　　How does the firm measure the performance of the technology transfer outcomes within the organisation?

C.6　　How does the firm align the technology transfer performance (or outcomes) with the organisational strategy?

C.7　　What are the current top three technology transfer initiatives within the company?

i) _____

ii) _____

iii)_____

C.8　　Does the company benchmark its technology transfer process with regional and international organisations? Yes / No

C.9　　Are intellectual assets evaluated and if so how?

C.10　　Who generally initiates the technology transfer process within the firm?

C.11　　How are the areas of technology transfer determined within the organisation?

C.12   Is the process for determining technology acquisition appropriate to meet the organisational goals?

C.13   In general, does the firm (or do the appropriate individuals) know where and to whom to turn to acquire the required technology?

C.14   What are the three keys types of technology transfer agreements used by the firm?

i) _____

ii) _____

iii)_____

C.15   How does the firm determine what is going to be patented?

C.16   What are the major three fields or disciplines generating patents?

i) _____

ii) _____

iii)_____

C.17   Are the institutional arrangements for the above appropriate? Yes / No

C.18   Does the firm carry out any greenfield research activity (i.e. research from the initial stage)? Yes / No

C.19   Does the organisation have any research links or collaboration with universities? Yes / No

C.20   Are the research links developed with external parties, if any, successful in leading to technology transfer? Yes / No / Not relevant

C.21   What are the strengths and weaknesses of the current institutional arrangements for acquiring and commercialising technology?

C.22   What suggestions can you offer to improve the technology acquisition and commercialisation within the organisation?

C.23   Why have the suggestions provided above not been implemented.

Section D –Technology Transfer and Organisational Culture

		ALWAYS	MOSTLY	SOMETIMES	NEVER
D1	Does the top management recognise technology transfer as an important part of the business' activities?				
D2	Is there top management representation in the technology transfer activities?				
D3	Do you feel that individuals within the company are committed to the technology transfer process?				
D4	Is technology transfer a formal function area, such as a department or office, in the organisation?				
D5	Is internal staff rotation actively encouraged to spread best practices and ideas?				
D6	Are the teams in the organisation effective and capable of learning from each other?				
D7	Are teams within the company supported with access to virtual or remote networks of knowledge?				
D8	Does the company form multi-disciplinary teams so as to transfer knowledge within the firm?				
D9	Is there a vision of how knowledge and technology transfer should be integrated into the business activities within the firm?				

		ALWAYS	MOSTLY	SOMETIMES	NEVER
D10	Is there a clear ownership of knowledge and technology transfer initiatives either by departments, units, sections, etc.?				
D11	Is the ownership process in championing the knowledge and technology transfer effective within the company?				
D12	Does the company systematically assesses its future knowledge and technology requirements?				
D13	Do you believe that there is a constant flow or generation of new knowledge / ideas within the company?				
D14	Do you feel that the organisational culture of the firm promotes technology transfer?				
D15	Is change accepted as part of working life within firm?				
D16	Do top management take an exemplary leading role in creating and sustaining a supportive learning/ technology transfer culture within the firm?				
D17	Do you feel that the company has an inspiring vision for technology transfer that clearly communicates that it is critical to organisational success?				
D18	Do you feel that the firm has a knowledge sharing culture and if so how is it promoted?				
D19	Do you feel that the organisational culture promotes a good and healthy level of communication between the				

		ALWAYS	MOSTLY	SOMETIMES	NEVER
	employees and if so how this carried out?				
D20	Does the firm visibly reward individuals for conduct and performance that enhances knowledge/technology sharing and if so how?				

Section E –Technology Transfer Impact and Resources

Please rank each source of technology according to its importance for your firm using the following measurement scale: 5 = very important and 1 = not important at all. If a particular source is not relevant or not employed please use 0. Please also indicate whether the source of technology is domestic (including an overseas branch of your operation) or foreign. Also, mark if the company has a formal relationship with the source of technology through an agreement or whether it is an informal arrangement.

	Source	Importance	Local or Foreign	Formal or Informal Arrangement
E1	Suppliers of equipment and capital inputs			
E2	Suppliers of raw materials and non-capital inputs			
E3	Government or semi-government research centres			
E4	Universities			
E5	Licensing			
E6	Customers			
E7	Competitors			
E8	Private sector consultancies			
E9	Fairs, exhibitions, trade missions, etc.			

