THE IMPACT ON KNOWLEDGE SPILLOVERS OF MNE OWNERSHIP MODES AND SUB-NATIONAL LOCATIONS:

Evidence from India

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ABSTRACT

The thesis investigates how FDI intra-industry spillovers are affected by MNE ownership modes and sub-national locations. A conceptual framework is developed which utilises IB theories to propose how MNE ownership modes and sub-national locations are likely to matter for FDI spillovers. The research propositions are explored quantitatively using an unbalanced firm-level panel dataset of 1624 Indian manufacturing firms (1991-2008) with 5203 firm-year observations. The model estimation is carried out in STATA 13.0 in two stages; firstly, by using semi-parametric (Levinsohn-Petrin) method to derive the dependent variable (TFP of domestic firms); and secondly, by using fixed effects model estimated in first-differences to relate TFP of domestic firms' with different measures of foreign presence. Results from the first model reveal that WOSs and MAJVs have positive spillover effects whereas MIJVs have negative spillover effects in the Indian manufacturing sector. The second model finds that the net spillover effect in non-metropolitan regions is higher than in metropolitan regions. The thesis discusses the possible major policy implications of the results and considers possible reasons for the differences in the spillovers for different ownership modes and sub-national locations.

Keywords: Knowledge spillovers; foreign direct investment; multinational enterprises; foreign ownership modes; sub-national locations; wholly-owned subsidiaries; majority-owned joint ventures; minority-owned joint ventures

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Ziko Konwar
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Dedicated to my grandfather (Koka), Late Sh. Tarun Ch. Chutiya

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

FIGURES

TABLES

LIST OF ABBREVIATIONS

AC	**Absorptive capacity**
ETEs	**Emerging and transition economies**
FDI	**Foreign direct investment**
FERA	**Foreign Exchange Regulations Act**
FIIA	**Foreign Investment Implementation Authority**
FII	**Foreign Institutional Investors**
FIPB	**Foreign Investment Promotion Board**
FIPC	**Foreign Investment Promotion Council**
FOAs	**Foreign-owned affiliates**
FSA	**Firm-specific advantages**
HCOM	**Host country operational measures**
HHI	**Herfindahl Index**
HMT	**Hong-Kong, Macau and Taiwan**
IB	**International business**
IPP	**Intellectual Property Protection**
IMF	**International Monetary Fund**
IMP	**Import penetration**
IPID	**Investment Promotion and Infrastructure Development**
IV	**Instrumental Variable**
KBAs	**Knowledge-based assets**
L-P	**Levinsohn-Petrin**

MAJVs	**Majority-owned joint ventures**
MIJVs	**Minority-owned joint ventures**
MNE	**Multinational enterprises**
MUA	**Metropolitan urban areas**
NIC	**National Industrial Classification**
NMNA	**Non-metropolitan and non-urban areas**
NRI	**Non-resident Indians**
OC	**Organisational capability**
O-P	**Olley-Pakes**
OECD	**Organisation for Economic Co-operation and Development**
RBI	**Reserve Bank of India**
R&D	**Research and development**
SIA	**Secretariat of Industrial Assistance**
TFP	**Total factor productivity**
UNCTAD	**United Nations Conference on Trade and Development**
WIR	**World Investment Report**
WOSs	**Wholly-owned subsidiaries**
WMS	**World Management Survey**

CHAPTER 1

INTRODUCTION

1.1. RESEARCH CONTEXT

The last few decades have witnessed extensive attempts by emerging and transition economies (ETEs) to attract foreign direct investment (FDI) by multinational enterprises (MNEs). Some of the incentives provided by host governments include relaxations in corporate tax, reduction in restrictions on foreign ownership in certain industries and locations as well as assurances of relatively favourable treatment on a par with domestic firms in terms of access to markets, suppliers and consumers (World Investment Report, 2003: 36). This is because MNEs transfer managerial skills, knowledge and technologies that can contribute to the knowledge stock of a host country and consequently lead to higher economic growth in the host country. These are the direct effects of inward FDI presence. The economic benefits of FDI for host countries, however, could also arise from the indirect transfer of technology, know-how and managerial skills through spillovers. These spillovers arise from transfers to indigenous or domestic firms from the introduction by MNEs of superior product and process technologies and managerial skills, the enhancement of human resources, and the stimulation of competition (Dunning & Lundan, 2008; Girma, Gong & Görg, 2008). These indirect (spillover) effects of FDI are the focus of this research.

The objective of this research study is to investigate FDI spillovers in the context of the Indian manufacturing sector by employing firm-level panel data and consideration of appropriate econometric modelling techniques. There are few published studies that have employed firm-level data to investigate spillovers in India, some examples are Kathuria (2002) and Marin and Sashidharan (2010). The thesis attempts to shed light on spillovers in India by considering important firm heterogeneity factors, such as the role of generic foreign ownership modes and sub-national locations with different levels of economic development, that are neglected in the existing literature on spillovers.

The existing literature has considered important industry conditions that are amenable to spillovers, such as the level of industry competition, export intensity and labour productivity (Liu, Parker, Vaidya and Wei, 2001; Buckley, Clegg and Wang, 2007; Keller and Yeaple, 2007), the role of country-level institutions facilitating trade openness and market supporting mechanisms (Fortanier, 2007), geographical proximity (Girma and Wakelin, 2007) and the role of firm heterogeneity (Zhang, Li, Li and Zhou, 2010; Wang, Deng, Kafourous and Chen, 2012; Damijan, Rojec, Majcen and Knell, 2013). The findings of these studies point to different combination of factors in a host country that could stimulate spillovers from foreign-owned affiliates (hereafter FOAs) of MNEs. Interestingly, the net effect of these important factors varies and sometimes could be the opposite, even in countries with similar levels of economic development. The effects also vary within different industries in a country. Thus, empirical evidence on the existence and key determinants of FDI spillovers is inconclusive (Wooster and Diebel, 2010; Havranek and Irsova, 2011).

In light of these findings, a systematic and discriminating research approach is necessary to identify key factors that affect FDI spillovers (Görg and Strobl, 2001; Crespo and Fontoura, 2007). The aim of the research study is to consider such an approach in the context of a few important research gaps which are outlined in the next section.

1.2. RESEARCH GAPS

Recent surveys of the literature on spillovers conclude that the empirical evidence is at best mixed (Görg & Strobl, 2001; Havránek & Irsová, 2012; Meyer & Sinani, 2009; Wooster & Diebel, 2010). The surveys highlight three important factors that might shed light on the mixed findings. *First*, the degree of foreign ownership is a primary factor in determining the strength of linkages between domestic and foreign firms and thereby affects spillovers (Javorcik & Spatareanu, 2008). The ownership strategies of MNEs may prevent spillover effects of knowledge-based assets (hereafter KBAs) since the use of wholly-owned subsidiaries (WOSs) enables MNEs to have better control over technology transfers than is the case with joint ventures (JVs) (Görg and Greenaway, 2004). *Second*, the location of MNEs' foreign-owned affiliates (hereafter FOAs) within a host country is likely to affect the extent of spillovers. This is primarily because certain locations are likely to enhance the volume and quality of linkages between FOAs and domestic firms relative to other locations (McDermott and Corredoira, 2010). For example, inter-firm networks in the high-tech software industry are likely to be more intensive in the metropolitan city of Hyderabad, India, which has a sizeable concentration of domestic and foreign firms, as opposed to a non-metropolitan region such as the city of Ernakulam (in the Indian state of Kerela) which has relatively few high-tech software firms and where this industry is yet to considerably grow. *Third*, the absorptive capabilities of domestic firms affect the ability of domestic firms to acquire spillovers (Cohen and Levinthal, 1990; Wang and Blomström, 1992). The concept of absorptive capacity refers to the internal abilities of firms to use the various sources of spillovers and convert them to useful competencies that enhance the productivity of the firm. This is a different concept from the location of the firm (referred to above) as this connects to the ability of firms to access spillovers available due to the geographical position of the firm.

A few studies have investigated the role of foreign ownership modes in spillovers (Dimelis and Louri, 2004; Javorcik & Spatareanu, 2008; Abraham, Konings & Slootmaekers, 2010). However, these studies only considered the comparison between WOSs and foreign-owned joint ventures (JVs) or between majority foreign-owned JVs (MAJVs) and minority foreign-owned JVs (MIJVs). This partial consideration of foreign-ownership modes provides inadequate conceptualisation of their role in spillovers and therefore limits understanding of this important firm heterogeneity issue (Görg and Greenaway, 2004). This study improves on the investigation of this important source of heterogeneity by simultaneously considering the implications of WOSs, MAJVs, and MIJVs for spillovers. A conceptual model maps the major possible routes between foreign ownership modes and spillovers, and thereby provides a set of postulations on how ownership affects spillovers. The framework leads to hypotheses on the overall relationships between foreign ownership modes and spillovers, but detail on the possible routes is not tested by the empirical work reported in this thesis. This is because the data requirements to empirically test these possible routes are very large and require what in effect is a major research programme.

The literature on spillovers has also considered the role of locations by investigating geographical proximity between firms, i.e. spillovers in industry-regions (Wei and Liu, 2006; Girma and Wakelin, 2007). However, the investigation of location of FDI sub-nationally and an assessment of their impact on domestic firms' productivity is scarce. Moreover, studies that consider regional effects tend not to consider the level of social and economic development of the regions. This is an important research gap in the literature, which limits understanding as to what type of regions are more amenable to spillovers, especially in the context of large ETEs with wide disparities in levels of economic development across regions. By considering spillovers in metropolitan regions and non-metropolitan and non-urban areas in India, the thesis provides a novel consideration on the effects of the level of social and economic development on spillovers. The study provides a conceptual framework (similar to the one on ownership modes) leading to postulations on how the characteristics of sub-national locations affect the possible pathways to spillovers and some factors that are likely to affect the overall relationship between sub-national location and spillovers.

The role of absorptive capabilities in domestic firms as an important mediating factor also needs investigation in the context of foreign ownership and sub-national locations. Although recognised as an important determinant of spillovers, the consideration of this factor is sparse in the existing literature. According to Havránek and Irsová (2012), among 1205 horizontal spillovers estimates from 52 studies, only 5.7% control for absorptive capacity of domestic firms. The current study considers and controls for this factor by using R&D intensity, which is regarded as an appropriate proxy to control for firm-level absorptive capacity (Cohen and Levinthal, 1989). Moreover, the research study uses an Indian dataset where all firms are publicly listed and therefore are large firms. Large firms are in a better position to acquire and develop resources to improve their learning competencies and are expected to have better absorptive capabilities relative to small firms in the economy (Sánchez and Díaz, 2013).

This research study, by providing better evidence on the role of foreign ownership modes and the social and economic characteristics of sub-national locations of FDI, delivers useful information for policy makers to assist them in better gearing FDI policies to achieve development goals.

1.3. RESEARCH OBJECTIVES AND RESEARCH QUESTIONS

The thesis has four research objectives:

1. To conceptualise the role of MNE ownership modes in spillovers.
2. To provide a conceptualisation of the links between sub-national locations and spillovers.
3. To empirically investigate the role of MNE ownership modes and sub-national locations in spillovers.
4. To provide clear policy, theoretical and managerial implications from the results.

In order to achieve the four objectives above, the two research questions that are explored in the thesis are stated below.

1. How do MNE ownership modes affect spillovers in India?
2. How do sub-national locations affect spillovers in India?

1.4. RESEARCH APPROACH

In this thesis, spillovers are defined as the increase (decrease) in the productivity of domestic (host country) firms caused by entry and presence of FDI agents, i.e. MNEs (Javorcik, 2004). This is usually regarded as an outcome associated with the unintended technological diffusion from KBAs of FOAs and the competition exerted by FOAs within an industry (Smeets, 2008). This is different from the effect of direct knowledge transfers from foreign firms to local firms which are deliberate transfers of technology from FOAs to local firms, for example, for the development of supply chains in a host country by MNE's (Javorcik, 2004).

The focus of this thesis is restricted to examining intra-industry (horizontal) as opposed to inter-industry (vertical) FDI spillover effects. Investigation of inter-industry spillovers is subject to criticism because of the restrictive assumptions used for the measurement of spillover variables (see Havránek and Irsová, 2011; Barrios, Görg and Strobl, 2011). Some of these assumptions are outlined below:

a. FOAs have similar input sourcing behaviour to domestic firms
b. all FOAs have similar input sourcing behaviour, irrespective of their country of origin
c. FOAs use domestically produced inputs in the same proportion as imported inputs
d. the demand for locally produced inputs in FOAs is proportional to the output share produced by FOAs in an industry.

In reality these assumptions are likely to be violated, and therefore estimation of vertical spillover effects requires sophisticated empirical methodologies and detailed firm-level data to mitigate these issues (Giroud, 2012). Moreover, there is a probability that the productivity growth through inter-industry linkages captured in spillover studies includes deliberate technology transfer from FOAs to local firms rather than genuine technological externalities (Keller, 2004). In other words, inter-industry spillover effects could include intentional knowledge diffusion originating from MNEs' desire to improve quality of inputs and to make the domestic supply chain more efficient (Smeets and De Vaal, 2011). Inter-industry spillover studies are therefore more connected to the development of supply chains than to genuine technological externalities arising from FDI.

Intra-industry spillover effects, on the contrary are on the whole unintentional as MNEs have a powerful incentive to minimise possible leakage of technology and know-how from their KBAs to domestic competitors in the same industry (Wang & Zhao, 2008). Moreover, recent firm-level evidence on positive intra-industry spillover effects in ten transition economies of Europe (Damijan, Rojec, Majcen and Knell, 2013) has renewed scholarly interest in this area. In the light of these factors, the study only considers horizontal/intra-industry spillovers in the context of a large emerging economy, i.e. India. Finally, as stated elsewhere in the thesis, spillovers will imply intra-industry spillovers from FDI.

In order to achieve the research objectives, the literature on the key theoretical antecedents of spillovers is reviewed. Extant international business (IB) theories including Ownership-Location-Internalisation (OLI), Knowledge-based view

(KBV) and Organisational capability view (OCV) are utilised to set the context for relationships between foreign ownership modes, sub-national locations and spillovers. This is followed by a review of the empirical literature to identify some of the well-established factors that affect spillovers. Conceptual frameworks are developed which illustrate the major possible pathways from different foreign ownership modes and sub-national locations to spillovers.

To answer the research questions, panel data analysis is conducted in STATA using firm-level data of Indian manufacturing firms from the PROWESS database provided by Centre for Monitoring Indian Economy Pvt. Ltd. The estimation of spillovers is conducted in two stages. In the first stage, the dependent variable, i.e. total factor productivity (hereafter TFP), is derived by using the Levinsohn-Petrin method (Levinsohn-Petrin, 1993). In the second stage, the dependent variable is related to the key measures of foreign presence and is then estimated using fixed effects model in first-differences. The results from model estimations are reported and the findings for MNE ownership modes and sub-national locations are considered in the context of the conceptual framework developed earlier in the thesis. Finally, clear policy, theoretical and managerial implications of the findings are provided.

1.5. ORGANISATION OF THE THESIS

The thesis is composed of seven chapters. The next chapter (Chapter 2) introduces the background to FDI in the context of India. This chapter considers FDI trends in India since independence. It discusses restrictions on FDI, foreign capital and discusses FDI inflows by industries, sub-national locations and by country of origin. The chapter concludes with a summary of the key policy issues related to foreign ownership modes and sub-national locations.

In Chapter 3, an extensive review of the existing literature is provided. This is done in two stages. In the first stage, the antecedents of spillovers from an IB theoretical perspective are highlighted. This chapter also considers the implications of IB theories on spillovers from MNE ownership modes and sub-national locations. In the second stage, a systematic review of the empirical literature on FDI spillovers is conducted. The review finishes with clear identification of the research gaps and then highlights how the current study closes the gaps.

Chapter 4 provides conceptual frameworks of spillovers, MNE ownership modes and sub-national locations. The chapter concludes with a summary of the operationalisation of key conceptual variables.

Chapter 5 discusses the methodological framework of the study. It provides a discussion on the philosophical approaches used and defends the methodological approach adopted for this study. The chapter also provides an overview of the characteristics and advantages of the Indian dataset along with a discussion of the selection of the estimation techniques used in the study. It ends with a brief discussion on the drawbacks associated with methodological approaches for estimation of spillovers.

Chapter 6 is divided into two sections. The first section reports the results for MNE ownership modes and spillovers indicating that WOSs and MAJVs are more amenable to positive spillover effects, whereas MIJVs generate negative spillover effects. The robustness checks associated with estimation techniques are also discussed followed by discussion of the key findings on spillover variables. The second section reports the results on the moderating role of sub-national locations and provides a similar discussion on whether metropolitan areas or non-metropolitan urban areas are more amenable to spillovers.

Chapter 7 discusses the key policy, theoretical and managerial implications of the research study and Chapter 8 concludes by revisiting research questions, providing a summary of research contribution and limitations of the research.

CHAPTER 2

BACKGROUND TO FDI IN INDIA

2.1. INTRODUCTION

The purpose of this chapter is to provide a background on FDI inflows in India and to identify some government policy issues on FDI that are likely to affect spillovers. The chapter is divided into four sections. In the next section (2.2), a historical backdrop of FDI in India during the pre- and post-liberalisation period is provided. Section 2.3 highlights trends and patterns in FDI inflows associated with both the pre- and post-liberalisation period in India. Section 2.4 discusses some of the patterns of FDI inflows categorised by different industries, Indian regions and by the country of origin of FDI. In section 2.5, a review of Indian government policy is conducted leading to a discussion of some fundamental policy issues that determine spillover effects in Indian industries.

In the last two decades, policymakers in ETEs including India have perceived FDI by MNEs as an effective tool to boost employment, upgrade skill-levels, improve domestic productivity, and accelerate economic growth (Balasubramanyam, 2001). The views on host country incentives for FDI have evolved drastically and the investment incentive schemes (for example, tax holidays and government subsidies) in ETEs have influenced the volume of FDI inflows in ETEs (World Investment Report, 2003). However, the efficacy of FDI inflows to ETEs, especially in terms of spillover effects, is highly debatable and has been subject to scrutiny (Kokko, 2003). The current chapter, in describing the trends and patterns of FDI inflows and discussing FDI policy, illustrates whether and how government policy is likely to affect FDI inflows and the extent of spillovers in India.

2.2. HISTORICAL BACKGROUND

Large-scale decolonisation during the post-war period led to a desire for development among countries that became newly independent. Proponents of the '*Big-Push*' theory suggested that the gains from growth would automatically trickle down from high-income countries to the lowest rung of the economic ladder (Rosenstein-Rodan, 1961). In reality, however, the growth rate in developing countries remained stagnant despite large-scale investment (Easterly, 2001). Structural weaknesses coupled with defective macroeconomic policies affected the process of growth in developing countries. In addition, developing countries faced severe external shocks with the soaring international oil prices of 1973-74 and 1979 (Balassa, 1981). These were some of the factors that hampered economic growth in developing countries.

The economic measures and efforts, e.g. import substitution industrialisation policies, put forward by governments in developing countries for about three decades failed to deliver (Chibber, 2003). At the same time, it was widely suggested that liberalisation of their national economies could help them to escape this stagnation. Therefore, many developing countries opened up their economies in the hope of stimulating economic development (Kulkarni and Jon Meister, 2009). India tried to liberalise its rather closed economy and put forward a case for reform.

However, in the financial year 1990-91, India entered a period of severe balance of payment crisis and political uncertainty. A rapid increase in India's external debt, coupled with political instability, led international credit rating agencies to lower India's rating both for short- and long-term borrowing. This made borrowing in international commercial markets difficult and also led to an outflow of foreign currency deposits kept in India by non-resident Indians (hereafter NRIs) (Cerra and Saxena, 2002).

The economic crisis in India exacerbated due to the Gulf war and further resulted in an increase in petroleum prices and virtual stoppage of remittances from Indian workers in the Gulf (Sahoo, 2005). These developments brought the country almost to the verge of default in respect of external payments liability. However, the imminent problems were averted by borrowing (standby) arrangements from the IMF and agreeing to certain emergency measures taken to restrict imports. In the wake of this crisis, a macroeconomic stabilisation strategy was adopted and the government initiated a structural adjustment programme supported by the IMF.

Subsequently, a variety of political reforms were launched. The reforms were backed by the notion that FDI was a relatively cheap and effective way of obtaining the latest technology from abroad that could improve productivity instead of direct purchasing of capital goods or adhering to licensing arrangements (Panagariya, 2004). Thus, apart from some structural adjustment both in the internal as well as external economy, the new economic policy was aimed at gradually encouraging FDI inflows.

2.3. FDI INFLOWS IN INDIA: TRENDS AND PATTERNS

The Indian government policy towards FDI before the financial crisis in 1991 was cautious and selective compared with that of the post-reforms period. The pre-liberalisation period was characterised by excessive state intervention in business and entrepreneurial growth, also known as *license raj* and protection of mature industries from competition (Salisu and Balasubramanyam, 2001). Policymakers in the post-liberalisation period, however, viewed FDI as a tool to bring about rapid economic development and macro-economic stability in the country.

The evolution of FDI trends in Indian industries can be summarised in four stages. The first three stages are associated with the pre-liberalisation period while the fourth stage is associated with the post-liberalisation period in India. In the first stage (1948-1967), a selective attitude to FDI was pursued with an imports-substitution industrialisation strategy being adopted to build local capabilities and improvements in the technological base through technological imports, foreign technological collaborations, and foreign investment. In the second stage (1968-1979), a restrictive attitude was adopted to promote exports and FDI. The restrictions on FDI were on sectors producing basic intermediate, consumer, and capital goods. Moreover, the foreign equity limit was revised from 40% to 49% and JVs could only be done with state-owned enterprises.

The third stage (1980-1990) was marred by deregulations where the government strategy was to promote and protect national industrial assets. Moreover, there were changes in policy directions including de-licensing some industrial regulations, promotion of Indian manufacturing exports and modernisation of manufacturing industries through liberalised imports of capital goods and technology. The fourth stage (1990 onwards) was associated with economic liberalisation and was introduced with the aim of bringing greater competitiveness, efficiency and technological upgrading, creating a successful exports promotion policy and launching India on a global platform. The economic reforms in India since 1991 have led to a more liberal policy regime by reforming the industrial licensing system and progressively removing many restrictions on foreign equity participation (Sahoo, 2005). Table 1 below highlights the volume of FDI and the characteristics of FDI in India during the four different time periods discussed above.

Table 1
FDI trends in India from 1948 onwards

TIME PERIODS	TOTAL FDI INFLOWS	KEY CHARACTERISTICS	RESTRICTIONS ON FOREIGN OWNERSHIP
1948-1967 (pre-liberalisation)	US$ 45 million – 100 million (approx.)	Nature resource-seeking FDI with a focus on extractive (e.g. petroleum) and certain service industries. Few pharmaceutical firms.	Minimal foreign ownership (less than 30% foreign equity) while some resorted to licensing for production (Balassa, 1981)
1968-1979 (pre-liberalisation)	U.S. 100 million – 192 million (approx.)	FDI stock in non-manufacturing industries was liquidated and these industries nationalized. FDI inflows in manufacturing industries such as electrical goods, machinery and machine tools, chemicals and allied products, pharmaceutical products increased (in 1980, it accounted for 58% of total FDI share in manufacturing).	Foreign equity ownership banned in most non-manufacturing industries, while by 1979 it increased to accommodate JVs (up to 40%) in the respective industries.
1980-1991 (pre-liberalisation)	FDI inflows in 1990 was US$150 million	FDI inflows increased in technologically intensive manufacturing industries, but the volume of FDI in service industries was low	Most manufacturing and service industries had a 40% equity ownership ceiling

1991 onwards (post-liberalisation)	US$144 million – 30380 U.S. million (approx.) in 2011	FDI inflows increased significantly in manufacturing and service industries after foreign ownership restrictions were systematically removed. Two official sources were established through which FDI was allowed, RBI and FIPB. FIPB acts as the highest authority acting in matters relating to approvals of FDI projects.	RBI – Automatic approval of equity ownership until 50% in 3 industries, 51% in 21 industries and 74% in 9 industries to be granted (greenfield investments are also approved by RBI) FIPB – Those FDI projects seeking to obtain 100% equity ownership in selected industries have to be approved by FIPB.

The next two sections will discuss in detail some of the policy measures and trends in FDI associated with both pre- and post-liberalisation periods.

2.3.1. FDI trends during the pre-liberalisation period

In 1947, India had a low stock of foreign capital that was mainly connected to the former colonial power, the U.K. After India achieved independence, it embarked on a strategy of industrialisation with active intervention from the government.

The changes to government policies had an important bearing on the FDI stock in India. According to a Reserve Bank of India (hereafter RBI) survey on international assets and liabilities in India, FDI was only Rupees 256 crores (US$45 million approximately) in 1948 (see Table 2). However, the bulk of the FDI stock at the time was natural resource seeking and the focus was on raw materials, the extractive industries, and some service sectors. The dominance of the higher share of natural resource-seeking investment in total FDI inflows in 1948, compared with manufacturing and service sectors, could be attributed to the demand for basic agricultural products such as tea and jute. The aggregate demand in the case of some manufacturing and service sectors was also increasing and most MNEs that had already served in the Indian market in 1947-50 through exports were gradually getting involved in establishing manufacturing affiliates.

Subsequently, FDI during 1950s and 1960s within the manufacturing sector was confined mostly to the petroleum industry although a few pharmaceutical MNEs established manufacturing affiliates during this period (Kidron, 1965). This increased total FDI stock in the country and it accounted for nearly Rupees

565.5 crores (US$100 million approx.) in 1964 compared with Rupees 256 crores (approximately US$45 million) in 1948.

During the period of 1964 to 1974, manufacturing sector attracted larger FDI inflows. By 1974, its stock increased to Rupees 628.6 crores, accounting for 68 per cent of total FDI stock. FDI inflows to the manufacturing industries were characterised by investment in technologically intensive industries such as electrical goods, machinery and machine tools, and chemical and allied products (in particular, chemicals, medicines and pharmaceuticals). These three manufacturing industries accounted for nearly 58 per cent of total FDI stock in 1974 compared to 41 per cent in 1964 (Kumar, 1995).

However, during the 70s, India faced numerous national political setbacks and nationalisation of assets was high on the government agenda. There were full restrictions on investment in non-manufacturing industries and this was mostly characterised by termination of FDI stocks (Balassa, 1981). As a result of the restrictions on FDI imposed during this period, the incentives for foreign MNEs to invest in India dwindled. Thus, the total FDI inflows (including all services and manufacturing sectors) into India accounted for only Rupees 933.2 crores in 1980 as compared to Rupees 916 crores in 1974. However, during the same period, the share of FDI in manufacturing industries continued to rise and by the end of the period, accounted for nearly 87 per cent of the total FDI inflows.

In 1980s, the liberalisation of industrial, trade, and foreign collaboration policies improved the investment climate and helped the country attract higher FDI inflows (RBI, 1985). The liberalisation policies also eased the restrictions on FDI flows to technology intensive manufacturing sectors and adoption of these policies resulted in a three-time increase of total FDI inflows in 1990.

To conclude, the industry-wide distribution of FDI stock during the pre-liberalisation period reveals that the manufacturing sector was given more preference by MNEs in comparison to other sectors (such as plantation, mining, services). This could have been the result of the import substitution policy adopted by the government during the period, as much of the imports were manufacturing products. However, the overall picture of FDI inflows in India was bleak before 1991, with some exceptions in the manufacturing sector.

Table 2
Industrial distribution of FDI Stock from 1948-90

SECTORS	Mid, 1948 Value (%)	March, 1964 Value (%)	March, 1974 Value (%)	March, 1980 Value (%)	March, 1990 Value (%)
Plantation	64 (25)	105.9 (11.7)	107.2 (11.7)	38.5 (4.1)	256 (9.5)
Mining	35.84 (15)	4.7 (0.9)	6.4 (0.8)	7.8 (0.8)	8 (0.3)
Petroleum	23.04 (9.0)	143.3 (14.7)	137.9 (14.7)	36.8 (3.9)	3 (0.1)
Manufacturing	51.2 (20.0)	229.3 (40.5)	628.6 (68.4)	811.6 (86.9)	2,298 (84.9)
Services	81.92 (31.0)	82.3 (14.6)	39.8 (4.4)	38.5 (4.1)	140 (5.2)
Total	256 (100.0)	565.5 (100.0)	916 (100.0)	933.2 (100.0)	2,705 (100.0)

Source: Kumar (1990); Note: Figures in parentheses indicate per centage; Value is in Rupees million

2.3.2. FDI trends during the post-liberalisation period

The main objective of the Indian government after the 1991 reforms was to create a friendly environment for stimulation of inward FDI inflows in India. This was initiated by diluting the provisions of the Foreign Exchange Regulation Act (hereafter FERA) and more specifically by removing the 40 per cent ceiling for foreign equity participation that existed during the pre-liberalisation period.

The new policy also extended automatic approval of MNE collaborations in certain industries. For example, in industries such as mining services, basic metal and alloys, electric generation and transmission, non-conventional energy generation and distribution, construction, land and water transport, storage and warehousing services and industrial and scientific instruments, the RBI granted automatic approval of collaboration to a prescribed limit of 74 per cent of foreign equity participation (RBI report, 2002). This could extend to 100% foreign equity participation if they were willing to conduct Greenfield investments. In the case of industries such as mining of iron ore, metal ore and non-metallic minerals, foreign equity participation could not exceed 50 per cent if automatic approval was sought. Moreover, in the period 1999-2000, the list of automatic approvals was widened covering important industrial and services sectors (Secretariat of Industrial Assistance Newsletter, 2001).

However, if a foreign investor wished to have to have an equity stake greater than 50 per cent and the content of their project application did not relate appropriately to the key conditions prescribed by RBI, documents were required to be routed through the Foreign Investment Promotion Board (hereafter FIPB), which was under the Ministry of Commerce, Government of India. The FIPB sometimes sanctioned 100% equity participation in cases where Indian companies were unable to raise funds, or in cases where at least half of output was meant for export, or when foreign collaborators were willing to bring in proprietary technology (IIC, 1997).

The FIPB also implemented the 100% FDI to trading, hotels and tourism-related companies, units of export-processing zones, and some banking and non-banking financial services. In addition, multilateral financial institutions were allowed to contribute equity in case there were shortfalls in holdings of NRIs within the overall permissible limit of 40 per cent in the public sector banks. FDI was also extended to certain areas where big foreign industrial conglomerates were not previously allowed to invest. This new policy also permitted the opening of branch offices of MNEs, thereby revoking the prohibition legislated in 1973.

Alternatively, domestic Indian firms were allowed to import technology including patents, trademarks etc. for which they were required to make royalty payments, technical services fees etc. The new policy changes also provided for automatic approval if the collaboration agreement regarding royalty payments up to US$ 2 million (net of taxes) was made in a lump sum or up to 5% of domestic sales and 8% of exports over a ten-year period from the date of agreement.

Reduction in the delays in setting up of FDI projects was associated with gradual removal of restrictions on foreign ownership and making the FDI application process much more transparent than before. Abolishing the industrial licensing system (except public sector undertakings and those units producing hazardous items) was a significant decision. Moreover, the Foreign Investment Promotion Council (hereafter FIPC) was set up in 1996 to identify projects within the country that required foreign investment and to target specific countries for attracting FDI (IIC, 1997). A period of 30 days was also given to the FIPB to speed-up the process of approvals of FDI projects. In sum, FDI proposals under new policies were approved under two routes:

a. Automatic route
b. FIPB route

2.3.2.1. Automatic route

The RBI approves proposals with a ceiling of equity participation up to 50% in three industries (i.e., private sector banking, telecommunication and coal and lignite). This rises to 51 per cent in twenty-one industries (i.e. petroleum, housing and real estate, trading, cable network, hotel and tourism etc). Up to 74 per cent is possible in nine industries: atomic energy, mining, establishment and operation of satellites, advertising and film, drugs and pharmaceuticals, power, broadcasting, township development, and postal services (RBI report, 2008). Moreover, MNEs that already have a foreign presence can also enhance equity up to these prescribed limits. However, NRIs or overseas corporate bodies predominantly owned by NRIs are allowed 100 per cent equity. Foreign technology agreements are also approved by the RBI subject to conditions such as the lump sum payment of fee does not exceed Rupees 10 million and the royalty payment is not more than 8 per cent on exports. The ceiling on the lump sum fee has recently been raised to US$ 2 million and a provision for payment of royalty of 5 per cent on domestic sales has been made.

2.3.2.2. FIPB route

The FIPB acts as the highest authority in matters relating to approvals of FDI projects. All proposals which do not fulfil the parameters prescribed in the automatic approval route are considered by FIPB. The board is supposed to ensure the expeditious clearance of proposals for foreign investment, review implementation of industrial policy regimes, undertake promotional activities, and interact with industry associations and organisations. The Ministry of Commerce approves proposals involving investment of up to Rupees 6,000 million (US$ 100 million approximately). Other proposals are subject to approval by the Cabinet Committee on Foreign Investment. The criteria of proposals are judged based on investment projections, potential for technology transfers, export potential, or opportunity for import-substitution, foreign exchange balance sheet, as well as potential for domestic employment.

Apart from these two bodies devoted exclusively to the purpose of investigating and clearing FDI proposals, there are a few other agencies such as the Foreign Investment Implementation Authority (FIIA), the Secretariat for Industrial Assistance (SIA), the Investment Promotion and Infrastructure Development

(IPID) cell, and the Project Monitoring Wing. There are also incentive packages offered to foreign investors that include sector specific tax rebates and concessions on import duties. There are minimal taxes on exports and a five-year tax holiday is given for investment in the power sector. However, this has been proposed to be raised to ten years in any block or fifteen years for mega projects of 1000 MW and above. In addition, some incentives are offered by state governments, including but not limited to the use of land, water, and power with concessional rates and sales tax concessions as well as cash subsidies. Table 3 below displays FDI equity inflows by both the automatic (RBI) and FIPB route from 1991 until 2009.

Table 3

Revised FDI equity inflows from 2000-2009

Route-wise FDI Inflows (in US$ million)

Year (Jan-Dec)	FIPB & SIA route	RBI's Automatic Route	Inflows through acquisition of existing shares #	RBI's Various NRI schemes*	Total
1991 (Aug-Dec)	78	-	-	66	144
1992	188	18	-	59	264
1993	340	79	-	189	608
1994	511	116	-	365	992
1995	1264	169	-	633	2065
1996	1677	180	88	600	2545
1997	2824	242	266	290	3621
1998	2086	155	1028	91	3359
1999	1474	181	467	83	2205
2000	1474	395	479	81	2428
2001	2142	720	658	51	3571
2002	1450	813	1096	2	3361
2003	934	509	637	-	2079
2004	1055	1179	980	-	3213
2005	1136	1558	1661	-	4355
2006	1534	7121	2465	-	11120
2007	2586	8889	4447	-	15921
2008	3209	23651	6169		33029
2009 (Jan-Mar)	1992	3528	635		6155
Total (as on March 31, 2009)	27867	48343	21012	2509	99732

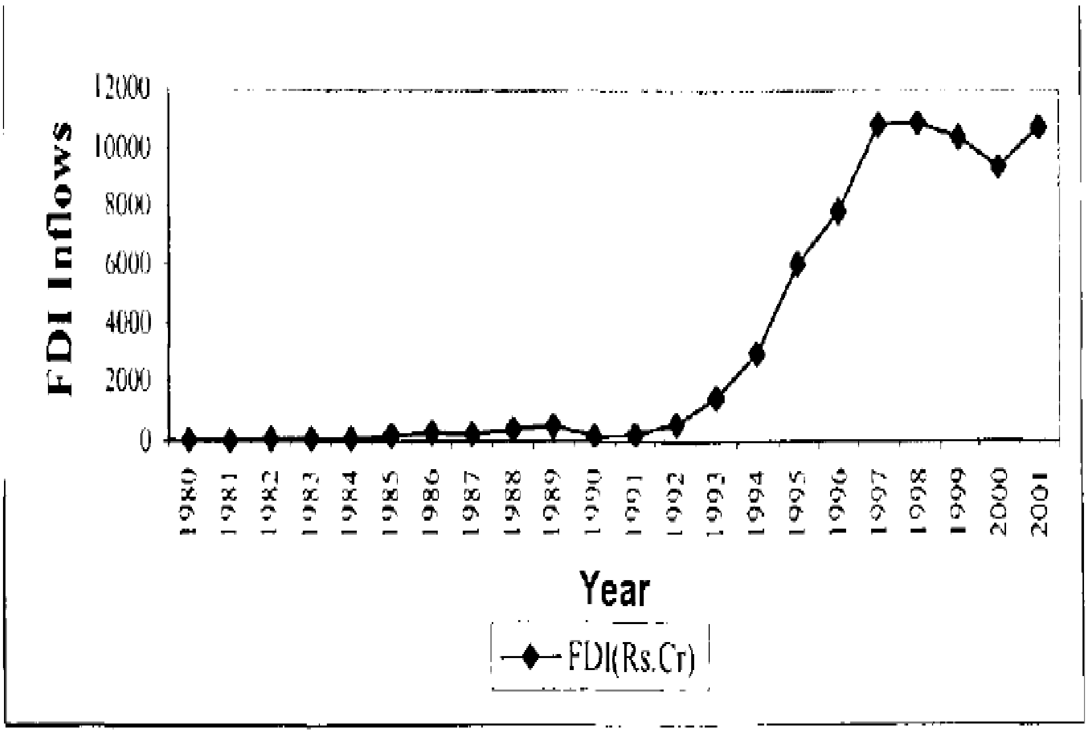
Source: National Council for Applied Economic Research Report, 2010

The post-liberalisation FDI policy regime in India played a crucial role in catalysing Indian economic development (Chalapati Rao and Dhar, 2011). A comparison of FDI inflows in the two decades, before and after the liberalisation period reveals the exponential growth of FDI inflows in the latter period. Figure 1 reveals that actual FDI inflows were negligible from 1980-85, but increased slowly until 1990. FDI inflows increased substantially after 1991 and reached their maximum in 1998, after which there was a gradual drop. The drop could be attributed to different factors, the most important being the Asian financial crisis in 1997, U.S. sanctions imposed after the nuclear tests in 1998, and the image of economic nationalism (Swadeshi) promoted by the new Indian government from 1998 (Kulkarni and Jon Meister, 2009). However, total FDI inflows again increased from US$3571 million in 2001 to US$33,029 million in 2009 (National Council of Applied Economic Research Report, 2011).

A comparison of FDI inflows in India with other BRICS economies reveal that India is an underperformer in attracting FDI (see Figure 2). This evidence is corroborated by UNCTAD data on an indicator (matrix) that combines the inward FDI performance index and the inward FDI potential index (World Investment Report, 2007). Figure 2 also shows that the share of FDI received by India in the last two decades remains weak compared to other large emerging economies such as China, Russia, and Brazil.

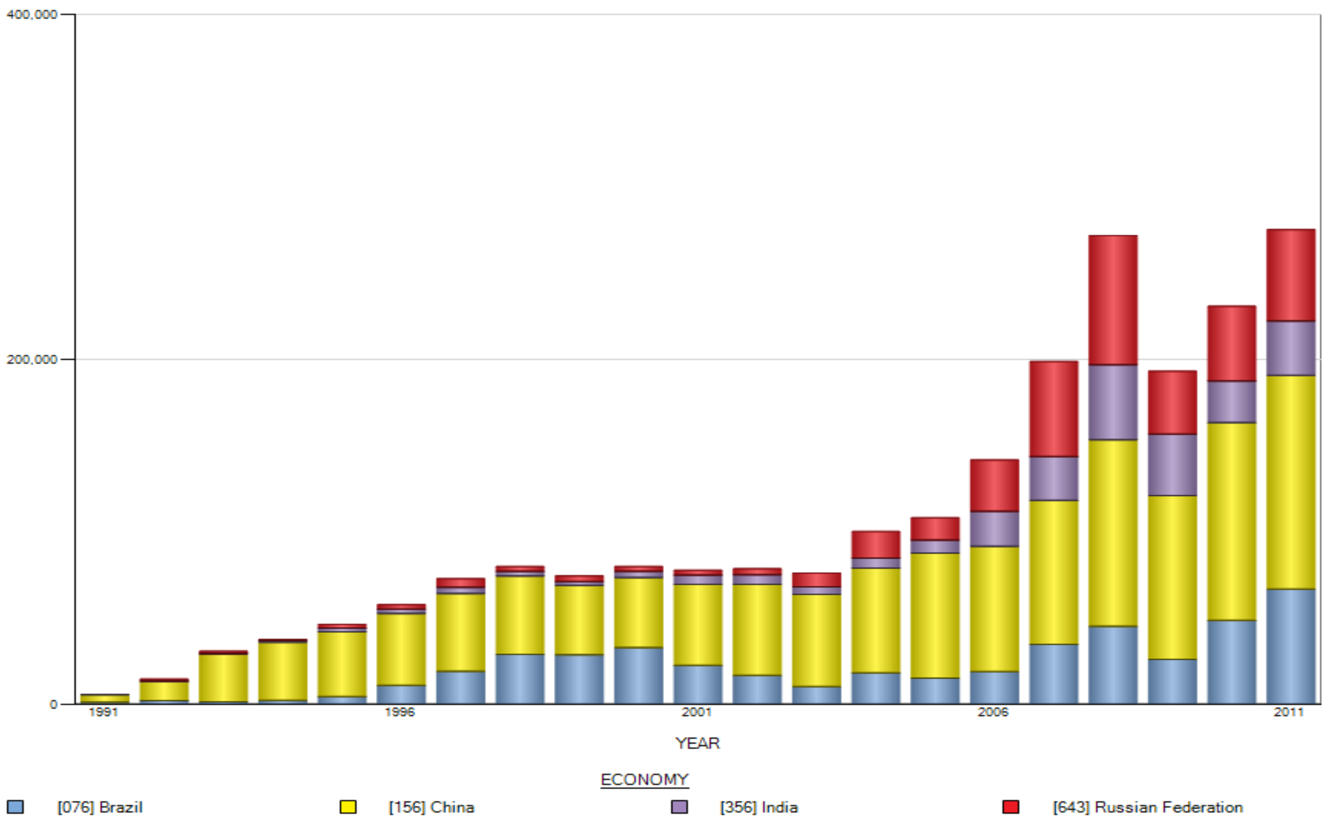
However, in the Indian context, the definition of FDI is also likely to lead to underestimation of total FDI inflows. The two official bodies that publish statistics on FDI, i.e. RBI and SIA, have since 1991 only reported on the equity component of FDI but have not considered reinvested earnings, proceeds of foreign equity listings, foreign subordinated loans to FOAs in India or depository receipts over 10% of equity from foreign institutional investors (hereafter FII) (Srivastava, 2003). Although the IMF guidelines estimate that these indicators are a part of FDI inflows, incorporating the above indicators into total FDI inflows to bring the definition of FDI in line with international standards was done in India only after 2001.

Figure 1
FDI Inflows from 1980-01



Source: SIA Newsletter Annual Report, 2002

Figure 2
FDI inflows: a comparison with BRIC economies



Source: UNCTADSTAT, 2013 (compiled by author); Value: US$ billion

2.4. FDI INFLOWS: INDUSTRY, SUB-NATIONAL LOCATIONS AND COUNTRY OF ORIGIN

This section will discuss the distribution of FDI inflows by industry and by sub-national locations. A short section is also devoted to FDI inflows by country of origin, as it is interesting to see which countries foreign firms are better equipped to deal with India's institutional systems.

