Sub-national locations and FDI spillovers: theory and evidence

1. INTRODUCTION

The ever-increasing importance of international capital flows, especially the role of foreign direct investment (FDI) in a host economy still generates significant interest and debate among policymakers on the aggregate benefits from inward FDI. While evidence of positive FDI spillovers reinforces host government's policy to attract multinational enterprises (MNEs) by providing incentive packages, the negative spillover effects are likely to foster protectionist arguments by host governments. An extensive literature on FDI spillovers has emerged in the last two decades, with characteristics and findings of these studies appearing in recent surveys (Meyer and Sinani, 2009; Wooster and Diebel, 2010; Havranek and Irsova, 2012). Two noteworthy conclusions deserve mention here. *First*, the role of some important determinants of FDI spillovers have been confirmed; ranging from domestic firms' characteristics such as *absorptive capacity*, *strength of linkages* and *transmission channels* (Castellani and Zanfei, 2003; Ben Hamida and Gugler, 2009), to mediating role of external factors including but not limited to industry-competition related variables (Keller and Yeaple, 2007; Altomonte and Pennings, 2009), country-level institutions (Fortanier, 2007) and geographical proximity (Girma and Wakelin, 2007) as well as appropriate methodological considerations (Görg and Strobl, 2001). Recent studies have also documented firm-heterogeneity issues affecting FDI spillovers such as motivations of foreign investors (Driffield and Love, 2007), MNEs' country-of-origin (Zhang et al, 2012), firm size and productivity gaps (Damijan et al, 2013) and MNE-ownership modes (Abraham et al, 2011). *Second*, the findings also reveal that the evidence on the existence and key determinants of spillovers are inconclusive (Crespo and Fontoura, 2007), attributed largely to partial or lack thereof rigorous theoretical insights (Görg and Greenaway, 2004) and measurement/estimation issues that raises questions on the validity of findings (Eapen, 2013).

Therefore, a systematic and discriminating research approach is necessary to identify key factors leading to positive, negative or insignificant FDI spillovers and to better inform the debate on host government's policy stance towards FDI (Smeets, 2008). The key contribution of this paper is the investigation of FDI spillovers by exploring an important contingency factor that has received renewed interest in international business (IB) literature, namely the sub-national location of foreign-owned affiliates (FOAs) of MNEs. The investigation of differences in sub-national locations and their impact on FDI spillovers does not only expand our conceptual understanding but also provides useful information for policy makers to enable them to better gear FDI policies to achieve development goals.

The role of sub-national locations in influencing location choice of FOAs (Chadee, Qiu and Rose, 2003; Ma, Delios and Lau, 2013) and performance of FOAs (Chan, Makino and Isobe, 2010; Ma, Tong and Fitza, 2013) have been well-established in IB literature. The relative importance of sub-national locations increases further in the context of large emerging and transition economies (ETEs) with high income disparities such as Brazil, Russia, India, China, South Africa (BRICS) and Mexico, Indonesia, Nigeria and Turkey (MINT). This is because large countries with high income inequalities have diverse economic landscapes where certain locations are characterised by better technological and physical infrastructure, regional absorptive capacity, intra and inter-firm networks and economic buzz (Storper and Venables, 2004; Girma, 2005; McDermott and Corredoira, 2010) than other locations. These locations provide distinctive sources of competitive advantages for MNEs thereby attracting FOAs for the purpose of exploiting and endogenising these location-based advantages (Rugman, 2010) and further developing their knowledge-based assets in the host country (Dunning and Lundan, 2008). As a result, MNEs' location-choices are driven by economic characteristics in these

locations relative to other locations (Chadee, Qiu and Rose, 2003), and competitive advantages accumulated in these locations are likely to boost performance of FOAs (Ma, Tong and Fitza, 2013). In this paper, we propose that differences in sub-national locations also have important implications for FDI spillovers. This is because innovation and productivity are likely to vary across different locations within a country and therefore are an important determinant of the extent of spillovers (Audretsch & Feldman, 2004). Moreover, differences in sub-national locations also increase with greater regional disparities in income (Chan, Makino and Isobe, 2010). Therefore, it is important to investigate whether and to what extent variation in sub-national locations with different levels of economic development interact with FOAs to give rise to spillovers.

Although past research has investigated regional dimension to FDI spillovers, the approach adopted in this study is different from earlier approaches in three different ways. First, while earlier approaches predominantly focused on geographical/spatial proximity or spillover benefits to domestic firms arising from co-location with foreign firms (Wei and Liu, 2006; Girma and Wakelin, 2007), the current approach investigates whether sub-national regions in interaction with FDI inflows matter for spillovers to domestic firms. The difference in both approaches arises from use of different theoretical underpinning and empirical modelling to investigate FDI spillovers. Second, past research on regional FDI spillovers utilised a definition of administrative regions [e.g. coastal, central and inland regions for China (Wei and Liu, 2006) or counties with higher/lower domestic and foreign firm agglomerations in the case of Ireland (Barrios, Bertinelli and Strobl, 2006)]. The measure adopted in this study is based on an income-based classification of regions (Lall, Koo and Chakravorty, 2003; United Nations Population Division World Urbanization Prospects, 2009) that is appropriate for analysis of sub-national