	Source	Importance	Local or Foreign	Formal or Informal Arrangement
E10	Other:			

Please mark which of the following tasks or activities your firm has learned, acquired or improved as a result of technology transfer

	Activity	Used as provided	Carried out Improvements	Not relevant
E12	Assembly components or final product			
E13	Manufacturing components			
E14	Factory layout and design			
E15	Machinery			
E16	Processes and procedures			
E17	Increase efficiency			
E18	Obtain international certification			
E19	Development of new products			
E20	Quality control			
E21	Other			
E22	Other			

E.23   Is there a defined budget to support knowledge and technology transfer process within the firm? Yes /No

E.24   Does the resource planning within the organisation take into account the technology transfer?

E.25   Do you feel that there is a sufficient level of resources devoted to technology transfer? Yes /No

E.26   List three areas where are the shortages in the budget as far as technology transfer resourcing is concerned?

i) _____

ii) _____

iii)_____

E.27   List three areas where are the surpluses in the budget as far as technology transfer resourcing is concerned?

i) _____

ii) _____

iii)_____

Appendix B

Technology Transfer Questionnaire Data Set

Sample Size   20
Start Date   May-12
Completion Date   Sep-12
Remarks   By means of Email, Face to Face and Telephone Interviews

A1. Interview Format: **COUNT**
Face to face   10
Email   7
Telephone   3
Fax   0
Written Letter   0

A.2 Interviewee's Age
18 – 25   3
26 – 35   8
36 – 45   6
46 – 55   3
56 – 65   0
66 – 75   0
76 or more   0

A.3 Interviewee's Work Experience (in years)
0 – 3   2
4 – 10   1
11 – 15   9
16 – 20   8

21 – 25	0
25 – 30	0
30 or more	0

A.4 Interviewee's Gender

Female	0
Male	20

A.5 Interviewee's Position/Role

Senior Executive	6
Director	4
Senior Manager	5
Manager	2
Senior Analyst	1
Analyst	2

Appendix C

Organisational Strategy Responses

	B.1 Can you tell us what you think was the aim of TEC as an organisation at the time of its establishment?
1	Establish defence industries in the UAE
2	Ensure capability building among nationals
3	Establish industrial base for high tech defence related industries
4	High tech transfer of technology in dual domains (military and civilian)
5	Investments that focus on growing businesses and people in the UAE
6	Create projects in the UAE and assist local companies by leveraging offset programs into technology economy
7	Create projects stemming from Offset Obligations
8	Start UAE industrial capability built up and tech transfer
9	Create an aerospace industrial cluster
10	Position the UAE as a preferred industrial partner for aerospace industries
11	Create maintenance and overhaul facilities in UAE for high end aviation platforms
12	Training of local talent in advanced technology aviation areas
13	Create a venue for advanced unmanned aerial systems
14	Growth of business and people of the UAE
15	Streamline the new industrial creation to be a technology transfer driven
16	Products of UAE to be made with UAE hands
17	Become the preferred UAE partner for global defence contractors
18	To own and produce UAE small arms and compete in global markets
19	Establish the UAE centre for advanced avionics partnering with international players
20	Build up the aviation sector to become an economical engine for the UAE GDP

	B.2 Do you feel that the aim of your company has changed and if so how?
1	Yes, adjusted to cope with changes
2	Yes, evolved to accommodate other parallel sectors
3	Yes, from very general to specific sector, aviation technology, etc.
4	No, refined to further support the dynamic market
5	There is an independent strategy that focuses on both sectors and on manufacturing and engineering capabilities and bringing tech into the people of UAE
6	Yes, it is more focused and segments are identified for investment
7	No
8	No
9	Yes, from being hasty to being focused
10	No
11	No
12	No
13	Yes, got more focused
14	No
15	Yes, got detailed
16	No
17	No
18	No
19	No
20	No

	B.3 How frequently is the strategy reviewed and what is the process?
1	2-3 times a year, executive management
2	Every 2 years, senior management retreat workshops
3	Yes, quarterly review
4	Quarterly review, periodic reviews to define corrective measures
5	It is reviewed as part of an annual cycle of strategy update, focuses on next year, budget and updated 5-year planning
6	5 years, through restructuring process
7	As required by industry
8	No
9	No formal review
10	Continuous dialogue between stakeholders and unit chiefs
11	n/a
12	n/a
13	n/a
14	2 times a year, annual review meetings
15	Quarterly meetings
16	Bi-annual
17	n/a
18	n/a
19	n/a
20	n/a