2.4.1. FDI inflows by industrial sectors

The economic reforms in India were accompanied by a broadening of the sources of FDI inflows and changed the industrial composition of FDI. Prior to economic reforms, FDI inflows were concentrated primarily in manufacturing activities because of the import substituting industrialisation programme. This encouraged tariff-jumping investments to capture the protected domestic market (Joshi and Little, 1993).

Figure 3 documents a comparison of the top performers (industry sectors) in attracting FDI inflows in the last two decades. This table has been adopted from a survey report published by the National Council of Applied Economic Research (hereafter NCAER), India and it presents the ranks, names, and shares of FDI inflows for the top 21 industrial sectors as reported in SIA publications. The figures are reported for two cumulative sub-periods i.e. from 1991-99 and 2000-09. In the first sub-period, the surveyed industries constituted 69.3% of total FDI inflows, whereas during the second sub-period it constituted 84.3% of the total FDI inflows. While the share of services industries, which includes both financial and non-financial sectors, has clearly increased three-fold, the top five recipient industries of FDI inflows include computer software & hardware, construction activities and housing & real estate.

Figure 4 displays the share of FDI inflows in manufacturing industries. It is evident that electrical equipment (including S/W & elec.) occupied the highest share, i.e., 30.6% during the period 2000-2007. This was followed by the transportation industry (9.9%), fuels (power & oil refinery) (7.7%), chemicals (other than fertilisers) (4.8%) and drugs and pharmaceuticals (4.0%). The remaining industries have a share of less than 4% of total FDI inflows in manufacturing.

The relative increase in FDI inflows in the manufacturing industries discussed above has been attributed to the presence of important skills in product, process and capital engineering in India due to its long manufacturing history and the gradual evolution of higher educational institutions. India’s cheap and relatively skilled manpower has been able to attract firms across diverse manufacturing industries. However, an alternative line of research also points to the employment of low-income and unskilled workers in large numbers by manufacturing firms and through exploitation of Indian labour standards (Chari and Gupta, 2008). This trend is observed, however in the case of highly concentrated manufacturing industries.

Figure 5 presents growth of FDI inflows in the services sector from 2005-08 (survey period by NCAER). It appears that financial services constitute almost half of total FDI inflows (47%), followed by banking and other services with 10% and 21.5%, respectively. Due to the increase in FDI in services post-2000, its share in total FDI inflows in India increased from 16.4 per cent in 2005 to 35.4 per cent in 2006, but this share declined in 2007 to 18 per cent, yet maintaining the net increase over the period 2005-08. However, compared to the share of manufacturing industries in total FDI inflows (34.02%), the share of the services sector in total FDI flows is weak and has only increased substantially in the past ten years. This trend could be attributed to an upsurge in FDI inflows in services sectors, particularly in financial services.

Figure 3

Top performers in Indian industries: a comparison (1991-99 v/s 2000-09)

	Aug 1991-Dec 1999	Jan 2000-March 2009
1	Transportation industry (8.9)	Services sector (21.2)
2	Electrical Equipment (including S/W & Elec) (8.0)	Computer Software & Hardware (9.
3	Service sector (7.0)	Telecommunications (7.1)
4	Telecommunications (6.9)	Housing & Real Estate (including Cineplex, Multiplex, Integrated Townships & Commercial Complexes, etc.) (6.1)
5	Chemicals (other than fertilisers) (6.9)	Construction Activities (5.7)
6	Fuels (Power & Oil Refinery) (6.3)	Automobile industry (3.9)
7	Food-Processing industries (4.1)	Power (3.6)
8	Paper and Pulp (including Paper Products (1.5)	Metallurgical industries (3.0)
9	Miscellaneous Mechanical & Engineering (1.4)	Petroleum & Natural Gas (2.6)
10	Textiles (including Dyed, Printed) (1.4)	Chemicals (other than fertilisers) (2.4)
11	Drugs and Pharmaceuticals (1.4)	Cement and Gypsum Products (1.9)
12	Trading (1.1)	Ports (1.7)
13	Metallurgical industries (1)	Trading (1.7)
14	Glass (0.9)	Drugs & Pharmaceuticals (1.7)
15	Commercial, Office & Household Equipment (0.9)	Electrical Equipment (1.6)
16	Industrial Machinery (0.6)	Information & Broadcasting (including Print Media) (1.5)
17	Rubber Goods (0.5)	Hotel & Tourism (1.4)
18	Hotel & Tourism (0.5)	Consultancy Services (1.4)
19	Agricultural Machinery (0.3)	Food-Processing industries (0.9)
20	Ceramics (0.2)	Electronics (0.8)
21	Miscellaneous industries (9.5)	Miscellaneous industries (5.0)

Note: Industry (share as percentage of total FDI stock)

Figure 4

Industry-wise break up of FDI inflows (manufacturing)

Sector code	Sector Name	2000	2001	2002	2003	2004	2005	2006	2007	Total	% Share
100	Metallurgical Industries	15.3	33.4	43.6	31.6	186.6	142.3	175.7	102.5	731.0	3.0
200	Fuels (Power & Oil Refinery)	112.6	387.4	647.5	161.3	155.6	62.6	259.6	113.1	1899.6	7.7
300	Boilers and Steam-Generating Plants	0.0	0.0	0.0	0.0	0.0	0.5	3.3	0.0	3.8	0.0
400	Prime Movers (other than Electrical)	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.3	0.3	0.0
500	Electrical Equipment (incl S/W & Elec)	279.2	455.9	664.6	295.0	861.9	1023.2	2035.8	1949.4	7565.2	30.6
700	Transportation Industry	283.3	308.1	442.5	328.9	175.2	218.6	402.3	298.3	2457.4	9.9
800	Industrial Machinery	4.9	27.3	16.3	10.4	9.4	33.8	25.9	16.6	144.4	0.6
900	Machine Tools	2.4	4.8	13.7	8.4	57.7	23.0	34.6	7.2	151.7	0.6
1000	Agricultural Machinery	3.6	0.0	14.5	0.0	0.0	61.6	56.3	0.0	136.1	0.6
1100	Earth-Moving Machinery	2.1	0.1	13.8	0.0	0.1	50.9	1.0	0.0	67.9	0.3
1200	Miscellaneous Mechanical & Engineering	25.5	77.4	27.8	41.5	15.6	50.4	51.0	62.4	351.7	1.4
1300	Commercial, Office & Household Equipment	12.8	3.4	2.5	10.8	2.4	35.6	6.2	41.7	115.4	0.5
1400	Medical and Surgical Appliances	2.3	42.8	24.5	2.1	4.9	1.7	2.0	11.9	92.2	0.4
1500	Industrial Instruments	0.0	6.1	0.9	1.3	1.1	0.0	0.4	0.0	9.7	0.0
1600	Scientific Instruments	5.5	4.9	0.2	0.0	0.0	0.1	0.1	0.0	10.8	0.0
1800	Fertilisers	0.1	0.0	16.4	21.6	13.5	4.2	5.0	0.3	61.0	0.2
1900	Chemicals (other than Fertilisers)	125.2	65.6	120.8	61.9	188.7	147.9	400.0	76.1	1186.2	4.8
2000	Photographic Raw Film and Paper	0.0	0.0	0.4	0.5	0.3	6.0	2.7	0.1	10.0	0.0
2100	Dye-Stuffs	1.1	0.0	0.2	0.4	1.2	0.0	0.0	0.0	2.8	0.0
2200	Drugs and Pharmaceuticals	48.4	90.7	52.3	60.7	341.4	116.3	216.1	72.0	997.9	4.0
2300	Textiles (including Dyed, Printed)	1.9	4.5	45.9	18.2	38.8	79.0	117.5	40.1	345.8	1.4
2400	Paper and Pulp (including Paper Products)	60.5	11.1	11.4	7.3	3.8	27.4	5.0	2.1	128.6	0.5
2500	Sugar	0.0	0.0	4.0	0.1	2.9	3.0	15.7	0.8	26.5	0.1
2600	Fermentation Industries	16.0	11.0	7.8	2.0	7.4	171.6	4.3	43.9	264.0	1.1
2700	Food-Processing Industries	51.7	63.5	197.3	66.9	80.7	40.7	54.0	54.9	609.5	2.5
2800	Vegetable Oils and Vanaspati	0.0	0.0	0.0	1.2	5.9	13.7	4.4	14.3	39.6	0.2
2900	Soaps, Cosmetics and Toilet Preparations	0.0	0.0	0.0	0.0	0.9	87.3	1.6	5.7	95.4	0.4
3000	Rubber Goods	3.8	0.7	46.3	18.1	43.8	34.2	18.4	4.1	169.3	0.7
3100	Leather and leather products	3.1	7.1	0.1	7.0	0.4	1.0	7.8	0.8	27.3	0.1
3200	Glue and Gelatine	0.0	0.0	6.2	0.0	0.0	0.0	0.0	0.0	6.2	0.0
3300	Glass	33.9	8.3	44.8	5.5	8.4	0.8	1.5	0.5	103.6	0.4
3400	Ceramics	1.9	2.9	0.3	1.4	26.3	6.2	44.5	13.5	96.9	0.4
3500	Cement and Gypsum Products	73.9	138.3	23.0	9.6	0.2	452.1	209.7	38.3	944.9	3.8
3600	Timber Products	0.0	0.0	0.0	0.1	0.0	0.4	0.0	0.0	0.6	0.0
3700	Defence Industries	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
4200	Miscellaneous Industries	927.6	508.3	254.0	311.1	283.4	396.9	1659.3	1532.0	5872.6	23.8
	Total	2098.6	2263.6	2743.6	1484.9	2518.6	3293.1	5821.7	4502.9	24726.0	100.0

Source: NCAER Report, 2010; Compiled using DIPP data: Note> Value is in US$ Million

Figure 5
Industry FDI inflows (services)

Category	2005	2006	2007	2008	Cumulative FDI*	Share (per cent)
Financial	344.2	1912.2	1345.9	3982.9	7585.2	47.0
Non-Financial Services	0.4	47.4	576.9	689.0	1313.7	8.1
Banking Services	82.9	131.8	552.0	847.2	1613.8	10.0
Insurance	69.7	74.6	276.8	636.9	1057.9	6.6
Outsourcing	11.4	32.0	126.7	372.8	542.9	3.4
Research & Development	22.0	36.9	73.0	433.3	565.2	3.5
Other Services	184.0	1704.0	493.9	1081.5	3463.4	21.5
Sector Total	714.6	3938.8	3445.1	8043.6	16142.1	100.0

Source: NCAER Report, 2010; Compiled using SIA Newsletters 2005 to 2008

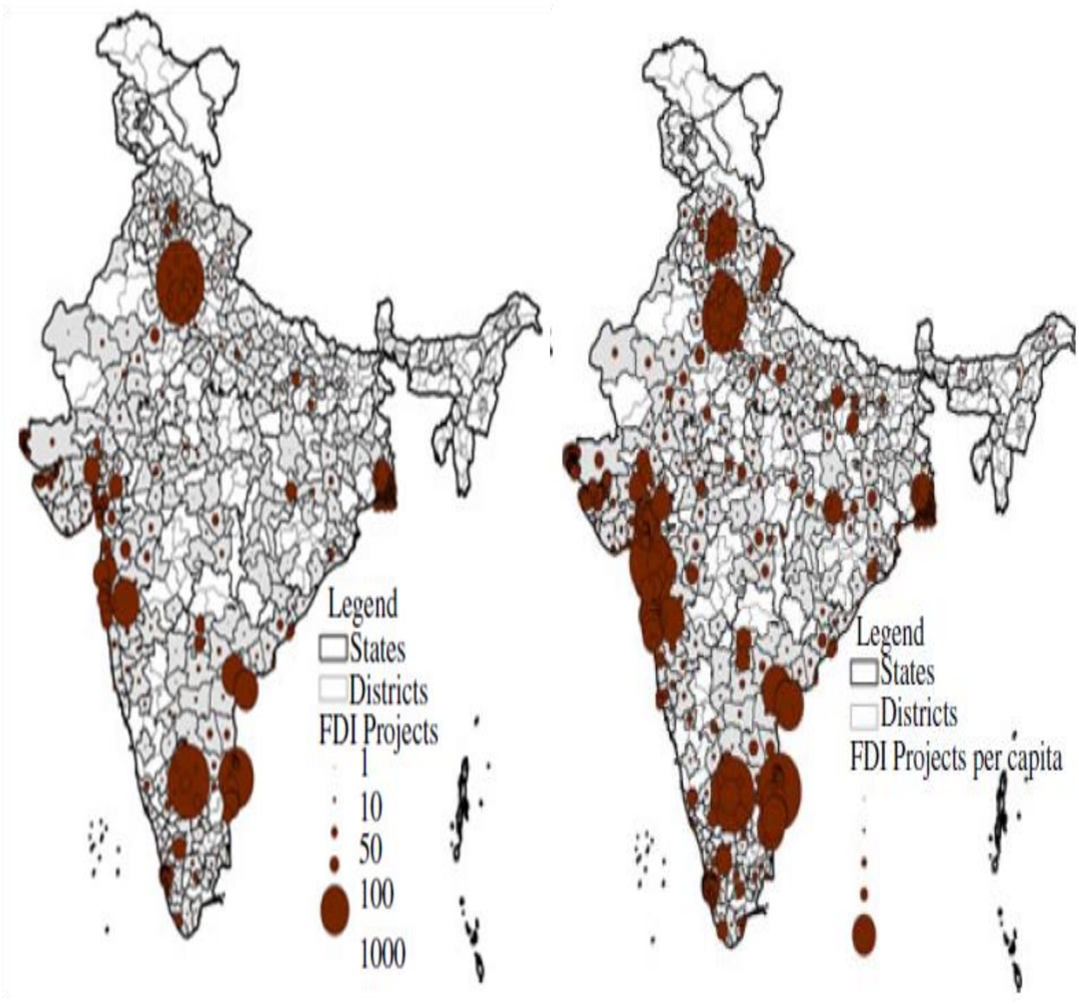
2.4.2. FDI inflows by sub-national locations

This section provides evidence of subnational disparities by taking into account a range of indicators. These include distribution of total Indian government approved FDI projects, Department of Industrial Policy and Promotion (hereafter DIPP) and Ministry of Commerce and Industry (India) data on total FDI inflows, productivity growth, technical and financial collaborations and Reserve Bank of India data on regional FDI equity inflows.

A study by Mukim and Nunnenkamp (2012) reveals that FDI projects in India that are approved by the government (whether through RBI automatic approval or through FIPB) are strongly concentrated at the level of Indian states. Figure 6 reveals that Maharashtra, Delhi, and Karnataka accounted for more than half of the amount of approved FDI during 2001–2005 period (Nunnenkamp and Stracke, 2008). It also shows that FDI is spatially concentrated within the states, i.e. at the district level. Figure 6 also reveals the density of FDI project applications in districts of India where the size of the circles is proportionate to the number of applications within the district.

In the study by Mukim and Nunnenkamp (2012), FDI sub-national data was compiled from DIPP, Ministry of Commerce and Industry and it consisted of a sample of 19,500 FDI projects approved in 447 districts belonging to 35 states and union territories. On the one hand, the map on the left-hand side illustrates that while some districts in the country potentially attract a lot of FDI activity, others are virtually empty. It appears that from the 604 districts that are surveyed by DIPP, FDI seems to be attracted to only 320 districts over the period of 1991–2005 (Mukim and Nunnenkamp, 2012). More interestingly, 50 per cent of all FDI is drawn to only six districts. On the other hand, the right-hand side map is a representation of the same but it controls for population in Indian districts. This map reveals that FDI applications increased in districts in the southern and western parts of the country, and activity in districts around Delhi and Mumbai is better highlighted compared to the left-hand side map.

Figure 6
FDI projects and distribution in subnational locations



Source: Mukim and Nunnenkamp (2012); compiled using DIPP data, Ministry of Commerce, Government of India

It is important to clarify the definition of Indian regions in terms of differences between states, union territories and zones as outlined in government and official reports. These three terms are used consistently in all official reports produced by the government of India. A state is referred to as an administrative division within India which has been vested with sovereign powers, according to Article 162 of the Indian constitution, with respect to formulating laws governing the economic, political and social aspects of its residents whereas a union territory is an administrative division which is governed by the federal/central government in India (Nagaraj, Varoudakis and Véganzonès, 1998). A zone is a collection of a few states or union territories that was established by the Indian government under the States Reorganisation Act, 1956 (vide-Part 3) Council to '*develop cooperative working between states*' and to improve socio-economic inequalities (Datt and Ravallion, 1998). There are twenty-nine states and seven union territories in India. These states are classified broadly into five different administrative zones, i.e. Southern, Western, Central, Northern, and Eastern. Fig 7 below displays average TFP growth (the case of 2 inputs) and the share of total FDI inflows stock (average) using aggregate industry data by different Indian states and zones from 2002-2005. In addition, the figure also provides the share (%) of zonal and state-level technical and financial collaborations and the state-level share (%) of manufacturing R&D intensity, on average, from 2002-2005.

Figure 7

FDI inflows, TFP growth, technical collaborations, financial collaborations and R&D intensity In Indian regions (states and zones): 2002-2005

INDIAN STATES	TOTAL FACTOR PRODUCTIVITY (2 INPUTS)	SHARE (%) IN TOTAL FDI INFLOWS STOCK	TECHNICAL COLLABORATI-ONS TOTAL SHARE (%)	FINANCIAL COLLABORATIO-NS TOTAL SHARE (%)	MANUFACTU-RING R&D INTENSITY* (%)
SOUTHERN ZONE					
ANDHRA PRADESH	0.449	6.045	5.23	6.60	0.60
KARNATAKA	0.646	11.975	9.67	13.53	0.65
KERELA	-0.006	0.897	1.36	1.75	0.05
TAMIL NADU	0.223	11.339	11.99	13.82	0.50
PONDICHERRY	0.851	0.623	0.84	0.61	1.02
TOTAL	**0.433**	**30.879**	**29.10**	**36.31**	
WESTERN ZONE					
GOA	0.679	0.501	1.30	1.18	0.83
GUJARAT	0.570	6.260	11.05	4.51	0.26
MAHARASHTRA	0.608	24.134	25.69	24.43	0.48
RAJASTHAN	0.145	1.405	2.07	1.70	0.14
TOTAL	**0.500**	**32.300**	**40.11**	**31.82**	
CENTRAL ZONE					
MADHYA PRADESH	0.074	4.478	1.44	1.21	0.55
JHARKHAND	1.208	0.071	1.04	0.19	1.09
CHATTISGARH	0.689	1.199	0.60	0.12	0.01
TOTAL	**0.608**	**5.748**	**3.09**	**1.52**	
NORTHERN ZONE					
DELHI	0.095	16.395	6.00	16.20	0.64
PUNJAB	0.130	1.079	1.22	0.96	0.43
HARYANA	0.591	1.915	6.12	3.88	0.62
HIMACHAL PRADESH	1.361	0.596	1.14	0.30	0.32
JAMMU & KASHMIR	1.771	0.004	0.06	0.01	0.01
UTTARAKHAND	1.063	0.074	0.46	0.20	0.42
TOTAL	**0.835**	**20.064**	**15.00**	**21.56**	
EASTERN ZONE					
MANIPUR	1.851	0.002	0.00	0.01	n/a
MEGHALAYA	3.986	0.026	0.00	0.04	n/a
NAGALAND	3.436	0.002	0.02	0.01	n/a
ORISSA	0.705	4.068	0.98	0.65	n/a
TRIPURA	-1.103	0.001	0.02	0.02	n/a
UTTAR PRADESH	0.205	2.375	5.46	3.71	0.45
WEST BENGAL	0.424	3.925	3.97	3.29	0.05
ASSAM	1.129	0.001	0.30	0.03	0.01
BIHAR	-0.157	0.357	0.44	0.20	0.00
TOTAL	**1.164**	**10.757**	**11.19**	**7.94**	
UNION TERRITORIES					
A & N ISLAND	6.368	0.007	0.00	0.06	n/a
CHANDIGARH	0.239	0.156	0.24	0.43	n/a
D & N HAVELI	0.390	0.060	0.96	0.17	0.33
DAMAN & DIU	0.716	0.029	0.30	0.20	0.11
TOTAL	**1.928**	**0.252**	**1.50**	**0.86**	

Source: Vadlamannati (2009), DIPP annual reports, 2002-2005 (http://dipp.nic.in/English/Publications/FDI_Statistics/FDI_Statistics.aspx), Pradhan (2011) & PROWESS data

*-2000-2008

The information for the first four indicators (TFP, FDI inflows, technical and financial collaborations) is derived by combining data from the DIPP Annual report (2014) and from regional-level information provided in Vadlamannati (2009:9). The information for manufacturing R&D intensity is derived from Pradhan (2011) which used the Prowess dataset and is the same data source used for this study. From Figure 7, it appears that productivity growth for states like Kerala, Tripura, Madhya Pradesh and Bihar is negative. The overall productivity growth for some smaller states such as Assam, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Uttarakhand, and Andaman Islands is relatively higher, which could be attributed to significant variations in data every year. For example, the number of industrial firms in Assam increased drastically in the late 1990s and early part of 2000, which increased output and fixed capital formulation (Vadlamannati, 2009). The TFP growth is highest in the Northern zone followed by Central, Western, Southern zone and Eastern zones.

The distribution of FDI inflows is quite uneven among Indian states as about 80% of FDI inflows are attracted by three zones, i.e. Southern, Western and the Northern zone. Whereas the Western and Southern zones attract the highest amount of FDI inflows with approximately 32% and 31% respectively, the Northern zone attracts about 20% of overall FDI inflows. Surprisingly, within these three zones, four states, i.e. Maharashtra, Delhi, Karnataka and Tamil Nadu, attract approximately 64% of total FDI inflows, whereas the other twenty-seven Indian states combined attract 36% of total FDI inflows in India (excluding Telengana which has been recently formed). However, if the share of the two industrialised states of Gujarat and Andhra Pradesh are removed, then remaining twenty-five Indian states attract less than 23% of total FDI inflows, thereby amounting to less than 1% share of FDI inflows per state. Thus, there is a significant cross-country variation as to distribution of FDI inflows within Indian regions.

The key recipients of technical and financial collaborations are the six industrialised states of Tamil Nadu, Gujarat, Andhra Pradesh, Maharashtra, Delhi, and Karnataka. Maharashtra, Tamil Nadu, and Karnataka have the highest share amongst both technical and financial collaborations. Whereas the Western zone has the highest share in total technical collaborations, Southern zone has highest share in financial collaborations. The disparity between states is apparent here with some states from the Eastern zone of India having virtually zero collaboration. Finally, the Central zone, Eastern zone, and union territories of India lag well behind in terms of all types of collaborations.

Figure 7 (final column) also highlights sub-national disparities in terms of industrial R&D among Indian states and they are reflected in the inter-state distribution of R&D intensity. A few states from the Southern, Western, and Northern zone tend to claim a disproportionate share of national manufacturing R&D between 2000 and 2008 (Pradhan, 2011). The share of three zones combined accounted for about 89% of total R&D intensity whereas the share of central and eastern zone remained relatively low. The top states were Maharashtra, Andhra Pradesh, Tamil Nadu, Haryana and Gujarat and their combined share was 63% in the period 2000-08, whereas the combined share of bottom ten states was between 2% and 3% during the same period. Of all

Indian sub-national regions, manufacturing firms' R&D intensity is just below 6% for eight states, about 11% for another 14 states, and exceeds 8% for just three states during the period 2000–2008 (Pradhan, 2011).

An interesting trend of FDI equity capital inflows of different states in India is further documented in Figure 8 shown below. The data is adopted from the DIPP annual report (2014) which provides information on state FDI equity-capital inflows that are received and approved through the RBI route and categorised by different RBI regional head offices in India. It is clear that Mumbai and New Delhi received the largest share of FDI inflows at 31% and 19% respectively whereas other industrialised states where RBI head offices are located (i.e. Chennai, Bangalore, Ahmedabad, and Hyderabad) received a very marginal share of FDI inflows. Chennai and Bangalore received 6% each while Ahmedabad and Hyderabad received 4% respectively. All other Indian RBI head offices (each) received 1% or less of total FDI inflows. This trend represents the stark disparities in inter-state distribution of FDI equity capital inflows.

Figure 8

FDI equity capital inflows received by RBI regional offices

RBI's REGIONAL OFFICE*	STATES COVERED	CUMMULATIVE FDI INFLOWS (APR, 00 - JAN, 14) in US$ million	% of TOTAL FDI INFLOWS
MUMBAI	MAHARASHTRA DADRA AND NAGAR HAVELI DAMAN & DIU	66,090	31
NEW DELHI	DELHI PART OF UP & HARYANA	39,778	19
CHENNAI	TAMIL NADU, PONDICHERRY	12,751	6
BANGALORE	KARNATAKA	12,278	6
AHMEDABAD	GUJARAT	9,409	4
HYDERABAD	ANDHRA PRADESH	8,492	4
KOLKATTA	WEST BENGAL SIKKIM A&N ISLAND	2,658	1
CHANDIGARH	CHANDIGARH PUNJAB HARYANA HIMACHAL PRADESH	1,265	1
BHOPAL	MADHYA PRADESH CHATTISGARH	1,114	0.5
KOCHI	KERELA LAKSHADWEEP	974	0.5
PANAJI	GOA	788	0.4
JAIPUR	RAJASTHAN	713	0.3
KANPUR	UTTAR PRADESH UTTARANCHAL	370	0.2
BHUBANESHWAR	ORISSA	357	0.2
GUWAHATI	ASSAM ARUNACHAL PRADESH MANIPUR MEGHALAYA MIZORAM NAGALAND TRIPURA	79	0
PATNA	BIHAR JHARKHAND	39	0
REGION NOT INDICATED		54,877	25.9
SUB-TOTAL		212,031	100.00

Source: Department of Industrial Policy and Promotion annual report, 2014 (http://dipp.nic.in/English/Publications/FDI_Statistics/2014/india_FDI_April2014.pdf)

***Regional FDI equity inflows classified as per RBI Regional office received FDI inflows**

A multitude of factors are attributed to this unequal distribution of FDI equity capital inflows. This is an interesting aspect, especially when the location choices of MNEs to establish FOAs are taken into account. Bhaumik, Gangopadhyay and Krishnan (2009) emphasise that state-level institutions surrounding the business environment influence the locational choices made by MNEs. It was further argued that variations in entry rates in manufacturing industries were increasingly related to factors such as quality of corporate governance after major reforms that were introduced in 1991. Mukim and Nunnenkamp (2012) put forward three important factors that influence the location choices of MNEs in India. They are the role of economic geography (i.e. economic diversity, market access potential), infrastructure (physical, financial and technological) and state-level institutions surrounding the business environment (labour regulations, informal business environment).

The information provided in Figures 6, 7 and 8 overall reflect the disparities in different Indian regions in terms of total factor productivity, financial and technical collaborations, technological intensity and FDI equity inflows among different Indian regions. However, the approach to categorise different Indian regions is through the use of a definition of administrative regions, i.e. either at the level of Indian zones or Indian states. Relying on this approach is problematic for two reasons highlighted below:

a. Classification of regions using zones or states might not exhibit similar functional similarities (Cörvers, Hensen and Bongaerts, 2006). To elucidate upon this point, the economic diversity within an administrative state (such as

Maharashtra) may be so large that some regions are not homogenous. For example, the state of Maharashtra has cities such as Mumbai and Pune that are economically and technologically advanced compared to tier-2 cities such as Nagpur and Thane that lag behind substantially. Again, the Vidarbha region within the state of Maharashtra is economically far less prosperous than the average city-region in Maharashtra. Similarly, other states in India are also likely to have pronounced differences within themselves in terms of levels of economic and technological development. As a result, the comparison of administrative zones or states is not conceptually justified.

b. The comparison of relative performance of administrative regions will not be meaningful as the information on planning, distribution and allocation of resources (financial, physical and human) will be dissimilar. Moreover, there will be marked differences in the size of population of different states making it difficult to compare and contrast them and derive meaningful inferences about their performance levels.

2.4.2.1. Sub-national locations with different levels of economic development

In order to take account of the problems of using administrative regions (either zones or states), a classification system of geographical areas based on the level of economic development is used. The selected system permits consideration of differences in GDP per head and population density. These factors are proxies for important differences in economic conditions (for example, the potential for agglomeration benefits, skill levels, density of resources etc.) that are important for spillovers.

This is done by following the UN Population Division World Urbanization Prospects (2009) and is classified as follows:

1. Metropolitan urban areas or MUAs: These are high-income regions or their agglomerations with high population, and GDP per capita of US$1000 or more.
2. Non-metropolitan and non-urban areas or NMNAs: These are regions located outside metropolitan areas as well as non-urban regions with a minimum population of 50,000 and with a GDP per capita of less than US$1000.

Using this classification to categorise Indian regions avoids the problems associated with comparing administrative-state regions or zones as highlighted above. This is an improvement from using a classification approach based on administrative regions because the concentration of both high-income and low-income sub-regions within an administrative state or a zone in India is likely. To elucidate further, there could be discrepancies between states within an administrative zone. For example, it is possible for states with negative TFP growth like Tripura and Bihar to co-exist with neighbouring states from the same (Eastern) zone such as West Bengal and Assam that display positive TFP growth, as shown in Fig. 7. Similarly, some states in the Southern zone, such as Andhra Pradesh and Karnataka, display high R&D intensity whereas states, such as Kerala, who fall in the same zone lag behind substantially in this aspect.

The approach used in this study, better captures the effect of spillovers as Indian regions categorised by level of income and population density, namely MUAs and NMNAs, are considered. The only published study similar to this approach is Sajarattanochote & Poon (2009) for Thailand. This approach is useful because it provides a richer conceptualisation of the role of sub-national locations for spillovers in ETEs like India. The findings of the study provide some important policy implications of spillovers when sub-national locations with different levels of economic development are considered.

The different types of MUAs and NMNAs are shown in Table 4 provided in the next page.

Table 4
List of MUAs and NMNAs in India

MUAs	NMNAs	NMNAs
AHMEDABAD	AGRA	GANDHINAGAR
BANGALORE	AKOLA	GUWAHATI
CHENNAI	ALIGARH	GWALIOR
DELHI	ALLAHABAD	HOWRAH
GHAZIABAD	ALMORA	INDORE
GURGAON	ALUVA	JAIPUR
HYDERABAD	ALWAR	JALANDHAR
KOLKATTA	AMBALA	JAMSHEDPUR
MADURAI	AMRITSAR	JODHPUR
MUMBAI	ANAND	KANPUR
MYSORE	ANKLESHWAR	KAPURTHALA
NASHIK	BHARUCH	KOCHI
NEW DELHI	BHOPAL	KOLLAM
NOIDA	BHUVANESHWAR	KOTA
PUNE	CHANDIGARH	KOTTAYAM
SURAT	COIMBATORE	KOZHIKODE
THANE	DAMAN	LUCKNOW
	ERNAKULAM	LUDHIANA
	FARIDABAD	MANGALORE

Source: Author's compilation from Prowess database

There are 18 metropolitan areas and 198 non-metropolitan and rural areas that are identified from the Prowess dataset. This is done by following the approach used in Lall, Koo and Chakravorty (2003) where information (definition) from the UN Population Division World Urbanization Prospects (2009) about metropolitan and non-metropolitan areas is used. In the next step, this information is utilised to scan and derive the domestic and foreign firms' locations from the Prowess dataset. The list of non-metropolitan areas is restricted to 38 in Table 4 to maintain brevity.

2.4.3. FDI inflows by country of origin

An analysis of the origin of the FDI inflows into India reveals that the new policy reforms have been accompanied by a broadening of the country sources of FDI. There were more than 100 countries contributing to FDI inflows in 2014 compared to only 29 countries in 1991 (SIA Newsletter, 2014). From Table 5 below, it is seen that of all investing countries, only six countries excluding Mauritius and Cyprus (i.e. Singapore, U.S.A., U.K., Germany, Netherlands, Japan) have the largest amount of FDI presence. Of these six foreign investors, U.S, U.K. and Singapore have had institutional ties such as legal, educational, political systems as well as cultural ties such as shared common language used in interaction and the nature of formal business transactions. Germany, Netherlands and Japan, however, have had their presence in India since early 2000 and their presence could be attributed to technological and market seeking opportunities as well as knowledge developing strategies such as R&D, technical collaborations etc.

Mauritius has been the top investor in India since 1991 and it has an increasing share in total FDI coming to India during the 2000s (SIA Newsletter, India). An agreement between India and Mauritius was signed in 1982 known as the Double Taxation Avoidance Agreement (DTAA) and this has played an important role in facilitating FDI in India via Mauritius. Moreover, Mauritius is regarded as a tax haven and a large number of FIIs who trade on the Indian stock markets operate from Mauritius. A large number of U.S. MNEs also use the offshore sector in Mauritius to channel their investments into India (NCAER, 2010). A similar set of agreements signed between India and Cyprus recently also explains the increasing FDI flows from Cyprus to India.

Table 5
FDI inflows by country of origin

Ranks	*Country*	*2012-13 (April - March)*	*2013-14 (April – March)*	*2014-15 (April-July, 2014)*	*Cumulative Inflows (April '00 - July '14)*	*%age to total Inflows (in terms of US $)*
1.	**MAURITIUS**	51,654 **(9,497)**	29,360 **(4,859)**	20,206 **(3,386)**	390,691 **(81,911)**	**36 %**
2.	**SINGAPORE**	12,594 **(2,308)**	35,625 **(5,985)**	9,978 **(1,669)**	135,785 **(27,115)**	**12 %**
3.	**U.K.**	5,797 **(1,080)**	20,426 **(3,215)**	4,911 **(824)**	105,796 **(21,588)**	**10 %**
4.	**JAPAN**	12,243 **(2,237)**	10,550 **(1,718)**	4,995 **(834)**	85,639 **(17,102)**	**8 %**
5.	**NETHERLANDS**	10,054 **(1,856)**	13,920 **(2,270)**	8,958 **(1,492)**	65,256 **(12,728)**	**6 %**
6.	**U.S.A.**	3,033 **(557)**	4,807 **(806)**	2,106 **(351)**	57,836 **(12,279)**	**5 %**
7.	**CYPRUS**	2,658 **(490)**	3,401 **(557)**	1,620 **(271)**	37,349 **(7,717)**	**3 %**
8.	**GERMANY**	4,684 **(860)**	6,093 **(1,038)**	1,881 **(314)**	33,487 **(6,833)**	**3 %**
9	**FRANCE**	3,487 **(646)**	1,842 **(305)**	692 **(116)**	19,399 **(3,994)**	**2 %**
10.	**SWITZERLAND**	987 **(180)**	2,084 **(341)**	653 **(109)**	13,801 **(2,817)**	**1 %**
TOTAL FDI INFLOWS FROM ALL COUNTRIES *		**121,907 (22,423)**	**147,518 (24,299)**	**64,193 (10,736)**	**1,108,624 (228,438)**	-

Source: FDI Factsheet, 2014; Department of Industrial Policy and Promotion

2.5. FDI POLICY IN INDIA: REVIEW OF KEY ISSUES

Caves (1996) argues that spillover benefits from FDI will depend on whether inward FDI is able to foster ‘better quality’ knowledge flows into the host economy. Therefore, some suggestions have been proposed for FDI incentives to be not of an ex ante type that is granted and paid out prior to the investment. Instead, government policy should focus on FDI that has the strongest potential for spillovers, for example through the introduction of education, training, and research and development (R&D) activities, developing linkages between FOAs and domestic firms (World Investment Report, 2008). Other suggestions include gradual removal of restrictions and making the business environment more favourable for foreign firms (e.g. foreign equity ownership, export or local content requirements, locational restrictions etc).

A strong motivation behind these suggestions is to improve the volume and, more importantly, the quality of knowledge transferred by MNEs to their FOAs in the host country, and the eventual diffusion of knowledge from FOAs to domestic firms (Nunnenkamp, 2005). The development and implementation of the right policy framework can boost the quality of FDI inflows in ETEs, while failure to do the same might hamper not only the volume of FDI inflows but in particular the ‘quality’ of knowledge transfers associated with FDI (Ramamurti and Singh, 2007). The policy framework, therefore, is an important mediator of the overall effects of FDI, especially in the case of ETEs like India (Balasubramanyam and Mahambare, 2003). Thus, the net impact of FDI inflows on a host economy through spillovers depends on both the dual role of ‘quality’ of inward FDI and the role played by host country policies. Scholarly suggestions, therefore, have included the investigation of policy frameworks related to FDI and their role in stimulation of spillovers (Crespo and Fontoura, 2007).

A contemporary issue that has long been associated with the FDI policy framework in India is the debate on restriction or promotion/relaxation of foreign ownership for FDI approved projects (Görg, Mühlen and Nunnenkamp, 2011). The perspectives of host country and MNEs in the context of foreign ownership in FDI approved projects usually conflict with each other. On the one hand, restrictions on foreign ownership in certain industries arise because host governments seek to avoid negative (crowding-out) effects of competition on domestic firms because of increased foreign presence. This is likely to arise as foreign firms, on average, are characterised by superior production processes (Kosova, 2010) and are endowed with superior KBAs (Dunning, 2000) that can outperform domestic firms by pushing up their average costs and reduce their market share (Aitken and Harrison, 1999). Other incentives for restrictions on foreign ownership include the desire to obtain a large share of FDI-related rents by insistence on participation of domestic firms in FDI projects (Karabay, Pulverer and Weinmüller, 2009). On the other hand, relaxation of restrictions on foreign ownership usually occurs at a stage when host governments are satisfied that domestic firms can compete with foreign firms (Malik, 2008), and that there are good absorptive capabilities of domestic firms to absorb technology and know-how diffused from FOAs (Girma, 2005; Jung Ha and Giroud, 2013). Other factors include the prospects of boosting wages and local employment through spillovers to domestic firms (Branstetter, 2006).

Restrictions on foreign ownership are likely to reduce the transfer of technology and know-how to host countries (Glass and Saggi, 2008). This implies that knowledge transfers to FOAs are likely to be limited and not well-developed when foreign ownership restrictions are in place. As a result, these FOAs must develop alternative knowledge-seeking strategies to deal effectively with the local business environment (Marin and Sashidharan, 2010), which could be costly or even time-consuming for the affiliates. However, this is likely to have negative consequences for knowledge diffusion to domestic firms as the volume and quality of technological know-how transferred to FOAs will be limited (Smarzynska, 1999). In other words, restrictions on foreign ownership are likely to affect knowledge transfer (to FOAs) and consequently affect spillovers (Glass and Saggi, 2008). Thus, an important policy objective for host country governments in ETEs with regard to restrictions/promotion of foreign ownership is to consider and effectively manage the trade-off between protecting domestic firms from competition and seeking to maximise rents from FDI at the possible cost of reducing the size and quality of technology transfers from MNEs.

Another important objective for policy-makers in ETEs is to channel the benefits of FDI across different regions within a country (Balasubramanyam, 2002). This is a significant policy objective as the concentration of FDI in a few economically developed regions may hinder the spillover benefits spreading across the wider economy (Mukim and Nunnenkamp, 2012). Moreover, efforts by host governments to distribute FDI inflows across sub-national locations are motivated by the desire to minimise widening income gaps between regions

(Vadlamannati, 2009). In India, there is a strong clustering of FDI in large and economically developed states like Maharashtra, Karnataka, Tamil Nadu, Delhi, Hyderabad and Gujarat (Nunnenkamp and Stracke, 2008; Mukherjee, 2011). A similar trend has also been observed in ETEs, including China where FDI has contributed to widening income disparities between coastal regions and provinces in the hinterland (Fujita and Hu, 2001; Zhang and Zhang, 2003).

From the perspective of the host government, it is critical to understand how sub-national locations in India that have different income levels moderate knowledge diffusion from FOAs to domestic firms. Therefore, the importance of sub-national locations for FDI inflows and its role especially in spillovers is a top policy priority. Thus, two key policy objectives in FDI policy of ETEs are seeking to maximise spillover benefits to the domestic economy from relaxing foreign ownership in FDI projects and spreading these benefits across different regions of the country. However, both these objectives may involve trade-offs in terms of maximising benefits to the domestic economy at the cost of lower volumes and quality of technology transfers.

A discussion of trends in FDI inflows earlier in the chapter suggests that government policy on FDI, particularly in relation to restriction on foreign ownership, is perhaps characterised by well-informed trade-offs (Chalapati Rao and Dhar, 2011). However, an important policy objective of Indian government is at times interventionist in nature. This is when it seeks to protect large and well-established domestic firms as well as small and medium-sized domestic firms from negative competition effects related to FDI presence (U.S.

International Trade Commission, 2007), i.e. the likelihood that FOAs will "cannibalise" domestic firms' market share and raise the latter's average costs leading towards firm exit (Görg and Greenaway, 2004).

On the other hand, another significant policy objective that is pivotal to enhancing uniform economic development and catch-up technologically is to boost quality of knowledge transfers by MNE parents in order to enable positive spillovers in domestic firms and maximise the share of FDI-related rents across different regions.

The Indian government, in trying to manage this trade-off, has geared its policy to marginally achieve both the stated objectives (Bajpai and Sachs, 2000). However, from an investing foreign firms' perspective, such a protectionist stance is likely to lead to cautious investment strategies where the value of the overall investment will be adjusted for depending on the perceived long-term benefits and institutional risks (Zhang and Hou, 2013). The consequences of such a policy stance, at least in terms of the potential for spillovers from FDI, are reduction in the quantity and quality of technology transfer from MNE parents to FOAs in India.

To reiterate the point, the current policy stance on FDI is not geared to develop the quality and volume of technology flows transferred from MNE parents to FOAs. Thus, the likelihood of spillovers affecting domestic firms will depend on the existing knowledge pools associated with different types of FOAs (an example cited in the literature is differences in KBAs associated with different foreign ownership modes such as WOSs, MAJVs and MIJVs: Javorcik and Spatareanu, 2008). The effects of these policy efforts need to be systematically considered in studies on FDI and its impacts on host economies.

2.6. CONCLUSION

India is one of the world's fastest-growing emerging economies and the share of aggregate FDI inflows in the country has significantly increased since the 1991 reforms. However, compared to other emerging economies such as China, Brazil and Russia, it is still lagging behind in attracting FDI (see Fig. 2). Despite liberalisation occurring two decades ago and the economy being open to foreign investors, disproportionate enforcement of these policy measures at state level and institutional obstacles prevents MNEs in Indian industries to adopt the full range of foreign ownership modes (Fernandes & Pakes, 2008). As highlighted earlier in the chapter, the policy objectives in India are characterised by the trade-off between protecting domestic firms from competition because of FDI and maximising the share of FDI-related rents including spillovers to domestic firms. This has significant costs, as adopting such a policy framework is likely to reduce the quality and volume of technology transfer to FOAs and the potential for spillovers will be eroded. In the light of these conditions, it is important to assess whether different foreign ownership modes, i.e. the extent of foreign ownership in FDI projects are likely to matter for spillovers.

Policymakers, on the other hand, are increasingly interested in boosting regional economic growth and minimising regional economic inequality through FDI. The research study seeks to consider the importance of India's policy environment for FDI and in the light of the background choose the role of foreign ownership modes and sub-national locations as important policy-related determinants of spillovers. It thereby investigates these two issues by employing firm-level data in the Indian manufacturing sector and prescribes important theoretical and policy implications which arise from the analysis.