locations with different levels of economic development. It therefore 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. Finally, recent study investigating sub-national locations and FDI spillovers in a large emerging economy, i.e. China has focused exclusively on cities or metropolitan regions (Li, Chen and Shapiro, 2013). The approach in this study, however, allows capturing the moderating effect on FDI spillovers from both metropolitan urban areas (MUA) or non-metropolitan and non-urban areas (NMNAs). The only published study similar to this approach is Sajarattanochote & Poon (2009) for Thailand. We believe that this approach is useful because it provides a richer understanding about the role of sub-national locations for FDI spillovers in ETEs and better explain how sub-national locations are likely to moderate technology diffusion from FOAs to other domestic firms in certain regions.

The findings of the study also have policy implications of FDI spillovers when sub-national locations with different levels of economic development, i.e. MUAs and NMNAs are considered. More specifically, 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. In this study, we derive useful information based on theoretical insights and literature on sub-national locations and link it to existing scholarship and IB theory on spillovers. This results in a theoretical framework which outlines the conditions under which FDI spillovers are likely to occur. We also present some exploratory evidence using firm-level data from the Indian manufacturing sector and an estimation framework modelling FDI spillovers and sub-national locations.

The investigation of FDI spillovers in the context of India is a reasonably good choice as FDI inflows has been significantly on the rise since the 1991 reforms. The 1991 reforms have led to a more liberal policy regime by restructuring the industrial licensing system and progressively removing restrictions on foreign equity participation (DIPP annual report, 2008). Following these reforms, FDI inflows increased from US$75 million in 1991 to US$40,418 million in 2008 (SIA newsletter, DIPP, 2010). Moreover, Indian policy-makers are concerned about the regional effects of FDI spillovers, in particular whether the effects vary by regions. This stems from the fact that FDI is spatially concentrated within certain states and industrial districts (Mukim and Nunnenkamp, 2012). The two Indian maps in Fig.1 reveal the density of FDI project applications where the size of the circles is proportional to the number of applications within an industrial district. This study examines the intra-industry (or horizontal) spillovers from FOAs to domestic firms listed on Indian stock exchanges. The study therefore focuses on spillovers on firms quoted on Indian stock exchanges. Most of these firms tend to be large. Such firms normally adopt innovations earlier and more comprehensively than small firms (Baptista, 1999) thus large domestic firms are more likely to swiftly and fully acquire spillovers from FDI.

{Insert Fig. 1 here}

The organisation of the paper is as follows. Section 2 reviews the relevant literature on sub-national locations and FDI spillovers to develop key theoretical insights. The discussion then leads to development of tenable conditions under which FDI spillovers are likely to occur when sub-national locations are considered. Section 3 describes the dataset, research methodology and variable measurement while Section 4 discusses some of the findings and the theoretical and policy implications of the results. Section 5 concludes the study.

2. FDI SPILLOVERS AND SUB-NATIONAL LOCATIONS

IB theory suggests that MNEs must possess firm-specific advantages (FSAs) in the form of new or advanced technologies and marketing and management know-how to overcome "*liability of foreignness*" (Dunning and Lundan, 2008). These MNE-FSAs and their deployment by FOAs in host locations in the form of KBAs mean there is potential for knowledge spillovers from MNEs as their presence enhances the existing knowledge stock in the host country. In this study, we rely on this well-established theory and regard intra-industry FDI spillovers as the impact on productivity of domestic (host country) firms caused by entry and presence of agents of FDI, i.e. MNEs (Javorcik, 2004). This is a net outcome of the unintended knowledge diffusion from knowledge-based assets (KBAs) of FOAs and competition exerted by FOAs within an industry (Smeets, 2008). This is different from knowledge transfers, which usually is a deliberate outcome of transfer of technology from corporate MNE parents to boost KBAs in FOAs in host country or transfers existing within the MNE network (Javorcik, 2004). The primary channels of FDI intra-industry spillovers are demonstration, labour mobility 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. Also 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 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 market may reduce domestic firm's market share forcing them to produce less output and thereby pushing up their average costs (Aitken & Harrison, 1999). Competition in 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 exist on FDI spillover effects in both developed and developing countries. Given the extent of the literature, the paper concentrates on reviewing recent published studies using firm level panel data for ETEs as it is more relevant to this study. Table 1 summarises the findings of major firm-level panel data studies and illustrates the mixed evidence on knowledge spillovers. The lack of consistent findings in these studies may connect to failure to adequately control for the major factors affecting spillovers, such as, the degree of openness of host countries, the competitive characteristics of industries, and the absorptive capacity of domestic firms. It may also link to the absence of appropriate consideration of key factors on which spillovers are contingent. This study therefore seeks to develop the analysis of FDI spillovers by investigating the implications of an under-investigated but important contingency factor, namely, the role of sub-national locations.