	B.4 How was the strategy developed and who were the key players?
1	Leadership and top management
2	In house development, senior management
3	Internally through directors and board
4	Leadership, stakeholders, senior executives dialogue
5	It was developed in CEO off-sites at leadership level, on work done in the investments and drawn together with individual unit objectives
6	Restructuring process using external consultant, internal workshops and senior management involvement
7	Senior management
8	Strategy function of the organisation established it
9	Senior management interaction with leadership
10	Senior management and stakeholders
11	Senior management
12	Leadership and senior management
13	Internal senior management
14	Workshops of senior staff
15	Leadership
16	Direction from leadership
17	Internal process with consultants
18	Directions from leadership
19	Workshops of senior management
20	Senior management

	B.5 Can you list what you feel are the current top three objectives as an organisation?		
1	Promote partnership between the national and international industrial leaders to facilitate modern technology transfer	Create employment opportunities for UAE nationals in specialised fields	Develop defence industry in UAE
2	Build industrial capabilities	Build human capabilities	Invest in strategic projects
3	Build defence capability	Attract new technology	Create internationally competing organisation
4	Groom local talent	Enter the right sector of technology	Harness technology leadership in UAE
5	Help build the industrial backbone in the UAE	Bring technologies in the UAE	Develop the business leaders of tomorrow
6	Development of AD industrial manufacturing and technology capabilities with specific focus on defence sector and aerospace	Develop local manpower	Assist in building local aerospace cluster
7	Industrial park	Support industry	Niche product focus
8	Enabler industries	Execute military requirement	Emiratisation
9	Enabler industries	Emiratisation	Home grown technology programs
10	Capability building	Emiratisation	Financial growth
11	Capability building	Home grown technology	Emiratisation
12	Sustainable business	R&D with international partners	UAE production
13	Capability building	Emiratisation	UAE IP creation
14	Transfer of technology	Capability building	Feed into UAE economy
15	Emiratisation	Industrial manufacturing	Sales to international markets
16	Capability building	Technology independence	Establish R&D in aviation
17	Industrial manufacturing creation	UAE IP creation	End user satisfaction in services
18	UAE employment	Global positioning of products	Economical benefit into UAE economy
19	Sustainable growth	Emiratisation	Industrial cluster population
20	International sales	Become a supplier to OEMs	Be a supply chain anchor in aviation composites

	B.6 Has the transfer of technology been a key issue and if so, how?		B.7 Is the management of technology/knowledge a part of the business strategy
1	Yes, ensure capability building in UAE	1	No
2	Yes, in almost every project as an active goal	2	Yes, to some extend
3	Yes, by having the tech transfer as criteria of partner selection	3	Yes
4	Yes, It is a challenge, need to start with partners, develop young people and measure success	4	Yes
5	Yes, and will only increase to be competitive and sustainable UAE businesses require such	5	Yes
6	Yes to some extent, in this domain tech partners resist and regulation limitations	6	Yes, need to be further improved
7	Yes	7	Yes, not explicit
8	Yes, discussed in all programs and initiatives	8	No
9	Yes	9	Yes
10	Yes, industrial manufacturing	10	Yes, but not implemented properly
11	Yes	11	No
12	Yes	12	Yes
13	Yes	13	No
14	Yes	14	Yes
15	Yes, main selection criterion	15	No
16	Yes	16	Yes
17	Yes, focus of all negotiations	17	Yes
18	Yes	18	No
19	Yes	19	No
20	Yes, main driver	20	No

	B.8 What steps have been taken to ensure that there is a transfer of technology?		B.9 Who are the key providers of technology / knowledge / know-how to?
1	Not explicit, embedded in projects	1	International defence contractors
2	Ensure there is proper transfer of technology methodology and enforced on the partner	2	Major defence contractors
3	Yet need to be groomed,	3	Technology international OEMs
4	Agreements, have a wish list and negotiate with the right partners	4	International partners
5	It is a central part of any business case Assessment both in investments and legal discussions	5	International technology partners, some UAE academic institutes
6	Definition of key technologies to be transferred and monitoring its implementation	6	Defence contractors
7	Discussions and contracts	7	Defence contractors
8	Not organised process	8	OEMs
9	Human capital	9	Defence contractors
10	Find foreign talent	10	OEMs
11	Not clear	11	OEMs
12	Not addressed	12	Defence contractors
13	Not followed up	13	Defence contractors
14	NA	14	Defence contractors
15	No measures yet	15	Defence contractors
16	Work in progress	16	OEM
17	Contractual lock-ins	17	OEM
18	Contracts	18	OEM
19	Legal documents	19	Defence contractors
20	NA	20	Defence contractors