From the above discussion, host government policy for spillovers has been regarded as central to the study. Thus, it is necessary to identify the key research gaps from the existing literature, especially in the context of ETEs. To do this, the next chapter reviews a wide set of literature on IB theories (such as OLI theory, OC view, the RBV and the KBV), economic theory of spillovers and the empirical evidence on spillovers. The review establishes a link between IB theory of foreign ownership modes and economic theory (of spillovers), that has been subject to partial investigation by researchers. It also identifies some of the research gaps in the literature and suggests means by which this study closes the gaps.

CHAPTER 3

LITERATURE REVIEW

3.1. INTRODUCTION

The overarching research question in this study is to investigate how foreign ownership modes and sub-national locations influence spillovers. A solid theoretical foundation that is grounded in rigor, consistency, clarity, brevity and effective analysis is fundamental to addressing research questions appropriately (Hart, 1998).

Such a foundation is possible by addressing two major issues in the review of the literature,

a. Consideration of the use of existing literature for the study using a concept-orientated approach as opposed to a chronological or an author approach (Webster and Watson, 2002).
b. Situating the study in the context of the existing body of knowledge to ensure that major issues affecting spillovers are adequately considered (Levy and Ellis, 2006).

In line with this approach, the chapter examines three major areas. *First*, it uses existing international business (IB) theory including the ownership-location-internalisation (OLI) paradigm, resource-based view (RBV), knowledge-based view (KBV) and organisational capability view (OCV) *Second*, it provides a discussion of existing theoretical models of spillovers to highlight the role of well-established factors. *Third*, it synthesises the different strands of the reviewed literature to identify key research gaps and reveal how the thesis closes these gaps.

The organisation of the chapter is as follows. Section 3.2 introduces some of the key IB theory (stated above) with the intention of establishing a firm foundation to investigate spillovers. It highlights the implications of these theories on spillovers from MNE ownership modes and sub-national locations. Section 3.3 discusses theory and evidence on spillovers along with the well-established factors, the key mechanisms of spillovers and the conceptual and methodological advancements that have emerged in this sub-field. The empirical evidence on FDI spillovers is examined for developing and transition economies together with the methodological and policy issues associated with spillover studies. The review considers suggestions from scholars to examine FDI spillovers by investigating firm-heterogeneity factors (Görg and Greenaway; Crespo and Fontoura, 2007). Section 3.4 considers how the study helps to close research gaps. Section 3.5 concludes the chapter.

3.2. INTERNATIONAL BUSINESS THEORY AND SPILLOVERS

The MNE is an entity which engages in FDI through its FOAs that are located in more than one country (World Investment Report, 2003). It is composed of a corporate headquarter (parent) in the home country (i.e. country of origin) and has foreign affiliates in other host countries. The corporate parent must possess at least 10% equity-ownership in order to exercise control over the FOAs, through voting rights, executive decision making or legal authority (OECD, 2008). However, the degree of MNEs' control over its FOAs will depend on the type of foreign ownership mode that the corporate parent possesses ranging from 100% ownership in the case of WOSs, more than 50% for a MAJV, or less than 50% for a MIJV.

The choice between different MNE ownership modes in a host country is determined by the interplay between the level of industry competition, the level of commitment of resource and capabilities to FOAs and institutional factors in the host country (Brouthers, 2002; Wei, Liu and Liu, 2005). The ownership mode influences both speed and volume of transfer of knowledge-based capabilities from parents to FOAs, for example, WOSs are associated with rapid transfer of technologies in comparison with JVs (Javorcik and Spatareanu, 2008). Moreover, the knowledge-based capabilities that form ownership advantages of MNE parents are deemed superior to knowledge-based capabilities residing in affiliates in host countries (Dunning, 1993; Caves, 1996). These flows of superior knowledge-based capabilities from MNE parents to

FOAs are likely to aid in development of knowledge-based assets (KBAs) in the host country (Dunning and Lundan, 2008).

The KBAs of FOAs are characterised by a superior pool of managerial and technological know-how, and are possibly potent sources of spillovers. The process of knowledge diffusion arising from these MNE-specific assets to host country firms has been a prominent argument of the "*knowledge pipeline model of FDI spillovers*" (Markusen, 1996; Caves, 1996). In this model, the proprietary tangible and intangible resources and capabilities of MNEs which form KBAs constitute the ownership or firm specific advantages (FSAs) that enable MNEs to exploit this and compete effectively in the host country (Blomström and Kokko, 2003). The core assumption in the knowledge pipeline model of spillovers is that MNE parents are effective in developing KBAs in host affiliates; and that leakages from these affiliates to domestic firms through interaction and other market exchange mechanisms give rise to spillovers (McDougall, 1960; Caves, 1974; Findlay, 1978). This view of the knowledge pipeline model has provided a framework for explaining spillovers in the IB literature, and therefore this approach is adopted for the study.

3.2.1. FSAs in different IB traditions

A comprehensive analysis of spillovers requires consideration of the key theoretical concepts from IB literature. Thus, the subsequent sections provide a discussion on the key IB theories that provides rationale for the existence and characteristics of spillovers.

3.2.1.1. Ownership advantages

The concept of MNE ownership advantages can be traced back to Stephen Hymer's seminal doctoral thesis which was submitted at Massachusetts Institute of Technology in 1960 (Hymer, 1976). Hymer postulated that in order to outweigh the lack of knowledge of operating in foreign markets, foreign firms must possess distinctive and superior resources and technological know-how. He attributed this to the fact that some firms have control over "*something valuable*" that is not accessible to other firms, at least in the short term. This logic was combined with the theory of market imperfections, which enables firms operating in these markets to use knowledge-based resources that others are not capable of utilising. The '*valuable knowledge-based resources*' that these firms own and control form special advantages that are initially created and developed in the foreign firms' home market (Kindleberger, 1969: 12). These advantages are also reflected in different degrees of market imperfections in different industries, and among groups of firms within the same industry (Hymer, 1976). Thus, Hymer's special "*ownership*" advantages of the MNE were derived from and contingent on the home country's factor endowments, institutions and government policies. These ownership advantages are then leveraged by the MNE across its network of FOAs to pursue value added activities. Ownership advantages transform MNEs into more efficient entities than their domestic counterparts and are more often considered an essential prerequisite for the initial act of entering and producing in foreign markets (Kogut, 1983).

3.2.1.2. Location advantages

An important aspect of MNE competitiveness in host countries has been attributed to location-specific advantages offered by diverse production sites across geographic frontiers (Kojima, 1978; Ozawa, 1982). These advantages have originated from random and cumulative processes of technological activities that are related to natural advantages and also from learning associated with producing in particular foreign locations (Cantwell and Piscitello, 2000; Cantwell and Piscitello, 2004). The concept of locational advantages can be traced to Raymond Vernon and Kiyoshi Kojima. Vernon utilised the product life cycle model to explain technological dynamism associated with the growth of post-war U.S. FDI in European countries. The model suggested that the determinants of locational strategies of U.S. MNEs varied according to the stage of the firm in the product cycle. It was also suggested that the propensity of MNEs to engage in FDI transforms as the product shifts from its innovatory to its mature and standard forms. Kojima viewed the MNE as an instrument by which the comparative trading advantage of nations would be better advanced. By distinguishing between import-substituting investment (trade displacing) and exports (trade-creating), he suggested that home country firms should invest abroad in industries requiring intermediate (but internationally mobile) products that fit supply comparatively well, but that need to be combined with non-transferable inputs in which the host country is relatively well endowed. The approaches of Vernon and Kojima, in combination, known as the macro economic development approach is inspired by the neoclassical theory of the spatial distribution of factor endowments and this has been extended to embrace intermediate products (Vernon, 1966; Kojima, 1978). It also emphasises the role of strategic factors arising from an oligopolistic market structure wherein MNEs compete vigorously, thereby influencing the response of other firms to factor endowments.

3.2.1.3. Internalisation advantages

A related theory that complements the concept of ownership advantages and is a rather more general theory of FDI had been proposed by Buckley and Casson (1976), later developed in Rugman (1981), Teece (1981) and Hennart (1982) to offer insights about the MNEs' consistent drive for cost efficiency and coordination among its different sub-units. This treatment of MNEs was influenced by the theory of the firm for its investigation of boundaries and organisation of the MNE (Coase, 1937), and transaction cost economics where the focus was on addressing issues inside the MNE such as uncertainty, asset-specificity, bounded rationality and opportunism (Williamson, 1975). The answer, albeit with scholarly disagreements, was that MNEs were better equipped to deal with communication, control and coordination costs and therefore could internalise key knowledge-producing activities and in the process exert proprietary control over the intangible, knowledge-based ownership advantages. Moreover, in internalisation theory another strong perception is that the firm is able to internalise externalities even when no market existed before, which is mirrored in the quote “the actions of firms can replace the market or alternatively augment it" (Buckley, 1981: 9). In other words, internalisation theory implies that knowledge is not only protected but also newly created in the absence of future markets. In summary, internalisation advantages refer to claims that MNEs exist because the firms are in a position to internalise markets across geographic frontiers, which can be interpreted as a cost-minimising behaviour. The boundary of the MNE ends where the sum of transaction costs (in external markets) and administrative costs (within the MNE network) is minimised (Forsgren, 2008). This condition also determines the type of entry mode used by MNEs in different locations in accordance with that type of organisational system minimising these costs (Buckley and Casson, 1976).

3.2.1.4. The Eclectic or OLI paradigm

Dunning (1991) proposed an alternative but related line of development which combined the theoretical traditions of the Hymer approach (O), the Vernon-Kojima approach arousing debate on location and its importance to MNE, i.e. (L) and internalisation (I) approach. He integrated these three theoretical traditions to develop a general and 'eclectic' model called the OLI paradigm, to explain better the pattern and extent of FDI. Thus, Dunning suggested that a firm will engage in FDI if three conditions are satisfied (1979: 275), which are:

a. It must possess knowledge-based ownership (O) advantages relative to domestic (host country) firms,

b. It must consider internalising these advantages (I) rather than use the market to pass (license) it to other firms, and

c. There has to be some location-specific advantages in using O advantages in a host country location rather than at home.

Dunning also distinguished between those ownership advantages that arise from the proprietary ownership of specific assets of the MNE – asset (Oa) ownership advantages – and the ownership advantages that can only be exploited if internalized – transaction (Ot) ownership advantages. The latter are advantages that the firm can choose to internalize (or not), since they result from the superiority of hierarchies relative to external markets in the common governance of a network of assets located in different countries (Rugman, 2010). However, critics suggested that the OLI paradigm does not have a fully-fledged global explanation and in fact includes "*too many variables that it loses its operationality*". Some regarded the OLI paradigm as a general theory of FDI and regarded internalisation as the key element in all existing explanations (Rugman, 1980; Hennart, 1986; Casson, 1987). Dunning, although accepting some of these claims, responded by stating that ownership advantages could be dynamic and volatile but nevertheless are important factors, that by being internalised, allow firms to cross borders and become MNEs (Dunning, 1991).

The major issue for spillovers from IB theories on FSAs is the prediction that MNEs have ownership advantages that can be transferred across frontiers to different locations to enable the exploitation of these advantages. Internalisation theory suggests that entry mode connected to exploiting FSAs in different locations is determined by transaction and administration costs. The traditional theories of IB therefore identify the generators of the knowledge transfers across frontiers by MNEs (the source of spillovers) and the entry modes they use to accomplish exploitation of FSAs.

3.2.1.5. Resource-based view, Knowledge-based view and Organisational capability view

The application of the RBV in IB deepened understanding of what constitutes 'O' advantages in the OLI paradigm (Dunning, 1980) and in particular the role of FSAs for success of MNEs' operations. The RBV regards firms' resources as central to developing and exploiting FSAs to generate competitive advantage as well as to conceive and implement strategies to improve its efficiency and effectiveness (Rumelt, 1984; Barney, 1991; Peteraf, 1993). Firms' resources are either tangible (physical assets, employees) or intangible (financial and technological assets) and the superiority of these resources vis-à-vis their competitors will depend on VRIN criteria, i.e. the extent of its value [V], rarity [R], inimitability (imperfectly available to MNEs) [I] and non-substitutability (imperfectly available to MNEs) [n] (Wernerfelt, 1984; Dierickx and Cool, 1989; Conner, 1991). However, the degree to which these resources are or could be exploited by the firm to generate competitive advantage depends on the combination of capabilities and competencies available within the firm (Prahalad and Hamel, 1990; Hamel and Prahalad, 1994; Teece, Pishano and Shuen, 1998). In other words, the RBV regards evolution of FSAs as a dynamic process, which depends on the experience, path-determined and learning process that contributes to capabilities and competencies to exploit firms' resources in different contexts.

Building on the approach of RBV, the KBV focuses on the question of how resources and capabilities can be organised, and on the importance of efficiently using these resources and capabilities (Kogut and Zander, 1993; Grant, 1996; Madhok, 1997). The KBV utilises internalisation theory and updates the RBV by emphasising that a firm's capacity to produce efficiently by advancing or updating knowledge will depend on how efficiently "*valuable KBAs*" are internalised so that these assets can be protected and exploited by firms. In other words, proponents of the KBV regard only KBAs that are *internalised* to the firm leading to capabilities, as being compatible with competitive advantages and being regarded as an efficient use of resources (Kogut and Zander, 1992; Nickerson and Zenger, 2004). The transfer of KBAs to FOAs, in cases where these KBAs develop capabilities that lead to competitive advantages, help to mitigate "*liability of foreignness*". This is done by developing FSAs that help to overcome the additional costs and challenges they face in host locations due to their foreign ownership. Therefore, there exist strong motivations for firms to increase the quality and volume of KBAs transfers in cases where these help to develop FSAs (Perri, 2011). The transfer of more and higher quality KBAs therefore adds to the knowledge pools available in host locations from which domestic firms may gain from spillovers.

The OCV complements the RBV that a firm’s success and strategy is determined by its history, people and the organisation itself (Forsgren, 2008). The OCV view suggests that FSAs are unique to each firm and their growth depends on the extent to which they have evolved in interaction with the other internal and external factors (Kogut and Zander, 1993; Madhok, 1997). This line of argument returns to the debate on what actually constitutes FSAs for the MNE, whether they are unique resources or capabilities/competencies or a combination of both that the firm has developed over a period of time.

While the Hymer tradition regards FSAs as being manifested in an MNE’s final products and its market position (i.e. market share) relative to their competitors, internalisation theorists regard FSAs as being manifested in the MNE's ability to reduce transaction costs through efficient monitoring of the production process. The implicit assumptions of the RBV approach are that FSAs reside in the firm's specific resource endowments and the capabilities to deploy them when required (Peteraf, 1993). Similarly, the KBV approach regards FSAs as being derived from development of idiosyncratic resources and capabilities that are the source of the KBAs of the MNE and which must be appropriated, protected and leveraged internally to generate competitive advantage (Grant, 1996; Casson, Dark and Gulamhussen, 2009). The OCV, however, regards FSAs as being manifested in the managerial and organisational routines and processes, which are further shaped by the ‘asset position’ and ‘path’ of the firm (Erramilli, Aggarwal and Dev, 2002). In essence the KBV and OCV views are not very different if managerial and organisational resources and capabilities are considered as KBAs. Both of these views regard the competencies of MNEs as crucial to effectively leverage KBAs within their organisational structures (i.e. internalise), which then permits the exploitation of FSAs across frontiers.

The RBV and OCV extend and develop the traditional OLI theories of IB by focusing on the role of resources and capabilities in the generation of FSAs. In particular, these theories examine the role of the transfer of resources and capabilities across frontiers as the main means by which MNEs seek to exploit and develop FSAs. The RBV approach is centered on the key role of the transfer of resources and capabilities whereby MNEs transfer knowledge across frontiers and thereby enhance knowledge pools in host locations that provide the basis for spillovers to occur. The KBV and OCV highlight the central role of knowledge transfer (or the transfer of KBAs) in the exploitation of FSAs across frontiers.

The transfer of KBAs to FOA adds to the size and quality of the knowledge pool in the host location that can spill over to domestic firms. The drivers of the transfer of KBAs is connected to the strategic goals of MNEs and the ways in which their organisational systems are constructed and operated to internalise KBAs and thereby exploit FSAs across frontiers. The application of key elements from the KBV in the context of the RBV therefore adds to our understanding of how the development of FSAs in FOAs contributes to the size and quality of the knowledge pools that increases the potential for spillovers to domestic firms.

3.2.1.6. Discussion

Combining the OLI, RBV, KBV and the OCV highlights the importance of knowledge transfer, especially of tacit knowledge for the exploitation of FSAs across frontiers. The tacit knowledge embedded in KBAs mainly results from extensive organisational routines and processes within MNE organisational systems. As a result, to maximise long-term rents on these assets, firms are likely to prevent dissipation of the same outside organisational systems which it does not effectively control (Kogut and Zander, 1993; Foss and Pedersen, 2001).

The transfer or replication of FSAs by MNE parents (especially the tacit components) is complex (Polanyi, 1957) and challenging, especially with cross-border transfer involving high cultural and institutional distance (Xu and Shenkar, 2002). However, once the transfer materialises, FOAs are engaged in converting tacit knowledge into knowledge that enable to achieve its host country objectives. Converting tacit knowledge into knowledge that is useable in host locations is at the heart of the transfer process of FSAs to FOAs in host locations. This process, however, increases the risk of leakage of firm-specific, proprietary knowledge (De Faria and Sofka, 2010). This is especially acute in locations where formal barriers (legal and institutional) or informal barriers (culture of imitation) do not adequately protect firms' proprietary knowledge from unwarranted use (Zhao, 2006; Alcácaer and Chung, 2007). These leakages, which are the source of knowledge pools, form the basis for spillovers to domestic firms in a host country. Domestic firms are better off the greater the quality and size of leakages from FOAs. The leakages provide domestic firms with suitable foreign technology and know-how (Kotabe, Martin and Domoto, 2003). The availability of knowledge pools also enables domestic firms to access and derive capabilities from these pools to improve their performance. This is through the provision of knowledge, including tacit knowledge, when KBAs are transferred by MNEs, but which have leaked through knowledge pools available to domestic firms (Podolny, 2001; Tian, 2007). The effect of spillovers domestically depends on the extent of the creation of knowledge pools from FOAs (i.e. the extent KBAs are internalised and protected from outsider firms relative to the leakages of such KBAs), the network connections or linkages between FOAs and domestic firms, and the capabilities of domestic firms to absorb and assimilate external knowledge deposited in the knowledge pools.

The concept of FSAs of MNEs has a uniting feature despite disagreements in the various scholarly traditions of IB literature (see Table 6). Although the mechanisms through which FSAs that are developed and exploited by MNEs will differ, for example, location and non-location bound FSAs (Rugman and Verbeke, 2001), the IB literature regards FSAs as one of the crucial explanations for success of MNEs in host locations (Rugman, Verbeke and Nguyen, 2010).

The knowledge pipeline model in IB literature (explained earlier) also regards FSAs that are transferred by MNE parents to FOAs as one of the key theoretical antecedents of spillovers (Caves, 1974; Findlay, 1978; Dunning and Lundan, 2006). The quality of KBAs in host locations is determined by the type of FSAs that MNE parents are keen on transferring and this is likely to affect net outcome of spillovers. The thesis adopts the knowledge pipeline approach whereby the role of FSAs of MNE parents transferred and the means by which transfer of KBAs in the transfer of FSAs is regarded as fundamental to spillover benefits in the host countries. Table 6 below highlights the different IB theoretical approaches in conceptualisation of FSAs. The current study, by considering firm-heterogeneity involving different foreign ownership modes of MNEs, provides a more credible explanation regarding control of KBAs in FOAs (an outcome of transfer of FSAs) and its role in spillovers.

Table 6
Firm Specific Advantages: meaning, characteristics and scholarly influences

CORE INTERNATIONAL BUSINESS THEORIES	CONCEPTUALISATION OF FSAs	CHARACTERISTICS OF FSAs IN EACH THEORETICAL TRADITION	KEY SCHOLARLY INFLUENCES
OWNERSHIP (O) ADVANTAGES APPROACH	FSAs are manifested in final products and market share of the firm	Physical, financial and technological resources	Bain (1956), Kindleberger (1969), Hymer (1970; 1976), Caves (1982)
INTERNALISATION ADVANTAGES (I) APPROACH	FSAs are manifested in the MNEs' ability to reduce transaction costs through efficient monitoring of the production process	Efficient monitoring of existing (and creation of new) physical, financial and technological resources	Coase (1937), Williamson (1975), Buckley & Casson (1976), Rugman (1981), Hennart (1982; 1991), Teece (1981)
LOCATION (L) ADVANTAGES APPROACH	FSAs are derived from learning by FOAs associated with production in diverse locations	Translation and capture of value-added activities specific to locations specialised in endowment of natural resources, human capital, infrastructure and governance	Vernon (1966); Kojima (1978; 1982), Dunning (1998); Cantwell & Piscitello (2002); Cantwell (2009)
OLI/ ECLECTIC PARADIGM	Combination of rationale in 'O' 'L' and 'I' tradition	Combination of advantages captured by MNEs outlined in 'O' 'L' and 'I'	Dunning (1980; 1981; 1988; 1993)

		tradition	
RESOURCE-BASED VIEW	FSAs are derived from a combination of capabilities and competencies needed to manage resources effectively	Resources (technological, physical, financial) & Capabilities (threshold and distinctive) of the firm assessed against VRIN (value, rarity, inimitability and non-substitutability) criteria	Penrose (1954), Rumelt (1984), Wernerfelt (1984); Dierickx and Cool, (1989); Connor (1991), Barney (1991); Amit and Schoemaker (1993); Mahoney & Pandian (1992), Peteraf (1993)
KNOWLEDGE-BASED VIEW	FSAs are derived from those knowledge-based resources and capabilities that can be internalised and leveraged effectively within the MNE.	All of above (resources and capabilities) specified in RBV which contributes specifically to MNE's knowledge-based competencies and that can be protected, leveraged and exploited.	Kogut & Zander (1992), Kogut (2000), Foss (1996), Nickerson and Zenger (2004), Spender (1996), Nonaka and Takeuchi (1995)
ORGANISATIONAL CAPABILITY VIEW	FSAs are derived through organisational routines and processes and they are path determined.	All resources, capabilities, competencies (knowledge) that are unique and have survived within the firm for a substantial time period	Grant (1996), Prahalad and Hamel (1990), Kogut and Zander (1993), Madhok (1997), Teece, Pishano and Shuen (1997), Erramilli, Aggarwal and Dev (2002)

3.2.2. How do ownership modes and sub-national locations fit in?

The FOAs of MNEs continuously develop their stock of KBAs and these are utilised to respond successfully to challenges in host market environments including 'liability of foreignness' (Zaheer, 1995; Dunning and Lundan, 2008). Knowledge flows associated with the KBAs in FOAs can emerge from different sources, e.g. know-how exchanged through licensing in markets, direct relationship with suppliers and investment in R&D locally etc. The knowledge flows from parent companies are normally regarded as the most valuable and rare (Kogut and Zander, 1993; Rugman and Verbeke, 2001). The other sources of knowledge flows to FOAs could be associated with location-specific characteristics (Cantwell and Mudmabi, 2011) or when the FOA evolves and develops knowledge independently of the parent MNE (Prahalad and Doz, 1987). However, analysis of KBAs derived from sources other than parent companies is beyond the scope of this research study. The knowledge and technological capabilities transferred by MNE parents are attempts at replicating FSAs, albeit imperfectly, in host locations (Cantwell and Piscitello, 2004). These FSAs, which are transferred via KBAs to FOAs, are also sought by host domestic firms (Spencer, 2008). Once the transfer materialises, the interaction between FOAs and domestic firms may generate spillovers, allowing the latter to gain access to KBAs (although imperfectly) and improving their products and processes (Haskel, Pereira and Slaughter, 2007). While MNEs would like to maximise the returns on their knowledge transfers abroad and protect core FSAs from leaking, domestic firms are better off the greater the size and quality of these knowledge leakages. Thus, MNE-FSAs and their protection in host countries from leakages as well as the efforts made by domestic firms to access these leaks form the basis of the knowledge pipeline model of spillovers.

The next sections explain why IB theory, specifically the KBV, better explain spillovers in the context of ownership modes and sub-national locations.

3.2.2.1 International business theory, ownership modes and spillovers

The relevance of MNE ownership modes as an important protection mechanism of FSAs and mediator of knowledge transfer to FOAs is well recognised in IB literature (Glass and Saggi, 2002; Mattoo, Olarreaga and Saggi, 2004; Hoekman and Javorcik, 2008). Three key points deserve mention regarding the role of MNE ownership modes; *first*, higher foreign ownership in FOAs is associated with larger transfers of superior technological and managerial know-how (KBAs) relative to FOAs with lower foreign ownership (Ramachandran, 1993; Saggi, 2002). *Second*, high-level foreign ownership modes having greater control in FOAs are characterised by relatively low knowledge transfer costs compared to low-level ownership modes with lesser control over FOAs (Desai, Folley and Hines Jr., 2003). *Third*, productivity levels of FOAs are associated with high-level ownership modes, e.g. WOSs are marginally better than shared ownership such as JVs, at least in the case of emerging and transition economies (ETEs) (Raff, Ryan and Stahlër, 2008).

Much of this evidence has been interpreted using IB theory on foreign ownership modes and the important role played by the FSAs of corporate parents. Despite the firm-level evidence on performance of different MNE ownership modes in host locations and its potential implications for spillovers, few studies (including unpublished work) have investigated the role of MNE ownership modes in spillovers (Blomstrom and Sjoholm, 1999; Javorcik and Spatareanu, 2008; Aini Khalifah and Adam, 2009; Abraham, Konings, and Slootmaekers, 2010; Sönmez and Pamucku, 2011). Moreover, the few studies that do look at this issue use different approaches (e.g. use of different definitions of foreign ownership) and do not clarify the theoretical associations between MNE ownership modes and the extent of spillovers in host locations, at least using IB theoretical lenses.

A clearer picture of spillover effects is likely to emerge only when ownership structure reflecting foreign investors' control over KBAs (through equity) in FOAs is considered. This is a firm heterogeneity issue that emphasises the importance of capturing differences in foreign ownership in modelling spillovers. Adopting a KBV view of the source of spillovers in the context of foreign ownership mode leads to a focus on three key aspects:

a. The level of protection afforded through ownership mode in MNE affiliates of core KBAs.

b. Consideration of whether the level of protection (and leakage of KBAs) differs by ownership modes.

c. The level of access to the leaked KBAs by domestic firms.

This implies that KBAs are the most important assets of the MNE and they give rise to spillovers in the host country. Adopting the KBV connects to ownership modes because the transfer of KBAs to FOAs and thereby the potential contribution to the knowledge pool available for spillovers to domestic firms is affected by ownership mode. The KBV centres on the development of resources into capabilities that lead to the acquiring of KBAs. The key capabilities identified in the KBV are normally linked to intangible assets connected to tacit knowledge. The capabilities to convert tacit knowledge into transferable KBAs are at the heart of the ways that MNEs transfer FSAs across frontiers. The effect of ownership modes for the transfer of KBAs to FOAs can be understood by using the KBV. High levels of ownership are likely to give greater protection of KBAs and thereby provide incentives to permit the transfer of KBAs across frontiers to exploit FSAs. Moreover, the ability to influence the difficult processes of converting tacit knowledge, which is at the core of KBAs, into useable FSAs in FOAs is likely to increase with high levels of ownership. Hence, higher levels of foreign ownership are likely to be associated with increased willingness by MNEs to transfer KBAs. The ability to internalise these KBAs limit leakages and this ability also increases with high levels of foreign ownership. The KBV therefore highlights two opposing forces at work in terms of the likely addition to the knowledge pool from the transfer of KBAs under different levels of foreign ownership. Higher levels of ownership boost the capabilities to transfer KBAs across frontiers, thereby increasing the potential leakages of knowledge. However, the ability to internalise KBAs also increases with higher ownership thereby reducing the likelihood of leakages into knowledge pools available for spillovers.

3.2.2.2. International business theory, sub-national locations and spillovers

Another research topic that has seen renewed interest in the IB literature is sub-national location. Two aspects within sub-national location that have attracted considerable scholarship are location choice of FOAs and their performance, especially in the context of large ETEs with high-income disparities (Chan, Makino and Isobe, 2010; Mukim and Nunnenkamp, 2012; Ma, Tong and Fitza, 2013). The emphasis on ETEs is not surprising given the rapid shift in location of international production in the last two decades (UNCTAD, 2010). More importantly, within-country differences could be key determinants of where MNEs decide to locate production and establish their FOAs. As a result, regional distinctions within countries are likely to influence the location of FOAs (Mody and Srinivasan, 1998; Chadee, Qiu and Rose, 2003).

Moreover, large countries have diverse economic and physical landscapes and certain locations possess better factor endowments, relative to others, that provide distinctive sources of competitive advantage for MNEs. This could have implications for performance of FOAs in certain locations (Ma, Tong and Fitza, 2013). Despite location-based advantages of MNEs being regarded as exogenous or country specific within the OLI tradition (Dunning, 1998), another set of scholarly work regards these advantages being endogenised by the MNE (Lall and Siddharthan, 1982; Erramilli, Agarwal and Kim, 1997; Rugman, 2010). The rationale is that firms have different capabilities and learn differently with regard to appraisal and exploitation of location-based value-added activities (Cantwell and Piscitello, 2000; Cantwell and Piscitello, 2005). In fact, MNEs that are efficient in using location-based advantages and do so repeatedly over longer time periods can transfer these learning competencies effectively to their other inter-related units (Andersson, Forsgren and Holm, 2002; Andersson, Dellestrand and Pedersen, 2013). These learning competencies derived from location-specific activities of FOAs contribute to the core FSAs of MNEs.

Despite the renewed interest in IB literature on intra-country location choice and performance of FOAs in large ETEs, there is a lack of scholarship on spillovers from a sub-national perspective. Although the extant literature investigates the spatial dimension to spillovers, this is limited to assessment of effects within industry-regions (often involving the concept of industrial clusters) and consideration of spillovers by administrative regions (Wei & Liu, 2006; Resmini & Nicolini, 2007). What is missing is how FOAs located in regions with different level of economic development could matter for spillovers (Girma and Wakelin, 2007; Jordaan, 2008). Although spillovers have been extensively investigated in terms of administrative regions and also for industrial cluster affects, the influence of sub-national differences have not been considered in terms of different levels of economic development. In particular, differences in spillovers between locations in large urban conurbations compared to smaller urban areas and rural areas.

An important issue here is how the transfer of KBAs is affected by the ability of FOAs in different locations to absorb these assets and convert them into FSAs. The location within a country affects this because the resources that are capable of being used to convert intangible assets into useable FSAs involve abilities to absorb and utilise effectively what is normally high volumes of tacit knowledge. This often requires highly educated and skilled labour and extensive access to sophisticated physical and institutional infrastructures. These labour and infrastructure resources are not uniformly distributed in host locations, therefore selection of particular locations (i.e. sub-national locations) plays an important role in the ability to transfer KBAs. Therefore, high transfers of KBAs may be skewed towards sub-national locations with high quality labour resources and good physical and institutional infrastructures. Sub-national locations with lower quality labour resources and infrastructures may, however, be attractive for the transfer of KBAs where the level of tacit knowledge required to convert KBAs to FSAs is low. In general, it would be expected that sub-national locations with high quality labour and good infrastructures will attract more KBAs and therefore the potential contribution to knowledge pools available to domestic firms would be larger than in sub-national locations that have lower resources of this type. However, as the transfer of KBAs to sub-national locations with poor labour and infrastructure resources is likely to be lower and less easy to internalise that in higher quality sub-national locations, it is possible that the addition to knowledge pools for domestic firms will be significant. Moreover, the lower level of KBAs transferred to such sub-national locations may make it easier for domestic firms to absorb the KBAs that have leaked into knowledge pools.

This research, by considering the role of MNE ownership modes and moderating role of sub-national locations in an emerging economy, explores the extent of their associations with spillovers. This is done by developing a conceptual framework in Chapter 4 that proposes mechanisms through which ownership modes and sub-national locations will affect spillovers.

The next sections specifically focus on the literature on spillovers in terms of both existing theory and evidence and clarifies the research gaps.

3.3. SPILLOVERS: THEORY AND EVIDENCE

The primary channels of spillovers, i.e. source of knowledge leakages, acknowledged in the literature are demonstration effects, labour mobility effects, and competition effects (Blomström and Kokko, 1998).

Demonstration effects in the same industry occur when domestic firms observe and imitate product and process technologies associated with FOAs. Akin to the analogy of '*reverse engineering*', the most important forms are imitation of managerial and organisational innovation, and imitation of technology (Ben Hamida and Gugler, 2009). Labour mobility effects arise when skilled employees that are trained in FOAs of MNEs move away from their employers to commence with entrepreneurial ventures or work for other domestic employers (Görg and Greenaway, 2005). The entry of MNE affiliates into an industry could also generate "*fresh winds of competition*"; however, its net impact could be bi-directional. On the one hand, the entry of MNE affiliates may force domestic firms to reduce X-inefficiencies or to upgrade their technological capabilities to remain competitive; as a result, there is an improvement in productivity of the latter (Görg and Greenaway, 2004). On the other hand, the entry of MNE affiliates increases competition in output and input markets. Competition in output markets may reduce domestic firms' market share forcing them to produce less output and thereby pushing up their average costs (Aitken & Harrison, 1999). Competition in the input market, such as labour markets, may lead to increase in wages and better employee compensation (Driffield & Taylor, 2000). This is likely to be unfavourable to domestic firms and could have a negative effect on their overall productivity.

A plethora of studies exists in the literature on intra-industry spillovers. Given the extent of the literature, this section will be divided into five sub-headings where the following issues will be addressed:

a. theoretical associations of well-established factors affecting spillovers
b. evidence for developed economies
c. evidence for ETEs
d. methodological issues
e. host country policy.

This systematisation of the literature will allow appropriate consideration of the key factors which spillovers are contingent on and in developing a better and clearer understanding of the core issues surrounding the literature. In addition, it will enable better identification of the current research gaps and permit development of a conceptual framework to address the gaps identified.

3.3.1. Spillovers: the known knowns

The conceptualisation of spillovers can be stretched to more than four decades ago (MacDougall, 1960; Caves, 1974; Findlay, 1978). A rich literature that has combined theoretical and empirical research has emerged in this area. The estimation of spillovers in earlier studies was characterised by the use of cross-sectional data at industry-level and these studies found a positive correlation between the presence of FOAs and industrial productivity. Some of the published work that adopted this approach includes Caves (1974) for Australia, Globerman (1979) for Canada, Blomström (1986), Blomstrőm and Persson (1983), Blomstrőm and Wolff (1994) and Kokko (1994) for Mexico, Blomstrőm, Kokko and Zejan (1994) for Uruguay, and Sjöholm (1999) for Indonesia. A few studies that used industry level panel data found different results. Cantwell (1989), investigating U.S. firms in Europe, found that spillovers are localised and negative competition effects prevail whereas Blomstrőm (1996) found no spillover effects in Mexico. Alternatively, Hubert and Pain (2000) found positive spillover effects dominating U.K. industries whereas Liu, Siler, Wang and Wei (2000) found evidence of enhanced labour productivity in U.K. industries due to foreign presence. Hejaz and Safarian (1999), using industry level panel data emphasised the importance of FDI over trade for R&D spillovers between G6 countries and their OECD recipients.

The drawbacks of spillovers studies using industry level data have also been documented, most importantly being problems in inferring the direction of causality (Görg and Strobl, 2001). It is quite likely that a positive association may result from the tendency of MNEs to locate in high productivity industries rather than by genuine productivity spillovers. Another probability could be of FDI inflows forcing less productive domestic firms to exit and/or MNEs increasing their share of the host country market, both of which would raise average domestic productivity in the industry (Smarzynska, 2003). Thus, failing to control for these issues in econometric modelling could be the reason behind mixed findings and inconclusiveness of previous results using industry-level data. The suggestion provided for researchers to address these issues is to employ firm-level panel data. Görg and Strobl (2001) argue that firm level panel data is the most appropriate estimation method because they allow the investigation of the following factors.

(a) *Development of domestic firms' productivity* over a longer period of time, rather than relying on single data points.
(b) *Spillovers, after controlling for other factors* (e.g. time invariant differences in productivity across industries that might be correlated with, but not caused by, presence of FOAs).
Thus, employing firm-level panel data has become the *sine qua non* in spillover research, aimed at better explanation of the micro-level effects of spillovers.

The exponential growth of the literature on spillovers in the last few decades has opened up a wide range of issues, especially with regard to the role of key contingency factors. This chapter focuses on the factors that have been well established, theoretically and empirically in the literature.

3.3.1.1. FDI spillovers and absorptive capacity

An important mediating factor that is well established in the spillovers literature is absorptive capacity (hereafter AC) of host country (domestic) firms (Cohen and Levinthal, 1990; Wang and Blomström, 1992; Nunnenkamp, 2004). The presence of sufficient AC allows domestic firms to integrate and adopt external knowledge flows within their productive processes (Perez, 1997; Kinoshita, 2001; Zahra, 2002). There are two aspects associated with AC of domestic firms, *first* being the search for available and relevant technologies and know-how (knowledge) and *second* the assimilation and transfer of knowledge internally to fit its own strategy (Eapen, 2012). Both aspects of AC are affected by the social structures (e.g. sparse or dense networks) in which firms are embedded.

Despite the complexity in conceptualising AC, the most commonly used measure of AC in the literature on spillovers is a crude one, generally known as the extent of research and development (R&D) expenditures (Griffith, Redding and Van Reenen, 2003; Chudnovsky, Löpez and Rossi, 2008; Marin and Sashidharan, 2010; Farole and Winkler, 2012). An alternative measure is the availability of skilled human capital (Kugler, 2006; Hale and Long, 2011) or investment in equipment for product/process innovation and training activities (Narula and Marin, 2003). The use of a particular measure is usually determined by the availability of data. The diversity in measurement of AC suggests that it is a multi-dimensional construct, and thus future studies should further unpack remaining dimensions of the required AC.

Liu, Siler, Wang and Wei (2000) and Marcin (2008) provide evidence that both intangible assets of a local firm and R&D intensity matter for productivity benefits in local firms. Whereas Sinani & Meyer (2004) find a positive moderating effect from investment in tangible assets and human capital, Blalock & Simon (2009) investigated three aspects of capabilities (productivity capability, AC and the capability for marketing, distribution and network) and found that each component may have a different role in spillovers. A macro-economic study of 119 countries also corroborates the results and discovers that social capabilities (measure of AC at country level) mediate the extent of technological upgrading from inward FDI (Kemeny, 2010). The findings suggest that developing economies endowed with better social capabilities have a stronger effect on technological upgrading from inward FDI but this effect is weak in developed economies.

An alternative measure, usually at the country-industry level has also been used to measure the potential for AC with positive and significant results being reported (Griffith, Redding and van Reenen, 2004). This actually is a measure for technological gap or backwardness and was used in Griffith, Redding and Simpson (2002) when investigating spillovers in the U.K. They operationalised it by using frontier-level TFP relative to TFP of domestic plants, where frontier-level TFP is defined either as the highest plant-level TFP at four-digit industry classification level at time t or as average TFP of the top three plants with the highest TFP. The implication is that increase in technological gap/backwardness enhances the potential for spillovers, as there is more to learn. Castellani and Zanfei (2003) used a slightly different measure of the same construct: the ratio of the average TFP level of foreign firms in two-digit industry *j* over firm *i*'s TFP level and found positive and significant results. These results were corroborated in Peri and Urban (2006) for a panel of German and Italian firms.

A few studies have used the inverse measure for technological gap/ backwardness suggested above to assess the role of AC in spillovers. Girma (2005), with a sample of 7516 British firms, used this measure and operationalised AC as firm's TFP level at time t - 1 relative to the highest level of TFP in the firm's industry at the four-digit level. The results confirm an inverted U-shaped effect of AC on spillovers. Surprisingly, Girma and Görg (2007), investigating British electronics and engineering industries and using the same measure, found a U-shaped effect of AC on spillovers. This result was confirmed in a theoretical model developed by Grünfield (2006). In line with this argument, Javorcik & Spartareanu (2008) further proposed that a firm being a leading-performer in their own respective industry could also be an indicator of strong AC.

3.3.1.2. FDI spillovers and transmission channels

A few limited studies using firm-level panel data have also focused on the impact on spillovers of different transmission channels such as employees, imitation by domestic firms and competition effects. Host-country workers are better trained and educated in FOAs than the average domestic firm. Thus, if workers trained in FOAs eventually move to a domestic firm or start entrepreneurial ventures, they can apply the knowledge acquired from the MNE to the domestic firm's benefit. The rationale is that tacit knowledge is embedded in employees trained in FOAs and their recruitment by domestic firms may lead to direct knowledge transfer (Liu, Lu, Filatotchev, Buck, & Wright, 2010). Although tacit knowledge is difficult to codify (Polanyi, 1957), transfer of key personnel trained in FOAs is likely to mitigate some of these difficulties through capabilities for better assimilating external technological know-how (Fu, Helmers and Zhang, 2012) and since human beings are regarded among the key agents through which technology spillovers materialises (Findlay, 1978). One of the first studies documenting the importance of this channel is Fosfuri, Motta, and Ronde (2001).

Markusen and Trofimenko (2007) investigate this issue using 304 Colombian plants employing at least 10 workers and finds that hiring foreign experts increases real wages at the hiring plant. This effect was found to be instantaneous (occurs immediately after hiring) and persistent (remaining even after the MNE trained worker exits the plant). Görg and Strobl (2005), using a panel of 228 Ghanaian manufacturing firms, indicate that a domestic firm owner's previous experience in an FOA increases the productivity of domestic firms but only if FOAs and domestic firms are in the same industry. In the case of emerging economies, Poole (2007) found evidence of spillovers through worker mobility in Brazil and interprets that an increase in the presence of foreign workers increases wages, indicating that knowledge is spilling over from former FOAs' employees to national firms. Hale and Long (2006), using a similar approach and a sample of 1,500 firms in five Chinese cities, also finds positive evidence.

In the case of demonstration effects, this is most likely to occur through spillovers within the same industry (Saggi, 2002). There have been few studies that explicitly investigate demonstration effects. Sinani & Meyer (2004) suggest that sales or output of FOAs are linked with knowledge diffusion of superior marketing and production skills through demonstration effects. In some studies, spillovers through sales and production activities are positive (Hoekman, 1996; Konings, 2001; Sembenelli & Siotis, 2008), while it is negative in Blomström & Sjöholm (1999).

Ben Hamida & Gugler (2009), using the same measure, also found demonstration-related spillovers in a sample of Swiss manufacturing and service firms. Alternatively, Cheung and Lin (2004) used another approach to assess spillovers through demonstration effects on three types of patent applications in 26 provinces in China: invention patents (new technological solutions), utility patents (solutions relating to the shape or structure of a product), and design patents (designs of shapes or patterns). It was found that increased FDI in a province has a positive effect mainly on design patents. As design patents are very easily imitated, this was interpreted as evidence of demonstration effects. Hale and Long (2006) also find some conditional evidence of demonstration effects through network externalities in China. A further measure used in the literature to investigate demonstration effects is the intensity of capital investment by MNEs (Wei & Liu, 2006). However, the few studies touching on this issue have come across contradictory results. Spillovers from MNE-specific capital investments appear positive in Dimelis & Louri (2001), but negative in Hu & Jefferson (2002).