{Insert Table 1}

2.1. Literature review and theory development

A wide range of factors are likely to influence the scope of FDI spillovers when differences in sub-national locations, i.e. MUA and NMNA are considered. However, a solid theoretical

foundation is possible only when it is grounded in rigor, consistency, clarity, brevity and effective analysis (Hart, 1998). In line with this objective of adopting a reductionist and parsimonious approach, three important factors associated with subnational locations and potential for FDI spillovers that provide reasonably good and consistent theoretical explanations are put forward.

a. Technological gap and absorptive capacity

The technological gap between FOAs and domestic firms can act as a conduit or constraint for domestic firms to benefit from knowledge spillovers (Sjohlöm, 1999; Castellani and Zanfei, 2003). This gap becomes extremely significant when the absorptive capacity of domestic firms in different sub-national locations is considered. Regions with larger technological gap between FOAs and domestic firms, usually NMNAs, are likely to benefit from spillovers as domestic firms' will have to '*catch up*' to improve their technological standards in respective industries (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 assimilate and absorb new knowledge and technologies than firms' with lower absorptive capabilities (Castellani and Zanfei, 2003). Alternatively, regions with relatively smaller technological gap between FOAs and domestic firms, found mostly in MUAs, imply relatively lesser 'catch up' by domestic firms, and therefore indicates a smaller scope for spillovers. An interesting paradox here is that lower technological gap between FOAs and domestic firms in MUAs would also imply that domestic firms, on average, have gradually improved their absorptive capabilities over a period of time. Thus, the net spillover benefits are likely to be higher in these regions when compared with domestic firms in NMNAs (Cantwell, 1989). This is the '*technology accumulation*' hypothesis and has found some support 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 likely effect of FDI spillovers, when sub-national locations with different levels of economic development are considered.

b. Social structure and network ties

Recent conceptualisation has regarded the social structure that foreign firms are embedded in as important for host country spillovers (Spencer, 2008). The presence of effective network ties reduces the constraints of domestic firms in search for foreign technology as well as 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 FDI spillovers could be clarified in three points. First, social network ties serves as the 'conduit' through which domestic firms learn about new practices, techniques and other opportunities (McEvilly and Zaheer, 1999) and thus is a source of valuable information flows (Podolny, 2001). Second, these 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 socialization and discussions (Greve, 1996; Rogers, 2003). Finally, network ties could 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 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 their ability to absorb technology spillovers.

In the context of differences in sub-national locations, i.e. MUAs and NMNAs, the characteristics of social network ties play a fundamental role in maximising spillovers to domestic firms. A simple assumption is made where on average, firms in MUAs are likely to be characterised by dense social network ties but lacking in depth whereas firms in NMNAs are likely to be characterised by sparse but deep social network ties. In a region characterised by dense social network ties (usually MUAs), all networks of firms are tied to each other whereas in a region characterised by sparse social network ties (usually NMNAs), the focal (domestic) firm are 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 potent in NMNAs and the information available to the focal (domestic) firm could be unique or novel (Burt, 1992). Alternatively, the depth of network ties is likely to be weaker in MUAs as the information available to all firms is similar. The deep and rich network ties of NMNAs relative to MUAs could act 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 spillovers to domestic firms (i.e. technology absorption by the focal firm) (Reagans and McEvilly, 2003). This is because co-operation and willingness to knowledge-sharing between firms are more possible in a dense rather than a sparse network as the former 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 stronger when source and recipient firms have closer interactions (Hamel, Doz and Prahalad, 1989) and which is likely to occur in a dense (MUAs) rather than a sparse network structure (NMNAs) (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 that are 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 at which technology could be scanned for availability+suitability and **b** - the absorption of that available technology. This relationship is clarified in table 2 below.

	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)

Table 2: Author's schematisation using Eapen (2012) typology of social structure
Note: Spillovers to domestic firms is the net effect of (a+b)

c. 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 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 of knowledge pools available for spillovers in NMNAs (Opp, 2012). In summary, FOAs in MUAs would have a larger 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 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 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.

2.2. Discussion

This section attempts to conceptualise the role of the three factors cited above that relate to the discussion on sub-national locations (MUAs and NMNAs) and spillovers.

On one hand, the technological gap between domestic firms and FOAs are lower in MUAs relative to NMNAs. This low level of technological gap between foreign and domestic firms in

MUAs warranties higher volume of transfer of KBAs to FOAs as MNEs are mildly concerned about leakage of proprietary know-how. Therefore, this contributes to presence of larger knowledge pools in MUAs. Also, absorptive capabilities of domestic firms in MUAs are relatively higher than in NMNAs (Castellani and Zanfei, 2003), thereby benefitting domestic firms' capabilities to absorb technology diffused in MUAs. Finally, the level of industry competition in MUAs is also likely to moderate these effects. The transfer of KBAs to FOAs in MUAs is also likely to be complemented by higher level of industry-competition. This is because high-level of industry-competition is likely to give rise to liability of foreignness for FOAs to compete successfully. As a result, corporate parents are likely to be better motivated to transfer higher volume of KBAs to mitigate liability of foreignness. This is likely to lead to increase in level of knowledge pools available for spillovers in MUAs relative to NMNAs. However, if competition in MUAs is moderate or relatively lesser, it is likely to inhibit transfer of sophisticated KBAs to FOAs. Moreover, competition could also affect domestic firms negatively if it is so low that they do not enhance domestic firm's performance and hinder motivation of domestic firms to compete and interact effectively with FOAs. Low level of industry competition is also likely to affect commitment of KBAs by MNEs. Thus, the overall effect for spillovers in MUAs could be summarised in the propositions below.