	B.10 How are the technology partners incorporated into the development of the business strategy of the company?		B.11 What can be done to enhance the firm's strategy development process to improve technology transfer?
1	They are not	1	Create a dedicated office for transfer of technology (ToT)
2	As targets of partnership	2	Create a road map for technology for next 5-10 years
3	Selection of partners through their certain capabilities	3	Build the right infrastructure to harness the technology
4	Growth through Joint Ventures	4	Require specialists foreign and local
5	Through joint venture contributions	5	Increase personal understanding of how technology Transfer works, what the issues are, what case studies need to be done, how to resolve conflict through improved negotiations
6	Not clear	6	Create technology office, liaison with other governmental bodies
7	Not clear	7	Build the right resources
8	Case by case	8	Create ToT office
9	No	9	Incentive resources
10	Sometimes through workshops	10	Encourage dialogue
11	NA	11	Create a ToT office
12	In JV structure of the company	12	Transparency among parallel industries
13	Service agreement	13	Involvements of more resources
14	NA	14	Workshops
15	Not incorporated	15	ToT office
16	Not clear	16	Define a proper process
17	Not involved	17	Incentive schemes
18	Workshops	18	University involvements
19	Internal seminars	19	ToT office
20	NA	20	Consultant agreements

	B.12 Why have the suggestions provided above (in Question B.11) not been implemented in improving the strategy development process within the company?
1	New organisation
2	Require adequate time to mature
3	Young organisation
4	In progress
5	Young organisation
6	Awareness and communication
7	Centralised decision making
8	Case by case decision making
9	New organisation
10	Require resources
11	Require grooming
12	Require time
13	Require time
14	Need decisions
15	Needs implementation
16	New organisation
17	Lack of resources
18	Need time
19	Need time
20	Young organisation

Appendix D

Technology Transfer Systems and Processes Responses.

	Do you have an office of technology transfer measurement?		Are there any pre-agreed goals as far as technology transfer is concerned?
YES	0	YES	14
NO	20	NO	6

	What are the top three technology transfer goals (in your opinion)?		
1	IP transfer and ownership	Source codes	Manufacturing capabilities
2	NA	NA	NA
3	NA	NA	NA
4	Electronics	Avionics	Simulation
5	Case by case basis	Governmental requirements	Military requirements
6	NA	NA	NA
7	Mechanical enablers	Munitions	Controllers and software
8	Mechanical and metallics manufacturing	Heavy vehicles	Munitions
9	Mechanical manufacturing	Munitions	Metallics
10	Control systems	Aircraft parts	Composites
11	IP ownership	Groom researchers in identified domains	Independence from technology monopoly
12	Create proper foundation	Science development	Composite domain
13	IP creation	New development independently	Source code of high tech equipment software
14	NA	NA	NA
15	Generate IP	NA	NA
16	IP	Composite knowledge	Participation in R&D
17	IP	NA	NA
18	IP	IP co-ownership	Research in UAE
19	Knowledge	Create UAE technology by UAE hands	Create UAE IP
20	Research foundation	NA	NA
	C.4		C 5

	How many technology transfer projects are initiated and completed each year respectively (on average)?		How does the firm measure the performance of the technology transfer outcomes within the organisation?
1	8//3	1	Yet to mature
2	3//2	2	Yet to mature
3	4//2	3	Currently there is no measure, however employment of UAE nationals is somewhat considered in development
4	10//4	4	To a certain extent, by any registered patents, employment
5	4-6//2	5	The researcher is considering how to bring various group related initiatives in balance such as R&D, tech road map
6	3-4//1-2	6	NA
7	7//2	7	Does not measure
8	6//2	8	No defined process
9	5-6//1-2	9	Not yet
10	6//3	10	Not yet
11	10//4	11	Yet to mature
12	4//1	12	NA
13	5//2	13	Not yet
14	3//1	14	Too early
15	6//3	15	Not yet
16	5//3	16	No defined process
17	6//2	17	Not yet
18	3//1	18	NA
19	3//1	19	NA
20	4//2	20	Not there yet

C6

	How does the firm align the technology transfer performance (or outcomes) with the organisational strategy?
1	NA
2	NA
3	NA
4	Half yearly reviews
5	Drive economic and commercial value from the UAE defence procurement program
6	NA
7	They don't
8	They don't
9	Not yet
10	Not yet
11	Ambiguous
12	NA
13	NA
14	No process
15	Not yet
16	Not defined yet
17	NA
18	NA
19	Not defined
20	Not in practice