Competition effects as a channel for spillovers has not received exclusive attention in the literature despite the theoretical argument that greater competition is likely to induce MNEs to transfer better knowledge-based capabilities to their FOAs, increasing the potential for spillovers (Blomström, Globerman, and Kokko, 2001). Glass and Saggi (1998) and Wang and Blomström (1992) have documented this point theoretically, although empirical studies have not explicitly studied the effect of host-industry competition on spillovers from FDI and more importantly competition exerted by FOAs in host industries and the extent of spillovers.

Kokko (1996) proposed that the foreign presence variable might be inappropriate for capturing spillover effects arising from competition. This is because spillovers from competition are not necessarily proportional to the presence of foreign firms, although demonstration and contagion effects are. Thus, disentangling demonstration and contagion effects (which characterise the spillover benefits of FDI through imitation of product and process technologies of MNE affiliates and/or through worker mobility) from that of competition effects was suggested through the use of technology and competition-related control variables. Studies using this approach in attempting to accurately identify spillover effects from competition have had limited success (Liu, Siler, Wang and Wei, 2000; Sinani and Meyer, 2004; Chang and Xu, 2008). There is yet to be a study that has explicitly separated spillover effects from demonstration, worker mobility and competition.

3.3.1.3. FDI spillovers and environment heterogeneity

Heterogeneity in the external environment is also likely to affect interaction between MNEs and domestic firms in an industry, affecting spillovers. A few important factors are discussed below.

a. Industry-level factors

The extent of industry-level environmental factors mediating between FOAs and domestic firms is likely to affect knowledge diffusion. One of the key factors is related to the technological intensity of industries. Domestic firms operating in industries with high technological intensity are more likely to benefit from spillovers than those in other industries (Kinoshita, 2001; Keller & Yeaple, 2009; Sembenelli & Siotis, 2008). The argument is that MNEs have superior technological and managerial know-how, also known as FSAs, that tends to generate competitive advantages and their exploitation is more likely to be in technologically intensive industries and therefore concentration of FDI is likely to be larger in such industries. Thus, more learning opportunities appear for domestic firms operating in technologically intensive industries than those in less technologically intensive ones. The evidence of the role of industry-technological intensity in FDI spillovers is consistent regardless of whichever classification for technological intensity is adopted, i.e. OECD's classification of high-tech industries (Görg & Strobl, 2003) or the relative share of industry's R&D expenses (Liu & Wang, 2003).

Another important industry-level factor that impedes spillovers is the technological gap between domestic firms and FOAs within an industry. Domestic firms, on average, are farther from the industry technological frontier than FOAs (Caves, 1996). While some level of technology gap is likely to aid in positive spillovers, suggesting that domestic firms' will have to gradually 'catch up' to improve their technological standards in an industry (Driffield and Love, 2001), a high level of technology gap prevents successful acquisition of foreign technology by domestic firms (Girma, 2005). Thus, industries characterised by a smaller technological gap between domestic firms and FOAs are more likely to benefit from positive spillover effects (Dimilis, 2005; Liu, Siler, Wang & Wei, 2000; Takii, 2005).

b. Country-level factors

Country-level factors, such as institutional reforms, degree of openness, quality and enforcement of intellectual property protection (IPP) regimes etc., can also matter for spillovers. A few cross-country studies have compared the impact of spillovers across countries with different institutional quality. In the case of transition economies in Eastern Europe, lack of progress in economic reforms is associated with a higher propensity for negative spillovers (Konings, 2001; Yudaeva, Kozlov, Melentieva, & Ponomareva, 2003). Fortanier (2007) proposes that the level of institutional development in transition economies, i.e. human capital, institutional quality and trade openness, is a moderator of spillovers.

The role of economic openness of a country can also affect spillovers as increased openness induces negative spillover effects. This arises from excessive competition due to the presence of MNE affiliates forcing domestic firms to exit the market (Beugelsdijk, Smeets & Zwinkels, 2008). The income level of the host country explains variances in spillovers. While spillovers contribute to economic growth in low-income countries, the positive effects may decline and negative effects emerge if the country reaches a higher level of institutional and economic development, (Meyer & Sinani, 2009). However, after a certain threshold inward FDI resumes positive spillover effects on host-country growth.

The role of IPP on spillovers is rare and only a few studies have investigated this phenomenon (Smeets, 2008). Branstetter, Fisman, and Foley (2006) analysed the effect of IPP on knowledge transfer from 1,000 U.S. MNEs to about 5,000 of their FOAs in 16 developing countries but the implications of their results for spillovers are unclear. Using Ginarte and Park (1997) index and using a 5-year panel of 2500 local firms and 350 FOAs in 22 OECD countries, Smeets and De Vaal (2007) finds positive spillovers in countries with weak IPP and negative spillovers in countries with high IPP. In the case of inter-industry spillovers, the findings are reverse, i.e. spillovers are positive in countries with high IPP and low in countries with weak IPP.

There are few studies that have implied the effects of IPP in their work. For example, Feinberg and Majumdar (2001), using a sample of 65 domestic firms and 30 FOAs, find no evidence of spillovers in Indian pharmaceutical industries, despite this sector being characterised by weak IPP in the given period (1980s – early 90s). Allred and Park (2007) theorise that an optimal and positive degree of IPP stimulates diffusion of a good volume of knowledge from MNE affiliates. Further studies investigating the relationship between the strength of IPP and spillovers are restricted because of two opposing effects indicated in the literature. A strong IPP regime induces MNEs to transfer core FSAs and larger volume of knowledge to FOAs, thereby increasing spillover potential. However, the presence of a good IPP regime makes it difficult for domestic firms to capture spillovers, for example, through imitation. Thus, it is difficult to disentangle the net effect of IPP on spillovers.

c. Spatial proximity

A large empirical literature suggests that spatial proximity (distance between firms) is an important condition for capturing spillovers. The reasons for the supposed importance of spatial proximity could be traced to the transmission channels of spillovers examined above. Girma and Wakelin (2007) argue that many of these transmission channels have a clear spatial component and their relative effectiveness in spreading knowledge benefits depends on the physical, technological or commercial distance between firms or the degree of technological similarities between senders and recipients of knowledge (Kaiser, 2002). Technological similarities can be measured (indirectly) to some extent through industry-specific or region-specific effects of MNE investments, while assuming that spillovers are limited to their respective industries and industry-in-regions. The transmission channels could be constrained by geographical distance.

Barrios, Bertinelli and Strobl (2006) found that spillovers are positive and significant in Irish counties with positive co-agglomeration of domestic firms and FOAs of MNEs. Nicolini and Resmini (2007) also report positive spillover effects on regional (domestic) TFP from FOAs located in the same region and negative spillover effects from the presence of FOAs in other regions. However, the extent to which geographical distance between firms, whether defined as physical, technological or commercial, as a factor for spillovers needs further research. Although regional spillovers are positive in the event of the predominant agglomeration effect in theory, this is not always the case (Haskel, Pereira, & Slaughter, 2007; Konings, 2001; Yudaeva, Kozlov, Melentieva, & Ponomareva, 2003). More theoretical and empirical work should be devoted exclusively to understanding the role of geographical distance in spillovers.

3.3.1.4. FDI spillovers and firm heterogeneity

The heterogeneity of MNEs with respect to their motivations for FDI, nationality of investors, firm size and type of ownership structure in FOAs could also affect spillovers. This is because FDI in a host country, unlike portfolio investment or investment in stock markets, are not homogenous flows of capital but are sources of different types of managerial and technological know-how (Fortanier, 2007). It is important to consider factors associated with firm-level heterogeneity to better understand the conditions under which spillovers occur (Görg and Greenaway, 2004; Wooster and Diebel, 2010).

a. Motivations for FDI

The potential for spillovers is likely to vary with strategic investment motivation of MNEs. The literature has distinguished between asset exploiting and asset-seeking FDI, whereby asset-exploiting FDI is further divided into market seeking and efficiency seeking (Markusen & Maskus, 2002; Dunning & Lundan, 2008). It is generally understood that MNEs' motivation for investment determines the volume and quality of KBAs to be developed in host locations. Beugelsdijk, Smeets and Zwinkels (2008) contrasted spillovers between efficiency-seeking activities (or vertical FDI) and market-seeking (or horizontal FDI) activities by FOAs. Whereas the former refers to FDI driven by international factor price differences, the latter relates to the motivation to penetrate the local market. The study finds that market-seeking FDI generates stronger positive spillovers than efficiency-seeking FDI if the host country is developed, the reason being market-seeking FDI utilises knowledge capital more intensively. However, no spillovers were detected from market- or efficiency-seeking activities in developing host countries. They interpreted this finding with the openness of developing host countries generating greater competition effects in local industries and negative effects dominating the domestic firms.

A few studies also investigated the impact of asset-seeking FDI that is increasingly relevant in IB environments because of globalization of R&D and international technology sourcing (Chung & Yeaple, 2008; LeBas & Sierra, 2002). Driffield & Love (2007) categorised MNE motivations into two types.

1) Those endowed with relatively inferior FSAs and thus driven by technology sourcing activities in the host country.
2) Those endowed with strong FSAs and thereby driven by technology-exploiting activities in the host country.

It was found that positive spillovers occur in industries where technology exploiting activities are carried out by FOAs, in contrast with negative spillovers in industries with greater share of technology-sourcing activities by FOAs. These findings echo the results in Girma (2005) who used a similar typology to categorise MNE investment motivations.

To summarise, FDI motivations should be based on exploitation of superior FSAs in order to be considered a source of positive FDI spillovers.

b. Nationality of the foreign investor

The nationality or country of origin of FDI firms is also important. The quality of KBAs held in an MNE affiliate is associated with its nationality as comparative advantages embedded in home countries are part of MNE-FSAs (Rugman & Verbeke, 2001). It is often argued that, on average, MNEs originating from developed countries tend to possess superior FSAs with regard to leading technologies and well-developed networks for marketing and distribution, while MNEs from emerging economies are associated with relatively inferior capabilities. Alternatively, a larger diversity in the nationality of MNE affiliates present in the host country also increases the potential for spillovers. Zhang, Li, Li and Zhou (2010) propose that the opportunity *to* learn for developing country host firms is enhanced through "*exposure to superior systems of technologies, management practices, and cultural values brought by foreign firms from different nationalities, leading to positive spillover effects*."

The evidence, however, is not straightforward. It has been found that FDI from Hong Kong, Macao and Taiwan (HMT-FDI) generates positive spillovers in labour-intensive sectors while western FDI generates positive spillovers in technology-intensive sectors (Buckley, Clegg and Wang, 2007). Similar findings are echoed in Abraham, Konings and Slootmaekers (2010) for China. Hu & Jefferson (2002) reported significant negative competitive pressures in China, as the level of foreign sales rises in the local industry, however these negative effects are particularly strong for FDI from OECD countries, while HMT-FDI generates lower negative effects on domestic rivals. In the case of diversity of FDI country of origin (nationality of MNEs) in China, Zhang, Li, Li and Zhou

(2010) found a positive and significant effect on knowledge spillovers nationally, but a negative effect locally.

c. Firm size

The role of heterogeneity in terms of firm size is also a contributing factor in spillovers. The source of firm size heterogeneity arises from,

i. firm size of FOAs, and
ii. firm size of domestic companies.

On the one hand, large FOAs are better equipped to receive higher volume of technological know-how and thereby increase the stock of KBAs in the host country (Teece, 1997; Ujjual and Patel, 2011). Large FOAs are also more likely to appropriate efficiency gains from FDI, mainly arising from the interaction between FSAs and the locational advantages of host-regions (Cantwell, 1995). Thus, their presence in terms of numbers within an industry stimulates network connections (formal or informal) with other firms, suppliers, etc. (Reichstein and Jensen, 2005) through which useful managerial know-how and best practices might leak to other domestic firms (Javorcik and Spatareanu, 2008).

On the other hand, size of domestic (host country) firms could be a relative measure of absorptive capacity (Cohen and Levinthal, 1990). Large domestic firms in emerging economies invest heavily in R&D and therefore are more suited to exploit their learning competencies to absorb and assimilate knowledge than small firms (De Fuentes and Dutrénit, 2013). In addition, large domestic firms are likely to be endowed with better network connections with other domestic firms through formal arrangements and by virtue of being locally embedded for a long time period. Thus, large domestic firms can better absorb spillovers as well as enhance quicker dissipation of knowledge to other firms that are tied to them.

In a stark contrast to this argument, small firms can also benefit from spillovers if they have a higher technology gap with FOAs and display increasing (low to medium) firm productivity over a given time period. This implies that small firms who are technologically backward and are introducing efforts to increase their productivity are also likely to benefit from intra-industry spillovers (Peri and Urban, 2006). The empirical evidence on firm size corroborates some of the propositions discussed in this section. Damijan, Rojec, Majcen and Knell (2013) find that overall in transition economies of Europe, negative spillovers are more likely to be associated with smaller firms whereas firm size does not matter for positive spillovers. However, micro and small firms in Bulgaria and Poland have benefitted from positive spillovers. These findings are echoed in the study of Nicolini and Resmini (2010) who finds similar evidence of firm size in the context of Bulgaria, Poland and Romania. Xu and Sheng (2012) also investigate the issue of firm size for Chinese firms wherein it was reported that large and medium-sized firms enjoyed greater spillover benefits than small firms. The effect is stronger for firms that have forward linkages with FOAs.

An important determining factor in the difference of results could be the measure adopted for firm size, for example in Chinese datasets, small firm censoring is done on the basis of a sales revenue threshold (Chang and Xu, 2008); therefore firm size measured by sales is a good indicator. In the case of 10 European transition economies, i.e. Bulgaria, Czech Republic, Estonia, Latvia, Lithuania, Poland, Romania, Slovenia, Croatia and Ukraine, number of employees was used as an indicator of firm size (Damijan, Rojec, Majcen and Knell, 2013).

d. Degree of foreign ownership in FOAs

One of the most important firm heterogeneity issues that has received much less attention, both theoretically and empirically, is the level of foreign ownership in FOAs and the implications for spillovers. The level of foreign ownership exercised by MNE parents and host country performance is well documented in the IB literature. The empirical evidence on the performance implications is inconsistent. Some studies find that WOSs outperform JVs because of superior knowledge, endowments, and larger transfers of core FSAs in WOSs compared with JVs (Chen and Hu, 2002; Gomes-Casseres and Jenkins, 2003; Gaur and Lu, 2007). This has been found for Japanese FOAs in the U.S (Vega-Céspedes and Hoshino, 2001) and Germany, France and U.K. (Nitsch, Beamish and Makino, 1996). Other studies find that JVs perform better than WOS because of the dominant role of the local partner in developing knowledge-based resources and capabilities (Makino & Delios, 1996; Makino and Beamish, 1998). There is no study that compares performance of MAJVs and MIJVs. The consideration of MNE ownership modes allows examination of their relative performance implications in host country industries and offers a better explanation as to how they could promote spillovers.

The empirical studies that consider role of MNE ownership modes in spillovers is limited and these studies provide mixed evidence. A unique feature is that the definition of foreign ownership is *inconsistent* throughout all studies. While a few studies differentiate between full or partial ownership, better interpreted as WOSs and JVs respectively (Javorcik and Spatareanu, 2008), others used definitions of the equivalence of majority or minority foreign ownership that equates to MAJVs and MIJVs (Blomström and Sjohölm, 1999; Dimelis and Louri, 2004; Takii, 2005). A few unpublished studies (all working papers) have categorised foreign ownership modes into fully-owned (WOS), majority-owned (MAJV), minority-owned (MIJV) (Sönmez and Pamucku, 2011) as well as equal domestic-foreign ownership along with the previous three categories (Tang, 2008). The consistency in the definition of foreign ownership is very important for policy purposes, especially in ETEs relying on FDI to achieve development objectives through spillovers (Balasubhramanyam, Salisu and Sapsford, 1996). This is because, *firstly*, it allows better identification of the actual composition of foreign ownership in FDI projects and *secondly*, it allows to better capture the degree of MNEs' control over KBAs. Whereas the first point refers to capturing actual FDI volumes in different types of transactional alliances with domestic firms such as JVs, the second point reflects the extent to which knowledge stock (KBAs of FOAs) for diffusion is available in the host country. A theoretical analysis of the extent to which KBAs can influence spillovers through different MNE ownership modes is conducted in the conceptual chapter (Chapter 4).

Focusing on the empirical evidence, Blomström and Sjohölm, (1999) using a cross-sectional sample of 13,663 Indonesian plants, found no significant spillover effects in majority or minority foreign-owned plants. This evidence was interpreted as type of foreign ownership in FOAs not being a determinant of the extent of FDI spillovers. However, Takii (2005), using a 5-year panel of 22,000 Indonesian firms, found positive spillover effects from both ownership types, but the effect is stronger for minority foreign ownership rather than majority or full foreign ownership. This was interpreted as wholly or majority-owned being better able to control diffusion of knowledge from their KBAs than minority-owned firms. In the case of Greece, Dimelis and Louri (2004) using a sample of 3,742 manufacturing firms detects no significant spillover effects from majority foreign ownership but finds positive effects for ‘smaller’ domestic Greek firms from minority foreign ownership. Javorcik and Spatareanu (2008), using a sample of 74,177 Romanian firms, provides evidence that WOS and JVs are associated with negative spillover effects with the effects from the former being higher than the latter. In the case of China, Abraham, Konings and Slootmaekers (2010) used 15,000 firms and finds evidence of positive spillovers for JVs and negative effects for WOS. Another study on China ascertains the role of both equity and non-equity JVs in generating positive spillovers, while WOS are not significantly associated with spillovers (Tian, 2010). Using a sample of 4504 Malaysian establishments, Aini Khalifah and Adam (2009) used three generic foreign ownership modes (defining them clearly) and found that WOS, MAJVs and MIJVs are associated with positive spillovers (measured by labour productivity) when proxied by value added and fixed assets but the significance of these results diminishes when measured by employment.

Alternatively, evidence from a few unpublished studies also discovers results that are consistent with previous studies. For example, Tang (2008), using a Chinese firm-level panel dataset, found that WOSs generate greater negative intra-industry spillovers than all JVs, while Sönmez and Pamucku (2011) found similar results using a panel of manufacturing firms in Turkey. Thus, it is evident that literature reveals no consistent patterns and also provides no clear theoretical analysis on the relationship between MNE ownership modes and the extent of FDI spillovers.

The lack of conclusive findings in the literature on spillovers and MNE ownership modes could be attributed clearly to definition and measurement of foreign ownership variables. An appropriate definition that reflects the actual level of foreign ownership in FOAs and its operationalisation is important for robust modeling of MNE ownership modes and spillovers (Ayyagiri, Lau and Spencer, 2009). A more pertinent issue, also, is the lack of comprehensive theoretical analysis involving generic MNE ownership modes and the potential for spillovers. This is despite the IB literature providing a rich theoretical background on the importance of generic MNE ownership modes and their performance implications in host countries (Makino & Delios, 1996; Makino and Beamish, 1998; Vega-Céspedes and Hoshino, 2001; Chen and Hu, 2002). Most importantly, three key factors have been identified in the literature on variation in performance of MNE ownership modes:

i. Role of knowledge pools
ii. Role of linkages/network connections
iii. Industry-competition effects

A clear and comprehensive theoretical analysis utilising these three factors to explain the extent of spillovers from generic MNE ownership modes is provided in the next chapter.

3.3.2. FDI spillovers: evidence for developed economies

The potential for FDI in developed economies is promising, at least in terms of spillovers (Fons-Rosen, Kalemli-Ozcan, Sørensen, Villegas-Sanchez and Volosovych, 2012). One of the key factors contributing to this generalised opinion on spillover potential is the role played by superior AC of developed economy firms relative to firms in developing economies (Crespo-Cuaresma, Foster and Scharler, 2004). The sufficient level of AC (at the level of firms, industries and regions) in developed economies could be attributed to a number of country-level factors. These include well-developed market supporting institutions (Buchanan, Le and Rishi, 2012), availability of skilled human capital (EngelBrecht, 1997; Benhabib and Spiegel, 2003) and better IPP regimes guaranteeing protection of proprietary technologies and know-how (Branstetter and Saggi, 2009; Papageorgiadis, Cross and Alexiou, 2014). The presence of these factors enhances innovation and technological breakthroughs in developed economies which further enhances their total knowledge stock (Feldman, 2001; Pinch, Henry, Jenkins and Tallman, 2003). The underlying rationale is that total stock of knowledge available in a country is an important driver of the extent of spillovers locally (Breschi and Malerba, 2001; Tallman, Jenkins, Henry and Pinch, 2004; Kafouros and Buckley, 2011). However, the spillover effect is moderated by industrial concentration and co-agglomeration as the ease at which domestic firms can search and absorb locally relevant knowledge declines with large industrial concentration (Cantwell and Mudambi, 2011).

The strategy of MNEs in transferring technological know-how to their FOAs is also an issue to be considered in the context of spillovers in developed host economies, although there is a lack of robust theoretical and empirical work inferring this relationship. Anecdotal evidence suggests that MNEs may be interested in deliberate knowledge outflows to host locations to boost quality of skilled labour, improve managerial and industry best practices and enhance overall productivity of firms in certain industries (Branstetter, 2001; Perri, Andersson, Nell and Santangelo, 2013). The Midlands region in the U.K. could be seen as an example (the most successful region in terms of attracting FDI during 1970s and 1980s) where some case evidence of spillovers to domestic firms in chemical, electrical and mechanical industries was documented (Driffield, 2004; Jones and Wren, 2008). The view is that MNEs may deliberately desire some level of spillovers in industries which are at an initial stage of development and where the costs of knowledge outflows will be compensated for by the long-term benefits received from the industry-region, namely a skilled and well-trained workforce, efficiency in supply chains etc. (Perri, 2011). This compensation is better guaranteed in developed than developing economies because of the quality of institutions and IPP protection suggested earlier.

Moreover, knowledge outflows from MNE affiliates to host locations may be limited to know-how that is not proprietary in nature and where diffusion of core FSAs can be prevented (Mansfield, Rapoport, Romeo, Wagner and Beardsley, 1977; Nadiri, 1993). Recent research has already started investigating the trade-off between knowledge outflows and knowledge inflows (Singh, 2007;

Knott, Hart and Wu, 2009; Perri, et al., 2013) and knowledge protection strategies adopted by MNEs in advanced economies (De Faria and Sofka, 2010). Although interesting, discussion of this new literature is beyond the scope of the current study.

The empirical evidence for spillovers in developed economies focuses on studies using firm/plant-level panel data, as they are likely to mitigate estimation biases associated with endogeneity and other measurement issues (Görg and Strobl, 2001). A few survey-based studies are also reviewed as data from firm level surveys allows unpacking the process of spillovers by allowing investigation of detailed and important nuances, albeit at the cost of generalisability of results.

In the case of the U.K, Girma and Wakelin (2007), using a sample of about 15000 plants from 17 electronics industries, finds that the extent of FDI intra-industry spillovers depends on the nationality of foreign investors. A positive and significant effect for Japanese FDI was found to be followed by a weaker effect for European FDI and an insignificant effect for U.S FDI. The spillover effect being stronger in developed regions relative to other government-assisted regions in the U.K. reinforces the role played by firms' superior AC in developed regions in better absorption of knowledge flows. In an earlier study in the U.K. by Girma and Wakelin (2002), spillovers were found to be confined to regions where FOAs are located, thereby implying the importance of spatial proximity. Haskel, Pereira and Slaughter (2007), using detailed U.K. plant-level data from ARD (Annual Census of Production Respondents Database), and ONS (Office for National Statistics), find evidence of spillovers from FDI through mobility of employees. The results suggested that a 10 percentage point increase in foreign presence in a U.K. industry (measured by foreign share of employment) raises the TFP of that industry's domestic plants by about 0.5%. The importance of AC of British firms is also documented, as Girma (2005) finds an *inverted* U-shaped effect of AC on FDI spillovers using a firm-level panel of 7516 firms, whereby spillover effect is maximised at intermediate levels of AC. An opposite effect (U-shaped) is found in the British electronics and engineering industries (Girma and Görg, 2007). Fu, Helmers and Zhang (2011), in a study of 1000 U.K. retail firms, found that management capabilities of FOAs that are codifiable (e.g. human resources capabilities) have a net positive effect, whereas management capabilities in FOAs that are tacit and firm-specific have a negative competition effect on domestic firms located in the same regions as FOAs. This study does not employ an equity-ownership criterion to define MNE affiliates and instead considers all firms that are of non-British nationality to be MNE-owned retail firms.

Evidence of positive spillover effects from FDI in U.S. manufacturing industries has been found in Keller and Yeaple (2007). Using a firm-level panel from S&P's Compustat database that accounts for more than 55% of total manufacturing firms, it was found that spillovers are more pronounced in high-technology than in low-technology industries. The results corroborate the findings of Branstetter (2001) who investigated U.S. affiliates of 189 Japanese firms using patent data and found evidence of positive spillovers from Japanese FDI in the U.S. In the case of European countries, Castellani and Zanfei (2003), using a sample of about 4000 firms from France, Italy and Spain, find evidence of positive spillovers where mediating effects of AC are insignificant but effects of technological gap are positive and significant. The findings of technological gap are similar in Peri and Urban (2006) who investigate 40,000 Italian and 800 German firms. Barrios, Bertinelli and Strobl (2006), using 338 plants spread across 26 Irish counties, found that spillovers are more pronounced in counties with higher co-agglomeration of FOAs and domestic firms.

Evidence of positive spillovers in the presence of sufficient AC has also been reported in Swiss manufacturing and service industries (Ben Hamida and Gugler, 2009). The evidence is based on firm-level surveys (KOF innovation survey) of 309 manufacturing and 238 services/construction firms. The study finds that domestic firms with medium-technological gap and high investment in product and process innovation contribute to demonstration-related spillovers, as measured by foreign firms' sales. Another study, using survey data of 210 FOAs in Sweden, finds evidence of spillovers and attributes this to competitive pressures exerted by FOAs promoting reaction by domestic firms' to improve product and process innovation (Hallin and Lind, 2012). The study highlights the importance of demonstration effects, especially imitation and competence development in response to changes in competitive positions.

Another study on Spanish manufacturing industries with regard to spillover impacts reveals contrasting evidence (Garcia, Jin and Salomon, 2013). The findings from a survey of 1799 firms suggests that FDI has a negative association with innovative performance of domestic firms (measured by patent application and product innovation counts) but has a net positive effect on traditional measures of productivity, i.e. labour productivity and TFP. The findings have crucial policy implications, especially from a developed economy perspective, as FDI may have productivity-enhancing effects in the short term but could have stagnating effects on domestic firms' innovation in the long term. The results from this study are in line with findings about knowledge protection strategies used in FOAs of MNEs in developed economies and that superior and dynamic MNE-FSAs are likely to be concentrated in the corporate parent while non-proprietary know-how and technologies are likely to be transferred and diffused eventually to host economies (De Fario and Sofka, 2010). A summary of the findings is displayed in Table 7.

3.3.3. FDI spillovers: evidence for emerging and transition economies

The literature on spillovers in ETEs is extensive and therefore it is essential to restrict the review to types of studies that include (a) and either (b) or (c) outlined below:

a. use firm/plant level panel data,
b. utilise large samples for better generalisability, and
c. provide clear implication of results and explicitly highlight contribution to the literature

The literature has seen a rapid surge of studies in ETEs (Wooster and Diebel, 2010). However, the majority of findings are at best mixed (sometimes for different studies analysing the same country) and conclusive results are yet to be established (Görg and Greenaway, 2004; Meyer and Sinani, 2009). The variation in findings could be attributed to differences in methodological approaches (Görg and Strobl, 2001), the role of model misspecification (Wooster and Diebel, 2010) and a lack of alternative empirical estimation frameworks (other than the production-function approach) (Driffield and Jindra, 2012). In addition, the majority of the studies are characterised by research designs that do not investigate factors explaining the conditional existence of knowledge spillovers simultaneously (Wei and Liu, 2006; Smeets, 2008). Most importantly from an IB perspective, there is an absence of robust theorising that could explain different types of FDI heterogeneity, effects of mediating and moderating factors and effects of transmission channels of knowledge spillovers in a single theoretical framework (Barbosa & Eiriz, 2009; Zhan and Mirza, 2012).

In the case of China, Wei and Liu (2006), using a 3-year panel of 16,000 firms, finds positive spillover effects and that they are more pronounced locally (industry within regions) rather than nationally. The effects for spillovers within regions are similar even when FDI is categorised into FOAs from HMT and OECD regions. The study, by using seven different measures of spillovers (measured through MNEs' equity share, capital, employment, sales, output, R&D, and equity measured by sales), also better captures different aspects through which spillovers are likely to be manifested in the host economy, mostly related to transmission channels of knowledge spillovers (Görg and Strobl, 2001). Chang and Xu (2008), distinguishing between spillover (contagion) effects and spillover effects from competition, used a similar Chinese dataset and found that spillover effects are more prominent at the national level while negative competition effects dominate at the local level and results in crowding-out of domestic Chinese firms. Tian (2007) and Tian (2010) employed a 3-year panel of 11,324 firms and conducted a deeper investigation of different transmission channels and foreign ownership modes. The results suggested that JVs have better prospects for spillovers than WOSs and investment in intangible assets by FOAs as opposed to tangible assets is a potent source of spillovers. Moreover, positive spillovers are more likely to occur through employment of unskilled workers in FOAs and least likely to occur through skilled employees. Finally, locally sold products generate positive spillovers rather than exported products and this is likely through sales of traditional products rather than newly developed products.

In another study, Abraham, Konings and Slootmaekers (2010), using 15,000 Chinese firms, find evidence of positive spillovers for JVs and negative effects for WOS and also discover that export-driven investment by HMT firms has a negative effect on knowledge spillovers. The importance of human mobility as a more dominant channel of spillovers is established in Liu, Filatotchev, Buck and Wright (2010). Utilising a sample of 1318 high-tech firms in the ZSP region of Beijing, it was found that returnee entrepreneurs of China promote direct technology transfer in FOAs and spillovers indirectly to other domestic firms. A very recent study also employed a process-dependent approach to investigating spillovers and explored the moderating role of pace and irregularity of foreign entry on spillovers (Wang, Deng, Kafouros and Chen, 2012). Using a sample of 42000 firms over an 8-year period, it was found that the pace and irregularity of foreign entry negatively moderates the relationship between foreign presence and spillovers. The results imply that domestic firms in low-tech industries are better able to overcome some of the negative effects of fast and irregular foreign entry.

In the case of spillovers in India, Kathuria (2002), using a 7-year panel (post-economic liberalisation) of about 500 manufacturing firms, finds that FDI inflows has a positive effect on scientific firms than non-scientific firms and this effect is stronger when controlled for R&D intensity. These findings on the importance of R&D activities is in contrast with the study by Feinberg and Mazumdar (2001), which finds insignificant spillover effects of FDI in pharmaceutical industries due to lack of complementarity between R&D activities of FOAs and domestic firms. Another firm level study by Kathuria, (2000), using a 13-year panel (preeconomic liberalisation), found negative spillover effects and attributed this to competition effects dominating positive productivity effects. The pre-liberalisation time period chosen also could explain the findings as volume of FDI inflows was lower and therefore was characterized by lesser scope for technology transfer to FOAs. Kemme, Lugovskyy and Mukherjee (2009), using a 6-year panel of 1800 IT and textile manufacturing firms, found evidence of positive spillover effects for the IT industry and insignificant effects for the textile industry. The factor explaining this difference was attributed to the presence of higher-level of human capital and higher labour turnover in IT than in the textile industries.

Recent research on spillovers in India has witnessed the adoption of a subsidiary-centered theoretical model (Marin and Bell, 2006). The key components of this approach were operationalised following the work of Cantwell and Mudambi (2005). In this study, Marin and Sashidharan (2010), using a firm level unbalanced panel of 2700 manufacturing firms (1994-2002), find that competence-creating MNE subsidiaries generate positive spillovers while negative effects are associated with competence-exploiting subsidiaries. The findings are robust after controlling for AC of domestic Indian firms and also after using different proxies of competence-creating and competence-exploiting subsidiaries.

Marin and Bell (2006), using a similar theoretical approach and utilising a survey of 1533 industrial firms in Argentina, find that domestic firms that invest in capital embodied technology and skill training are more likely to benefit from spillovers arising from technologically active MNE subsidiaries. Another study, using an unbalanced panel of 722 manufacturing firms in Argentina, finds that spillovers are conditional on AC of domestic firms, regardless of the innovativeness of FOAs (Chudnovsky, Lopez and Rossi, 2008).

Evidence of spillover effects in Indonesia has been documented in Takii (2005) and Todo and Miyamoto (2006). Takii (2005), using a five-year panel, found that spillovers effects were smaller in industries where FOAs have a higher share of foreign ownership implying a greater degree of protection of KBAs and knowledge diffusion from FOAs with majority foreign ownership. In addition, negative spillover effects were found in industries with greater technological gap between FOAs and domestic firms. Todo and Miyamoto (2006) found that spillovers in Indonesian manufacturing industries are dependent on the extent of R&D activities conducted by FOAs. Bwalya (2006), using a firm level unbalanced panel for manufacturing firms in Zambia, finds negative spillover effects and attributes this to the lack of AC of domestic firms and competition effects.

The evidence on spillovers in ETEs using firm-level panel data indicates few positive spillover effects from FDI. This is important given the fact that firm level panel data is the most appropriate estimation method of FDI spillovers (Görg and Strobl, 2001, Görg and Greenaway, 2004). Djankov and Hoekman (2000) find evidence of negative spillovers in the case of the Czech Republic from 1992 to 1996 and also suggest that knowledge transfer to FOAs has been largely absent. Kinoshita (2000), however, finds evidence of positive spillovers in the Czech Republic (1995 to 1998), although they are limited to domestic firms engaged in R&D or firms that produce electrical equipment. In the case of Russia, Yudaeva, Kozlov, Melentieva & Ponomareva (2003), using a 5-year panel, found that the location and size of domestic firms were important determinants. While medium-sized firms benefitted from positive spillover effects, regions with high educational attainments were a necessary condition for spillovers. Schoors and van der Tol (2001) and Javorcik (2004) found no evidence of spillovers for Hungary and Lithuania respectively.

A few comparative studies on spillovers in ETEs have also been conducted. Konings (2001), comparing Bulgaria, Poland and Romania using a 3-year panel, reveals that FDI is important for technology transfers to FOAs but provides no evidence of positive spillovers to domestic firms. Instead, this study finds significant evidence of negative spillovers in Poland. Tytell and Yudaeva (2005) demonstrate positive spillover effects on domestic firms in Poland, Romania, Russia and Ukraine, but only in the case of export-oriented FDI. Damijan, Knell, Majcec and Rojec (2003), investigating 10 transition economies, did not find evidence of spillovers, whereas Nicolini and Resmini (2010) find spillover effects on domestic firms in Bulgaria, Romania and Poland. Another recent comparative study of 10 transition economies by Damijan, Rojec, Majcec and Knell (2013), by using a 10-year panel of 90,000 firms, finds positive effects overall but maintains that firm heterogeneity with respect to AC, firm size, firm productivity and technology levels are key determinants of the positive effects.

Table 7 summarises the overall findings of spillovers from FDI in ETEs as well as from developed economies.

Table 7

Summary of research findings on spillovers using firm/ plant-level panel data in developed, emerging and transition economies[1]

Sl. No.	Developed Economies	Authors	Time period	Sample size	Sign	Findings
1	U.K	Girma and Wakelin (2002)	1980-92	15000	+	Spillovers confined to regions where FOAs are located
2	U.K	Girma and Wakelin (2007)	1980-92	15000	+	Spillovers effects related to nationality of FDI. Positive effects higher from Japanese FDI than European FDI and insignificant for US-FDI
3	U.K	Girma (2005)	1989-99	7516	+	Exploiting FDI had positive effects whereas sourcing FDI has no effect
4	U.K	Girma and Görg, (2007)	1980-94	2100	+	Positive spillover effects are mediated by AC. Knowledge spillovers highest at intermediate levels of AC
5	U.K	Haskel, Pereira and Slaughter (2007)	1977-92	13,449 -21,413	+	Positive spillover effects most likely through worker mobility
6*	U.K	Fu, Helmers and Zhang (2011)	2007	1000	+/ -	Positive spillover effects from foreign firms' management (e.g. HRM) capabilities that are codified, negative spillover effects from management capabilities that are tacit and firm-specific
7#	U.S.	Branstetter (2001)	1980-97	189	+	Spillover effects arise from greenfield FOAs with superior productivity
8	U.S.	Keller and Yeaple (2007)	1987-96	1277	+	Positive spillover effects are confined to high-technology than in low-technology industries
9	Ireland	Barrios, Bertinelli and Strobl (2006)	1983-98	338	+	Positive spillover effects likely in regions where FOAs and domestic firms co-agglomerate

[1] The definition of developed, developing and emerging economies follows World Economic Outlook Report (2013) published by the International Monetary Fund (http://www.imf.org/external/pubs/ft/weo/2013/01/weodata/groups.htm#oem).

10	Italy France Spain	Castellani and Zanfei (2003)	1992-97	4000	+	Spillover effects are higher the greater the technological gap between FOAs and domestic firms, no effect for AC on knowledge spillovers
11	Italy Germany	Peri and Urban (2006)	1993-99	40000 800	+	Spillover effects are higher the greater the technological gap between FOAs and domestic firms
12*	Switzerland	Ben Hamida and Gugler, 2009)	1999 and 2002	547	+	Spillovers occur through demonstration effects and this is confined to firms with medium-level technological gap relative to FOAs and higher investments in product and process innovation
13*	Sweden	Hallin and Lind (2012)	2005	210 FOAs	+	Spillover effects arise from competitive pressures exerted by FOAs
14*	Spain	Garcia, Jin and Salomon (2013)		1799	-/+	FDI negatively affects innovation-related spillovers but positively affects labour and TFP productivity.

Sl. No.	Developing Economies	Authors	Time period	Sample size	Sign	Findings
1	Argentina	Marin and Bell, (2006)	1992-1996	1533	-	Negative effects due to lesser technological capabilities of MNE subsidiaries
2	Argentina	Chudnovsky, Lopez and Rossi (2008)	1992-2001	722	?/+	Positive effects dependent on AC of domestic firms
3	China	Wei and Liu (2006)	1998-2001	16000	+	Positive spillover effects found for industry within regions, and this is robust to country of origin, i.e. HMT or OECD FDI
4	China	Tian (2007)	1996-99	11324	+	Positive effects if domestic firms have intangible rather than tangible assets
5	China	Chang and Xu (2008)	1998-2005	200,000	+/-	Competition effects dominate spillover effects in regional markets and the reverse occurs in national markets. HMT firms display negative competition effects in regional markets than non-HMT firms; for national markets the results are insignificant

6	China	Tian (2010)	1996-99	11324	+	Positive effects are related to employment of unskilled labour and investment in intangible assets (input) and sales of products adapted to local market (output). Positive spillovers more likely from JVs than WOS
7*	China	Abraham, Konings and Slootmaekers (2010)	2002-04	15000	+/-	Positive spillover effects from JVs and negative effects for WOSs Export driven investment by HMT firms give rise to negative spillover effects
8	China	Liu, Filatotchev, Buck and Wright (2010)	2006	1318	+	Spillover effects arise through labour mobility, especially returnee entrepreneurs employed by FOAs in China
9	China	Wang, Deng, Kafouros and Chen (2012)	1998-06	41641	+/-	Pace and irregularity of foreign entry negatively moderate the spillover effects of FDI
10	India	Kathuria (2000)	1976-89	368	-	Negative effects arise from lack of R&D capabilities of domestic firms
11	India	Feinberg and Majumdar (2001)	1980-94	95	^	Insignificant effects arising from lack of complementarities between R&D activities of domestic firms and FOAs
12	India	Kathuria (2002)	1990-97	500	-/+	Negative spillover effects for total sample overall, attributed to absence of domestic firms' AC and negative competition effects dominating smaller positive effects. Positive spillover effects found for scientific firms with high levels of R&D activities
13	India	Kemme, Lugovskyy and Mukherjee (2009)	1985-90	1800	+	Spillover effects dependent on higher level of human capital and labour turnover
14	India	(Marin and Sasidharan, 2010)	1994-2002	2700	+/-	Competence creating MNE subsidiaries generate positive while competence exploiting subsidiaries generate overall negative effects
15	Indonesia	Takii (2005)	1990-95	20000	+/-	Positive spillover effects from majority owned foreign plants and negative spillover effects due to high technology gap

16	Indonesia	Todo and Miyamoto (2006)	1994-97	6073	+/^	Positive spillover effects in R&D performing firms and insignificant effects for non-R&D firms
17	Venezuela	(Aitken and Harrison, 1999)	1976-89	4000-6000	-	Negative competition effects dominate positive spillover effects
18	Morocco	(Haddad and Harrison, 1993)	1985-89	3933	-	Negative competition effects arising from competitive pressures of FOAs
19	Zambia	(Bwalya, 2006)	1993-95	145	-	Negative spillovers due to insufficient absorptive capacity and negative competition effects.

Sl. No.	**Transition Economies**	**Authors**	**Time period**	**Sample size**	**Sign**	**Findings**
1	Czech Republic	Djankov and Hoekman (2000)	1992-96	513	-	Negative spillover effects through JVs as well as all FOAs because of lack of knowledge transfer to FOAs and negative competition effects
2	Czech Republic	Kinoshita (2000)	1995-98	704	^/+	Insignificant effects overall, positive spillover effects are determined by the extent of AC, measured by R&D intensity
3	Lithuania	(Javorcik, 2004)	1996-2000	2461	-	Negative spillover effects (no explanation put forward)
4	Romania	(Javorcik and Spatareanu, 2008)	1998-2003	13129	-	JV's and WOSs generate negative spillover effects
5	Russia	(Yudaeva, Kozlov, Melentieva and Ponomareva, 2003)	1992-97	14000	+	Better regional AC measured by high educational attainments and medium sized firms benefitting from positive spillover effects

6	Bulgaria Romania Poland	(Konings, 2001)	1993-97 1994-97 1993-97	2321 3844 262	- - +	Negative competition effects/ Lack of firms' restructuring Lack of firms' restructuring Late reforms brought lesser competitive pressures from FOAs giving rise to positive spillovers
7	Bulgaria Romania Poland	(Nicolini and Resmini, 2010)	1998-2003	50000	- + ^/-	Insignificant effects Positive spillover effects for productive large firms with good AC Insignificant effects overall, negative effects for domestic firms with low productivity gap relative to foreign firms and dominance of competition effects

8	Romania	Damijan, Knell, Majcec and Rojec (2013)	1995-05	48500	+	Positive effects for all firm size, regardless of firm productivity and technological gap
	Bulgaria		1995-05	9500	+	Positive spillovers for micro and large firms, firms with high productivity and lesser technological gap
	Czech Republic		1995-05	8500	-	Negative spillovers for micro and small firms as well firms with low technology gap
	Poland		1995-05	6000	+/-	Positive spillover effects for small and large firms and negative effects for medium-sized firms
	Ukraine		1998-05	5500	-	Negative effects for micro and large firms with low and intermediate productivity. Also negative effects for firms with lesser and higher technological gap
	Croatia		1995-05	4000	+	Positive spillover effects for medium-sized firms, firms with extremely low or very high productivity and firms with low technological gap
	Estonia		1997-05	4000	-	Negative spillover effects for micro and small firms, and firms with high productivity and low technological gap
	Slovenia		1995–03	4000	-	Negative spillover effects for small firms regardless of their productivity, and for firms with low and intermediate levels of technological gap
	Lithuania		1995-05	700	-/+	Negative spillovers for less productive firms and positive effects for firms with low and intermediate levels of technological gap
	Latvia		1996-05	1500	-/+	Negative spillovers for firms with low productivity and positive spillovers for firms with high technology gap

3.3.4. FDI spillovers and methodological issues

A crucial issue that has been regularly addressed by researchers on the lack of consistent results for spillovers is differences in methodological approaches adopted, and the failure to control for endogeneity that biases the estimation framework (Görg and Strobl, 2001; Wooster and Diebel, 2010). A few of the most dominant issues that could explain variation in results on FDI spillovers are discussed below.