P1: *The potential for spillovers will be higher in MUAs when low technological gap and good absorptive capabilities of domestic firms (relative to NMNAs) are effectively complemented by high industry-competition between domestic firms and FOAs giving rise to larger knowledge pools (relative to NMNAs).*

P2: *The potential for spillovers will be lower in MUAs when low technological gap and good absorptive capabilities (relative to NMNAs) are not complemented by high industry-competition between FOAs and domestic firms.*

Alternatively, NMNAs are usually characterised by a higher level of technological gap between domestic firms and FOAs where the objective of domestic firms is likely to be guided severely by technological catch-up. This implies that the threat of leakage or imitation of proprietary know-how in NMNAs will be severe and therefore might hinder the transfer of proprietary KBAs to FOAs in these regions. Moreover, domestic firms in NMNAs are likely to have lesser absorptive capabilities compared to MUAs and these regions are also associated with low level of industry competition. However, gradual increase in level of industry competition, for e.g. through product diversification and sales targeted at consumers in these regions, and to increase market share by firms could lead to changes in the competitive landscape. This could imply that FOAs will readjust their competitive strategy in terms of transfer of KBAs and at the same time could also push domestic firms to compete effectively with FOAs to avoid losing market share. NMNAs are likely to have positive spillover effects in such situations, with changes in level of industry-competition being the key moderator. This leads to the following two propositions:

P3: *The potential for spillovers will be higher in NMNAs when high technological gap and weak absorptive capabilities of domestic firms (relative to MUAs) are offset by increases in level of industry competition (leading to gradual development of knowledge pools in NMNAs)*

P4: *The potential for spillovers will be lower in NMNAs when high technological gap and weak absorptive capabilities of domestic firms (relative to MUAs) are complemented effectively by low level of industry-competition (relative to MUAs) leading to lower knowledge pools.*

Spillovers in MUAs and NMNAs are also likely to affected by social network ties between firms. It is well known that dense social networks in which domestic firms are embedded in MUAs constrain the search for novel foreign technology as the depth of network ties between firms in these regions is weaker. However, better absorption of knowledge diffused from FOAs is likely in MUAs rather than NMNAs as the high density of networks indicate complementary routines and capabilities to integrate foreign technologies and common understanding shared between firms (Eapen, 2012). This could again be moderated by the level of industry competition. For e.g., domestic firms and FOAs in MUAs might be reluctant to engage in extensive networks and collaboration if level of industry-competition is not high enough to permit these strategic interactions. This could result in lesser knowledge diffusion between FOAs and domestic firms as a result of weak linkages and weaker interaction. This leads to the following two propositions:

P5: *The potential for spillovers will be higher in MUAs when dense network ties between firms is complemented by high level of industry competition and good capacity of domestic firms to absorb diffused technology and know-how (relative to NMNAs).*

P6: *The potential for spillovers will be lower in MUAs when dense network ties between firms is offset by the low capacity of domestic firms to search for relevant and novel technology and know-how (relative to NMNAs)*

In NMNAs however, the sparse social networks in which domestic firms are embedded in, indicate that they are good at searching for relevant foreign technology because of depth of network ties between firms but not well equipped to absorb technology diffused from other firms because of the sparseness of their network ties resulting in lesser and non-frequent interactions. Thus, sparse social networks in NMNAs 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. However, once the technology is scanned for availability, the absorption capacity is lower in domestic firms located in NMNAs. Thus, the probability of domestic firms benefitting from spillovers in NMNAs is exposed to a combination of these two factors. The role of industry competition is also an important moderator here. This is because increases in level of industry-competition could suggest that sparse networks between firms will gradually become more valuable. Thus, two propositions are highlighted below with regard to the role of network ties for spillovers in NMNAs.

P7: *The potential for spillovers will be higher in NMNAs when the sparse network ties and low level of industry-competition are likely to be offset by good capacity of domestic firms to search for relevant technology (relative to MUAs).*

P8: *The potential for spillovers will be lower in NMNAs when the sparse network ties and low-level of industry-competition are complemented effectively by low capacity of domestic firms to absorb diffused technology (relative to MUAs).*

The end outcome of technological gap, absorptive capabilities, social network ties and level of industry competition in MUAs and NMNAs would be contingent on the relative magnitude of these factors in influencing the transfer of KBAs in FOAs and the strength of linkages or network connections between FOAs and domestic firms in both regions. It is not possible to determine, apriori, which factors are likely to dominate when sub-national locations and spillovers are considered. This will require rigorous empirical testing of the role of these factors. Overall, the conditions highlighted above documents the different permutations and

combinations which link the potential for spillover effects from MUAs and NMNAs. This can be summarised in the schematisation provided below.