C.7

	What are the current top three technology transfer initiatives within the company?		
1	Rocket motors	Surface treatment (aviation)	Composites
2	AMMROC	TEC	HORIZON
3	Build to print technologies	Integration into platforms	Sub system level manufacturing
4	Service companies (MRO)	System integration	Guided missiles
5	Technology road map pilot	Training academy	R&D unit
6	Armoured vehicles	Composite material for aviation	Precision metal works
7	Missiles	Propellants	Composites
8	Firearms	Munitions	Composites
9	Vehicles	Reverse metal engineering	Firearms
10	Engine parts	Guidance	Munitions
11	Confidential	Confidential	Confidential
12	Composite structure	Composite panels	Surface treatment
13	Confidential	Guidance systems	Metallic precision manufacturing
14	Industrial processes for surface treatment	Firearms patent	Sniper Patents
15	Composite panels	Chassis	Range Extenders
16	New remote control technology	Auto landing	Confidential
17	n/a	n/a	n/a
18	Confidential	Confidential	Confidential
19	n/a	n/a	n/a
20	Vehicles	Metallic manufacturing	Munitions

	C.9		C.10
	Are intellectual assets evaluated and if so how?		**Who generally initiates the technology transfer process within the firm?**
1	No	1	Not clear
2	Not yet	2	Not mature yet, opportunity driven
3	No	3	No owner to this process yet
4	Not yet, too early	4	Common goal of functional units
5	Not yet	5	It is centralised and stems from overall strategy and corporate vision
6	No	6	Not clear
7	No	7	Case by case
8	No	8	No process
9	No	9	Not clear
10	Not yet	10	Not under a specific process
11	Under definition	11	No clear process
12	No process	12	Case by case
13	Not yet	13	Need process
14	No	14	Not clear
15	Not always	15	Strategy
16	Not clear	16	End user
17	No	17	Leadership
18	No	18	Senior management
19	NA	19	Not defined
20	No	20	Need by end user

	C.11 How are the areas of technology transfer determined within the organisation?		C.12 Is the process for determining technology acquisition appropriate to meet the organisational goals?
1	Top management	1	No
2	Strategy areas of focus	2	To some extent needs further development
3	Driven from the overall strategy	3	No
4	Strategy of organisation	4	Yes,
5	Strategy of the organisation, and leadership requirements	5	Yes, to some extent, suitable to the current stage of organisation
6	NA	6	To be enhanced
7	By strategy department	7	No
8	Case by case	8	No
9	Not clear	9	No
10	Strategy	10	No
11	Strategy	11	No
12	Strategy	12	No
13	Investments	13	No
14	Case by case	14	Not clear
15	Not clear	15	Not clear
16	Strategy	16	Needs improvements
17	From corporate strategy	17	Needs improvement
18	Strategy office	18	No
19	Defence contractors' proposals	19	No
20	Defence contractors' proposals	20	No

C.13

	In general, does the firm (or do the appropriate individuals) know where and to whom to turn to acquire the required technology?
1	No
2	For the short term it does
3	No
4	To some extent
5	To some extent through research and sector identification
6	Some individual program managers
7	No
8	No
9	No
10	No
11	To some extent
12	No clear process
13	No
14	No
15	No
16	Not clear
17	Ambiguous
18	Not clear
19	Not clear
20	No

C.14

	What are the 3 keys types of technology transfer agreements used by the firm?		
1	Joint ventures	License	Service level agreements
2	SLA	MLA	IP licensing
3	Technical assistance agreements	Manufacturing license	NDA's
4	JV	SLA	MLA
5	Manufacturing licenses	Tech transfer agreements	Sale and purchase agreements
6	NA	NA	NA
7	Licensing	MLA	TAA
8	Licensing	JV	TAA
9	SLA	IP agreements	Teaming agreements
10	SLA	IP agreements	Teaming agreements
11	SLA	JV	TAA
12	SLA	IP agreements	TAA
13	SLA	Licensing	TAA
14	SLA	Licensing	TAA
15	SLA	Licensing	TAA
16	SLA	Licensing	TAA
17	SLA	Licensing	TAA
18	SLA	Licensing	TAA
19	SLA	Licensing	TAA
20	SLA	TAA	Licensing