3.3.4.1. Modelling and estimation methods

A number of common methodological issues are likely to affect the results. These include consideration (or lack thereof) of level of industry aggregation, type of data employed (industry versus firm; cross-sectional versus panel), the relationship (linear or non-linear) between FDI presence and productivity growth of domestic firms, the use of foreign presence measures and the application of appropriate econometric techniques (Meyer and Sinani, 2009; Wooster and Diebel, 2010; Knell and Rojec, 2011). A few of these factors are discussed below:

a. Level of industry aggregation

Level of aggregation (industrial classification categories) influences the results of FDI spillovers analysis as the higher the level of aggregation, the stronger tends to be the evidence for externalities and learning effects (Keller, 2004: 60-61). Data that are more disaggregated at the level of industry are more likely to capture heterogeneity across firms while aggregate level studies cannot control for this and may suffer from composition and aggregation biases that tend to inflate spillovers estimates. Firm heterogeneity seems to be quite strong in the case of FDI spillovers and therefore micro data sets provide a better estimation of firm behaviour (Knell and Rojec, 2011: 20).

b. Type of data employed

The characteristics of data also have an influence on spillover estimates. On the one hand, Görg and Strobl (2001), from a meta-analysis, indicate that findings of spillovers are less affected by whether the studies use industry or firm level data, than whether the data used are cross-sectional or panel. On the other hand, cross-sectional studies are likely to overstate FDI spillover effects because they do not allow for the time-invariant firm or industry specific effects that may impact the relationship between MNEs and productivity, for which the researcher does not have any information (Görg and Greenaway, 2004). An example is the likelihood of more productive industries attracting MNEs within the same industry and this yielding a positive relationship between MNE and domestic productivity even without spillovers taking place. The use of panel data would allow the time-invariant effects to be controlled for in the estimation (Görg and Strobl, 2001: 737-738).

c. Relationship between foreign presence and domestic productivity: is it linear?

An important methodological issue that has received renewed interest and consideration in the literature is determining the shape of relationship between

FDI inflows & TFP growth of domestic firms (Kokko, Chen and Tingvall, 2012). The idea of a linear relationship between foreign presence and productivity growth of host countries as envisaged in the literature (e.g. Findlay, 1978; Blomström, 1989; Wang and Blomström, 1992) has been reconsidered (Perez, 1998; Buckley, Clegg and Wang, 2003). Buckley, Clegg and Wang (2003) explain negative spillovers by the fact that they dominate the positive effects in the longer term although the possibility of both positive and negative spillovers was associated with the operations of MNEs. Positive spillover benefits increase with foreign presence up to a certain threshold, however increased foreign presence may inhibit the growth and performance of domestic firms and then spillover benefits start to decline. The evidence about the possibility of a curvilinear relationship between the degree of foreign presence and spillovers is found for Chinese manufacturing firms (Buckley, Clegg and Wang, 2003). Some factors that have prevented this linear relation in influencing the direction and scale of spillovers are the initial technological gap between domestic and foreign firms (Castellani and Zanfei, 2003), the level, pace and irregularity of foreign entry in a country (Wang, Deng, Kafouros and Chen, 2012) and the strength of market mechanisms enhancing interaction between FOAs and domestic firms. A very important role is also played by policies of host governments in boosting positive spillovers across locations. This is done essentially by facilitating trade-off between spillovers (positive) and competition (negative) in host markets (Asiedu and Esfafahani, 2001; Karabay, 2010) and promoting interaction through linkages between domestic firms and FOAs in the technological space (Eapen, 2012). These factors, however, are not explicitly accounted for in econometric analysis of spillovers (Perez, 1998: 4).

d. Measures of foreign presence

The appropriateness of foreign presence measures in modeling spillovers is crucial as different measures of foreign presence yield different evidence (Görg and Strobl, 2001). The literature identifies seven measures of foreign presence that have been used in FDI spillover studies:

i. Share of foreign employment in total employment (Liu, Siler, Wang and Wei, 2000; Buckley, Clegg and Wang, 2002)
ii. Share of foreign sales in total sales (Kathuria, 2002; Ben Hamida and Gugler, 2009)
iii. Share of foreign output in total output (Konings, 2001)
iv. Share of foreign capital in total capital (Wei and Liu, 2001)
v. Share of foreign assets in total assets (Haddad and Harrison, 1993)
vi. Share of foreign equity participation (weighted by both sales and employment) (Aitken and Harrison, 1999; Hu and Jefferson, 2002)
vii. Share of foreign R&D stock (Feinberg and Majumdar, 2001; Wei and Liu, 2006)

It is well established that different measures of foreign presence capture different channels or aspects of spillovers (Görg and Strobl, 2001; Wei and Liu, 2006). The use of single measures, e.g. foreign capital and a positive effect from that measure, indicate that the foreign presence produces a positive capital spillover effect. The positive effect implies the demonstration effect of the suitability of the FDI project, or the superiority of machinery or equipment embodying updated technologies. Alternatively, if employment measure displays a positive effect, then the spillover will be closely associated with employee turnover or contagion between employees in FOAs and domestic firms and can be referred to as employment spillovers (Wei and Liu, 2006). Similarly, it is possible to have spillovers from sales, output and R&D. Whereas sales spillovers are linked with knowledge diffusion of the superior product and marketing skills, output spillovers are concerned with the demonstration effects of superior products (Liu, Wang and Wei, 2009) and could also be linked with knowledge acquisition via reverse engineering of the product (Tian, 2010). R&D spillovers are the leakage of know-how from R&D activities of FOAs to domestic firms (Todo and Miyamaoto, 2006). To summarise, the findings from FDI spillovers are enhanced with the use of different measures of foreign presence, as each measure is associated with capturing one or closely related aspects of spillovers.

e. Estimation techniques

The appropriateness of estimation techniques in modelling FDI spillovers is more likely to generate robust results. Ordinary-least squares (OLS) estimation or static panel data techniques leads to biased estimates of spillovers as they are unable to control and mitigate the issue of endogeneity of input choices or simultaneity biases. Fixed effects estimation, Olley-Pakes (O-P) method (Olley and Pakes, 1996) and Levinsohn-Petrin (L-P) method (Levinsohn and Petrin, 2003) of estimating TFP are likely to better mitigate simultaneity biases (Damijan, Knell, Majcen and Rojec, 2003). The use of O-P method to control for firm selection bias, instead of the more frequently used time-differencing method, leads to a substantially greater role for spillovers (Olley and Pakes, 1996). Another method to achieve consistent coefficients is by instrumenting the independent variables that cause endogeneity problems (i.e. through the use of inputs in the production function) (Van Beveren, 2010). This is useful because the instrumental variable (IV) technique, for example, the Generalised Method of Moments (GMM) estimator, does not rely on strict exogeneity of the inputs for consistent estimation unlike the fixed effects estimator (Wooldridge, 2009). This, however, is possible only when appropriate instruments are selected which:

i. are correlated with the inputs (endogeneous regressors)
ii. cannot enter the production function directly, and
iii. cannot be correlated with the error term (i.e. productivity)

f. Incomplete datasets

A recent issue that has been highlighted is the role of incomplete datasets (Eapen, 2013). It is well known that the majority of manufacturing census datasets (e.g., Haskel et al., 2007; Zhang et al., 2010) invariably miss data on small firms in the economy. Moreover, secondary datasets, such as Compustat (Keller & Yeaple, 2009), select mostly publicly listed firms and therefore some private-unlisted firms including WOS, JVs, and many domestic firms do not enter the data sample. Incomplete datasets can bias the findings on spillover estimates in two ways: measurement and selection problems. That is:

i. The systematic non-inclusion of foreign firms (whether WOSs or JVs) can underestimate the true effect, whereas the spillover effect is likely to be overestimated if domestic firms are missed out from the sample.

ii. The selective censoring of firms in manufacturing census datasets can cause selection problems. For example, if small domestic firms which are likely to have lower AC (Blalock and Simon, 2009; Zhang, Li, Li and Zhou, 2010) are missed out from the sample, this can lead to overestimation of the true spillover effect. An example is the Chinese National Bureau of Statistics dataset (Chang and Xu, 2008, Wang, Deng, Kafouros and Chen, 2012).

This issue is related specifically to data organisation/management and although it is regarded as arguably necessary to have some level of censoring of firms for the purposes of generating more robust results with a dataset that has balanced information (as in Castellani and Zanfei, 2006), doing so may amplify the causal inference problem (Angrist & Krueger, 2001; Angrist & Pischke, 2009). Although Eapen (2013) provides partial solutions to mitigate problems associated with incomplete datasets through employing Monte-Carlo simulation techniques, this is beyond the scope of the current study. Thus, following conventional FDI spillover studies such as Haskel, Pereira and Slaughter (2007) and Keller and Yeaple (2009), this issue will not be addressed in the current research study.

3.3.4.2. TFP estimation

The estimation of spillovers using a TFP approach has been the benchmark so far in firm-level studies (Liu, Wang and Wei, 2009; Wang, Deng, Kafouros and Chen, 2012). This is because technological change (which ultimately manifests in productivity) is an important determinant of TFP and most of the theoretical models of spillovers from FDI relate to the improvement of domestic firms' technological progress (Das, 1987; Wang & Blomstrom, 1992). However, the measurement of TFP in the literature on productivity growth has been conducted through different estimators including index numbers, instrumental variables estimation techniques and semi-parametric estimation techniques such as O-P method and L-P method (Van Biesebroeck, 2007). These estimation methods have different data requirements and the use or selection of these methods depends on availability of firm-level data. Although the purpose of this chapter is not to review all these estimation techniques, it is important to understand some of the most basic issues outlined below, that are associated with TFP estimation (Van Beveren, 2010).

a. Endogeneity of input choices or simultaneity bias

One of the most important issues is the manner in which endogeneity of input-choice biases the estimation framework. Inputs in the production function are not independently chosen, but are determined by the characteristics of the firm including its efficiency (Marschak and Andrews, 1944). The 'endogeneity of input choices', better known as 'simultaneity' bias, could be defined as the correlation between the level of inputs chosen and unobserved productivity shocks (De Loecker, 2007). Simultaneity bias arises from the fact that the choice of inputs is not under the control of the econometrician, but determined by individual firms' choices (Griliches and Mairesse, 1995). In other words, if the firm has prior knowledge of productivity when input decisions (price or quantity) are made, endogeneity arises because input quantities will be partly determined by prior beliefs about its productivity (Olley and Pakes, 1996; Ackerberg, Benkard, Berry and Pakes, 2007). Therefore, OLS estimation techniques, which require that the inputs in the production function are exogenous, are not an appropriate modeling framework for estimation of TFP. One of the traditional methods to deal with simultaneity bias is fixed effects estimation method and IV estimation method (Griliches and Mairesse, 1995), however recent methodologies include O-P method (Olley and Pakes, 1996), Blundell and Bond (1999) and L-P method (Levinsohn and Petrin, 2003). Recent review suggests that some of these estimators have performed better in comparison with others (Van Biesebroeck, 2007).

b. Endogeneity of attrition or selection bias

Another issue associated with estimation of TFP is firm selection. Traditionally, estimation of TFP was conducted by utilising balanced panels where information on firms that entered and exited in the sample period was omitted. However, theoretical models have demonstrated (Jovanovic, 1982; Hopenhayn, 1992), and empirical evidence for Spanish manufacturing industries (Farinas and Ruano, 2005) has confirmed, that the growth and exit of firms is motivated to a large extent by productivity differences at the firm level. The problem remains even with the use of unbalanced panels (i.e. where firm entry and exit are considered), when the exit decisions of firms are not taken into account explicitly resulting in selection bias. The origin of this bias emerges from the fact that the firms' decisions on the allocation of inputs in a particular period are made conditional on its survival. In other words, selection bias is likely to generate a negative correlation between firm exit and *inputs*, causing the capital (or labour) coefficient to be biased downwards. Thus, ignoring the exit rule of the firm from the sample will result in TFP estimates that are biased upwards (Ackerberg, Benkard, Berry and Pakes, 2007). This problem will be severe with use of balanced panels that does not consider firm exit and will result in TFP estimates being further biased upwards (Wedervang, 1965). The solution to mitigate this issue in TFP estimation has been provided by Olley and Pakes (1996).

Apart from these two core issues discussed above, there are other important issues. These include *omitted price bias* (using industry-level price indices to deflate firm level sales and input expenses) (De Locker, 2007) and the likelihood of firms being multi-product or multi/plant (Bernard, Redding and Schott, 2009). However, these two issues have not been systematically dealt with yet in the literature on spillovers and therefore are regarded as either unimportant for current research or suggestions to improve have been forwarded in future research (Van Beveren, 2010).

In summary, failure to take into account all the relevant issues in the two sub-sections discussed above while estimating spillovers could lead to inconsistent findings.

3.3.5. FDI spillovers and host government policy

Host country policy is also important for attracting FDI and the institutional conditions that it creates for spillovers to materialise (UNCTAD, 1996). Some general policy tools are aimed at improving the overall macro-business environment for FDI (for example, trade policy, science and technology policies etc.), and market-supporting institutions (for example, infrastructure, quality of human capital, labour laws etc.) that can be implemented throughout a country or in certain industries and regions. Specific policies could be aimed for MNEs (for example, through the FIPB in India) and to develop domestic firms' productive and technological capabilities. The latter policies are directly related to rules and regulations governing the entry and operations of MNE affiliates, the standards of treatment accorded to them, the functioning of the markets in which they are active and their level of interaction with domestic firms (UNCTAD, 2008). These policies are known as host country operational measures (hereafter HCOMs) and they are fundamental to ETEs that are interested in boosting spillover effects (UNCTAD, 2003).

HCOMs are used to promote both *efficacy* and *volume* of FDI to meet its objectives, although the former is more important than the latter in terms of spillovers (Balasubramanyam, 2003). Efficacy is related to '*unbundling the bundle*' of KBAs, i.e. capital, technology, managerial know-how and marketing skills embedded in FDI. The volume of FDI is related to steady accumulation of the *bundle* of total knowledge stock available in a country. The *unbundling* process differs across countries depending on the specific policies adopted towards FDI, either through restrictions in terms of ownership of assets (e.g. by limiting foreign equity share leading to MIJVs, MAJVs or WOSs), restrictions in investment by industries (high, medium or low-tech) and through adherence to location-specific protocols (metropolitan, urban or rural areas) (Balasubramanyam, Salisu and Sapsford, 1996). Besides, the unbundling process is likely to be effective only when domestic firms interacting with FOAs in the market are better endowed with capabilities to absorb knowledge diffused from the latter. This might vary across countries, depending on the extent to which HCOMs facilitate the unbundling process domestically (UNCTAD, 2010).

Better known as firms' AC, host country policy plays a dominant role in upgrading domestic capabilities through implementation of policies towards improvement of skill level, upgrading the quality of components and provision of market intelligence (minimising search and transfer costs of valuable knowledge) of domestic firms. In other words, the process of unbundling not only depends on the policy stance adopted towards FDI but also the level of capability building efforts promoted by host governments.

The literature on spillovers has not explicitly considered the role of host governments' policy and there is an absence of comprehensive explanation as to the extent to which host country policy is likely to affect spillovers (Crespo and Fontoura, 2007). Although most studies do infer policy implications from the findings of the studies (Wei and Liu, 2006; Wang, Deng, Kafouros and Chen, 2012), this is different to consideration of key policy-related factors and conducting a theoretical and empirical analysis to explain their role in spillovers. An example is the role of policy of Chinese and Indian governments on FDI equity ownership restrictions in certain industries and their implications for spillovers. While China has been performing better with respect to removing equity ownership restrictions in most manufacturing, retail and service industries (except those where state-owned enterprises dominate) in the last decade (Huang and Tang, 2012), the process has just taken off in India recently. The few studies that investigated the role of foreign equity ownership restrictions (differentiating between WOSs and JVs) in China found positive effects from JVs and negative effects from WOSs (Abraham, Konings and Slootmaekers, 2010; Tian, 2010). The positive effects could be more or less explained by the government policy of having mandatory JVs by MNEs with domestic (and state-owned) firms and this might be influenced by the better prospects of knowledge diffusion in JVs during the time period 1996-2004. Negative effects from WOSs are more complex and can be attributed to competition exerted by MNE affiliates which has a market-stealing effect and therefore negatively affects domestic Chinese firms. However, the trend in the increase of WOSs in the last 8-10 years in China and conversion of JVs into WOSs could suggest a different policy agenda of the Chinese government (Jonas, Puck and Mohr, 2010). It might be associated with the desire to increase the quality of knowledge stock as WOSs are characterised by transfer of superior and newer technologies and management know-how (Ramachandran, 1993). There has been no study, so far, on the degree of foreign ownership in FOAs and their implications for spillovers in the context of India.

The importance of identifying host country policy issues affecting spillovers is essential for ETEs. This is because governments in ETEs are interested in maximising spillover benefits and are aware of the costs that have to be incurred to retain such benefits (Karabay, 2010). Thus, addressing policy factors and the extent to which they affect spillovers in ETEs and the relative costs to be incurred are a way forward to achieve these objectives.

3.4. RESEARCH GAPS

The purpose of this section is to identify some of the key research gaps from the reviewed literature. Identification of research gaps will allow unpacking of ‘the black box’ that the literature on spillovers has so far generally ignored and contribute to the few existing studies that have attempted to open this black box (Smeets, 2008; Wooster and Diebel, 2010). These research gaps are stated below:

a. MNE ownership modes and spillovers

The first research gap in the literature is the partial treatment of MNE ownership modes and their implications for spillovers. Scholars have investigated the role of ownership modes for spillovers following calls for a systematic and discriminating approach (Görg and Greenaway, 2004; Smeets, 2008) but the treatment of this important firm heterogeneity issue remains marred by inconsistencies.

First, all published studies [with the exception of Aini Khalifah and Adam (2009) for Malaysia] have not considered the three generic MNE ownership modes in one study. Furthermore, a clear theoretical analysis connecting WOSs, MAJVs and MIJVs to spillovers is missing. This has prevented much-deserved theory building involving MNE ownership modes and spillovers. This is an important gap in the literature because the implications for each ownership mode on spillovers are likely to be different (Meyer and Sinani, 2009).

Second, as indicated earlier in this chapter, not all the existing studies use the definitions on foreign ownership consistently. The use of an appropriate definition of foreign ownership, especially in the context of ETEs, is more important as these economies are characterised by firms whose equity ownership are owned by diverse shareholders and are unstable relative to developed economies (Sarkar, 2010; Chalapati Rao and Dhar, 2011). Thus, in the context of ETEs, it is important to distinguish between shareholders that have some level of decision-making authority (e.g. through exercise of voting rights) from those that do not have these privileges. The failure to consider groups that have genuine control over foreign ownership leads to inaccurate definition and measurement of the same.

b. Host country policy and spillovers

The second important research gap is the absence of explicit consideration of host government policy with regard to ownership modes in ETEs. This is important given the extent of influence and information that host governments in ETEs possess about MNEs and their role in development (Salisu and Balasubramanyam, 2001). Government policy often determines the extent of foreign ownership in industries as well as locations within a country. Government policy in this area may be influenced by improved knowledge of the existence and extent of spillovers connected to ownership modes.

c. Sub-national locations and spillovers

Another important gap that has not been adequately addressed in the literature is the moderating role of sub-national locations for the existence of spillovers. Improved knowledge in this area would be beneficial for policy reasons connected to economic development in metropolitan and non-metropolitan areas in ETEs. Moreover, knowledge on spillovers in sub-national locations would contribute towards improving understanding of how MNEs affect and are affected by location in areas such as large cities compared to less urbanised areas.

The moderating role of sub-national locations is important for two reasons. *Firstly*, large ETEs such as India are characterised by diverse economic landscapes and FDI could be attracted to specific locations within a country, for example either in metropolitan cities, less developed urban areas, or even in rural areas. This diversity is more acute in ETEs relative to developed economies, especially when disparity in economic development or income-levels of regions is considered (Chan, Makino and Isobe, 2010). Although there are significant regional variations within advanced economies these differences (particularly between highly urbanised and less urbanised areas) are more pronounced in ETEs. There is evidence that the size and characteristics of regional differences in ETEs declines as these economies grow, but the current differences between the less developed areas of ETEs are normally very pronounced (Fan and Suni, 2008; Petrakos, 2001). This diversity in location can affect FOAs, in the volume and quality of KBAs available to domestic firms in some locations relative to others and can affect spillovers to firms that are located in different regions. Moreover, diversity of FOAs' location within an emerging economy reflects disparities in income levels, regional absorptive capabilities and technological sophistication thereby offering different prospects for domestic or foreign firms' performance and productivity when they interact with the local environment (Meyer, Mudambi and Narula, 2011). The study by Chan et al. (2010) also highlights that variation in return on investment (return on sales) and investment risk (return on sales deviation) sub-nationally is much higher in large emerging economies, for example, China, compared to developed economies, for example, the U.S. In essence, a varying degree of performance implications is likely to manifest for firms in different locations within an emerging economy (Ma, Tong and Fitza, 2013). These differences in sub-national locations are likely to affect spillovers in a number of ways:

a. It is likely to affect size and volume of knowledge transfer to FOAs (depending on the level of economic development and industry-competition locally), which will directly affect the level of knowledge pools in specific locations.

b. It is likely to affect absorptive capabilities of domestic firms that are an important mediator of spillovers. This is because domestic firms located in cities or metropolitan areas are constantly driven by high level industry-competition to catch-up technologically and match productivity with their competitors, thereby improving absorptive capabilities. In contrast, domestic firms located in less urban or rural areas, on average, do not succumb easily to pressures of industry competition as they are better embedded locally. Thus, their absorptive capabilities are marginally inferior.

c. It is also likely to affect the flow of information through informal network connections between firms that facilitate spillovers. The network connections between firms in cities or metropolitan areas are stronger allowing them to benefit from non-redundant information (Rogers, 2003; Dyer and Hatch, 2006). However, these connections are weaker in less urban or rural areas that inhibit the flow of information.

Within-country locations that display different levels of economic development in large ETEs are likely to have also different potential for spillovers. This is because the net effect of interplay between the knowledge pools of FOAs, the network connections between FOAs and domestic firms, and the absorptive capabilities of domestic firms, are likely to vary by locations with differing levels of development. A significant policy incentive in large ETEs (associated with mitigating uneven economic development of regions from FDI inflows) warrants the investigation of sub-national locations with different income levels and their implications for spillovers.

Secondly, the literature (even in the case of large ETEs) has systematically ignored the role of sub-national locations with different income levels for spillovers. Although a host of studies has investigated differences in regions to assess impact on spillovers in emerging economies (Wei and Liu, 2006; Chang and Xu, 2008; Zhang, Li, Li and Zhou, 2010) the definition is limited to administrative regions (e.g. coastal, central and Western area in China) and not defined *a priori* by income levels. Classification of locations by income reveals net measurable differences in economic prosperity, regional AC and technological sophistication that cannot be captured by other random categorisation, e.g. administrative regions. Furthermore, the income-based approach is appropriate for analysis of sub-national locations with different levels of economic development as it overcomes a limitation of the previous approach where the concentration of both high-income and low-income sub-regions within an administrative region is likely.

As Ma et al. (2013) suggests, the combination of contingency approaches studying interaction effects (Boyd, Hitt and Ketchen, 2012) with specific theories (KBV, knowledge pipeline model etc.) allows better understanding of the application and prediction of these theories. Thus, it represents an important step in explaining how subnational locations may interact with FDI inflows and whether the effect will vary with other classes of effects (e.g. industry, time).

These three research gaps identified from the review of the existing literature are addressed in the research. The consideration of these research gaps permits the development of a more disaggregated approach that enhances the identification of FDI spillovers compared to previous studies.

This research study considers the three generic MNE ownership modes defined in accordance with the OECD (2008) benchmark, i.e. WOSs defined as foreign firms that have 100% equity ownership, MAJVs as firms with equity ownership from 51% to 99% and MIJVs as firms with 10% to 50%. Moreover, unlike previous studies, foreign firms' equity shareholders are separated into promoters and non-promoters. Promoters are usually firms or corporate groups that have significant control and decision-making authority whereas non-promoters such as foreign institutional investors, venture capital funds, banks, mutual funds and insurance companies, do not exercise direct control and their voting rights are curtailed (Ayyagiri and Lau, 2009). This updated definition and measurement technique further improves Javorcik & Spatareanu's (2008) approach of using direct ownership figures. Moreover, the consideration of promoters' equity share is a better proxy accounting for degree of direct control over FOAs of MNEs' (corporate parent), and by implication, the control of KBAs. Therefore, differentiating between generic MNE ownership modes based on this definition can better account for the quality of KBAs in FOAs with different degree of foreign ownership.

The research also provides an analytical framework that may help the identification of key factors useful for developing host country policy connected to spillovers. A detailed explanation of the analytical framework involving MNE ownership modes and spillovers including the development of propositions is provided in the next chapter (Chapter 4).

The research considers the moderating role of sub-national locations in spillovers. This is done by differentiating regions according to their income levels and grouping them under: (a) metropolitan urban areas (or MUAs) and (b) non-metropolitan and non-urban areas (or NMNAs). The first category refers to well-developed metropolitan areas thought to possess agglomeration economies and superior technological and knowledge intensity. The second category refers to non-metropolitan and non-urban areas where agglomeration economies are likely to be lower than metropolitan areas as will be the technology and knowledge intensity. Only one study has used an income-level approach to define sub-national locations and investigated their implications for spillovers (Sajarattanochote and Poon, 2009). A detailed discussion on the classification and operationalisation of this variable is provided in the methodology chapter (Chapter 5).

In addition, this research study has employed a firm-level panel dataset (Prowess, CMIE) to investigate spillovers where information on publicly-listed firms is available. Firms that are publicly-listed are usually large in size in terms of sales, number of employees and their dedication to learning and developing competencies (measured through marketing, export and R&D intensity) (Marin and Sashidharan, 2010), thereby implying that their capabilities to be innovative and absorb spillovers are higher than small firms (Cohen and Klepper, 1996; Baptista, 1999). This is an important consideration given spillovers to domestic firms vary with firm size (Damijan, Rojec, Majcen and Knell, 2013). This research study therefore investigates the implications for spillovers in large domestic firms who are better endowed with AC and are usually dominant in local markets (through either reputation or embeddedness). It also constitutes an important policy agenda for large ETEs who are more concerned about upgrading technological capabilities of dominant firms in an economy that contributes to employment and economic growth rather than less dominant small firms whose contribution to employment and economic growth are marginal, and sometimes even insignificant.

Finally, in order to capture better the different channels through which FDI spillovers are likely to materialise, this research study uses three measures of foreign presence; foreign sales/total sales, foreign employment/total employment and foreign capital/total capital. This is in line with existing studies such as Wei and Liu (2006) and Tian (2007, 2010) who emphasises the importance of using different foreign presence measures and states that studies not considering this issue are unlikely to capture the complex and rich variety of sources through which knowledge spills over in an economy.

3.5. CONCLUSION

In this chapter, the core IB theories of MNEs are discussed and a comprehensive review of findings on spillovers is reported. The first part of the review, identified as fundamental for spillovers, are the role of FSAs and their transfer and replication in FOAs in host countries. The second part of the review identified well established factors such as heterogeneity arising from the external environment as well as firm heterogeneity, the evidence in developed, emerging and transition economies, methodological issues and host country policy issues related to spillovers. Similar to findings from extensive surveys, the literature review discovers inconsistencies and mixed findings (Smeets, 2008; Meyer and Sinani, 2009; Wooster and Diebel, 2010).

The outcome of the literature review is a focus on the key research gaps that have long been ignored in the IB literature. In the next chapter, these research gaps are dealt with specifically by developing a conceptual framework that combines theory on MNE ownership modes and economic theory on spillovers. An analytical framework to explain the moderating role of sub-national locations is also provided. The conceptual framework will provide a deeper insight into the (conditional) existence of spillovers by considering MNE ownership modes, an important firm heterogeneity issue. Smeets (2008) suggested that FDI heterogeneity, mediating factors and spillover channels coexist and interact in determining the extent of spillovers. The conceptual framework therefore is an attempt to address some of these factors simultaneously.

CHAPTER 4

CONCEPTUAL FRAMEWORK

4.1. INTRODUCTION

This chapter provides a conceptual framework of the impact of MNE ownership modes on spillovers based on the extensive literature review reported in the previous chapter. It considers three major factors: *knowledge pools*, *linkages between domestic and foreign firms* and *competition effects* and explains how these three factors affect the relationship between foreign ownership modes and spillovers and the moderating role of sub-national locations on spillovers. The existing literature highlights the significance of MNE ownership modes as an important firm-heterogeneity issue and explains *why* this matters for spillovers. The purpose of this chapter, however, is to illustrate the key causal connections that link spillovers to seek ways to explain how different foreign ownership modes affect spillovers; this relates to the *how* phenomenon about spillovers (Bello and Kostova, 2012). This is achieved by using IB theories connected to MNE ownership modes with well-established economic concepts of spillovers. The analysis is conducted in two stages. In the first stage, an investigation is carried out on the role of three generic foreign ownership modes: WOSs, MAJVs and MIJVs. In the second stage, the moderating role of sub-national locations is considered.

Existing studies on spillovers do not consider the three generic possibilities – WOSs, MAJVs and MIJVs – simultaneously and give less attention to the size and quality of knowledge pools associated with the ownership modes. Some studies consider MAJVs and MIJVs (Dimelis and Louri, 2004) whereas others investigate WOSs and JVs (Javorcik and Spatareanu, 2008; Abraham et al., 2010).

Also, the existing literature views spillovers from JVs as likely to be higher relative to WOSs because the enhanced network connections of domestic partners in JVs with other domestic firms provide an effective mechanism for the diffusion of technologies (Abraham, Konings & Slootmaekers, 2010; Javorcik & Spatareanu, 2008). In the case of WOSs, the greater control by foreign firms over their KBAs limits spillover effects (Javorcik & Spatareanu, 2008). The connection between ownership mode and spillovers is, however, more complicated than is implied by this view. According to the KBV, although the ability of domestic firms to gain access to the MNEs' knowledge pools is likely to be better in the case of JVs, the size of the pool of knowledge available for spillovers is possibly higher in WOSs than in JVs. The greater degree of control afforded by WOSs is likely to induce MNEs to transfer more and higher quality technologies thereby creating a larger pool of knowledge that has potential for spillovers. Leakages from knowledge pools are likely to be greater in JVs, but the size and quality of the pools is perhaps greater in WOS. Similarly, regarding the differences between MAJVs and MIJVs the existing literature emphasizes that the linkages that domestic partners in JVs have to other domestic firms may be stronger in MIJVs than MAJVs (Ramachandran, 1993) because the domestic partner in a MIJV often has frequent and deeper interactions with domestic agents (domestic competitors, suppliers etc.). However, according to the KBV, MAJVs may be more likely to receive newer and more advanced technologies than MIJVs, providing better knowledge pools that permit access to a higher quantity and quality of KBAs than is the case for MIJVs. The conceptual framework therefore firstly incorporates KBV to assess spillovers from FOAs in host countries with the consideration of three generic ownership modes simultaneously.

Consideration of sub-national locations is important because innovation and productivity potential differ across locations within a country and therefore could be an important determinant of spillovers (Audretsch & Feldman, 2004). Past research has investigated the regional dimension of spillovers in the context of administrative regions and by considering the geographical proximity effect (Girma and Wakelin, 2002; Jordaan, 2008). The impact on spillovers of sub-national locations with different levels of economic development, however, has not been investigated thoroughly as demonstrated in the Literature Review chapter (Chapter 3). The moderating role of sub-national locations, categorised by income levels and levels of urbanisation on spillovers, is important as regions with different levels of economic development affect absorptive capacity, industry-competition and network ties between firms in these regions (Sajarattanochote and Poon, 2009). As a result, the potential for spillovers in different regions within a country will be markedly varied. Despite the importance of sub-national locations for spillovers, research incorporating this contingency factor is rare, other than by administrative regions and the presence of industrial clusters. The conceptual framework therefore extends the literature by inclusion and analysis of differences in sub-national locations with the level of economic development and the level of urbanisation as an important factor for spillovers.

The conceptual framework developed in this chapter responds to suggestions of adopting a systematic and discriminating approach to identify key contingency conditions for spillovers (Görg & Greenaway, 2004; Smeets, 2008) in general and to the call for research, made by Barbosa & Eiriz (2009), to investigate the effect of MNE ownership modes on spillovers specifically.

It improves upon existing studies on spillovers in three ways:

a. It adopts the knowledge-based view (connected to the resource-based theory) as the theoretical basis to links spillover to generic foreign ownership modes.
b. It simultaneously considers three key factors: knowledge pools, linkages and competition effects associated with foreign ownership modes, including WOSs, MAJVs and MIJVs
c. It highlights the moderating role of sub-national locations as an important factor affecting spillovers.

The conceptual framework, by focussing on interaction between the major factors affecting host-country spillovers from MNE ownership modes, provides a broader perspective (Narula and Driffield, 2012; Zhan and Mirza, 2012). The conceptual framework, however, is only applicable to analysis of spillovers in the case of ETEs. This is because the bulk of FDI inflows are from developed economies to ETEs and FDI inflows from ETEs to developed economies or between ETEs is a recent phenomenon and these flows may have different motivations and objectives as compared to flows from developed economies (World Investment Report, 2012). Moreover, the key factors of spillovers identified and well-established in the literature, such as technological gap, industry competition, linkages between domestic firms and FOAs etc., are likely to be more relevant for ETEs (as opposed to developed economies) as their objective is to catch up with the productivity and technology frontier (Wang, Liu, Wei and Wang, 2014).

Contemporary IB theories such as *differentiated inter-organisational networks* regard FOAs to be both receivers and creators of knowledge, contributing to the global competitive advantage of MNEs (Bartlett and Ghoshal, 1989). This view is perhaps not as applicable in the case of FOAs in ETEs where they are perceived as being primarily knowledge-receivers (Subramaniam and Watson, 2006). Moreover, empirical evidence on the issue is scarce for FOAs in ETEs (Driffield, Love and Menghenillo, 2010). As the conceptual framework is geared towards analysis of firms in ETEs, the view taken of the FOA here is as an active knowledge receiver with a limited knowledge-creation role. This further reinforces the importance of KBAs transferred to FOAs as the driver of the latter's performance (Kogut and Zander, 1993; Pedersen, Petersen and Sharma, 2003) and for better prospects of spillovers originating from such transfers in a host country (Buckley, Clegg and Wang, 2007; Driffield and Love, 2007). Following the logic, the conceptual framework is geared to analysis of spillovers in the case of ETEs.

The structure of the chapter is as follows. Section 4.2 provides an assessment of the key mechanisms underlying MNE ownership modes and spillovers, and then concludes with testable research propositions. Section 4.3 examines the moderating role of sub-national locations. Finally, section 4.4 summarises the conceptual framework and highlights its usefulness for a comprehensive understanding and investigation of spillovers. It also includes a summary of the conceptual variables and their operationalisation.

4.2 MNE OWNERSHIP MODES AND SPILLOVERS

Knowledge pools are reservoirs of technological resources, know-how and managerial capabilities, often associated with technology transferred by MNEs (Grant, 1996). Firms in ETEs characterised by lower levels of technological dynamism are likely to benefit from the presence of knowledge pools arising from technology transfer to FOAs (Blomström and Kokko, 2003). The investment by MNE parents plays a significant role in boosting knowledge pools in the host country by transferring assets and expertise (KBAs) to host locations (Caves, 1982; Dunning and Lundan, 2008). The transfer of KBAs is also often necessary to fulfil the strategic and operational objectives of MNEs in host countries (Holm & Pedersen, 2000). The IB literature is well-established on the role of FOAs in international technology transfer which contributes to knowledge pools (Hymer, 1976; Markusen, 1995) and especially the potential for spillovers domestically from such transfers (Blomström and Kokko, 2003; Haskel, Perreira and Slaughter, 2007).

Although extant IB literature regards the importance of transfer of KBAs in FOAs, the evidence at firm-level of the effect of such transfers on spillovers is inconclusive (Meyer and Sinani, 2009; Wooster and Diebel, 2010). This is attributed, at least in part, to heterogeneity in FOAs that leads to a multitude of different motivations and outcomes associated with the transfer of KBAs to host countries (Görg & Greenaway, 2004). The conceptual framework, in this chapter, provides a means of analysing the effects of one aspect of heterogeneity, namely foreign ownership mode, on spillovers by considering how the conditions under which transfer of KBAs under different foreign ownership modes may affect spillovers.

The key components of the conceptual framework include MNE ownership modes and sub-national locations. In order to illustrate the relationship of these components to the extent of spillovers in the host country, a few theoretical constructs are used. They are *knowledge pools*, *linkages* or *network connections* and *industry-competition*. The strength of knowledge pools varies with the choice of ownership modes and therefore is an important theoretical construct in IB literature (Makino and Beamish, 1998; Gaur and Lu, 2007). The extent of linkages and network connections of FOAs with other domestic firms can also affect spillovers (Eapen, 2012). These linkages and connections could be perceived as the 'pipes' through which knowledge flows from the MNE are related to host country firms (Podolny, 2001). The effect of linkages and network connections of FOAs on spillovers will depend on FOAs' degree of embeddedness in the host locations. Competition effects exerted by FOAs are an important determinant of spillovers and often considered as a 'double-edged sword'. On the one hand, local firms are forced to use their resources more efficiently or search for new technologies because of competition from FOAs; on the other hand, they may be forced to reduce the output or exit from the market if the competition is 'severe' (Blomström and Kokko, 1998).

These three key theoretical constructs, derived from the literature, provide a means to develop an analysis of the relationship between foreign ownership modes and spillovers. These three constructs have been used in the literature on spillovers inconsistently and the aim of this chapter is to use them to provide consistent inferences as to how foreign ownership modes affect spillovers.

4.2.1. Role of knowledge pools for spillovers

The transfer of KBAs enhances knowledge in FOAs which enables them to offset '*liability of foreignness*' and to develop competitive advantages in host locations (Dunning & Lundan, 2008). Since WOS enables better internalisation of KBAs and provides greater control over these assets than JVs (Buckley & Casson, 1976), MNEs are likely to transfer technologies of newer vintage through WOS and older technologies through JV (Mansfield & Romeo, 1980). MNEs may also commit more resources to transfer KBAs to WOS (Blomström & Sjöholm, 1999) and thus increase the quality, volume, and speed of technology transfer in WOS compared to JVs (Mansfield & Romeo, 1980). Hence, the size and quality of technologies transferred to WOS that become available for domestic firms to access and to learn from is more potent than those associated with JVs (Tortoriello & Krackhardt, 2010).

While WOSs receive newer and sophisticated technologies than MAJVs (Ramachandran, 1993), MAJVs receive more mature technologies than MIJVs (Almeida & Fernandes, 2008; Desai et al., 2004). A JV between a foreign and domestic firm induces threats regarding appropriability of know-how. This threat is higher in the case of MIJVs where the domestic partner has a dominant role. As a result, the capacity and motivation to transfer KBAs is lower in MIJVs. In summary, the volume and quality of transfer of KBAs, and thereby the size of knowledge pools, increases with the degree of foreign ownership in FOAs, i.e. pools are smaller in MIJVs, intermediate in MAJVs and largest in WOS.

4.2.2. Role of linkages and network connections for spillovers

The linkages or network connections of FOAs with other domestic firms in an industry can also affect the extent of spillovers. Although size and quality of knowledge pools play a vital role, the extent of the 'diffusion' or 'leakage' from these pools is likely to occur when linkages/network connections are strong enough to permit extensive knowledge diffusion. Linkages are likely to affect spillovers in two ways. First, they provide opportunities for domestic firms to acquire physical technology conducive to catch-up (Meyer & Sinani, 2009) by allowing for richer interactions that are crucial to transfer and absorption of know-how (Kotabe, Martin and Domoto, 2003). Second, they act as conduits for information flow that can benefit host country firms, e.g. learning about new best practices and techniques (McEvilly & Zaheer, 1999; Podolny, 2001).

The extent of spillovers through linkages is likely to be stronger when FOAs have a higher degree of local embeddedness as this will permit closer and richer interactions between FOAs and domestic firms. In general, WOSs have weaker linkages than JVs as their degree of local embeddedness is lower and they tend to protect their KBAs to minimise threat to the appropriability of their know-how. Thus, the potential for spillovers from WOSs through linkages is likely to be less than JVs because they are more embedded in the host country market (Belderbos, Capannelli & Fukao, 2001; Chen, Chen & Ku, 2004; Eberhardt, McLaren, Millington & Wilkinson, 2004; Wei, Liu, Wang & Wang, 2012) and can quickly respond to local conditions (Inkpen, 2000; Zhou & Li, 2008). This is of particular importance for the transfer of tacit knowledge such as management know-how (Inkpen, 2000; Kogut and Zander, 1993). Within JVs, MIJVs have domestic partners with a more dominant role and therefore their linkages to other domestic firms in MIJVs are likely to be stronger than MAJVs. As Javorcik and Spatareanu (2008) point out, in an MIJV, the domestic partner can be in charge of hiring policies and place local staff in key technical or managerial positions without taking actions to limit employee turnover. To summarise, the effects of linkages or network connections on spillovers should be highest in MIJVs followed by MAJVs and lowest in WOS.

4.2.3. Role of competition effects for spillovers

Chen (1996) introduces two firm-specific and theory-based constructs – market commonality and resource similarity – which have also been used recently to investigate industry-competition effects of FDI (Wang et al., 2014). Market commonality refers to '*the degree of presence that a competitor manifests in the markets it overlaps with the focal firm*', and resource similarity is '*the extent to which a given competitor possesses strategic endowments comparable, in terms of both type and amount, to those of the focal firm*' (Chen, 1996: 104). It is further stated that the severity of competition is determined by the degree of market commonality and resource similarity. A JV with stronger linkages is likely to facilitate knowledge diffusion and exploiting compatible resource/assets between partners (Inkpen, 2000; Kogut & Zander, 1993) relatively more than a WOS. Thus, a JV is likely to tap into the sourcing networks of its domestic partners which are often used by other domestic firms, leading to high level resource similarity with other domestic firms (for example, Belderbos, Capannelli and Kyoji, 2001; Wei et al., 2012).