Sub-national locations ➡ Key Factors ⬇	**MUAs**	**NMNAs**
Technological gap Absorptive capacity	Low High	High Low
Network ties*	High	Low
Industry competition	High	Low

Table 3: Author's schematisation of key factors affecting sub-national locations and spillovers; *-refer to Table 2 for details on spillover effects of network ties in MUAs and NMNAs

The consideration of the moderating role of sub-national locations in explaining FDI spillovers is important as it essential to investigate how FOAs and different within-country locations interact and stimulate knowledge diffusion. A list of the conceptual variables that will be operationalised for the purpose of the study are provided below. The list also includes a few variables where operationalisation will not be possible, firstly, because these constructs have not been well-established in the literature and will need investigation for selection of appropriate proxies, secondly, data at firm-level to capture these constructs are unfortunately not unavailable.

CONCEPTUAL VARIABLES	**OPERATIONALISATION OF VARIABLES**
1. Sub-national locations	Income classifications, metropolitan urban areas and non-metropolitan urban areas
2. Absorptive capacity	R&D intensity and firm scale
3. Competition	Herfindahl Index and import penetration
4. Knowledge pools	*Not applicable#*

5. Linkages or network connections	*Not applicable#*
6. Social network ties	*Not applicable#*

Operationalisation of conceptual variables; # - not tested due to data availability issues

3. DATASET, VARIABLE MEASUREMENT AND MODEL ESTIMATIONS

3.1. Dataset and variable measurement

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). Several published studies have used this database to investigate spillovers, including Balakrishnan, Pushpangadan and Babu (2000), Kathuria (2002), Topalova (2004), Kumar and Aggarwal (2005) and Pradhan (2006). There is a significant advantage of employing this dataset as majority of these firms are large enough to be listed on India's stock exchanges. Large firms normally adopt innovations earlier and more comprehensively than small firms (Baptista, 1999) and thus large domestic firms are more likely to swiftly and fully acquire spillovers from FDI. Moreover, 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). 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). Finally, the adjustment of nominal data is done by using GDP

deflator for sales and employment data and Reserve Bank of India wholesale price index for expenditures, assets and income data (Marin and Sasidharan, 2010). The data cleaning and inputting process excluded firms that did not report, or provided insufficient information, on key economic activities. The final dataset contains 1,683 firms with 11,429 firm-year observations, of which 1,452 firms are domestic firms. The number of foreign firms in our sample is in line with other studies using PROWESS, for example Marin and Sasidharan (2010), which includes 273 foreign firms in their sample.

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 classifications on sub-national regions used information from PROWESS on firms' locations which is then 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 Urbanization Prospects (2009) and are as follows:

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

2. Non-metropolitan and non-urban areas (NMUA): 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.

3.2. Model estimations

The model is estimated by incorporating sub-national location where the foreign presence variable is interacted with another variable, RGFP, which indicates foreign presence within regions (MUAs & NMNAs). The baseline model is therefore expressed in the following form,

$$\ln TFP_{ijst} = \alpha 0 + \alpha 1 FORFP_{jt-1} + \alpha 2 RGFP_{jt-1} + \alpha 3\ HHI_{jt-1} + \alpha 4 IMP_{jt-1} + \alpha 5 RD_{ijst-1} + \alpha 6 SCALE_{ijst-1} + \mu_{ijst} \quad (1)$$

where $\ln TFP_{ijst}$ is the logarithm of the TFP of domestic firm i in industry j, in state s, at time t. RGFP indicates the foreign presence within regions while 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. Three different measures are used, as the study in previous chapter, 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) (Wei and Liu, 2006). These different measures are employed to maximise the detection of knowledge spillovers. The introduction of a one year lag deals with the potential problem that spillovers will not raise instantaneously. Moreover, this lag structure allows in controlling for simultaneity bias arising from the fact that MNEs may be attracted to productive industries (Aitken and Harrison, 1999).

Finally, following Aitken and Harrison (1999), Javorcik (2004) and Haskel, Perreira and Slaughter (2007), the first-differencing model is estimated as it generates more robust results than the fixed effects model. Estimating first-differences remove 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). This approach is consistent with previous papers on FDI spillovers (Javorcik, 2004; Javorcik and Spatareanu, 2008) and thus the discussion involves the use of first differencing.

3.3. Results

Tables 4a and 4b provides key summary statistics and correlation matrix along with variation inflation factors. They indicate that the data do not suffer from any serious problems of multicollinearity. Table 5 shows the estimation results. The results for spillovers from sub-national locations (see columns 1, 2 and 3) and aggregate foreign presence reveal that there are significant and positive FDI spillover effects on TFP of domestic firms when the total sales and fixed assets measure are used. Thus, consideration of interaction between sub-national location and foreign presence reveals a significant effect on spillovers. The dummy for sub-national locations i.e. MUA or metropolitan regions and NMNA or non-metropolitan regions is 1 & 0 respectively. These are specified on a model where it is interacted with aggregate foreign presence. Table 5 reveals that when aggregate foreign presence is interacted with sub-national locations, the coefficients are significant for all three 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 and fixed assets measure. This implies that the net impact on spillovers in non-metropolitan regions or NMNA (dummy 0) is higher than metropolitan regions or MUA (dummy 1) for these two measures. Overall these results indicate that the effects of spillovers are higher in NMNA than MUA. The reason for such a finding could be attributed to the complex interplay of factors postulated earlier which links sub-national locations with spillovers.