C.15   C.16

	How does the firm determine what is going to be patented?		What are the major three fields or disciplines generating patents?		
1	No process	1	Metallic processing	Small arms design	Chassis
2	Based on design criteria	2	Firearms	Unmanned systems	Metallic processing
3	NA	3	NA	NA	NA
4	Competition and value	4	Light armours	Heavy vehicles	Aerospace
5	NA	5	Too early to generate patents	Too early to generate patents	Too early to generate patents
6	NA	6	NA	NA	NA
7	NA	7	Munitions	Light ammo	Composite structures
8	NA	8	Munitions	Light ammo	Electronics
9	Not clear	9	NA	Fire arms	NA
10	NA	10	NA	Fire arms	NA
11	NA	11	NA	NA	NA
12	NA	12	BA	NA	BA
13	Not there	13	Not ready yet	Not ready yet	Not ready yet
14	Not implemented	14	NA	NA	NA
15	Not yet	15	NA	NA	NA
16	NA	16	NA	NA	NA
17	NA	17	In progress	In progress	In progress
18	Not yet	18	NA	NA	NA
19	In progress	19	Vehicles	NA	NA
20	No process yet	20	Firearms	Vehicles	NA

Appendix E

Technology Transfer and Organisational Culture Responses.

		ALWAYS	MOSTLY	SOMETIMES	NEVER
D1	Does the top management recognise technology transfer as an important part of the business activities?	18	0	2	0
D2	Is there top management representation in the technology transfer activities?	2	2	10	6
D3	Do you feel that individuals within the company are committed to the technology transfer process?	2	5	8	5
D4	Is technology transfer a formal function area, such as a department or office, in the organisation?	0	1	1	18
D5	Is internal staff rotation actively encouraged to spread best practices and ideas?	1	1	14	4
D6	Are the teams in the organisation effective and capable of learning from each other?	0	3	17	0
D7	Are teams within the company supported with access to virtual or remote networks of knowledge?	1	2	15	2
D8	Does the company form multi-disciplinary teams so as to transfer knowledge within the firm?	2	2	6	10
D9	Is there a vision of how knowledge and technology transfer should be integrated into the business activities within the firm?	0	4	12	4
D10	Is there a clear ownership of knowledge and technology transfer initiatives either by departments, units sections etc.?	0	0	7	13

		ALWAYS	MOSTLY	SOMETIMES	NEVER
D11	Is the ownership process in championing the knowledge and technology transfer effective within the company?	0	0	3	17
D12	Does the company systematically assess its future knowledge and technology requirements?	0	0	5	15
D13	Do you believe that there a constant flow or generation of new knowledge / ideas within the company?	1	0	3	16
D14	Do you feel that organisational culture of the firm promotes technology transfer?	2	1	2	15
D15	Is change accepted as part of working life within firm?	1	1	5	13
D16	Do top management take an exemplary leading role in creating and sustaining a supportive learning/technology transfer culture within the firm?	4	4	5	11
D17	Do you feel that the company has an inspiring vision for technology transfer that clearly communicates that it is critical to organisational success?	1	1	7	11
D18	Do you feel that the firm has a knowledge sharing culture and if so how is it promoted?	0	0	6	14
D19	Do you feel that the organisational culture promotes a good and healthy level of communication between the employees and if so how this carried out?	3	2	12	3
D20	Does the firm visibly reward individuals for conduct and performance that enhances knowledge /technology sharing and if so how?	0	0	4	16

Appendix F

Technology Transfer Impact and Resources Responses

	Source	Importance	Local or Foreign	Formal or Informal Arrangement
E1	Suppliers of equipment and capital inputs	4	L/F	F
E2	Suppliers of raw materials and non-capital inputs	4	L/F	F
E3	Government or semi-government research centres	1	L/F	F/I
E4	Universities	2	L/F	F/I
E5	Licensing	4	F	F
E6	Customers	2	L	F
E7	Competitors	2	F	I
E8	Private sector consultancies	2	F	F
E9	Fairs, exhibitions, trade missions, etc.	3	F	I
E10	Other:	n/a	n/a	n/a
E11	Other:	n/a	n/a	n/a

	Activity	Used as provided	Carried out Improvements	Not relevant
E12	Assembly components or final product	20	5	
E13	Manufacturing components	17	3	
E14	Factory layout and design	20	4	
E15	Machinery	20		
E16	Processes and procedures	20	5	
E17	Increase efficiency		20	
E18	Obtain international certification	20	3	
E19	Development of new products	1	19	
E20	Quality control	20	2	
E21	Other			
E22	Other			

		YES	NO
E.23	Is there a defined budget to support knowledge and technology transfer process within the firm?	0	20
E.24	Does the resource planning within the organisation take into account the technology transfer?	2	18
E.25	Do you feel that there is a sufficient level of resources devoted to technology transfer?	0	20