In terms of market commonality, JVs are also more likely to exert stronger competitive pressure on domestic firms than WOSs, as JVs tend to have greater degree of embeddedness in the industry and are more familiar with local markets. This effect is more likely to be dominant in a MIJV than a MAJV as the domestic partner of the MIJV has greater control because of its dominant equity share, thus providing better knowledge of domestic markets which enables the MIJV to engage with and monitor competition more efficiently (Chen & Chen, 2005). Within WOSs, Greenfield WOSs are keen on launching standardised product lines belonging to their corporate parents to better exploit FSAs (Rugman, Verbeke & Nguyen, 2011). This might augment the extent of ‘liability of foreignness’ faced by WOSs thereby thwarting their efforts to compete for higher sales compared to JVs. WOSs established through acquisitions are more likely have higher level local embeddedness and could embark on the transfer of KBAs more suited to local conditions which might stimulate greater degree of industry competition than greenfield WOSs. However, due to their liability of foreignness they may not be able to fully explore the local distribution and sourcing network previously processed by the acquired local firm. As a consequence, the competition effect resulting from the presence of WOSs in terms of market similarity is unlikely to be greater than that from JVs.

In the context of spillovers, industry competition is likely to display both positive and negative effects (Blomström & Kokko, 1998). Positive effects emerge when domestic firms are able to adjust input costs vis-à-vis their output and respond effectively to the presence of FOAs, the failure of which leads to the loss of market share, reduction in profit, and ultimately exit from the market. Although the discussion above postulates that MIJVs are more likely to exert ‘severe’ competition on domestic firms, followed by MAJVs and then by WOS, the association between the severity of competition between FOAs and local firms and FOAs’ ownership mode has not been verified empirically in the literature. Therefore, the discussion above only provides an indicative view on the competition effect associated with FOAs’ ownership modes.

4.2.4. Discussion

Spillovers from JVs may be higher relative to WOSs because the good network connections of domestic partners in JVs with other domestic firms provide an effective mechanism for knowledge diffusion. WOSs provide greater control over KBAs as they can internalize routines and divisional functions related to KBAs (Buckley and Casson, 1976; Kogut and Zander, 1993) and limit potential for knowledge diffusion outside the MNEs' network. The ability therefore of domestic firms to gain access to the MNEs' knowledge pools is likely to be better for JVs, but the pool of knowledge that is available for spillovers is most likely to be richer and deeper in WOSs than in JVs. Although knowledge pools are lower in JVs compared to WOSs, a higher degree of local embeddedness in JVs facilitates richer interactions through network connections with other domestic firms and therefore the extent of spillovers could be higher from JVs than from WOSs (Tian, 2010).

MAJVs and MIJVs also differ in promoting knowledge diffusion. MAJVs are better equipped to protect their core KBAs, as they are associated with the transfer of newer and more mature technologies than MIJVs (Hauswald and Hege, 2005). However, the network connections to other domestic firms are stronger in MIJVs than in MAJVs. These network connections are likely to have the strongest influence in the transfer of tacit knowledge (Kogut and Zander, 1993; Inkpen, 2000) because of the interpersonal connections between national (domestic) partners in JVs and domestic firms (Javorcik and Spatareanu, 2008). The stronger network connections of domestic partners in MIJVs with other domestic firms could result in higher potential for knowledge diffusion from MIJVs (Ramachandran, 1993).

The effects of competition from foreign ownership modes are less clear but it is acknowledged in the literature that negative spillovers are more likely to result from severe competition (Chang and Xu, 2008). Thus, the analysis hereafter summarises the likelihood of MNE ownership modes being associated with the extent of spillovers, when all three constructs – knowledge pools, strength of linkages and severity of competition – are considered together.

A schematisation of spillovers in relation to MNE ownership modes is given below and is used as a guide in developing research propositions:

Table 8
Author's schematisation of the key factors affecting the relationship between MNE ownership modes and spillovers

Ownership Modes → Key factors ↓	**MIJVs**	**MAJVs**	**WOSs**
Knowledge pools	Low	Intermediate	High
Linkages	High	Intermediate	Low
Competition	Severity: Low or high		

WOSs have well-developed knowledge pools relative to MAJVs and MIJVs and a positive effect is likely to dominate when knowledge pools in WOSs are large enough to compensate for the absence of well-developed linkages (compared to JVs) and especially when competition effects arising from presence of WOSs is minimal. Alternatively, negative effects will dominate when these knowledge pools are large but not enough to compensate for the absence of strong linkages (compared to JVs) and especially when the WOS's competition with domestic firms is severe which mitigates positive effects from knowledge pools. The discussion leads to four propositions regarding the extent of spillovers from WOSs with the assumption that WOSs transfer more and higher quality KBAs than JVs.

WOSs

P1*: In the absence of severe competition, spillover effects from WOSs are likely to be positive and larger than from JVs when their lower level of linkages with domestic firms is offset by their larger knowledge pools relative to MAJVs and MIJVs.*

P2*: In the absence of severe competition, spillover effects from WOSs are likely to be positive and smaller than from JVs when their lower level of linkages with domestic firms is not offset by their larger knowledge pools relative to MAJVs and MIJVs.*

P3: *In the presence of severe competition, spillover effects from WOSs are likely to be negative (or neutral if the negative competition effect exactly cancels out the positive spillover effect) and more significant than from JVs when their lower level of linkages with domestic firms is compensated by their larger knowledge pools relative to MAJVs and MIJVs.*

P4: *In the presence of severe competition, spillover effects from WOSs are likely to be negative (or neutral if the negative competition effect exactly cancels out the positive spillover effect, which is very unlikely) and more significant than from JVs when their lower level of linkages with domestic firms relative to MAJVs and MIJVs is not outweighed by their larger knowledge pools.*

MAJVs are characterised by better linkages to domestic firms, relative to WOS. The positive effects of MAJVs will dominate when these linkages are large and deep enough to compensate for the low knowledge pools in MAJVs (compared to WOSs) and when competition effects are moderate enough to allow for such effects. Negative effects are likely to dominate MAJVs when the linkages, despite being large and deep, do not permit steady diffusion of knowledge due to the presence of low knowledge pools (compared to WOSs). This effect could be augmented when competition effects from MAJVs do not affect, motivate or enhance performance of domestic firms. Finally, MAJVs would have no effect on spillovers when low knowledge pools do not compensate for the presence of linkages and when competition effects are low. This leads to the following research propositions regarding the extent of FDI spillovers from presence of MAJVs, assuming that MAJVs transfer less and lower quality KBAs than WOS.

MAJVs

P5: In the absence of severe competition**,** *spillover effects from MAJVs are likely to be positive and larger when lower level of knowledge pools relative to WOSs is offset by better linkages to domestic firms than WOSs.*

P6: *In the absence of severe competition, spillover effects from MAJVs are likely to be positive and smaller when better linkages to domestic firms relative to WOSs are not offset by lower level of knowledge pools than WOSs.*

P7: *In the presence of severe competition, spillover effects from MAJVs are likely to be negative (or neutral if the negative competition effect exactly cancels out the positive spillover effect) and more significant than from WOSs when the lower level of knowledge pools relative to WOSs are compensated by the better linkages to domestic firms than WOSs.*

P8: *In the presence of severe competition, spillover effects from MAJVs are likely to be negative (or neutral if the negative competition effect exactly cancels out the positive spillover effect) and more significant than from WOSs when the lower level of knowledge pools relative to WOSs are not compensated by the better linkages to domestic firms than WOSs.*

In MIJVs, the presence of well-developed linkages indicates that they are the most potent channels for knowledge diffusion. Thus, positive effects will dominate when likelihood of well-developed linkages to domestic firms (than WOS and MAJVs) offsets the effects of lower knowledge pools (than WOS and

MAJVs). This is also conditional on higher competition effects arising from MIJVs, forcing domestic firms to improve productivity. Alternatively, the negative effects are likely to dominate when well-developed linkages (relative to MAJVs and WOS) are not compensated by the presence of low knowledge pools (than MAJVs and WOS) and when high competition negatively affects the performance of domestic firms. Finally, insignificant effects could emerge from MIJVs even in the presence of well-developed linkages as they could suffer from low level of knowledge pools and the competition effects do not mitigate to enhance domestic firm's performance.

MIJVs

P9*: In the absence of severe competition, spillover effects are likely to be positive and larger from MIJVs when well-developed linkages to other domestic firms (relative to WOSs and MAJVs) are large enough to offset lower knowledge pools (than WOSs and MAJVs).*

P10: *In the absence of severe competition, spillover effects are likely to be positive and smaller from MIJVs when well-developed linkages to other domestic firms (relative to WOSs and MAJVs) is not offset by lower knowledge pools (than WOSs and MAJVs).*

P11: *In the presence of severe competition, spillover effects from MIJVs are likely to be negative (or neutral if the negative competition effect exactly cancels out the positive spillover effect) and more significant than from WOSs and MAJVs when lower level of knowledge pools (compared to WOSs and MAJVs)* *is compensated by well-developed linkages to other domestic firms (relative to WOSs and MAJVs).*

P12: *In the presence of severe competition, spillover effects from MIJVs are likely to be negative (or neutral if the negative competition effect exactly cancels out the positive spillover effect) and more significant than from WOSs and MIJVs when well-developed linkages to other domestic firms (relative to WOSs and MAJVs) do not offset lower level of knowledge pools (compared to WOSs and MAJVs).*

The twelve research propositions outlined above link generic MNE ownership modes affecting spillovers under different levels of transfer of KBAs that affect the size and quality of knowledge pools, linkages to domestic firms, and competition effects. This is an improvement upon existing studies, as they do not clearly indicate the conditions on when and how foreign ownership influences spillovers.

4.3. SUB-NATIONAL LOCATIONS AND SPILLOVERS

Despite the importance of sub-national locations with different levels of economic development for host country policies, only one study has investigated its role in the context of spillovers (Sajarattanochote & Poon, 2009). Earlier studies used a definition of administrative regions rather than classifying regions by income or level of economic development (Wei & Liu, 2006; Resmini & Nicolini, 2007). The latter approach is more appropriate for analysis of subnational locations in ETEs with wider disparities in income and economic development. The advantages of this approach are discussed earlier in the Background chapter and it is adopted for the study. In line with this approach, sub-national locations are categorised into MUAs and NMNAs following the work of Lall, Koo and Chakravorty (2003).

A wide range of factors could influence the scope of spillovers on domestic firms, when MUAs and NMNAs are considered as a moderator. However, three well-established factors are likely to provide reasonably good and consistent theoretical explanations.

4.3.1. Technological gap and absorptive capability

The technological gap between FOAs and domestic firms can act as a conduit and the absorptive capability as a constraint for domestic firms to benefit from spillovers (Sjohlöm, 1999; Castellani and Zanfei, 2003). This gap matters when the absorptive capabilities of domestic firms in different locations with varying levels of economic development are considered. Regions with high technological gap between FOAs and domestic firms, usually NMNAs, are likely to benefit more from spillovers, as domestic firms' in these regions have a strong need for new technologies so that they can catch up (Wang & Blomstrom, 1992; Driffield and Love, 2001). However, the domestic firms' absorptive capabilities can moderate this relationship, as domestic firms with higher absorptive capabilities are better able to absorb and assimilate new know-how and technologies than firms with lower absorptive capabilities (Castellani and Zanfei, 2003). An interesting paradox here is that lower technological gap between FOAs and domestic firms in MUAs would imply that domestic firms, on average, have higher absorptive capabilities and vice versa. Thus, the net spillover effects are likely to be dependent on both the technology gap and absorptive capability between foreign and local firms (Cantwell, 1989). This is also a 'technology accumulation' hypothesis that domestic firms can close the technological gap by improving their absorptive capabilities over time if the gap is small. There is some support for this effect for Mexico (Kokko, 1994) but the effects are unclear for other developing countries, e.g. Uruguay in Kokko, Tansini and Zejan (1996) and Indonesia in Sjohölm (1999). Thus, the dual role of technological gap and absorptive capacity could explain the spillover effects when sub-national locations with different levels of economic development are considered.

4.3.2. Social structure and network ties

The social structure that foreign and domestic firms are embedded in also affects spillovers (Spencer, 2008). The presence of effective network ties reduces the constraints of domestic firms in search for foreign technology and in absorption of appropriate technology diffused from FOAs (Eapen, 2012). Thus, good network ties boost the absorptive capabilities of domestic firms and determine the extent of technology absorption from foreign technology space. The relationship between social network ties of domestic firms and the propensity for spillovers could be clarified as follows. *First,* social network ties serve as the ‘conduit’ through which domestic firms learn about new practices, techniques and other opportunities (McEvilly and Zaheer, 1999) and thus acts as a source of valuable information flows (Podolny, 2001). *Second*, these network ties serve as channels for mutual negotiations between firms regarding the applicability and risks of foreign technologies and their suitability and value which are arrived at through socialisation and discussions (Greve, 1996; Rogers, 2003). *Third*, network ties provide a context for richer interactions between domestic firms and FOAs (Dyer and Hatch, 2006). As spillovers are informal transfers of knowledge (externalities), the lack of enhanced interaction between FOAs and domestic firms in the host economy constrains the adoption and absorption of diffused technology by the latter. Thus, the strength of social network ties that domestic firms possess is critical for spillovers.

In the context of different sub-national locations, i.e. MUAs and NMNAs, social network ties can play an important role in spillovers. A simple assumption is made where, on average, firms in MUAs are likely to be characterised by extensive social network ties but lacking in depth, whereas firms in NMNAs are likely to be characterised by sparse but deep social network ties. This is because in a region characterised by dense network ties (usually MUAs) all networks of firms are tied to each other whereas in a region characterised by sparse network ties (usually NMNAs) the focal (domestic) firm is tied with other firms that may not in turn be tied to each other. Thus, the depth of network ties is likely to be richer and more potent in NMNAs and the information available to the focal (domestic) firm, albeit limited because of the low density of network, could be unique or novel (Burt, 1992). The deep and rich network ties of NMNAs relative to MUAs could act as a bridge to access an innovative source and help generate non-redundant information benefits that aid domestic firms in search of available and applicable technology (Eapen, 2012). However, once the technology is scanned for suitability and value, MUAs can better facilitate domestic firms in spillovers than NMNAs (i.e. technology absorption by the focal firm) (Reagans and McEvilly, 2003). This is because the former with extensive network ties promotes the formation of common language and shared understanding between all firms (Tortoriello and Krackhardt, 2010). Moreover, the complementary routines and capabilities to integrate foreign technologies by firms are more easily developed when there is close proximity between source and recipient firms (Hamel, Doz and Prahalad, 1989; Kotabe, Martin and Domoto, 2003).

In summary, domestic firms located in MUAs face higher constraints for search of foreign technology but lower constraints for assimilating and absorption of diffused technology while the reverse is true in the case of domestic firms located in NMNAs. The net spillover effect in domestic firms located either in MUAs or in NMNAs will be the result of a combination of:

a. the ease by which technology could be scanned for availability + suitability
b. the absorption of that available technology.

This relationship is clarified in the schematisation provided below.

Table 9
Author's schematisation using Eapen's (2012) typology of network ties. Note: Spillovers is the net effect of a + b

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	MUAs	**NMNAs**
Density of network ties	Higher	Lower
Depth of network ties	Lower	Higher
a. Implications for search of foreign technology	Weaker as all firms strongly tied to each other have similar information	Better, as all firms loosely tied to each other, thereby focal firm can access unique or novel information
b. Implications for absorption of diffused foreign technology	Richer as firms are strongly tied to each other (dense)	Weaker as firms are loosely tied to each other (sparse)

4.3.3. Level of industry competition

The level of industry competition can also affect spillovers in MUAs and NMNAs. Anecdotal evidence suggests that industry competition is likely to be higher in MUAs than in NMNAs as the former are characterised by a larger density population of firms than the latter (Lall, Koo and Chakravorty, 2003). On the one hand, MNEs are bound to commit more resources to FOAs in MUAs where competition between firms is high. This stems from the fact that FOAs are at a disadvantage compared to domestic firms in accessing local information networks and knowledge base, thereby suffering from liability of foreignness in the host country (Zaheer, 1995). This liability, in the context of higher competition, would compel MNEs to transfer sophisticated technologies to FOAs in MUAs to improve their performance (Miller and Parkhe, 2002). As a result, the pool of knowledge available for domestic firms competing in the same industry with FOAs will be higher in MUAs. On the other hand, NMNAs are characterised by lesser degree of industry-competition between firms, partly due to lesser population of firms as a whole. As a result, the incentives for MNEs to commit proprietary knowledge-based resources to FOAs are lower in NMNAs, which is likely to reduce the volume and quality of knowledge pools available for spillovers in NMNAs (Opp, 2012).

In summary, domestic firms in MUAs would have a larger and higher quality and bundle of knowledge pool relative to FOAs in NMNAs. Since domestic firms in NMNAs have lesser absorptive capabilities relative to those in MUAs, the unbundling of the '*bundle of knowledge pools*' will be more challenging for the former group of firms than the latter. Therefore, the net effect on spillovers will be higher for domestic firms located in MUAs than that in NMNAs, when degree of industry-competition is considered.

Alternatively, a higher degree of industry competition in MUAs (relative to NMUAs) implies that the level of interaction between domestic firms and FOAs will be more enhanced. This also indicates that the linkages or network connections between domestic firms and FOAs are bound to be stronger in MUAs than in NMNAs. The overall effect on spillovers from industry competition will be that domestic firms with a good level of absorptive capabilities are more likely to benefit from knowledge diffusion in MUAs than in NMNAs. This is because the level of industry competition being higher in MUAs (relative to NMNAs) would boost knowledge pools and the strength of linkages or network connections between FOAs and domestic firms in MUAs as opposed to NMNAs.

The discussion above summarises some generic factors that are likely to link differences in subnational locations with the extent of spillovers. The overall effects of sub-national locations on the extent of spillovers will depend on the relative magnitude of these three generic factors, i.e. which factor dominates over others. These locational related factors have different effects on spillovers and are interrelated with each other. It is not possible to derive any specific propositions, as the roles of these factors on spillovers have not been systematically considered in the literature. However, given the importance of subnational location in spillovers, an empirical investigation is desired and the analysis above informs such empirical investigation.

4.4. CONCLUSION

The conceptual framework developed in this chapter develops the micro-level antecedents or theoretical constructs that connect foreign ownership modes to spillovers and considers the role of sub-national locations, i.e. MUAs and NMNAs.

The contribution of the conceptual framework is two-fold. *First*, it provides a comprehensive illustration of all well-established factors that should be accounted for when trying to understand spillover effects from MNEs ownership modes and sub-national locations. The role of foreign ownership modes is an important firm heterogeneity issue, and has been a response to the call in recent research for an improved understanding of the spillover benefits arising from MNEs' presence within the host country (Meyer and Sinani, 2009; Eris and Barbosa, 2009). The consideration of the moderating role of sub-national locations in explaining spillovers is also important as it is essential to investigate how FOAs and locational variables interact. A further contribution of this study is that it considers sub-national locations categorised by income to understand the significance of spillovers in regions with different levels of economic development.

The second contribution of the conceptual framework is that it adds a set of useful micro insights from heterogeneous and more recent strands of IB research to the traditional literature on spillovers. Specifically, by using the KBV of IB theory, it combines prior theory on foreign ownership modes and economic theory on spillovers.

The conceptual framework developed in the study will be tested against data from the Indian manufacturing sector to assess spillovers. This can also be used as a tool for policy analysis and in future empirical research to assess comprehensively spillover effects in ETEs. A list of the conceptual variables that will be operationalised for the purpose of the study is provided below. The list also includes a few variables where operationalisation will not be possible; *firstly*, because these constructs have not been empirically tested in the literature and will need further investigation for selection of appropriate proxies; *secondly*, data at firm level to capture these constructs are usually not available.

CONCEPTUAL VARIABLES	**OPERATIONALISATION OF VARIABLES**
1. MNE ownership modes	Foreign equity share, WOSs-100%, MAJVs-51-99%, MIJVs-10-50%
2. Sub-national locations	Income classifications, metropolitan urban areas and non-metropolitan urban areas
3. Absorptive capacity	R&D intensity and firm scale
4. Industry competition	Herfindahl Index and import penetration
5. Knowledge pools	*Not applicable#*
6. Linkages	*Not applicable#*
7. Social network ties	*Not applicable#*

- Cannot be operationalised due to data availability issue

CHAPTER 5

METHODOLOGY

5.1. INTRODUCTION

The primary objective of this chapter is to outline the methodological approach, the choice of modelling framework and the choice of dataset that would be most appropriate to analyze spillovers in the context of the Indian manufacturing sector. To the author's knowledge, only one previous study (Aini, Khalifah and Adam, 2009) has considered the role of three generic foreign ownership modes, WOSs, MAJVs & MIJVSs, in examining FDI spillovers. Thus, an endeavour to fill this important research gap is operationalised by, *firstly*, defining the level of foreign ownership associated with the corresponding ownership mode appropriately and, *secondly*, using appropriate estimation techniques for measuring spillovers so as to minimise estimation bias and also generate robust results. The study also investigates the effects of sub-national locations on spillovers by categorising sub-national locations with different levels of economic development (income).

The chapter includes discussions on the dominant philosophical approaches in the economics tradition and a defence of the approach used for this study. Emphasis is given to the prevailing (production function) approach to spillovers and related issues that are at the core of econometric modeling of spillovers. A short section has been devoted to discussion on the data sources employed for the research study. Finally, an attempt has also been made to incorporate some of the major limitations associated with the methodological approaches to estimating spillovers.

The organisation of the chapter is as follows. Section 5.2 provides a discussion on the philosophical paradigms underpinning this research study. Section 5.3 outlines the methodological approach used for modeling spillovers. Section 5.4 provides a quick description of the primary dataset underlining its strengths as well as the secondary sources used for supplementing the firm-level data. Section 5.5 explores the estimation techniques that are going to be used for this research study and section 5.6 concludes the chapter.

5.2. PHILOSOPHICAL APPROACHES UNDERPINNING THE RESEARCH STUDY

The philosophical approaches to theorising and measurement within the discipline of economics have been dominated by positivist approaches (Caldwell, 1980). This could be attributed to the prevailing notion that positivism appears to be rigorously constructed with a consistent body of beliefs that is capable of providing a firm and coherent epistemological basis for scientific methods (Blaug, 1980; Boylan and O'Gorman, 1991). A fuller understanding would be gained by considering the commonly accepted philosophical and methodological beliefs underpinning the current research discipline. Robson (1993) and Crotty (1998) highlight the importance of four elements in social science research which are crucial in ensuring the soundness of research projects and making its outcomes convincing:

1. Methods, or the techniques and procedures which are used to gather and analyse data related to the research questions and research hypothesis
2. Methodology, or the strategy (plan of action or design) behind the choice and use of particular methods, also linking the choice and use of methods to the desired outcomes
3. Philosophical perspective (or theoretical stance) informing the methodology thereby providing a context for the process and also of its logic and criteria
4. Epistemology (or the theory of knowledge) which is embedded in the philosophical perspective and the methodology.

Different social science disciplines follow distinctive philosophical approaches to developing research design. However, in the case of economics, it is tacitly assumed and accepted that the purpose of economic theory is to provide explanations of economic events or law-like generalisations (Caldwell, 1984). Thus, the first task of a researcher in economics is to develop generalisations about empirical regulations, after which hypotheses are developed to construct an economic theory (Hutchison, 1938). Next, comparing consequences with the related facts empirically tests the economic theory and therefore the predictive success of the tested theory is the measure of its explanatory capacity. A further step in the development of economic theory is formulating current theory in the most sophisticated way possible, also known as '*axiomatising*' the theory. This allows in developing core principles that are regarded as fundamental explanatory factors of the economic order in question. However, the two distinct domains of criteria governing the choice of economic theory is ***formal/logical*** criteria, i.e. related to axiomatisation of theory independently, irrespective of what it says about any economic system and ***criteria for assessment*** of its core principles. The latter is used for evaluation of explanatory capacity of the theory under investigation.

In the context of the above discussion, the five key philosophical approaches within the discipline of economics are ***logical positivism with falsification, instrumentalism, priorism, scientific realism and rhetoric methodology***. In order to understand the major differences between them, Fox (1997) has stressed four key issues to be addressed:

a. the purpose of economic enquiry,

b. legitimate sources of knowledge,

c. scope of the subject matter

d. appropriate structure of economic theory.

Logical positivism with falsification is the most widely applied methodology in this research area where observation of phenomena is seen as the only acceptable legitimate source of such scientific knowledge. This approach rejects the use of speculation about the nature of reality because it introduces subjectivity and ideology into the scientific enquiry. Falsification is seen as the only appropriate process for validating knowledge claims (Popper, 1959). Researchers adopting this particular philosophical stance see themselves as true scientists. However more recent developments in positivism have weakened the criterion of acceptability by moving from falsification to confirmation with the requirement that empirical evidence supports the hypothesis being tested only to a certain degree (Caldwell, 1980).

Instrumentalism, also referred to as positive economics, aims to develop scientific theory or postulate hypotheses that yield valid and meaningful predictions about phenomena which are not yet observed. It accepts human introspection as a useful source of knowledge. Instrumentalism treats theories as instruments, whereby theories are assessed on the basis of how useful they are in prediction (Quine, 1980). Successful prediction is evaluated in terms of regularities among observables. Theory is seen as a means to an end, with the end being the reliable prediction.

Under ***priorism***, the purpose of economic enquiry lies in improving the understanding of human social interaction. In this approach, observation plays a secondary role in the development and validation of theory, with reason being regarded as the acceptable source of knowledge and the researcher is assumed to exist as part of the phenomenon (Crotty, 1998). A dominating view in this approach is that it is not optimistic about the prospects of quantitative prediction, with hypothesis testing playing a secondary role. Therefore priorism is overall often seen as unscientific.

The aim of ***scientific realism*** is more than prediction, as it attempts to identify and understand the relationship between causes and effects. Reason as a source of knowledge is drawn from definitions and also from general axioms that are intended to convey substantive knowledge about reality (Kuhn, 1970). Scientific realism attempts to create a literally true story of what the world is like, independently of human thought or observation.

Conversation and rhetoric methodology assumes that the subject matter of economics is a historical and not a predictive science with the aim being social self-understanding. Followers of this methodology concern themselves less with the structure of theory than with the structure of relationships and communication. The writings of researchers are seen as the primary sources of knowledge with normative questions being irrelevant. Conversation and rhetoric methodology rejects the proposition that the purpose of economic analysis is prediction and control (Porter et al., 2000).

There has been an increasing amount of multidisciplinary research within the discipline of economics in the past two decades. This has contributed to flexibility in philosophical and methodological orientation rather than granted by any of the single methodological approaches outlined above (Johnson, 1996). The boundaries between the different methodologies are hence getting blurred and pluralist approaches are more frequently found.

In the context of research on spillovers, the objective is to acquire value-free knowledge and use observation as the only legitimate and acceptable source of scientific knowledge (Driffield and Jindra, 2012). Other sources of knowledge, like human introspection, considered in instrumental methodology or rhetoric methodology are not used. Existing studies on spillovers seldom aim at prediction about phenomena not yet observed, as exercised in the instrumental methodology. Considering the brief outline of the five main methodologies, it could be suggested that positivism is the key methodological approach adopted in the context of this research study. The positivist-deductivist approach is focused on the search for and testing of causal and associational relationships (Popper, 1972; Feyerabend, 1962). The research questions developed in the study will be based on deduction from the findings and key gaps of existing positivist literature in the area. Moreover, as the primary objective of the research is to compare roles of different foreign ownership modes in spillovers, a reductionist approach is adopted that will identify and test the significance of standard models measuring spillovers. This reductionist approach is necessary to conduct a large-scale quantitative study. The availability of data and of robust testing techniques to conduct the appropriate tests requires the use of reductionist modelling of key concepts that can be identified and measured correctly. This type of approach dominates the field of study in this area (see for example, Wei and Liu, 2006; Buckley, Clegg and Wang, 2007; Tian, 2010; Wang, Deng, Kafouros and Chen, 2012; Damijan, Rojec, Majcen and Knell, 2013). The investigation of the existence and extent of well-defined concepts that are based on causal relationships arrived at by deduction from theory, from existing evidence and the reductionist modelling of major determinants, is best served by a positivist approach (Easterby-Smith et al., 2002).

However, the study considers a ***positivist*** paradigm albeit without falsification. This is because the current research study, despite using a positivist-deductivist approach, does not develop hypothesis as a means to explicitly test existing relationships between some key economic variables that are important constructs in the conceptual framework, such as the role of knowledge pools and the strength of linkages between domestic and foreign firms. These variables have been theoretically well-established in the IB literature, however their effects have not been empirically tested in the literature. Thus, it is not possible to have a prior knowledge on *firstly*, to what extent these variables affects the magnitude of results and *secondly*, whether an interplay of these variables dominates the true effects for foreign ownership modes. Thus, an initial step to clarify this issue is to develop research questions, explore the results and explain how the variables under investigation lead to positive, negative or no spillover effects. In other words, while this approach is rooted in the positivist-deductivist framework, it attempts to develop a critical approach to understanding and explaining the relationship between economic variables.

This current approach used for the study does not allow in falsification and therefore the philosophical approach to this research study is primarily positivist-deductivist in nature with a critical mode of enquiry.

Table 10 below depicts clearly the methodological and philosophical perspectives on which this research is based upon.

Table 10
Methodological perspectives of this research

Epistemology	Philosophical perspective	Methods
Reductionism	Positivist-deductivist	Panel data analysis

Source: Crotty (1998)

5.3. FDI SPILLOVERS & METHODOLOGICAL APPROACHES

The production function approach to measuring spillovers in host country has been the dominant approach since the 1980s (Driffield and Jindra, 2012). This includes analysis in both developed and developing host economies where diffusion of knowledge occur (or spills over) from FOAs of MNEs to host domestic firms. The presence of spillovers through FDI has been inferred by the empirical literature mainly on the basis of analysis of productivity (Görg and Strobl, 2001). The analysis has progressed through time from consideration of labour productivity through to total factor productivity (TFP) using Solow residuals and varying degrees of econometric sophistication, to productivity growth in a dynamic framework (Driffield and Jindra, 2012). As the analysis on FDI spillovers is confined to a production-function specification, the empirical literature has to consider a range of alternative methods for externalities between foreign and domestic firms. The most popular channels for spillovers considered in the literature are demonstration (reverse engineering) effects (Blomström and Kokko, 1998), labour mobility effects (Driffield, 2001) and competition effects (positive or negative) as a result of the presence of FOAs of MNEs (Chang and Xu, 2008). The production function approach essentially aims to quantify the incidence and magnitude of FDI-induced productivity effects.

One of the theoretical rationales behind this is rooted in the standard '*knowledge pipeline model*' where knowledge flows from MNE parents to FOAs in the host country (deliberate) and then diffuses to domestic firms (deliberate or unintentional). However, a major drawback of the production function approach is the inability to disentangle non-pecuniary technological externalities from pecuniary externalities (Castellani, 2012) or other competition-related effects (Kosova, 2010). In other words, this approach has a tendency to compound effects. This is reflected in the empirical evidence so far where the results are largely inconclusive and sometimes contradictory for certain countries.

The production function approach was first conceptualised in the work of Caballero and Lyons (1989, 1990, 1992), who investigated whether an increase of output in one industry led to positive externalities in other industries. A similar methodological approach has been applied within the spillovers literature since the 1980s to examine the scale and scope of MNE investment on spillovers that are linked to knowledge transfers. However, Driffield and Jindra (2012) provide a skeptical account of this approach and emphasise that researchers need to consider a number of important factors when applying this approach in quantitative studies. These factors are discussed below.

Firstly, a measure of *TFP* is required to appropriately model spillovers based on the production function approach and not merely a proxy such as labour productivity. Whereas some studies employ gross output to compute TFP, others use value added but it is important to deflate inputs and outputs to track the changes in quantities rather than prices. Moreover there are substantial measurement issues with factor capital, especially in ETEs, which arise owing to poor accounting standards and the tendency to misstate the value of capital. Furthermore, materials used in production, depreciated capital reported in income statements or energy consumption are used as proxy for capital utilisation. Due to the limitations associated with the measurement of TFP, the empirical literature usually starts with a relatively simple production function by obtaining an estimate of TFP by estimating the following:

$$tfp_{it} = lnQ_{it} – B_{l}\ lnL_{it} – B_{K}\ lnK_{it}$$

Here, Q, L and K represent output, labour and capital of the firm, and the estimates of the *B* terms are derived either through estimation or simply from the relative factor shares of the two inputs. Ideally, the measure of TFP should allow for the endogeneity of the investment decision by the firm, in the face of potential changes in productivity. A few commonly applied approaches in recent years are the semi-parametric approaches suggested by Olley and Pakes (1996) and Levinsohn and Petrin (2003). This method allows for firm-specific productivity differences that exhibit idiosyncratic changes over time by controlling for the endogeneity of input selections.

Secondly, prior studies on spillovers using industry-level data have overstated the spillover effects, owing to the fact that the productive sectors are more likely to attract FDI (Görg and Strobl, 2001). Thus, although a correlation between FDI and productivity growth can be established at the industry level, this is not necessarily indicative of spillovers. The use of firm-level data, however, can mitigate this problem to a certain degree.

Thirdly, the use of panel data rather than cross-sectional data is recommended as the researcher can distinguish between mere correlation (more productive sectors attracting FDI) and can also impose a dynamic element on the specification. For example, use of panel data could allow FDI in one year to impact on TFP in subsequent years. In addition, panel data allows for firm-level heterogeneity, which has a significant impact on the results from estimating productivity growth models (Lee, Kim and Heo, 1998).

Fourthly, in estimating spillover effects, the size of FDI stock (in terms of employment, sales, equity or output) of a certain industry is taken as proxy for the potential for technological externalities. If the coefficient for foreign presence is significant for productivity changes in domestic firms within the same industry, this is taken as evidence for spillover effects (whether negative or positive). In standard economic applications, competition is considered to be perfect which may not be reflective of real world applications. Thus, to incorporate imperfect competition, either a mark-up factor between price and value of the marginal productivity of inputs could be introduced or producer concentration could be controlled by means of the Herfindahl index. However, a problem with the traditional production function approach is that it may confound the productivity gains from spillovers, with the efficiency losses from increased competition or 'crowding out' effects (Chang and Xu, 2008).

Fifthtly, the common assumption of the production function approach when estimating spillovers is the presence of a linear relationship between FDI stock and the potential for spillovers (Findlay, 1978). This assumption is too simple and lacks rigor. For example, it will be difficult to visualise if an industry with a high share of FDI stock generates spillovers but at the same time if there are only a few domestic firms present in the industry. An alternative explanation could be that the potential for spillovers is higher when MNEs combine domestic and foreign inputs rather than solely sourcing locally. The combination of different inputs might require a higher level of production complexity and coordination, which in turn triggers spillovers on the back of production linkages between foreign and domestic firms.

Moreover, the argument for a non-linear relation between the technological gap and spillovers is that if domestic firms and MNEs are at the same technological level and using identical technologies (no technology gap), there is not much knowledge that could potentially spill over (Chen, Kokko and Tingvall, 2010). However, it is unlikely that spillovers will occur if the technological gap is so large that MNEs and domestic firms do not feature in the same technology space. Therefore, an intermediate range with an optimal technology gap could be the answer to realised spillovers.

Sixthly, the production function approach for measuring spillovers also requires a suitable measure of inward FDI. MNE presence may be measured as the increase in foreign sales, employment or net capital investment. Of these, the sales (or value added) measure is the most attractive in the spirit of Caballero and Lyons (1990). However, it is also important to allow for the relative size of the penetration, rather than merely the absolute level as this will vary with absolute industry size. Alternatively, a recent trend seen in studies on estimation of FDI spillovers is the use of different measures of MNE presence in same study (e.g. share of sales, employment, fixed assets, equity, R&D of MNEs in the industry) (Wei and Liu, 2006; Liu, Wei and Wang, 2009; Wang, Deng, Kafouros and Chen, 2012). This is done to maximise the detection of spillovers.

Finally, it is important to distinguish between genuine spillovers and simple demand effects (Oulton, 1998). For example, if aggregate demand in an industry increases, this may improve performance in the incumbent firms as well as attract entry from MNEs. This effect could lead erroneously to a spurious correlation and thereby an overestimation of apparent spillover effects (Barrel and Pain, 1997).

In the light of the above factors, the production function approach led estimation techniques to regress the TFP estimates against the externality terms within a fixed-effects model, including a time trend (or alternative measure of exogenous technical progress) and other explanatory variables. Driffield and Jindra (2012) further add that any inferences derived from such specifications could be estimates of the net effect of a number of competing effects which includes not only spillovers but also direct technology transfer effects, competition effects and crowding-out effects.

There are also other important issues that could bias the estimation framework of spillovers, especially in the estimation of TFP. The two common issues are associated with simultaneity or selection bias. The estimation of TFP with traditional OLS (ordinary least squares) methods to a firm-level panel dataset could introduce simultaneity or endogeneity of input bias (Van Beveren, 2010). This is defined as the correlation between the level of inputs chosen and unobserved productivity shocks (De Loecker, 2007). Simultaneity bias arises from the fact that the choice of inputs is not under the control of the econometrician, but determined by the individual firms' choices (Griliches and Mairesse, 1995). Another issue is that if the entry and exit of firms is not controlled for, a selection bias will emerge (De Loecker and Konings, 2006). This bias emerges because the firms' decisions on the allocation of inputs in a particular period are made *conditional on its survival* (Olley and Pakes, 1996). If firms have some knowledge about their productivity level prior to their exit, this will generate correlation between estimates and the fixed input capital, which is conditional on being in the data set (Ackerberg, Benkard, Berry and Pakes, 2007). While traditional methods to deal with the simultaneity issue include fixed effects estimation and use of instrumental variables (Griliches and Mairesse, 1995), recent years have seen greater use of the Levinsohn Petrin method (Levinsohn and Petrin, 2003), the Blundell and Bond method (Blundell and Bond, 1999) and the Olley-Pakes method (Olley and Pakes, 1996) to mitigate this issue. In the case of selection bias, although this has been discussed in the literature since Wedervang (1965) and estimation techniques to mitigate this issue have been proposed by Heckman (1979), the estimation algorithm proposed by Olley and Pakes (1996) is the most widely used to address this issue.

5.4. DATA SOURCES

The study uses the PROWESS database of the Centre for Monitoring Indian Economy (CMIE). This database contains information on all types of firms, i.e. public and private, MNEs and domestic firms, which are listed on India's stock exchanges. The database embraces firms that account for 75% of all corporate taxes, more than 95% of excise duty and 60% of all savings of the Indian corporate sector (Marin and Sasidharan, 2010). There is a significant advantage of employing this dataset as the majority of these firms are large enough to be listed on India's stock exchanges, thus enabling the investigation of spillovers from large FOAs to large domestic firms. Large firms, on average, are better at adopting managerial best practices, including the introduction of new production techniques and management of human capital, to improve firm productivity (Bloom & Van Reenen, 2007). Large firms also adopt innovations earlier and more comprehensively than small firms and therefore are more likely to swiftly and fully acquire spillovers from FDI (Baptista, 1999). In addition, firm size is an important determining factor of their relative absorptive capacity. This is because large firms have better access to finance and have greater ability to exploit external knowledge associated with knowledge diffusion activities (Cohen and Klepper, 1996). As a result, the knowledge pools of FOAs and absorptive capabilities of domestic firms are likely to be better captured in the case of large firms. Thus, investigation of spillovers with a focus on large firms could be considered as the most plausible scenario. The PROWESS database is extensively used and there are a good score of firm-level published studies using this database (e.g. Balakrishan, Pushpangadan & Babu, 2000; Kathuria, 2002; Kumar & Aggarwal, 2005; Marin & Sasidharan, 2010; Topalova, 2004).

The industrial groupings for the study followed the National Industrial Classification (NIC) 2008 code for the manufacturing sector. Moreover, the definition of foreign ownership was a minimum of 10% of foreign equity (Chalapati Rao and Dhar, 2011). To supplement missing information in PROWESS on the level of foreign ownership, other sources such as company websites and annual company reports are used. In the data cleaning and inputting process, firms that did not report, or provided insufficient information on key economic activities, are excluded. The final dataset contains 1,624 firms with 5,203 observations covering the period of 1991-2008, of which 1,398 firms are domestic firms and 226 are FOAs. The number of FOAs in our sample is in line with other studies using PROWESS, for example Marin and Sasidharan (2010) include 273 FOAs in their sample. Similar studies on the manufacturing sector in Argentina by Chudnovsky, López and Rossi (2008) and Marin and Bell (2006) have 145 and 283 FOAs respectively in their samples.

An important empirical contribution of the current study is the consideration of an appropriate definition of foreign ownership. Studies which do not appropriately define the real level of foreign ownership lead to inaccurate definition of the degree of foreign ownership and thereby provide misleading estimates of the spillovers that are associated with different degrees of foreign ownership. The problem is further exacerbated in the case of ETEs and should be considered for the following reasons:

a. Defining foreign (equity) ownership appropriately allows in distinguishing between dominant shareholders (who exercise voting rights) from ordinary shareholders (Ayyagiri, Dau and Spencer, 2009; Sarkar, 2010).

b. Firms in emerging and transition economies (ETEs) display greater diversity in equity-ownership shareholding and are unstable relative to developed economies (Sarkar and Sarkar, 2003).

Thus, failure to consider group(s) that has actual insider control over firm ownership (and by implication knowledge-based assets or KBAs) will lead to inaccurate definition and measurement of the same. In the context of this study, MNE ownership modes are determined by using direct foreign ownership (promoter's) figures from the PROWESS equity datasheet. In essence, it includes all three generic ownership modes and uses a better definition of foreign ownership mode than existing studies. The improvement in definition of this study (following Ayyagari, Dau & Spencer, 2009; Sarkar, 2010) is that the share of foreign ownership is by reference to the dominant shareholder with voting rights. This is an appropriate definition of foreign ownership because promoters (those with voting rights), such as firms or corporate groups, possess significant control and decision-making authority, whereas non-promoters (those without voting rights), such as foreign institutional investors, venture capital funds, banks, mutual funds and insurance companies, do not exercise direct control (Chalapati & Dhar, 2011). This study uses a more comprehensive method of identifying foreign ownership mode than the existing literature and thereby improves the prospects of capturing how these modes affect spillovers. This measurement technique updates Javorcik & Spatareanu's (2008) definition on foreign ownership using direct ownership figures and is more applicable for ETEs. Using promoter's equity share allows in determining and considering the degree of control of technology and know-how (including KBAs) that can be exercised by the foreign (MNEs) corporate parent.

The ownership modes are defined using OECD (2008) classifications and following the work of Javorcik and Spatareanu (2008) and Aini Khalifah and Adam (2009):

WOSs: foreign firms with 100% foreign ownership.

MAJVs: foreign firms whose equity share ranges from 51% to 99%.

MIJVs: foreign firms whose equity share ranges from 10% to 50%.

In many cases, the equity share datasheet is not available in PROWESS. In such a situation, information on equity share of promoters (foreign and domestic) has been retrieved from the firm's website. This information is used only until the year in which data is available for the firm in PROWESS. For example, if data for the firm is from 2003-2008, equity share information is used only for the following years (and not current equity share information). Moreover at times, information on equity share is not available from both the PROWESS datasheet and also from the firm's website. In this case, other secondary sources are used to determine the classification of the foreign firm's equity. To illustrate this, Assam Carbon Products, for example, is a foreign firm but has no equity share information available in the Prowess datasheet. It has a website but it does not report shareholding information. The only information provided is that Morgan Crucible Co. (U.K) has a stake in the firm. To validate this information, use was made of government websites [one such example is the Securities & Exchange Board of India (SEBI, accessible at http://www.sebi.gov.in/) to provide information on foreign equity]. The data gathered from this website is further supplemented by another reputed website (http://www.securities.com) to check the information found on the SEBI website. Finally, the adjustment of nominal data is done by using GDP deflator for sales and employment data and the Reserve Bank of India wholesale price index for expenditures, assets and income data (Marin and Sasidharan, 2010).