The results for controls on industry competition (Herfindahl index and import penetration) are 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 negatively 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 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 large firms in India receive higher positive spillover effects when they are located in NMNAs rather than MUAs.

4. DISCUSSION

The findings reported in this study contribute to the emerging research theme on the role of sub-national locations and its importance for spillovers. It is found that FDI spillovers 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 (NMNA) in India benefit more from presence of FOAs of MNEs than in metropolitan and urban regions (MUA). This could be attributed to a combination of a range of factors developed in section 2. The first and the most important factor could be the higher level of technological gap between FOAs and domestic firms in NMNA. Anecdotal evidence suggests that firms in important high-tech industries such as software manufacturing and pharmaceuticals in India are concentrated mostly in metropolitan areas. As a result of sharing a common technological space in MUA regions, domestic firms here have relatively

lesser technological gap with MNE affiliates. Thus there are no unique information or knowledge benefits that could affect domestic firms in these regions. Alternatively, higher technology gap in NMNA could allow 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. In MUAs, because of a dense network structure domestic firms do not have access to bridge ties for novel information sources and thus do not have much to improve through information benefits (Eapen, 2012). NMNAs in India are characterised by sparse network structures and they reduce constraints of (efficient) domestic firms in the search for available technology (Tortoriello and Krackhardt, 2010). The level of absorptive capabilities of 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, it is a minimum level of absorptive capacity and value of information that are rooted in the network ties in sparse (NMNA) and dense (MUA) structures that determines the net impact on spillovers to domestic firms. 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.

The findings on the role of subnational locations for FDI spillovers in India indicate that positive effects emerge for both MUAs and NMNAs, implying support for conditions 1, 4, 5 and 7 developed in literature review section (section 2). However the positive effects of knowledge spillovers are stronger in NMNAs relative to MUAs. This can be interpreted from anecdotal evidence that suggests that NMNAs in India are characterised by 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 in 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 relatively moderate degree of competition is likely to influence domestic firms in NMNAs in India to enhance their learning capabilities.

In the case of MUAs in India, it is quite likely that these regions are characterised by 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 because of the presence of dense network ties between firms. Thus, domestic firms in MUAs, on average are likely to be more close to the technological frontier. Furthermore, absorptive capacity of domestic firms in MUAs in India is higher relative to domestic firms in NMNAs. Although this helps in facilitating spillover benefits to MUAs (supported by the empirical findings), the magnitude of these effects will be lesser as domestic firms are not technologically backward in these regions (implied from low technology gap between domestic firms and FOAs) and therefore do not have much to learn. Furthermore, dense networks in MUAs make it difficult for firms, mostly domestic, to be benefitted 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 knowledge spillovers as the transfer of KBAs to FOAs increase 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. However, it 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 with 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 and social network ties to investigate their role in knowledge spillovers is not available. Therefore it is not possible to assess the magnitude of these factors as there lies a complex interaction of these factors related to subnational locations and its role in influencing spillovers. Some of the empirical results reported in this study on sub-national locations may also be closely associated with specific characteristics of India as an emerging economy.

5. CONCLUSION

The policy implications for subnational 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 knowledge spillovers is larger as it implies that they have more to learn. This however depends on the relative absorptive capacity of domestic firms in these regions. If Indian government wish to boost firm-level absorptive capacities 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 weaker in magnitude than NMNAs. This could be because of the low level of technological gap and better regional absorptive capacity. 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 further difficult to assess the magnitude of the forces. Thus, it is important that government takes measures to develop absorptive capacity 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 knowledge spillovers from the findings that are recommended are appropriate only in the case of large and 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, micro, small, medium-sized and large firms (Damijan, Rojec, Majcen and Knell, 2013).

Fig. 1. FDI projects and distribution in subnational locations

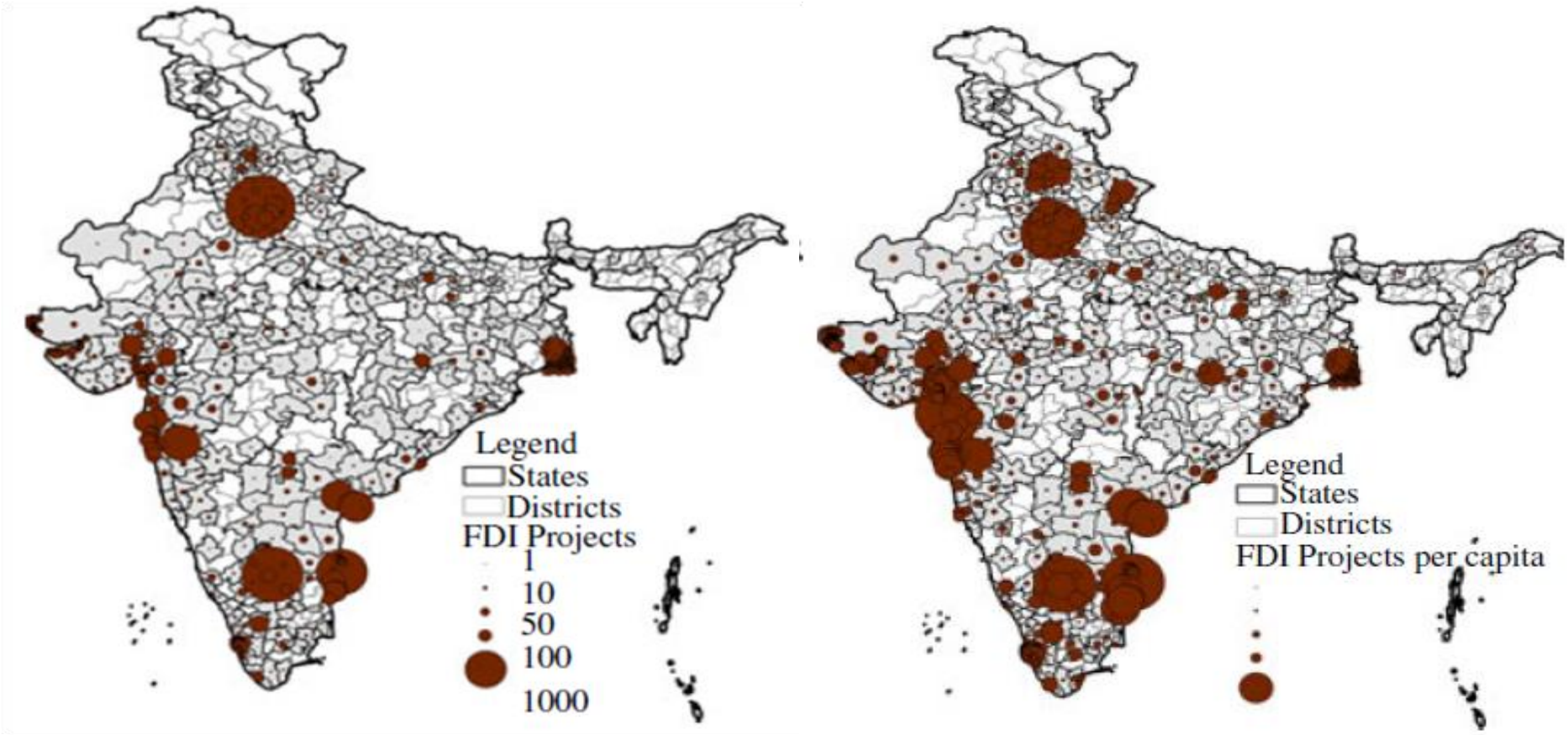

Figure 1
Source: Mukim and Nunnenkamp (2012); compiled using DIPP data, Ministry of Commerce, Government of India

Table 1: Review of literature on FDI spillovers for developing and transition economies[1]

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

[1] The definition of developing and transition 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).

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 forwarded)
4	Romania	(Javorcik and Spatareanu, 2008)	1998-2003	13129	-	JV's and WOSs generate negative spillover effects
5	Russia	(Yudaeva et al , 2003)	1992-97	14000	+	Better regional AC measured by high educational attainments and medium sized firms benefitting from positive spillover effects
6	Bulgaria	(Konings, 2001)	1993-97	2321	-	Negative competition effects/ Lack of firms' restructuring
	Romania		1994-97	3844	-	Lack of firms' restructuring
	Poland		1993-97	262	+	Late reforms brought lesser competitive pressures from FOAs giving rise to positive spillovers
7	Bulgaria	(Nicolini and Resmini, 2010)	1998-2003	50000	-	Insignificant effects
	Romania					
	Poland				+	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		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	Damijan, Knell, Majcec and Rojec (2013)	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

	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

Table 4a: Summary Statistics and correlation matrix

Table 4b: VIF Results

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 5: FDI spillover results

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)

REFERENCES

ABRAHAM, F., KONINGS, J., & SLOOTMAEKERS, V. 2010 FDI spillovers in the Chinese manufacturing sector Evidence of firm heterogeneity *Economies of Transition* 18 (1): 143–182

AITKEN, B. J., & HARRISON, A. E. 1999. Do domestic firms benefit from direct foreign investment? Evidence from Venezuela. *American Economic Review*, 89(3): 605- 618.

ALTOMONTE, C., & PENNINGS, E. 2009. Domestic plant productivity and incremental spillovers from foreign direct investment. *Journal of International Business Studies*, 40: 1131-1148.

AUDRETSCH, D. B. & FELDMAN, M. P. 2004. Knowledge spillovers and the geography of innovation. In: HENDERSON, J. V. & JACQUES-FRANÇOIS, T. (eds.) Chapter 61 Handbook of Regional and Urban Economics. Elsevier.