5.5. MODEL ESTIMATION METHODS

The assessment of the spillover effects, i.e. productivity growth of domestic firms caused by FDI presence, requires estimates of the TFP of firms, as stated in earlier sections. Problems of estimation arise if firms adjust their inputs according to their expectations about economic conditions, leading to the possibility that idiosyncratic shocks in productivity are captured in the error term (Griliches and Mairesse, 1995). The Levinsohn and Petrin (2003) approach, henceforth the LP method, is commonly used to overcome this potential problem (Javorcik and Spatareanu, 2008; Liu, Wei and Wang, 2009). The LP method is easier to implement than the alternative approach by Olley and Pakes (1996) because there is no requirement for information on firm entry and exit and no information loss resulting from negative values in the proxy investment variable. Very few firms exited the dataset which provides another reason to use the LP method. Thus, the LP method of estimating TFP for 2 digit level industry production functions provides the data for the dependent variable. The model estimation exercise is carried out in Stata Version 13.0.

The control variables include competitive characteristics of industries (industry concentration) and import penetration ratios (IMP) and the key conditions in domestic firms that affect absorptive capacity (R&D intensity or RD) and firm scale (SCALE). Industry concentration is measured with Herfindahl index (HHI). The RD and SCALE variables are proxies for firms' own innovation efforts and scale effect, respectively.

The baseline model is therefore:

$$\ln TFP_{ijst} = \alpha_0 + \alpha_1 FORFP_{jt-1} + \alpha_2 HHI_{jt-1} + \alpha_3 IMP_{jt-1} + \alpha_4 RD_{ijst-1} + \alpha_5 SCALE_{ijst-1} + \mu_{ijst} \qquad (1)$$

Where $\ln TFP_{ijst}$ is the logarithm of the TFP of domestic firm i in industry j, in state s, at time t. The HHI and IMP variables are two industry level proxies for industry competitive conditions – Herfindahl index of concentration and import penetration ratio. The RD and SCALE variables are firm level proxies for absorptive capacity, that is R&D intensity and firm scale. Following Wei and Liu (2006), to maximise the detection of spillovers, three different measures are used to capture FDI spillover effects (FORFP): the share of MNEs' employee compensation in the 3-digit industry (Employment); the share of total sales by MNEs in the 3-digit industry (Total Sales) and the share of MNEs' fixed assets in the 3-digit industry (Fixed Assets). Foreign ownership mode is categorised by: (1) wholly owned subsidiaries (WOS), where the MNE has 100% promoter's equity; (2) majority joint-ventures (MAJV), where the MNE has 51% to 99% promoter's equity, and (3) minority joint-ventures (MIJV), where the MNE's promoter's equity is from 10%-50%. The study measures spillovers from WOS, MAJV and MIJV in the same way as aggregate FDI presence (Eq. 1), by changing the shares of all MNEs to the shares of WOS, MAJV and MIJV in the 3-digit industry, respectively. This leads to the 2nd model which is represented by:

$$\ln TFP_{ijst} = \alpha_0 + \alpha_1 WOSFP_{jt-1} + \alpha_2 MAJVFP_{jt-1} + \alpha_3 MIJVFP_{jt-1} + \alpha_4 HHI_{jt-1} + \alpha_5 IMP_{jt-1} + \alpha_6 RD_{ijst-1} + \alpha_7 SCALE_{ijst-1} + \mu_{ijst} \quad (2)$$

The introduction of a one-year lag deals with the potential problem that spillovers will not raise instantaneously. Moreover, this lag structure allows better controlling for simultaneity bias arising from the fact that MNEs may be attracted to productive industries (Aitken and Harrison, 1999). The definition and measurement of the key variables used in the study can be found in the appendix.

Alternatively, following Lall, Koo and Chakravorty (2003), this study classifies sub-national regions according to their level of economic development. This approach provides not only a more disaggregated set of regions than using administrative definitions of regions, but also delivers a coherent system of classifying regions by level of economic development. The classification of sub-national regions used information from PROWESS on location of FOAs. This information is then further connected to economic regions in India using data from the Census Office, government of India website (http://censusindia.gov.in/). The definitions of the two sub-national variables come from the United Nations Population Division World Urbanisation Prospects (2009) and are as follows:

1. Metropolitan urban regions (or MUAs): These are metropolitan regions or their agglomerations with high population density, and GDP per capita of US$1000 or more.

2. Non-metropolitan urban and rural regions (or NMUAs): These are regions located outside metropolitan areas with a minimum population of 50,000 and with a GDP per capita of less than US$1000.

Equation (3) is estimated by incorporating sub-national location variables, where foreign presence interacts with another variable, RGFP, which indicates foreign presence within regions (MUA and NMNA). This is expressed in the following form:

$$\ln TFP_{ijst} = \alpha_0 + \alpha_1 FORFP_{jt-1} + \alpha_3 RGFP_{jt-1} + \alpha_3 \, HHI_{jt-1} + \alpha_4 IMP_{jt-1} + \alpha_5 RD_{ijst-1} + \alpha_6 SCALE_{ijst-1} + \mu_{ijst} \quad (3)$$

Equations (1), (2) and (3) are with corrections for heteroskedasticity and for clustering at the industry-year level to account for correlations between firm observations within the same industry-year (Wooldridge, 2002). The correlation between foreign presence and productivity enhancement in firms may connect to other factors, which can be assumed to be fixed, such as firm, time, industry, and region specific factors connected to such things as organisational and industry culture, technology opportunities, external policy shocks and infrastructure conditions. To control for these fixed effects, use is made of year, industry, and region dummies in a fixed effects panel data model. An alternative method to the fixed effects model is first differencing. Following Aitken and Harrison (1999), Javorcik (2004) and Haskel, Perreira and Slaughter (2007), the first-differencing model is estimated which involves the loss of 225 firms from the sample, but generated more robust results than the fixed effects model. This is because estimating first-differences removes unobserved time-invariant industry and region-specific effects (assuming that the time-varying disturbances in the original equations are not serially correlated) and thereby produces estimates that are no longer biased by any omitted variables that are constant over time (Bond, Hoeffler and Temple, 2001). Javorcik (2004) states that the examination of longer differences gives relatively more weight to more persistent changes in the variables of interest and hence reduces the influence of noise.

This approach to measuring spillovers is consistent with previous studies (Javorcik, 2004; Javorcik and Spatareanu, 2008) and thus the discussion involves the use of first-differencing. The final econometric issue is selection bias, which may occur due to firm entry and exit, but may simply reflect some firms choosing not to report. This problem can, to some extent, be controlled for by the use of unbalanced panels (Levinsohn and Petrin, 2003) which the study takes into account. Other estimation techniques involve the use of Heckman (1979) technique or O-P method (Olley and Pakes, 1996). Unfortunately, the O-P method cannot be used for this study as the implementation of the method requires data on firm entry and exit which is not available from the dataset. However, research is still continuing on developing a best estimator for addressing issues such as selection bias (Haskel, Perreira and Slaughter, 2007). As a result, following Haskel, Pereira and Slaughter (2007), a structural approach is not suitable to address possible selection bias.

5.6. CONCLUSION

The purpose of this chapter was to address the research gaps identified in the literature (see Chapter 3) and consider the key variables for operationalisation which were considered in the conceptual framework chapter (Chapter 4). This is done by providing a methodological framework to analyse the role of foreign ownership modes and sub-national locations in spillovers. The methodological approach used in the study benefits from a better definition and operationalisation of key variables of interest and the parsimonious use of sophisticated econometric techniques.

On the one hand, despite the production function approach being one of the most dominant quantitative methods to investigate spillovers, it is only limited in its capacity to address some of the empirical challenges addressed above (see section 5.3). An important contribution in this regard could be to find means within this approach to appropriately disentangle pure technological spillovers from competition or crowding out effects. A framework proposed in the literature to address the issue is the combination of a competitive fringe framework on entry and exit of firms within the production function approach (Kosova, 2010). On the other hand, the acquisition of qualitative data gathered through standardised surveys (firm-level) as well as case study evidence can shed greater light on the spillover process (Driffield and Jindra, 2012). Case study evidence, however, can only be used to develop the theoretical framework through induction and it is not generalisable to large samples. In the case of standardised surveys, useful information could be obtained on qualitative indicators although the challenges to this are the cross-sectional nature of surveys, and lack of harmonisation with existing standards for technological indicators offered by other international agencies such as the World Bank (Productivity and Investment Climate Private Enterprise Survey) or UNIDO (Africa Foreign Investor Survey).

In summary, the chapter has provided a discussion and defence of the philosophical approach that the research study has adopted according to model estimation techniques to be used for data analysis within the production function approach. It also provides a brief summary of the firm level database along with supplementary data sources used for compiling the final dataset.

The next chapter (Chapter 6) discusses the results of econometric modeling in the context of foreign ownership modes and the moderating role of sub-national locations on spillovers.

CHAPTER 6

DATA ANALYSIS - RESULTS AND DISCUSSION

6.1. INTRODUCTION

This chapter is divided into two sections. The first section reports the results on the impact of MNE ownership modes on spillovers and provides a discussion in reference to the propositions developed in the conceptual framework. The second section is focused on the moderating role of sub-national locations on spillovers in the host country. The firm-level data for the quantitative analysis is derived from a primary source which is the PROWESS database, Centre for Monitoring Indian Economy, India. The secondary sources used to complement the primary dataset were websites and reports of foreign companies operating in India, Indian government publications (for example, data from the Department of Industrial Policy and Promotion) and data from United Nations World Urbanization Prospects. The secondary sources were used, specifically, to supplement missing information in PROWESS on the level of foreign ownership and for information related to location of MUAs and NMNAs. All firms in the PROWESS database are listed on the Indian stock exchanges and therefore comprises of large firms (Kathuria, 2002). Firm size is a determining factor of R&D and large firms have better absorptive capabilities to exploit external knowledge associated with knowledge diffusion activities along with benefitting from economies of scale and scope, and access to finance (Cohen and Klepper, 1996).

The results for MNE ownership modes suggest that consideration of the generic MNE ownership modes, which are not accounted for in prior studies on spillovers, provides better explanation of spillover effects in host countries. The consideration of the three generic foreign ownership modes as opposed to two used in the existing literature and the use of an appropriate definition and measurement of foreign ownership than previous studies also better clarifies the conceptual links between foreign ownership modes and spillovers. The findings also enable development of policy guidance on what foreign ownership modes are most amenable to spillovers and contradict some findings in previous studies on foreign ownership modes and spillovers. The findings reinstate the need for investigating firm heterogeneity issues in the context of MNEs' foreign ownership. The first section of the chapter is organised as follows. Section 6.2 documents the results and key findings on the spillover variables. Section 6.3 provides a discussion on the results with reference to the key conceptual links and propositions associating foreign ownership modes and spillovers. Section 6.4 concludes the section with a brief summary.

The results for sub-national locations suggest that there are differences in spillover effects arising from the presence of FOAs across different locations in India. The findings contribute to discussion on the renewed interest of the moderating role of '*location* and *geographic space*' in spillovers (Beugelsdijk and Mudambi, 2013). The study of interaction between sub-national locations with different levels of economic development and FOAs, and its implication for domestic productivity, is an emerging research theme (Vadlamannati, 2009; Sajarattanochote & Poon, 2009) as opposed to the role of '*geographical proximity'* which is dominant in the existing spillovers literature (Wei & Liu, 2006; Crespo, Poenca and Fontoura, 2012). In line with this approach to analysing the interaction between sub-national locations and spillovers, the current study adopts the former approach. The structure of the chapter's second section is organised as follows. Section 6.5 documents the results and key findings on the spillover variables, when sub-national locations are considered. Section 6.6 provides a discussion of the results with reference to some likely theoretical associations of spillovers with MUAs and NMNAs developed earlier in the Conceptual Framework chapter.

SECTION A

6.2. RESULTS

6.2.1. Discussion on TFP

Table 11 presents a summary of firms' TFP in terms of industry and foreign ownership mode. It is clear that foreign firms do not always have higher productivity than domestic firms. In sectors 11 (beverage production), 13, 14, 15 (textile, wearing apparel, leather and related products), 19 (coke and refined petroleum products), 22 (rubber and plastic products), and 26 (computer electronic and optical products), the average TFP of domestic firms is higher than that of foreign firms. A number of explanations are provided as to why this is likely to be the case.

Firstly, this trend is likely to be prominent in the case of highly concentrated industries and/or industries employing low-income and unskilled workers (Chari and Gupta, 2008). The aforementioned industries might have inadequate enforcement of regulations on labour laws and domestic firms that are well embedded to exploit this criteria are in a position to increase their share of inputs, especially employees, with the same factor price relative to FOAs. In other words, domestic firms in these industries face weak labour regulations domestically and are therefore in a position to extract higher returns from employees, although the price of labour is the same for FOAs. Alternatively, FOAs in these industries encounter effective monitoring of labour regulations and therefore are unable to utilise similar strategies.

Secondly, findings from the World Management Survey (hereafter WMS) reveal that the quality of management practices in the most reputed Indian domestic firms, including industrial conglomerates, is world class and has similar management quality standards as that of the U.K. and U.S. (WMS Manufacturing Report, 2011; Bloom, Genakos, Sadun and Van Reenen, 2011). In contrast, a high proportion of poorly managed domestic firms also exist in India that are either government-owned or family-owned (Bloom and Homkes, 2008). The survey also finds that Indian domestic firms demonstrated a larger spread of productivity among manufacturing plants compared to domestic firms in China. This suggests that the Indian business environment is conducive to much more variation in management practices and productivity. Firms that are well managed are also more productive than poorly managed firms. Thus, the findings of TFP of Indian domestic firms being higher than FOAs in the aforementioned industries might therefore be explained by the presence of exceptionally well-managed domestic Indian firms displaying above average productivity.

Third, a large proportion of FOAs that display lower TFP than domestic firms in the industries mentioned above might be affected by *liability of foreignness*. This liability arises from structural and institutional costs of foreign firms trying to embed themselves in the host economy (Zaheer, 2002). Structural costs are associated with foreign firms developing their linkages and network connections with host country actors (Qian, Li and Rugman, 2013). Thus, access to important information could be poor if the network position of FOAs is under-developed in the host economy (Anderrson, Forsgren and Holm, 2007).

Institutional costs are related to the regulatory, normative and cognitive differences between the home and host country of FOAs (Bell, Filatotchev and Rasheed, 2012). These costs affect the legitimacy, and therefore the embeddedness of FOAs in the host economy. Thus, FOAs in certain Indian manufacturing sectors are likely to be affected by these costs and this could explain why they have lower TFP than domestic Indian firms.

Fourth, firms in the PROWESS database include mostly large firms. Large firms are likely to be more productive than small firms because of higher absorptive capabilities, being well endowed with resources and know-how and because of better links to other firms within an industry in order to access useful information. As mentioned by Eapen (2013), large economic databases have a tendency to censor small firms during the data gathering process as they are of less strategic importance to the host economy (in terms of employment and economic growth). Thus, the TFP estimates of domestic firms in the aforementioned industries might be inflated as a result of non-inclusion of small firms.

Table 11
Classification of firms by industry and TFP

	2 digit sector	Sector	No. of obs.	Domestic firms (TFP)	WOS (TFP)	MAJV (TFP)	MIJV (TFP)
1	10	Food processing	1452	38.744	43.432	52.744	41.325
2	11	Beverage production	174	0.027	0.005	0.004	
3	13, 14, 15	Textiles, Wearing apparel, Leather & related products	148	0.174	0.108		
4	16, 17, 31	Wood & wood + cork products, furniture, Paper and paper products	26	3.803	4.844		
5	19	Coke & refined petroleum products	212	1.473	1.118	0.795	1.293
6	20	Chemicals & chemical products	2677	8.449	11.496	12.934	6.237
7	21	Pharmaceutical, medicinal & botanical products	1531	9.987	22.679	15.166	7.924
8	22	Rubber & plastic products	1325	3.829	2.584	2.268	3.590
9	23	Non-metallic mineral products	46	0.068	0.110	0.114	
10	24, 25	Basic metals, Fabricated metal products except machinery & equipment	134	1.007	1.432	0.822	1.593
11	26	Computer electronic & optical products	415	12.566	6.348	4.719	4.281
12	27	Electrical equipment	585	4.231	4.309	4.951	9.653
13	28	Machinery & equipment n.e.c	705	0.709	0.505	0.790	0.533
14	29, 30	Motor vehicles trailers & semi-trailers, Other transport equipment	40	3.928	5.599		5.235

6.2.2. Summary statistics and key results

Table 12a provides key descriptive statistics and correlation matrix whereas Table 12b reports the VIF (variation inflation factors). Information from these two tables is used to check whether multicollinearity among the explanatory variables is likely to affect model estimation. Multicollinearity occurs when there is a linear relationship between one or more of the explanatory/independent variables allowing one or more variables to be linearly predicted from others with a non-trivial degree of accuracy (Freund, Wilson and Sa, 2006). This will lead to high standard errors of the parameter estimates if the corresponding independent variable is highly correlated to other independent variables in the model. Thus, it is important to uncover those explanatory variables that are involved in particular near (linear) dependencies and to assess the degree to which the estimated regression coefficients are being degraded by the presence of the near (linear) dependencies. From Table 12a, it is seen that pair-wise correlations of the explanatory variables is not high enough to pose a serious problem involving multicollinearity (Tabachnick and Fidell, 2001). However, it has been argued that inspecting pairwise correlations using the correlation matrix is limiting and is not sufficient to diagnose multicollinearity. It is quite possible that the pairwise correlations are small, and yet a linear dependence exists among three or even more variables (Gujarati, 2003). In order to mitigate this issue, VIF are often relied upon to help detect multicollinearity. A VIF quantifies how much of the variances of the estimated coefficients are inflated when multicollinearity exists. Thus, a VIF for the estimated coefficient b_k (denoted VIF_K) is the factor by which variance is inflated. In inspecting Table 12b for VIF scores, it is seen that none of the variables exceed more than 2.5 (problems arise if the VIF score is more than 5 for explanatory variables using discrete data) and which is regarded as an acceptable threshold (Mansfield and Helms, 1982). Thus, the two tables indicate that the data do not suffer from serious problems involving multicollinearity (Neter, Wasserman, & Kunter, 1985).

Another important issue when undertaking panel data estimation is to investigate if the data is heteroskedastic and how best to mitigate the impact of heteroskedasticity on the variance of coefficient estimates, and by implication, the standard errors (Arrelano, 2003). Heteroskedastic errors are likely to be present when sub-populations within the dataset have different variabilities from each other. This could bias the estimates from the regression and violate basic assumptions of the model that errors are uncorrelated and have a normal distribution, and also that the error terms have a constant variance (White, 1980). In order to check the presence of heteroskedasticity in the data, the Breusch-Pagan/Cook-Weisberg test was conducted in Stata. The results are reported in Table 13a and 13b. From Table 13a, it can be seen that all three models of aggregate foreign presence (i.e. measured by employment, sales and capital) have p-values of less than 0.05. This therefore rejects the null hypothesis *Ho*, i.e. variance of the error term is constant, and therefore points to the presence of significant heteroskedasticity in the data. From Table 13b, the results are similar for models of foreign ownership modes (measured by employment and sales) whereas p-value in the model for foreign ownership modes measured by capital (0.129) implies that data is not heteroskedastic to an extreme degree. Overall, the Breusch-Pagan/Cook-Weisberg test suggests that the data is heteroskedastic and this might cause the standard errors to be biased. In order to mitigate this issue, robust standard errors are prescribed as it relaxes either or both the assumptions that errors are i.i.d (i.e. independent and identically distributed). As a result, using robust standard errors tends to be more trustworthy when heteroskedasticity is present in the data (Berry and Feldman, 1985). Thus, following the theoretical approach in Stock & Watson (2008), robust standard errors clustered by industry-year are used in the fixed-effects estimation exercise to mitigate for the bias that heteroskedastic errors are present in the data.

A final test to check whether the fixed effects model is statistically valid and robust relative to the random effects model is done by conducting the Hausman test (Hausman and Taylor, 1981). In this test, the null hypothesis is that both the fixed effects and random effects estimation are appropriate and ideally should have "*similar*" coefficients. The alternative hypothesis is that the fixed effects estimation framework is appropriate whereas the random effects estimation framework is not, implying that there will be marked differences between the two sets of coefficients (Maddala, 1992). The reason behind this is that random effects estimation makes an assumption (which fixed effects does not) that the random effects are orthogonal to the regressors (Lange and Ryan, 1989). When the Hausman test is conducted in Stata, the random effects estimator will be inconsistent if this assumption is not valid whereas the fixed effects estimation will not be affected. As a result, if the assumption does not hold there will be a bigger difference between coefficients from fixed- and random-effects (leading to a large Hausman statistic). Table 14a and 14b reports the results of the Hausman test investigating the validity of fixed effects v/s random effects estimation model for both aggregate foreign presence and foreign ownership modes respectively. The findings suggest that the Hausman statistic is large enough for both sets of results and indicates that there are significant differences in the coefficient estimates of fixed effects and random effects model. Thus, the null hypothesis that both models are appropriate for estimation is *rejected* and the alternative hypothesis accepted in favour of the fixed effects estimation. Following this logic, the focus of the study will be on results from fixed effects model estimated in first differences.

Table 12

Descriptive statistics, correlation matrix and VIF

Table 12a: Descriptive Statistics and Correlation Matrix

	VARIABLES	Mean	Std. Dev.	1	2	3	4	5	6	7	8
1	TFP	1.55	1.60	1.00							
2	WOSEMP	0.15	0.20	0.12	1.00						
3	MAJVEMP	0.07	0.11	0.09	0.18	1.00					
4	MIJVEMP	0.03	0.07	-0.09	-0.07	0.08	1.00				
5	HHI	0.21	0.20	-0.22	-0.13	-0.17	-0.10	1.00			
6	IMP	0.05	0.09	0.01	-0.04	0.08	-0.05	-0.04	1.00		
7	RDINTEN	0.00	0.06	-0.02	0.01	0.04	0.02	0.01	0.00	1.00	
8	SCALE	0.85	2.43	0.03	-0.09	-0.04	0.00	0.02	0.00	-0.01	1.00

	VARIABLES	Mean	Std. Dev.	1	2	3	4	5	6	7	8
1	TFP	1.55	1.60	1.00							
2	WOSTSALES	0.16	0.20	0.12	1.00						
3	MAJVTSALES	0.06	0.09	-0.01	0.15	1.00					
4	MIJVTSALES	0.02	0.04	-0.14	0.01	0.25	1.00				
5	HHI	0.21	0.20	-0.22	-0.10	-0.18	-0.22	1.00			
6	IMP	0.05	0.09	0.01	-0.04	0.21	-0.02	-0.04	1.00		
7	RDINTEN	0.00	0.06	-0.02	0.02	0.05	0.01	0.01	0.00	1.00	
8	SCALE	0.85	2.43	0.03	-0.10	-0.05	-0.01	0.02	0.00	-0.01	1.00

	VARIABLES	Mean	Std. Dev.	1	2	3	4	5	6	7	8
1	TFP	1.55	1.60	1.00							
2	WOSTGFA	0.08	0.13	-0.01	1.00						
3	MAJVGFA	0.07	0.10	0.05	0.08	1.00					
4	MIJVGFA	0.03	0.09	-0.09	-0.03	-0.05	1.00				
5	HHI	0.21	0.20	-0.22	-0.02	-0.10	-0.08	1.00			
6	IMP	0.05	0.09	0.01	0.00	0.00	-0.02	-0.04	1.00		
7	RDINTEN	0.00	0.06	-0.02	0.04	0.01	0.01	0.01	0.00	1.00	
8	SCALE	0.85	2.43	0.03	-0.08	-0.03	0.01	0.02	0.00	-0.01	1.00

S.D. = standard deviation. All spillover variables are measured by employment (EMP), fixed assets (GFA) and total sales (TSALES).

Table 12b: Variance Inflation Factors

VARIABLES	VIF	1/VIF
WOSEMP	1.47	0.678004
MAJVEMP	1.34	0.747288
MIJVEMP	1.61	0.621431
HHI	2.42	0.413831
IMP	1.44	0.693369
RDINTEN	1.02	0.983069
SCALE	1.02	0.980576
Mean VIF		

VARIABLES	VIF	1/VIF
WOSTSALES	1.41	0.710133
MAJVTSALES	1.40	0.713645
MIJVTSALES	2.01	0.498102
HHI	2.51	0.398312
IMP	1.46	0.682993
RDINTEN	1.02	0.982634
SCALE	1.02	0.979887
Mean VIF		

VARIABLES	VIF	1/VIF
WOSGFA	1.35	0.739480
MAJVGFA	1.34	0.746838
MIJVGFA	1.44	0.693634
HHI	2.43	0.411900
IMP	1.41	0.707001
RDINTEN	1.02	0.980582
SCALE	1.02	0.983194
Mean VIF		

Table 13

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity

FP measured by employment	**FP measured by sales**	**FP measured by fixed assets**
chi2(1) = 6.44	chi2(1) = 5.08	chi2(1) = 4.32
Prob>chi2 = 0.011	Prob>chi2 = 0.024	Prob>chi2 = 0.037

13(a). Aggregate FP** using three measures

OM measured by employment	**OM measured by sales**	**OM measured by fixed assets**
chi2(1)= 15.19	chi2(1) = 5.21	chi2(1) = 2.29
Prob>chi2 = 0.0001	Prob>chi2 = 0.022	Prob>chi2 = 0.129

13(b). Foreign OM*** (WOSs, MAJVs and MIJVs) using three measures

Table 14

Hausman test for testing model validity: fixed effects v/s random effects

Ho: difference in coefficients not systematic

EMPLOYMENT	SALES	FIXED ASSETS
chi2(23) = **43.13**	chi2(23) = **43.66**	chi2(23) = **43.24**
Prob>chi2 = **0.0067**	Prob>chi2 = **0.0058**	Prob>chi2 = **0.0065**

14a. Aggregate foreign presence

EMPLOYMENT	SALES	FIXED ASSETS
chi2(23) = **44.32**	chi2(25) = **44.26**	chi2(25) = **46.25**
Prob>chi2 = **0.0100**	Prob>chi2 = **0.0101**	Prob>chi2 = **0.0060**

14b. Foreign ownership modes

Table 15 shows the estimation results of spillovers without reference to foreign ownership modes (see columns 1, 2 and 3). It reveals that there are positive spillover effects on TFP of domestic firms when the total sales (**0.158****) and fixed assets (**0.158****) measures of spillovers are used. Both the measures are significant with p values < 0.05, i.e. statistically significant at 5% level. Table 16 considers spillover effects of aggregate foreign ownership being decomposed into the three generic foreign or MNE ownership modes. Columns 4, 5 and 6 reveal the identification of both negative and positive spillover effects when using a comprehensive definition of foreign ownership modes that includes WOSs, MAJVs and MIJVs. The findings reveal that WOSs has positive spillover effects with the total sales (**0.167****, significant at 5% level) and fixed assets (**0.322*****, significant at 1% level) measure. MAJVs gives rise to positive spillover effects from all three measures, i.e. employment (**0.136****), total sales (**0.249*****) and fixed assets (**0.232*****). While the employment measure is significant at 5% level (p<0.05), total sales and fixed assets are significant at 1% level (p<0.01). Finally, MIJVs exert negative spillovers effects on domestic Indian firms and this is captured again by two measures with both being significant at 1% level (p<0.01) respectively, i.e. employment (**-0.424*****) and fixed assets (**-0.355*****). The findings from both WOSs and MAJVs in the case of India are similar to earlier studies such as Abraham, Konings and Slootmaekers (2010) and Tian (2010) in the sense that impact of MAJVs has been documented to be higher than WOSs in both these studies. However, as opposed to finding negative spillover effects from WOSs in Javorcik & Spatareanu (2008) and Abraham, Konings and Slootmaekers (2010), this study finds that WOSs are also associated with positive spillover effects. The findings for MAJVs are also consistent when compared to some earlier studies for emerging economies such as China (Tian, 2007) and transition economies such as Romania (Javorcik and Spatareanu, 2008) indicating that government policy of progressively removing foreign equity restrictions is beneficial, at least when spillovers is considered. The effects for MIJVs as a foreign ownership mode is negative and significant for both employment and fixed assets measure and this contradicts previous studies where the effects of MIJVs were found to be positive and significant (Dimelis & Louri, 2004).

Moreover, the R^2 values, signifying explanatory power of the models, are reported (see Table 15 and 16). These are acceptable estimates given the appropriate diagnostic tests such as multicollinearity, heteroskedasticity, Hausman test etc., that were considered earlier prior to estimation and are also in line with R^2 estimates reported in the literature using Levinsohn-Petrin semi-parametric estimation method (Altomonte and Pennings, 2009). The Fisher-statistics (F-stats) are also reported for all the models (both for aggregate foreign presence and for foreign ownership modes). The F-test checks whether some of the key assumptions of a classical linear regression model hold, i.e.

a. whether the model is correctly specified,

b. whether the error terms are normally distributed

c. whether the error terms have a mean zero and a common variance, and

d. whether the error terms are independent across observations.

It can be seen from the F-stats score that all the fixed effects estimations are robust and statistically significant (at 5% level apart from ownership modes, Table 16, column 6 which is significant at 1% level). Also, the F-test in a panel fixed effects estimation framework is a better measure of the explanatory power of the model (Baum, 2006; Nicholls, 2007).

Table 15

Aggregate foreign presence and spillovers: results from fixed effects model estimated in first-differences

	(1)	(2)	(3)
FDI Spillover variable measurement	EMP	TOTAL SALES	FIXED ASSETS
FORFP	0.038	**0.158****	**0.154****
	[0.059]	**[0.063]**	**[0.066]**
LD.HHI	0.027	0.013	0.019
	[0.073]	[0.072]	[0.073]
LD.IMP	**0.231****	**0.229****	**0.240****
	[0.102]	**[0.101]**	**[0.101]**
LD.RDINTEN	**0.116*****	**0.112*****	**0.130*****
	[0.042]	**[0.040]**	**[0.042]**
LD.SCALE	**-0.014***	**-0.012***	**-0.013***
	[0.007]	[0.007]	[0.007]
Industry effects	Yes	Yes	Yes
Region effects	Yes	Yes	Yes
Time effects	Yes	Yes	Yes
N	3652	3652	3652
R^2	0.281	0.281	0.282
F-Stats	1.64**	1.63**	1.76**

Dependent variable is the logged TFP calculated using Levinsohn and Petrin (2003) procedure

Robust Standard errors clustered by industry-year in brackets

* p < 0.10, ** p < 0.05, *** p < 0.01

Table 16

Foreign ownership modes and spillovers: results from fixed effects model estimated in first-differences

FDI Spillover Variable Measurement	(4) EMP	(5) TOTAL SALES	(6) FIXED ASSETS
LD.WOS	0.028	**0.167****	**0.322*****
	[0.077]	**[0.065]**	**[0.096]**
LD.MAJV	**0.136****	**0.249*****	**0.232*****
	[0.065]	**[0.083]**	**[0.085]**
LD.MIJV	**-0.424*****	**-0.355*****	-0.119
	[0.156]	**[0.120]**	[0.115]
LD.HHI	0.022	-0.001	-0.014
	[0.074]	[0.074]	[0.076]
LD.IMP	**0.205****	**0.246****	**0.234****
	[0.096]	**[0.102]**	**[0.096]**
LD.RDINTEN	**0.115*****	**0.115*****	**0.137*****
	[0.043]	[0.042]	[0.041]
LD.SCALE	**-0.012***	-0.011	**-0.012***
	[0.007]	[0.007]	[0.007]
Industry Effects	Yes	Yes	Yes
Region Effects	Yes	Yes	Yes
Time Effects	Yes	Yes	Yes
N	3652	3652	3652
R^2	0.283	0.282	0.284
F Stats	1.70**	1.56**	1.86***

Dependent variable is the logged TFP calculated using Levinsohn and Petrin (2003) procedure

Robust Standard errors clustered by industry-year in brackets

* p < 0.10, ** p < 0.05, *** p < 0.01

6.2.3. Key findings on spillover variables

The results confirm that the identification of the existence of spillovers is enhanced in a more disaggregated approach. The findings from the study also benefit from the use of a more developed set of foreign ownership modes and use of a better definition and classification than previous studies. These results enable the research questions of the study to be answered. All three foreign ownership modes influence spillovers, with WOSs and MAJVs having a positive effect and MIJVs having a negative effect on TFP of domestic firms. All three measures of spillovers are significantly associated with all three foreign ownership modes, but there is no consistent relationship across all three measures. These findings echo existing studies such as Abraham, Konings and Slootmaekers (2010), Dimelis and Louri (2004) and Javorcik and Spatareanu (2008) by highlighting that spillovers are contingent on foreign ownership modes. However, contrasted with existing findings, results from this study strongly indicate that WOSs also have potential for spillovers while MIJVs are not always beneficial for spillovers. Large firms in India benefit through positive spillover effects from WOSs and MAJVs, but suffer through negative spillover effects from MIJVs. The results for MAJVs are perhaps more robust because positive associations were identified for all the measures of spillovers, whereas both WOSs and MIJVs are picked up by two measures.

The results for controls on industry competition (Herfindahl index and import penetration) are consistent across all specifications. Focusing on the results from the 2nd specification (Table 16), Herfindahl index have insignificant effects whereas the effects for import penetration is positive and significant at 5% level [for employment (**0.205****), total sales (**0.246****) and fixed assets measure (**0.234****)]. By implication, this finding suggests that the positive spillover effects from WOSs and MAJVs and the negative spillover effects from MIJVs holds true when domestic firms' exposure to different levels of import penetration within an industry is accounted for. This therefore complements the findings of spillover effects within a competitive-fringe framework with the assumption that firms compete within an industry on the basis of similar product lines (Driffield and Jindra, 2012). Alternatively, the findings for the controls at the firm-level for absorptive capacity of domestic firms reveal that R&D intensity is positive and significant at 1% level across all three measures, i.e. [employment (**0.115*****), total sales (**0.115*****) and fixed assets (**0.137*****). This implies that the findings on spillover effects hold true when firm-level absorptive capacity of domestic firms is accounted for. Scale, however, is negative and weakly significant (10%) across two measures [employment (-0.012*) and fixed assets (-0.012*)].

An important point to be raised here is the discussion with reference to the sample size (number of firm-year observations is 5203). While this is aptly called "*an unduly large sample size*", especially when firm-level data is used for investigating productivity issues, it is in line with existing studies on spillovers in some emerging economies, i.e. Marin and Sashidharan (2010) for India and Marin and Bell (2006) for Argentina. In fact, the sample size for studies investigating spillovers in China ranges from 15,761 firms (Wei and Liu, 2006) to 41,641 firms (Wang, Deng, Kafouros and Chen, 2012) whereas a recent study investigating spillovers in 10 transition economies had a sample of 90,000 firms with 315,000 firm-year observations (Damijan, Rojec, Majcen and Knell, 2013). Researchers on spillovers are highly recommended to use datasets that capture all firms in the economy, i.e. a full population, wherever possible (Wooster and Diebel, 2010; Eapen, 2013). This is for the following two reasons: Firstly, spillover studies using incomplete datasets are likely to elicit incorrect measures of foreign presence or underestimate true foreign presence in an industry (Eapen, 2013). Incorrect measures of foreign presence are likely to affect the estimation of true spillover effect from foreign to domestic firms (for a technical summary, see Eapen (2013; pp.722-725). In sum, when a dataset misses out foreign firms, the underestimation of foreign presence is likely to be severe in industries where foreign firms are more prevalent. Thus, it is likely that in estimating spillover effects, the productivity differences between domestic firms get mapped onto incorrect variations in foreign presence. As a result, when productivity gains in domestic firms are attributed to smaller changes in foreign presence than they should be, this can result in overestimating the spillover effect.

Secondly, studies on spillovers using incomplete datasets are exposed to a censored selection process by which firms are included in the dataset (and estimation model). The primary interest in FDI spillover estimation is to observe the conditional mean function, i.e. change in average domestic firm productivity for different levels of foreign presence. However, studies estimating spillover effects from incomplete datasets are implicitly making identification assumptions of no censoring and no heterogeneity in spillover effects as well as the assumption that the distribution of outcomes for missing firms does not differ from that of non-missing firms (Carrol, Ruppert, Stefanski and Crainiceanu, 2006). Therefore, it is likely that when selection issue is overlooked, it is in effect modelling the spillover effect for firms that only are observed.

Finally, despite use of a large reputed Indian firm-level database, it is quite possible that not all firms of the Indian economy (especially micro, small and medium sized private or family-owned firms) are accounted for in the total population. Since there is a lot of heterogeneity among firms in India, deriving information from a sub-sample risks using an unrepresentative sample of firms. There is therefore a tradeoff between the problems of unduly large sample and an unrepresentative sample. In the current study, this issue was considered and eventually the best practice in the literature of using a large sample size was followed.

In the context of this study, the dataset used covers 14 key manufacturing industries of the Indian economy and is the closest indicating representativeness of the population of firms. This is complemented by the fact that it has been used in the majority of the published studies on spillovers or studies investigating FOAs' technological activities in India, e.g. Kathuria (2002), Topalova (2004), Kumar & Aggarwal (2005) and Marin and Sashidharan (2010). Alternative data gathering techniques including firm-level surveys are unlikely to provide the sample size and wide information on firm-level variables in a number of industries required to estimate spillovers. The current study does not conduct additional sensitivity tests with regard to the impact of *a. incompleteness*, and *b. censoring* on the estimated spillover coefficients as suggested by Eapen (2013). This is because it is beyond the scope of the current study. However, care has been taken to make sure there is no systematic censoring of firms (apart from firms that do not report) and also to include in the final dataset all foreign and domestic firms available for each industry.

6.3. DISCUSSION

The findings reported in this chapter are interesting and add to the growing stream of literature that suggests that models of spillovers need further development to enable better identification of knowledge spillovers (Crespo and Fontoura, 2007, Marin and Sasidharan, 2010). In this study, consideration of the generic FDI ownership modes enables development upon the existing approaches and thus examines the full extent of the relationship of how ownership modes matter for spillovers. The results suggest that accounting for foreign ownership modes, based on a fuller classification than is normally used in the literature, enables a more detailed identification of FDI spillovers than seems to be the case in studies that do not account for this factor in deciding on foreign ownership mode. Moreover, consideration of promoters and avoiding non-promoters equity share in defining level of foreign ownership allows identification, more accurately than existing studies, of the actual insider control over KBAs or technological know-how by MNE affiliates which are likely to contribute to knowledge pools. This is also one of the better approaches to deal with firm heterogeneity issues arising from FDI presence in the host country.

In this study, MAJVs are seen to have robust spillover effects, i.e. enhancement in domestic firms' TFP through all three foreign presence measures (EMP, TSALES & FIXED ASSETS) relative to WOSs. This supports proposition ***P5*** of the conceptual framework. This could be attributed to the fact that MAJVs in India are characterised by the presence of well-developed linkages with large and well-reputed domestic firms and the complementary role played by fairly large and high quality knowledge pools of MAJVs relative to MIJVs, as well as the role of moderate industry competition. Although knowledge pools in MAJVs are smaller than in WOSs, it is an important factor which determines the extent to which domestic firms can search for and scan relevant technology and know-how. Moreover, moderate competition generated between MAJVs and domestic firms facilitates the latter in learning from competition and improving productivity and performance. Thus, on average, moderate competition arising from the presence of MAJVs incentivises domestic firms to better adapt to competition and improve their productivity.

The case of positive spillover effects from WOSs in Indian industries is an interesting finding although the effects are slightly weaker than MAJVs. This finding could be connected to an important theoretical argument put forward in the conceptual framework about WOSs, in that they are characterised by large knowledge pools but have less developed linkages when compared to JVs. It suggests that WOSs have the most advanced knowledge pool reserves that are available for domestic firms to learn, absorb and assimilate. However, the lower level of linkages with domestic firms implies that only domestic firms that are very well connected through trade or informal business links to wholly-owned affiliates will benefit from spillovers. In this study, the positive spillover effects for WOSs in Indian industries means that large knowledge pools offset the lower level of linkages. The threshold level of competition generated by WOSs also aids in enhancing productivity of domestic firms. The capture of spillovers from WOS through only two measures may arise from differences in protection of intellectual property and in competition compared with MAJVs. It is possible that WOSs use better protection mechanisms to defend their KBAs in Indian manufacturing sectors thereby preventing leakage from knowledge pools. In India, due to weak protection of intellectual property, WOSs may also be associated with the transfer of inferior (non-proprietary) technologies and therefore the quality of knowledge pools might be of low quality. The finding supports proposition ***P1*** of the conceptual framework.

MIJVs, on the other hand, could be seen as foreign ownership modes which are best avoided in the Indian case. This could be strongly associated with competition effects dominating over the positive spillover effects from strong linkages generated by MIJVs (Chen, Kokko and Tingvall, 2011). While the competition effects arise from competition between FOAs and domestic firms for market share, the spillover effect arises from FOAs' stock of knowledge pools and linkages with domestic firms (Chang & Xu, 2008). MIJVs are characterised by lower knowledge pools but extremely well-developed linkages and a higher degree of competition effects on domestic firms. However, in the case of India, it could possibly be related to the fading away of positive effects after 2-3 years of setting up of the MIJV and dominance of negative competition effects after that time period (Merlevede, Schoors and Spatareanu, 2010). In summary, the avoidance of MIJVs as a foreign ownership mode may be best because the competition effects from MIJVs are likely to dominate any positive spillover effects (Chen, Kokko & Tingvall, 2011). MIJVs are characterised by low-level knowledge pools but significantly well-developed linkages and a higher degree of competition effect on domestic firms. As a result, negative competition effects from MIJVs are likely to outweigh the positive effects that are likely to arise from good linkages with domestic firms and knowledge pools

(Merlevede, Schoors & Spatareanu, 2010). Another way of interpreting this is that the high competition effects and the presence of strong linkages in MIJVs is not enough to offset the likelihood of lower knowledge pools in MIJVs relative to WOS and MAJVs. This finding is supported by proposition ***P12*** from the conceptual framework. The use of three measures of foreign presence has also enhanced the identification of spillovers as suggested in earlier studies (Wei and Liu, 2006; Tian, 2010). However, these three measures of foreign presence representing foreign presence in fixed assets, sales and employment within an industry, are highly correlated and despite the argument for combining these measures into a *grand composite index*, they were not included in the same regression to avoid multicollinearity.

In essence, the results provide some support for some of the key arguments developed in the conceptual framework. The key arguments being both knowledge transfer potential and linkages of FOAs are equally important for spillovers and competition effects generated by FOAs moderate the extent to which domestic firms will learn and enhance their performance and productivity. Unfortunately, the data needed to test for the presence and weight of the three generic and important qualitative factors on FDI-mediated spillovers is not available. Therefore, it is not possible to argue the magnitude of these factors as there lies a complex interaction of how these factors influence spillovers. Some of the empirical results reported in this study may also be closely associated with specific characteristics of India as an emerging economy. The nature of both formal and informal institutions in India leads to a business environment and organisational processes in firms that are significantly influenced by the institutional systems. These institutional characteristics include extensive protection of some industries, low levels of technological dynamism, and weak enforcement of some regulations (Kumar, 2003; Chittoor, Ray, Aulakh and Sarkar, 2008). Although care has been taken to control for unobserved heterogeneity and external shocks on firm productivity in the given time period by including dummies for time, industry and regions and also using lagged variables, it is possible that the characteristics described above are endogenous to firm performance, i.e. intrinsically related and co-determined. The empirical approach used in this study does not allow the disentangling of such complex effects. To more thoroughly account for such factors requires qualitative case studies and detailed firm-level surveys to provide data that would provide better insights into these characteristics and their impact on spillovers. However, this is beyond the scope of the current study. Moreover, approaches such as these are not compatible with statistical testing of the effects of ownership modes for spillovers.

Governments in developing countries, including India, often favour JVs over WOSs believing that the active participation of domestic firms will bring greater benefits to other domestic firms. The findings provide strong support for this view in the case of India. However, policymakers also need to understand that restrictions on absolute foreign ownership could also prevent accumulation of larger and deeper knowledge pools that are associated with technology transfer in WOSs. As a result, the potential for knowledge spillovers in domestic firms from such pools will be higher than from presence of strong network connections and linkages that other domestic firms have with partners of JVs.

Host country policymakers also need to be reminded that increase in level of support and incentives from government to encourage domestic firms to effectively interact with WOSs might enhance the prospects of positive spillovers from the deep knowledge pools that such FOAs are likely to develop in host locations.

6.4. CONCLUSION

This chapter has assessed spillovers in Indian manufacturing industries by considering the role of MNE ownership modes. The general findings are as follows:

1. Domestic Indian firms benefit significantly from spillovers through the presence of MAJVs and to a large extent from WOSs. Thus, the linkages and network connections of domestic firms with FOAs, the size of knowledge pools accumulated by FOAs and the moderating role of competition co-determines the extent of overall spillover effects.
2. There are negative spillover effects associated with the presence of MIJVs and these results are significant for two measures. Thus, they represent ownership modes that harm domestic firms greatly because of the role that they could play in market-stealing effects (Aitken and Harrison, 1999).
3. The results confirm previous findings and are in line with studies that different measures of foreign presence may capture different aspects of spillovers (Wei and Liu, 2006).

In general, the study, by disaggregating data to include foreign ownership modes, was able to identify contingencies under which both positive and negative spillovers arise. Unlike more aggregated studies, this approach suggests that spillovers may exist for all three generic foreign ownership modes.

The overall outcomes for spillovers for foreign ownership mode may depend on whether high knowledge transfer potential is likely in WOSs, which outweighs the lower transfer of KBAs but better linkages to domestic firms that probably arise in JVs. The results for this study suggest that MIJVs appear to have the lowest prospects of spillovers. This may mean that the strong network linkages to domestic firms by the national partner in MNE affiliates do not, in most cases, overcome the disadvantages of the lower knowledge transfers that MIJVs receive. In the case of MAJVs, however, it is possible that these network linkages compensate, or indeed outweigh, the benefits of higher knowledge transfers in WOSs. This issue requires further research, with richer data, possibly augmented by qualitative studies and/or surveys, to untangle the relative weights of these conflicting drivers of spillovers. Longitudinal studies are also necessary to understand the evolution of spillovers from innovation and technology diffusion (Baptista, 1999) arising from FDI.

The interpretation of the arguments and results presented in this study requires caution. First, the findings draw on a specific spectrum of the Indian economy, i.e. large listed firms in the manufacturing sector. Therefore, any generalisation from this in terms of both sector and firm selection needs care. Second, although the study took measures to mitigate the endogeneity issue, a more effective solution involves using datasets that cover a longer period and contain information on effective instrumental variables.

SECTION B

6.5. RESULTS

Table 17 reports the estimation results for spillovers from sub-national locations with different levels of economic development (see columns 1, 2 and 3) and aggregate foreign presence. Columns 1, 2 and 3 reveal that there are significant and positive spillover effects, i.e. gains in TFP of domestic firms, with all the foreign presence measures where employment (**0.190****) and total sales (**0.149*****) is significant at 5% level ($p<0.05$) and fixed assets measure (**0.286*****) is significant at 1% level ($p<0.01$). Thus, consideration of interaction between sub-national location and foreign presence reveals a net positive and significant effect on spillovers. The dummy for sub-national locations, i.e. MUAs or metropolitan regions and NMNAs or non-metropolitan regions, is 1 & 0 respectively. These are specified on a fixed-effects model estimated in first differences where it is interacted with aggregate foreign presence. As articulated above, when aggregate foreign presence is interacted with sub-national locations, the coefficients are significant for all three foreign presence measures. However, focusing on the variable indicating interaction between foreign presence and sub-national location (RGFP) reveals that the coefficient is negative and significant for employment (**-0.261*****) at 1% level and significant for fixed assets measure (**-0.210****) at 5% level. This implies that the impact of spillovers to non-metropolitan regions or NMNA (dummy 0) is higher relative to metropolitan regions or MUA (dummy 1) for these two measures. Overall these results indicate that the effects of spillovers are higher in NMNAs than MUAs. The reason for such a finding could be attributed to the factors developed in the

Conceptual Framework chapter that conceptualised the links between spillovers and sub-national locations with different levels of economic development, i.e. MUAs and NMNAs.

The results for controls on industry competition (Herfindahl index for concentration and import penetration) are once again consistent across all specifications with the former having insignificant effects and latter being positive and significant. The findings for the control for absorptive capacity of domestic firms reveal that R&D intensity is positive whereas scale is negative and significant across all specifications. The differences between this study and previous research may arise because of the use of a dataset which covers only listed firms and hence focuses on large firms. However, as explained earlier, spillovers are more likely to affect large firms because of their higher level of absorptive capabilities. The results from this study indicate that domestic firms in India are likely to benefit from net higher positive spillover effects when they are located in NMNAs rather than MUAs.

Table 17

Aggregate FDI and interaction term (RGFP): results from fixed effects estimated in first differences

FDI Spillover Variable Measurement	(1) EMP	(2) TOTAL SALES	(3) FIXED ASSETS
LD.FORFP	**0.190****	**0.149****	**0.286*****
	[0.077]	**[0.063]**	**[0.079]**
LD.RGFP	**-0.261*****	0.013	**-0.210****
	[0.083]	[0.015]	**[0.092]**
LD.HHI	0.021	0.011	0.012
	[0.073]	[0.072]	[0.073]
LD.IMP	**0.195***	**0.256****	**0.232****
	[0.103]	**[0.109]**	**[0.102]**
LD.RDINTEN	**0.103****	**0.114*****	**0.138*****
	[0.043]	**[0.040]**	**[0.042]**
LD.SCALE	**-0.014***	**-0.012***	**-0.013***
	[0.007]	**[0.007]**	**[0.007]**
Industry effects	Yes	Yes	Yes
Region effects	Yes	Yes	Yes
Time effects	Yes	Yes	Yes
N	3652	3652	3652
R^2	0.463	0.462	0.462

Dependent variable is the logged TFP calculated using Levinsohn and Petrin (2003) procedure

Robust Standard errors clustered by industry-year in brackets;

Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$,

*RGFP** represents regional foreign presence (interaction term)

6.6. DISCUSSION

The findings reported in this chapter are interesting and contribute to the emerging research theme on the role of sub-national locations in spillovers. In this study, it is found that spillovers from FDI are contingent on sub-national locations. Consideration of sub-national location based on the level of economic development reveals the benefits of more disaggregated studies of spillovers to identify the conditions under which they exist. The overall results for sub-national location imply that non-metropolitan and non-urban regions in India benefit more from presence of FOAs than metropolitan and urban regions. This could be attributed to a range of factors developed in the conceptual framework.

The first and the most important factor could be the higher level of technological gap between FOAs and domestic firms in NMNAs. Anecdotal evidence suggests that firms in important high-tech industries, such as software manufacturing and pharmaceuticals in India, are concentrated mostly in metropolitan areas or their agglomerations in India. As a result of sharing a common technological space in metropolitan regions, domestic firms are likely to have relatively less technological gap with MNE affiliates. Thus, there are no unique information or knowledge benefits in these regions that could motivate domestic firms to catch up. Alternatively, the higher technology gap in NMNA regions allows domestic firms to gradually catch up with the technological frontier and thereby improve their ability to absorb spillovers in these regions (Driffield and Love, 2001; Castellani and Zanfei, 2003).

A second factor could be the role of social network ties of domestic firms in both MUAs and NMNAs. On the one hand, because of a dense network structure in MUAs where all firms are tied to each other, domestic firms do not have access to bridge ties for novel information sources and thus do not have much to improve and learn through unique information benefits (Eapen, 2012). Although, intuitively, dense network structures will promote greater interaction between firms in MUAs, the depth of network ties is not likely to be richer as similar information is available to all firms. The non-metropolitan and non-urban regions in India, on the other hand, are characterised by sparse network structures and these structures reduce constraints of (efficient) domestic firms in the search (scan) for available technology (Tortoriello and Krackhardt, 2010). This is because regions with sparse social network structures are characterised by the presence of deep ties between firms, which not only increases the capacity to scan available foreign technology but also benefits from the presence of unique information as a result of deep ties. The level of absorptive capabilities in domestic firms (indicated by positive and significant coefficients in all empirical specifications) to assimilate and absorb technology diffused from FOAs could also explain why domestic firms in non-metropolitan regions have a higher impact than metropolitan regions. In this case, a reasonable explanation originally put forward by Eapen (2012), is that a minimum level of absorptive capacity and the value of information that are rooted in sparse network ties (of NMNAs) is likely to contribute to net higher impact on spillovers to domestic firms, relative to MUAs that are otherwise characterised by dense network ties. Finally, the level of industry competition among domestic firms and FOAs in both MUA and NMNA could also determine which regions are more amenable to spillovers. There are no direct tests that are considered regarding the magnitude of this factor in the model specification; however, it is an important factor that is likely to affect the overall results.

The findings on the role of sub-national locations for spillovers in India indicate that positive effects emerge for both MUAs and NMNAs. However, these positive effects are, on average, higher in non-metropolitan urban areas relative to metropolitan urban regions. This can be interpreted from anecdotal evidence that suggests that NMNAs in India are characterised by a high level of technological gap and low regional absorptive capacity relative to MUAs, which means that they have greater potential to learn and benefit from spillovers. Similarly, the presence of sparse network ties for firms in NMNAs (relative to MUAs) suggests that these firms, on average, have access to unique or novel information as sparse networks reduce constraints of (efficient) domestic firms in the search for available technology. As a result, sparse network ties could be more beneficial for enhancing domestic productivity in NMNAs relative to MUAs. Moreover, the level of industry competition also moderates this relationship, as a relatively moderate degree of competition is likely to influence domestic firms in NMNAs in India to enhance their learning and technology absorption capabilities.

In the case of MUAs in India, it is quite likely that these regions are characterised by a low level of technological gap between domestic firms and FOAs. This could be because information flows regarding technology and know-how travels faster in metropolitan cities as a result of the presence of dense network ties between firms. Thus, domestic firms in MUAs, on average, are likely to be closer to the technological frontier. Furthermore, the absorptive capabilities of domestic firms in MUAs in India are higher relative to domestic firms in NMNAs. Although high absorptive capabilities help in facilitating spillover benefits to MUAs (supported by the findings on controls for absorptive capacity), the magnitude of the net spillover effects will be lower as domestic firms are not technologically backward in these regions (implied from low technology gap between domestic firms and FOAs). As a result, firms in MUAs, despite having the necessary absorptive capabilities, do not have much to catch up on technologically and improve their productive capabilities. Furthermore, dense networks in MUAs make it difficult for firms, mostly domestic, to benefit from unique or novel information (Eapen, 2012). However, these dense networks help in faster diffusion of know-how across firms that are tied up with each other, implying spillover benefits of smaller magnitudes and relatively less important know-how than sparse networks offer. A high degree of competition in MUAs also moderates spillovers as the transfer of KBAs to FOAs increases with greater intensity in the degree of industry competition. However, FOAs will use appropriate mechanisms to prevent leakage of proprietary KBAs in environments associated with high industry competition, usually associated with MUAs. This also implies that domestic firms will not be able to easily access knowledge pools of FOAs in metropolitan regions or MUAs where environments are characterised by high industry competition.

Unfortunately, the data needed to test for the presence and weight of the above qualitative factors, such as knowledge pools, regional absorptive capacity, linkages etc. to investigate their role in spillovers across different locations, is not available. Therefore it is not possible to assess the magnitude of these factors as they co-interact to influence the extent of spillovers.

CHAPTER 7

POLICY, THEORETICAL AND MANAGERIAL IMPLICATIONS

7.1. INTRODUCTION

In this thesis, a conceptual framework has been developed to investigate spillovers from different MNE ownership modes and by consideration of the moderating role of sub-national locations. The findings from the data analysis suggested that the identification of spillovers is enhanced in a more disaggregated approach. It was also argued that the size and the extent of spillover benefits depend largely upon the interaction between domestic firms and FOAs. The strength of these interaction mechanisms are influenced by the key theoretical constructs, namely knowledge pools, linkages and industry-competition, which were proposed in the conceptual framework chapter, and they explain how MNE ownership modes could be associated with spillovers in the host country. In the case of sub-national locations, the constructs include absorptive capacity of regions, level of technological gap, social network ties between firms and level of industry competition. These theoretical constructs have been identified from the literature where their application is inconsistent so far. The consideration of MNE ownership modes and sub-national locations for spillovers allowed the choosing of these relevant theoretical constructs that have been used inconsistently in the literature.

The purpose of this chapter is to address the key policy, theoretical and managerial implications that arise from the findings in Chapter 6.

7.2. POLICY IMPLICATIONS

In the case of foreign ownership modes and spillovers in India, FDI policy is usually characterised by trade-off between the need to protect domestic firms from negative competition (crowding-out) effects and the desire to enhance positive spillover effects and to maximise the share of FDI-related rents, as stated earlier in the background chapter. Morever, an important feature of FDI policy in India is also to spread the benefits of FDI across different regions by boosting spillovers in metropolitan, non-metropolitan and rural areas.

From the findings of the data analysis, it is observed that MAJVs have the best prospects for spillovers as there are extensive network connections/linkages between domestic partners of MAJVs and other domestic firms in the industry. These network connections act as the pipes through which knowledge and information flows quickly to other domestic firms in the economy. The domestic JV partners in India are usually large firms and some of them are dominant in local markets. Moreover, some of these large firms are cherry-picked by the Indian government to form JVs because of their reputation, management expertise and degree of network connections to other important actors in the host economy such as suppliers, and other domestic firms within and across industries. In fact, the government's role in facilitating JVs is motivated to a great extent by the desire to maximise spillovers and increase productivity of other domestic firms in the economy. The findings on MAJVs in the research study therefore provide some support on the implications of FDI policy in India.

However, the Indian government has by and large ignored the role of WOSs. This could be because the network connections or linkages in WOSs, especially in ETEs like India, are usually not well-developed, in comparison with JVs which are better embedded in the host economy. Local embeddedness of FOAs can improve access and acquisition of external knowledge in host countries as well as help in social or informal interactions with wider actors (Hansen & Løvås, 2004; McEvily & Zaheer, 1999). In the case of WOSs, due to their lower degree of embeddedness in the host economy, they may be impaired from having effective social or informal interactions with other domestic and foreign firms. As a result, linkages of WOSs might be inferior due to low level of local embeddedness whereas in JVs, the local embeddedness is relatively strong because of the role of the domestic partner which has a long-standing partnership and larger degree of informal interactions in local markets. This degree of embeddedness is highest in MIJVs because the domestic partner has a more dominant role in local markets than MAJVs.

Surprisingly, in the findings in Chapter 6 (Table 16), WOSs are also associated with positive spillover effects for at least two measures: total sales and fixed assets. Spillovers through total sales imply that Indian domestic firms are likely to learn through demonstration effects in output markets of the superior products and marketing skills of FOAs whereas spillovers through fixed assets suggests that the positive externalities are closely related to the demonstration effect of the suitability of the project, or the superiority of machinery or equipment embodying updated technologies (Wei and Liu, 2006; Tian, 2007). The positive spillover effects from WOSs imply that linkages or network connections (which are under-developed in WOSs relative to JVs) is only one aspect of the mechanisms behind spillovers. The findings on WOSs could therefore be associated with the presence of larger knowledge pools, which compensates for the lack of well-developed linkages. These knowledge pools are characterised by advanced technological and product/process related know-how and the presence of superior managerial capabilities and are highly potent sources of knowledge.

The capture of spillovers from WOSs through only two measures could suggest two points. First, WOSs might use better protection mechanisms to defend their KBAs in Indian manufacturing sectors and prevent leakage from knowledge pools. Second, WOSs in India might actually be associated with transfers of inferior (non-proprietary) technology due to a weak intellectual property protection environment and therefore quality of knowledge pools might be of substandard quality. The findings might further explain the existing FDI policy stance in India, which is aimed at restricting foreign ownership in certain industries and protecting domestic firms from adverse competition thereby reducing, albeit unintentionally, the quality of technology transfers, even in the case of higher level foreign ownership modes such as WOSs.

The long-term implications for Indian policy-makers are crucial in this case as WOSs are potent channels for international technology transfer. Therefore, FDI policy, which is better geared to improve the overall knowledge pools in the case of both WOSs and JVs, is recommended. However, this has to be viewed in terms of the trade-off that was discussed in the background chapter (chapter

2) and by understanding the possible costs that needs to be incurred from adopting such a policy. However, failure to consider this important factor in FDI policy may result in the majority of Indian manufacturing domestic industries being characterised by technological backwardness in the long run owing to lack of good quality technology transfers (Ramamurti and Singh, 2007).

Finally, MIJVs have also played an important role in Indian manufacturing industries since Indian independence from colonial rule. As indicated in the background chapter, early industries such as machinery and tools, chemicals and allied products etc. that opened up towards FDI were characterised by the presence of MIJVs to reduce the overall foreign presence in industry and from the notion that larger linkages of domestic partners in MIJVs with other domestic firms will enhance spillovers. However, the findings in the case of Indian manufacturing industries do not support this notion (Chapter 6, Table 16). The findings suggest that MIJVs generate negative spillover effects captured by two measures of foreign presence, employment and total sales. In line with the theoretical arguments in the literature on spillovers, negative effects from employment suggest that increase in foreign presence through better remuneration packages and increase in wages may lead to decrease of productivity in domestic firms and eventually lead to firm exit. The productivity in domestic firms can get depressed when employees working in domestic firms demand better wages but are not adequately compensated resulting in a gradual decline in motivation for work. They are also likely to be attracted by better remunerations packages offered by FOAs and might move to work there or in other productive domestic firms which are in a position to pay better wages. Unfortunately, the lack of more detailed data (e.g. matched employer-employee dataset) prevents acquisition of useful information on the process through which negative effects from MIJVs (employment) are likely to occur. Anecdotal evidence suggests that wages in India are not competitive, especially in concentrated labour-intensive industries (Chari and Gupta, 2008). Thus, the presence of negative spillover effects (through wages), on average, in Indian manufacturing industries is not an overstatement.

Negative spillover effects through sales can occur when domestic firms are not able to compete effectively with FOAs in the output market and thereby raise their average costs. In the case of MIJVs, the negative competition effects are likely to dominate over any small positive spillover effects as the domestic partner in MIJVs is dominant in local markets by virtue of having strategic resources relevant to the local market and therefore are better adapted to dealing with local competitive pressures. This factor combined with some basic level of transfer of KBAs associated with MIJVs can allow them to better confront competition in local markets than existing domestic firms.

In sum, avoiding the negative effects of competition for domestic firms is an important policy objective for the Indian government. However, when the three generic ownership modes are considered, MIJVs are the only foreign ownership mode that is likely to be associated with negative spillover effects through competition whereas MAJVs and WOSs are not associated with negative competition effects. Thus, it is recommended that MIJVs are best avoided in the context of Indian manufacturing industries while relaxing restrictions on foreign ownership (to include both MAJVs and WOSs) progressively but in a consistent manner can enhance positive spillover effects.

The policy implications for sub-national locations in the context of India are two-fold. First, NMNAs in India are likely to be characterised by higher technological gap between domestic firms and FOAs. Thus, their ability to benefit from spillovers is larger as it implies that they have more to learn. However, this depends on the relative absorptive capabilities of domestic firms in these regions. If the Indian government wishes to boost firm-level absorptive capabilities in these regions, investment in terms of improvement in physical and technological infrastructure, development of interaction between FOAs and domestic firms through promotion of foreign trade and development boards, and investment in human capital will be required.

Second, the study finds that the spillover effects in MUAs are relatively weak in magnitude compared with NMNAs. This could be because of the low level of technological gap among leading firms (foreign and domestic) within an industry in MUAs and better regional absorptive capacity in MUAs. An alternative explanation could also be that FOAs in MUAs are not transferring superior technologies and therefore the overall quality of technology transfers are of inferior quality. This could be an outcome of the current FDI policy of having restrictions on foreign ownership in FOAs or maybe associated with environment-related factors such as absence of adequate IPP regimes, presence of institutional obstacles to technology transfer etc. or could be a combination of both. The unavailability of firm-level data to test the role of knowledge pools, linkages and competition makes it difficult to assess the magnitude of the forces. Thus, it is important that government takes measures to develop absorptive capabilities in NMNAs with immediate effect if benefits of FDI are expected to be evenly distributed. Moreover, outlining a clear policy framework that systematically relaxes restrictions on foreign ownership as a matter of urgency and improving the investment climate are possible solutions to increase the quality of technology transfer in FOAs.

A word of caution here is that the analysis of spillovers for this research study includes publicly-listed firms which are large and are better endowed with absorptive and innovative capabilities. Thus, the policy implications of spillovers from the findings that are recommended are appropriate only in the case of large and well-reputed Indian firms. Consideration of the policy implications of foreign ownership modes and sub-national locations for small firms or medium-sized firms may require consideration of a dataset that includes all firms in the economy, i.e. micro, small, medium-sized and large firms (Damijan, Rojec, Majcen and Knell, 2013).

7.3. THEORETICAL IMPLICATIONS

The spillover effects of MNE investment in host countries have long been subjected to scholarly debate. MNEs play dual roles, i.e. of a cross-border source of investment for ETEs, as well as engines of knowledge transfer (Singh, 2005). In this context, the effectiveness of FDI promotion policies has been debated in both developing and developed countries. Although, scholars from development economics have contributed immensely to this debate, international business scholarship on the spillover benefits of FDI in ETEs has been rather absent (Meyer, 2004). This could be attributed partly to the lack of firm-level perspectives in the existing literature on spillover assessment. While international business scholars have only recently turned to addressing the firm-level process of spillovers (Liu, Filatotchev, Buck and Wright, 2010; Wang, Deng, Kafouros and Chen, 2012), there is an absence of good theoretical frameworks that specify the diverse contingencies for spillovers. This has weakened policy-makers' efforts to make an *ex ante* assessment of the role assumed by MNEs in economic development (Zhan & Mirza, 2012).

This thesis has aimed to address calls for a systematic and discriminating approach to identify conditions for spillovers and attempted to unpack some of the 'known unknowns' of the spillover phenomenon. More specifically, it has addressed an important firm-level heterogeneity issue, i.e. the role of MNE ownership modes and an external factor that has long been ignored in the literature, i.e. the moderating role of sub-national locations with different levels of economic development. The thesis has borrowed some key theoretical constructs that are well established in international business literature, such as knowledge pools, linkages and industry-competition effects and demonstrated their relevance to the assessment of spillovers from MNE ownership modes and sub-national locations. By using quality insights from the international business literature, the thesis has closed some important research gaps relating to the role of MNE ownership modes and sub-national locations. Overall, the key theoretical contributions of the thesis are the following:

First, a conceptual framework is developed that provides an explanation of how foreign ownership modes link to spillovers. This framework focuses on core concepts connected to ownership modes that influence both the contribution to knowledge pool by FOAs and the leakages from these pools to domestic firms. This framework, with suitable development, could form the basis for future research that could enhance our understanding of how ownership modes affect the size and quality of knowledge pools (that provide the basis for spillovers) and on the means whereby knowledge leaks from these pools to domestic firms. Improved understanding in these areas would be helpful for public policy on ownership regulations for inward FDI and for regional and local policies seeking to promote development. Greater understanding in this area would also help to develop IB theories on FDI and the effects on host locations.

Second, existing research on spillovers and foreign ownership modes are limited to either WOSs or MAJVs or MAJVs and MIJVs (Javorcik and Spatareanu, 2008; Abraham, Konings and Slootmaekers, 2010). This limits examination of the possible range of foreign ownership modes. i.e. WOSs, MAJVs and MIJVs. This study uses the concept of control rather than shareholding to define WOSs and thereby avoids misclassifying firms as JVs when in terms of control they are actually WOSs. By considering MAJVs and MIJVs the study also considers differences in the level of control by foreign owners in JVs. This more complete consideration of foreign ownership provides a stronger theoretical foundation of the ways by which the impact of the level of control that foreign owners have affects spillovers. This is important because it provides the basis for theoretical and empirical work on the effects of inward FDI on host locations that has a stronger foundation in the control aspect of firms with different degrees of foreign ownership. The focus on a more complete specification of foreign ownership also has implications for public policies concerned with the effects of foreign ownership modes of MNEs on host locations.

Third, the thesis provides a better understanding of the role of sub-national locations (categorised by level of economic development), on spillovers. Prior studies on spillovers have not taken into account the moderating role of sub-national locations by considering regions with different levels of economic development (with the exception of Sajarattanochote & Poon (2009) for Thailand). Considering the effects of sub-national location on spillovers increases understanding on how this factor influences spillovers and thereby helps with public policy seeking to encourage development in particular areas, especially in the context of highly urbanised and less urbanized areas. This contribution is also important because it complements the growing IB literature on sub-national location and the strategies and FDI policies for firms (Beugelsdijk and Mudambi, 2013).

7.4. MANAGERIAL IMPLICATIONS

In addition to the policy and theoretical implication of the key findings, some managerial implications at the firm-level are also recommended. On the one hand, considering the role of MNE ownership modes, it can be said that MAJVs are more likely to diffuse technological know-how to domestic firms in India than WOSs and MIJVs. Therefore, managers that are part of MAJVs are suggested to take steps to prevent leakage of the same. This can be done by providing better remuneration to skilled employees working in joint venture projects and especially through enforcement of long-term employment contracts. In the case of India, this will depend on the extent of industrial laws protecting employers and especially the nature of their domestic enforcement mechanisms. Moreover, care should be taken by project managers in MAJVs to ensure that product- and process-related information are kept secret until the project is complete.

In the case of findings from WOSs, managerial implications are complex as they are associated with prevention of leakage from KBAs. Despite the transfer of KBAs to FOAs in the host country, the issue of appropriability by domestic firms from these assets is ambiguous (Teece, 2000). This is because product- and process-related knowledge are often difficult to protect in countries with weak IP protection thereby limiting quality of transfer of KBAs by MNEs (Smeets and DeVaal, 2011). Also, in many cases, strong appropriability by domestic firms is the exception rather than the rule (Teece, 2000). WOSs can reduce threat to appropriability in weak IP protection regimes such as India through institutional arbitrage and by developing strong internal linkages (Zhao, 2006). However, this is limited to a few capable and experienced MNEs and thus even under strict protection mechanisms, knowledge nevertheless spills over from FOAs to domestic competitors through reverse engineering, personnel turnover and competition for better market shares (Blomström and Kokko, 1998).

On the other hand, managers in domestic firms should also be aware of the process of spillovers and the mechanisms underlying this process, since the spillover benefits are not quasi-automatic. The first requirement for large domestic firms is to invest in learning efforts by improving R&D expenditures as well as employing skilled human capital. Secondly, the importance of informal network connections should also be emphasised as information on product- and process-related knowledge is usually shared in conferences, meetings etc. Third, the desire to engage in formal or informal networking and partnership with WOSs and their related networks or the domestic partners (in case of JVs) is also an important determinant of learning. However, this process will depend on the extent to which FOAs are embedded in the host economy reflecting the strength of linkages and network connections and exposure of their product/process or technology-related capabilities.

In the context above, while policy suggestions comprise of motivations from host country governments to maximise positive spillover effects by supporting domestic firms, managerial motivations in MNE affiliates are to mitigate these effects by removing the threat to appropriability (World Investment Report, 2007).

Finally, spillovers could also be related to the strategy of the corporate parent in facilitating spillovers in host countries. As addressed in the Literature Review chapter, there are certain long-term benefits that FOAs seek to derive by allowing short-term knowledge outflows that are not proprietary in nature or are not genuine firm-specific capabilities. This is a deliberate strategy of MNEs and studies on spillovers are unlikely to capture this directly in empirical studies. However, unintentional spillovers (likely to be captured in studies on intra-industry spillovers) are likely to be best for host country firms, as they are associated with leakage of core proprietary know-how. This explains to some extent the limited evidence of positive effects on intra-industry spillovers in ETEs as MNEs are likely to protect diffusion of core know-how to their competitors in the same industry. Some exceptions, such as Wei and Liu (2006) and Tian (2010) for China, Marin and Sashidharan (2010) for India and Damijan, Rojec, Majcen and Knell (2013) for ten European transition economies, suggests that these effects might be associated with low-quality transfers of knowledge, which FOAs of MNEs are willing to sacrifice for larger market penetration. On the contrary, the relatively large evidence on positive inter-industry spillover effects could be suggestive of the fact that FOAs are willing to deliberately transfer knowledge to their suppliers to boost their supply chains.

CHAPTER 8

CONCLUSION

8.1. INTRODUCTION

The thesis investigated a crucial firm heterogeneity issue for spillovers, i.e. the role of generic foreign ownership modes, and an important external factor that is linked to the policy objective of Indian government to boost FDI benefits across regions, i.e. moderating role of sub-national locations.

In the first instance, a background to FDI policy environment in India is provided in chapter 2. The thesis provides an extensive literature review of the theoretical views on spillovers including the links to ownership modes and sub-national locations (Chapter 3). The literature review revealed that there was little conceptual understanding on how different types of foreign ownership may influence spillovers. This motivated the development of a conceptual framework (Chapter 4) that connects MNE ownership modes and sub-national locations to spillovers. The thesis then set out the empirical methods (Chapter 5) to test the research propositions using firm-level Indian data, derived from PROWESS, Centre for Monitoring Indian Economy pvt. ltd. The thesis used best-practices for the identification and measurement of variables and for the estimation techniques that were used. Results from the data analysis (Chapter 6) suggest that MNE ownership modes influence the extent of spillovers and that the net effect is higher in non-metropolitan and non-urban regions relative to metropolitan urban regions. Finally, a discussion of the important policy, theoretical and managerial implications are provided in chapter 7.

The next section of the thesis revisits the initial research questions outlined in Chapter 1. The 2 key research questions that were proposed are:

1. Do MNE ownership modes matter for spillovers?

2. Are differences in sub-national locations associated with spillovers?

The findings from the empirical analyses of Chapter 6 are then summarised, followed by a statement of the major contributions of the research. The thesis concludes by acknowledging limitations associated with the current research study and offers suggestions to address them in future research.

8.2. RESEARCH QUESTIONS REVISITED

This thesis explores a few contingency conditions through which MNE ownership modes and sub-national locations are likely to influence spillovers in host country firms (Gorg & Strobl, 2001; Crespo & Fontura, 2007; Smeets, 2008; Wooster and Diebel, 2010). Despite a large volume of research on spillovers, there is rather inadequate conceptualisation of the role of these two important factors on the FDI spillover process. The thesis by appropriately conceptualising the links between MNE ownership modes, sub-national locations and spillovers is an attempt to close some of the research gaps and challenge traditional assumptions about FDI as a rather automatic process (Acemoglu, 2012).

Previously held assumptions that have taken for granted the role of firm heterogeneity (involving MNE ownership modes) and an external environment factor (involving sub-national locations) have been addressed. The first restrictive assumption in the literature arises from the failure to develop an analytical framework regarding the potential of generic MNE ownership modes and their association with extent of spillovers. The second assumption arises from a failure to consider the moderating role of sub-national locations, especially in the context of locations with different levels of economic development. Building on these two specific research domains and developing a conceptual framework, the research has addressed an important host country policy issue by placing them in a specific research context of a newly industrialising Indian economy that has sought to maximise spillover benefits from gradual relaxation of restrictions on foreign ownership and the desire to spread these benefits evenly throughout all Indian regions.

8.3. SUMMARY OF RESEARCH FINDINGS

One of the first finding of the research study was that spillovers vary depending on the heterogeneous role of foreign (MNE) ownership modes. The study marked a shift from existing studies that have fully explored different firm heterogeneity factors involving MNE investment types, such as country of origin and investment motivation to a fuller consideration of generic MNE ownership modes. This was justified by adopting the knowledge pipeline model of spillovers and adopting a KBV of IB theory where the role of KBAs in FOAs assumes a central role to explain spillovers from different ownership modes.

Previous research on spillovers has not been consistent with the choice of MNE ownership modes and their implications on spillovers. The research findings from this study consider three generic MNE ownership modes – WOSs, MAJVs and MIJVs – and demonstrates that MAJVs have the best prospects for spillovers as the positive evidence is consistent across three foreign presence measures, which are employment, total sales and fixed assets. This is followed by WOSs, which captures the positive evidence in two foreign presence measures: total sales and fixed assets. The research study also finds that MIJVs, which are associated with lower level of foreign ownership, generate negative spillovers as a result of dominance of competition effects. This is captured by two foreign presence measures: employment and total sales. These findings support some of our propositions developed in the conceptual framework that acknowledges the complexity of relationships and by identifying some of the conditions through which spillovers (positive, negative and insignificant) are likely to materialise under generic MNE ownership modes.

This study also confirmed the moderating role of sub-national locations (defined by the level of economic development) on spillovers. More specifically, it explores the role of metropolitan areas and non-metropolitan urban areas and rural areas and finds that spillovers are positive in both regions, but the net effect of spillovers is higher in the latter than the former. This is an important finding given the lack of attention that the moderating role of sub-national locations has received in the literature on spillovers and in the background of renewed interest on the role of sub-national locations in IB literature (Ma, Tong and Fitza, 2013).

A summary of findings of this research study is shown in table 18.

Table 18
Summary of research findings

KEY VARIABLES	FINDINGS	PROPOSITIONS SUPPORTED FROM CONCEPTUAL FRAMEWORK	THEORETICAL EXPLANATION
WOSs	2 +ve (total sales and fixed assets)	***P1***	Knowledge pools are large enough to offset likelihood of lower level of linkages to domestic firms and competition complements these effects
MAJVs	3 +ve (employment, total sales and fixed assets)	***P5***	Lower knowledge pools are offset by likelihood of better linkages (domestic partners in JVs) to domestic firms aided by moderate competition
MIJVs	1 -ve (employment and total sales)	***P12***	Likelihood of well-developed linkages to domestic firms (than WOS and MAJVs) does not offset minimal knowledge pools and competition effects dominate

- TFP (dependent variable) estimated using Levinsohn and Petrin (2003) method; Foreign presence is estimated using fixed-effects in first differences and by including time, industry and region dummies (Javorcik and Spatareanu, 2008)

8.4. KEY RESEARCH CONTRIBUTIONS

This thesis has contributed to existing research in four important ways,

1. First, the thesis develops a conceptual framework by combining IB theory on foreign ownership modes and theory (and evidence) on spillovers and by further considering the role of sub-national locations. The conceptual framework aids in understanding the contingencies under which spillovers are likely from consideration of these two factors. The use of three relevant theoretical constructs (namely knowledge pools, linkages and industry-competition) that have so far been considered in the literature, but used inconsistently, enables in identifying these contingency conditions.

2. Second, the thesis considers three generic MNE ownership modes as opposed to two used in all previous studies (with the exception of one study that investigates this issue in a restricted manner). The use of three generic foreign ownership modes allows better conceptualisation of the links between ownership modes and the extent of spillovers and provides a fuller understanding of the role of generic MNE ownership modes in economic development in the host country.

3. Third, the study utilises an improved and updated definition of MNE ownership modes compared to previous studies which is more applicable to investigation of foreign ownership in ETEs. As suggested earlier in the thesis, the improvement in definition of foreign ownership modes in this study (following Ayyagari, Dau & Spencer, 2009; Sarkar, 2010) is that the

share of foreign ownership is by reference to the dominant shareholder with voting rights. This is an appropriate definition of foreign ownership because promoters (those with voting rights), such as firms or corporate groups, possess significant insider control and decision-making authority over KBAs, whereas non-promoters (those without voting rights), such as foreign institutional investors, venture capital funds, banks, mutual funds and insurance companies, do not exercise direct control (Chalapati & Dhar, 2011). This study therefore uses a more comprehensive method of identifying foreign ownership mode than the existing literature and thereby improves the prospects of capturing how these modes affect spillovers.

4. Finally, the thesis is one of the first studies to consider the role of spillovers in India through generic MNE ownership modes and the moderating role of sub-national locations. Previous studies in India have considered quality of FDI (Pradhan, 2006) and investigated firm heterogeneity in terms of the competence-creating and competence-exploiting role of FOAs (Marin and Sashidharan, 2010). The study, by using firm-level panel data and using three foreign presence measures of spillovers in Indian manufacturing industries, therefore further extends the literature in the context of a large economy by considering an important firm heterogeneity issue, i.e. foreign ownership modes, and the role of sub-national locations according to different levels of economic development.

8.5. RESEARCH LIMITATIONS AND FUTURE RESEARCH SUGGESTIONS

As with all research studies, this thesis also has a few research limitations, which are highlighted below:

1. The thesis was unable to directly test for magnitude and robustness of the theoretical constructs, such as knowledge pools, extent of linkages and competition effects arising from FOAs, which are used as a basis for explanation of findings from MNE ownership modes and sub-national locations. This is because of the lack of availability of good qualitative data at firm-level. Although these theoretical constructs are well-established in the IB literature and spillovers literature, the majority of studies take them for granted and existing studies have only recently begun to empirically investigate some of these constructs, albeit in a limited fashion (Driffield, Love and Menghenillo, 2010). Following the majority of the research studies, the current study was also unable to empirically explore the role of these theoretical constructs. Future research that wishes to investigate the effects of generic MNE ownership modes and sub-national locations on spillovers therefore should try to consider appropriate proxies to capture these theoretical constructs and, more importantly, data that can be tested at firm-level.

2. A second limitation is that the thesis uses a firm-level panel dataset that covers publicly-listed firms and therefore is biased in favour of large firms in India. Thus, the findings are applicable to a particular spectrum of the Indian economy, i.e. large, well-reputed and locally-dominant firms. In

order to investigate the full extent of the role of spillovers, different types of firms that includes non-listed firms as well as micro, small, medium and large firms should be used (Eapen, 2013). Moreover, evidence suggests that the size of domestic firms is an important aspect of firm heterogeneity and is also a major determinant of spillovers in transition economies in Europe (Damijan, Rojec, Majcen and Knell, 2013).

While this thesis has answered two important research questions, there are new questions that need to be investigated as well as new ideas concerning role of MNE ownership modes and spillovers. Some of the proposals for future research are suggested below:

1. The role of theoretical constructs that have been used to explain the strength of relationships explaining MNE ownership modes, sub-national locations and spillovers is important, given they are well established in the literature. However, research investigating these important theoretical constructs on performance of FOAs as well as on other domestic firms is rare. Thus, researchers that are interested in foreign and domestic firms' performance and productivity issues in the case of ETEs using firm-level data are recommended to investigate the role of these firm-level constructs.

2. Another relevant suggestion that will complement this study and improve our understanding of spillovers in ETEs from foreign ownership modes is to further test the conceptual framework in different countries as well as

through comparison in cross-country contexts. If cross-country studies are conducted, then consideration should be given to countries that are at relatively similar levels of economic development, e.g. BRICS. Testing the conceptual framework in the context of different ETEs will provide an opportunity for further reassessment of spillovers from FDI under generic MNE ownership modes and enhance the validity and explanatory power of the conceptual framework.

3. An interesting result highlighted in the Data Analysis chapter (6) is that domestic firms' TFP is higher than foreign firms in certain industries. Notwithstanding the possible reasons for this result (outlined in Chapter 6), this indicates a need for further research on this issue. A final suggestion for future research is therefore to further explore some of the key reasons as to why in certain industries domestic firms have higher TFP than foreign firms (Table 11). This interesting finding also suggests, for example, that some foreign firms are outsourcing innovation/knowledge to leading domestic firms in India thereby leading to high productivity in those industries. There are a host of possible reasons for the higher productivity of Indian firms in some industries, which requires further research to improve our understanding. Investigating this issue is crucial as IB theory, ex-ante, regards firm-specific assets/capabilities or KBAs of MNEs as superior to domestic firms which is an indicator of better performance and enables MNEs' to offset “liability of foreignness”. However, performance of MNEs’ are likely to be co-determined by other industry-related strategic factors (as Table 11 suggests), which needs in-depth exploring.

APPENDIX A

Variable definition and measurement

Variable	Definition and measurment
LTFP	Log of TFP (total factor productivity)
HHI	The sum of squared firm shares of sales in a 3-digit industry
IMP	The ratio of imports to domestic demand in a 3-digit industry
RDINT	The ratio of domestic firm's R&D expenses to sales
SCALE	The ratio of domestic firm's sales to average 3-digit industry-level sales
FORFP	Foreign spillover variable proxied by the share of foreign-invested firms in a 3-digit industry total or in a 3-digit industry within a region, excluding the focal firm.
WOSFP	WOS spillover variable proxied by the share of wholly-owned subsidiary of MNEs in a 3-digit industry total or in a 3-digit industry within a region, excluding the focal firm.
MAJVFP	Majority JV spillover variable proxied by the share of majority-owned foreign firms in a 3-digit industry total or in a 3-digit industry within a region, excluding the focal firm.
MIJVFP	Minority JV spillover variable proxied by the share of minority-owned foreign firms in a 3-digit industry total or in a 3-digit industry within a region, excluding the focal firm.

Ownership mode is determined using the following classifications:

- Wholly-owned subsidiaries (WOS): *firms whose foreign promoters' equity share is 100% in the Prowess database* and defined as a wholly-owned subsidiary by the firm's website and secondary sources.
- Majority-owned foreign firms (MAJV): firms whose foreign promoters' equity share ranges from 51% to 99% in the Prowess database.
- Minority-owned foreign firms (MIJV): firms whose foreign promoters' equity share ranges from 10% to 50% in the Prowess database.

Information regarding ownership modes is from the equity share datasheet provided by Prowess. However, in the case of some WOS, secondary sources such as websites and company reports are used to complement equity-share information from Prowess database. In cases where the information about a firm is not available in Prowess (whether it is a WOS or not) and is also not verifiable from the corporate websites of firms, other secondary sources were used to determine the classification of the firm. Assam Carbon Products, for example, is a foreign firm but has no equity share information available in the Prowess dataset. It has a website but it does not report shareholding information. The only information provided is that Morgan Crucible Co. (UK) has a stake in the firm. To validate this information, use was made of government websites such as Securities & Exchange Board of India (SEBI, accessible at http://www.sebi.gov.in/) to provide information on foreign equity. The data gathered from this web site was further supplemented by another reputed website http://www.securities.com to check the information found on the SEBI website.

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