BALAKRISHNAN, P., PUSHPANGADAN, K. & BABU, S. 2000. Trade liberalisation and productivity growth in manufacturing: evidence from firm-level panel data *Economic and Political Weekly*, 35, 3679-3682

BEN HAMIDA, L., & GUGLER, P. 2009. Are there demonstration-related spillovers from FDI? Evidence from Switzerland. *International Business Review*, 18, 494–508.

BLOMSTRÖM, M. & SJÖHOLM, F. 1999. Technology transfer and spillovers: Does local participation with multinationals matter? *European Economic Review*, 43, 915-923.

BLOMSTROM, M., & SJOHOLM, F. 1999. Technology transfer and spillovers: Does local participation with multinationals matter? *European Economic Review* 43(4-6): 915-923.

BRANSTETTER, L. G. 2001. Are knowledge spillovers international or intranational in scope?: Microeconometric evidence from the U.S. and Japan. *Journal of International Economics*, 53(1): 53-79.

BAPTISTA, R. 1999. The Diffusion of Process Innovation: A Selective Review. *International Journal of the Economics of Business*, 6, 107-129.

BURT, R. S. 1992. *Structural holes: The social structure of competition.* Cambridge, MA: Harvard University Press.

BWALYA, S. M. 2006. Foreign direct investment and technology spillovers: Evidence from panel data analysis of manufacturing firms in Zambia. *Journal of Development Economics*, 81, 514-526.

CANTWELL J. 1989. *Technological Innovation and Multinational Corporations.* Oxford: Basil Blackwell.

CASTELLANI, D., & ZANFEI, A. 2003. Technology gaps, absorptive capacity and the impact of inward investments on productivity of European firms *Economics of Innovation and New Technology*, 12, 555-576

CHADEE, D.D., QIU, F., & ROSE, E. 2003. FDI location at the subnational level: a study of EJVs in China *Journal of Business Research* 835-845

CHAN, C. M., MAKINO, S., & ISOBE, T. 2010. Does subnational region matter? Foreign affiliate performance in the United states and China *Strategic Management Journal* 31: 1226–

1243

CHARI, A. & GUPTA, N. 2008. Incumbents and protectionism: The political economy of foreign entry liberalization. *Journal of Financial Economics*, 88, 633-656.

DAMIJAN, J.P., ROJEC, M., MAJCEN, B., & KNELL, M. 2013. Impact of firm heterogeneity on direct and spillover effects of FDI: Micro-evidence from ten transition countries *Journal of Comparative Economics* 41: 895–922

DUNNING, J. H. & LUNDAN, S. M. 2006. *Multinational Enterprises and the Global Economy.* Edward Elgar: Cheltenham

EAPEN, A. 2012. Social structure and technology spillovers from foreign to domestic firms *Journal of International Business Studies* 43, 244-263

EAPEN, A. 2013. FDI Spillovers in Incomplete Datasets *Journal of International Business* Studies 44, 719–744

FORTANIER, F. 2007. Foreign direct investment and host country economic growth: does the investor's country of origin play a role? *Transnational Corporations* 16(2): 41-76.

FU, X., HELMERS, C., & ZHANG, J. 2011 The two faces of foreign management capabilities: FDI and productive efficiency in the UK retail sector *International Business Review*, 21 (1): 71-88

GIRMA, S. & WAKELIN, K. 2007. Local productivity spillovers from foreign direct investment in the U.K. electronics industry *Regional Science and Urban Economics*, 37: 399-412

GÖRG, H. & STROBL, E. 2001. Multinational Companies and Productivity Spillovers: A Meta-Analysis *Economic Journal*, 111, 723-739.

GÖRG H, GREENAWAY D. 2004. Much ado about nothing? Do domestic firms really benefit from foreign direct investment? *World Bank Research Observer*, 19(2): 171-197.

HASKEL, J. E., PEREIRA, S. C. & SLAUGHTER, M. J. 2007. Does inward foreign direct investment boost the productivity of domestic firms? *Review of Economics and Statistics*, 89, 482-496.

KATHURIA, V. 2002. Liberalisation, FDI, and productivity spillovers—an analysis of Indian manufacturing firms. *Oxford Economic Papers*, 54, 688-718.

KELLER W., & YEAPLE, S. R. 2009. Multinational enterprises, international trade, and productivity growth: firm level evidence from the United States. *The Review of Economics and Statistics* 91 (4), 821–831.

KONINGS, J. 2001. The effects of foreign direct investment on domestic firms. *Economics of Transition*, 9, 619-633.

KOTABE, M., MARTIN, X., & DOMOTO, H. 2003. Gaining from vertical partnerships: Knowledge transfer, relationship duration, and supplier performance improvement in the US and Japanese automotive industries. *Strategic Management Journal*, 24, 293–316

Kosova, R. 2010. Do foreign firms crowd out domestic firms? Evidence from the Czech republic *The Review of Economics and Statistics*, 92(4): 861–881

KUMAR, N. & AGGARWAL, A. 2005. Liberalization, outward orientation and in-house R&D

activity of multinational and local firms: A quantitative exploration for Indian manufacturing. *Research Policy*, 34, 441-460.

LALL, S.V., KOO, J., & CHAKRAVORTY, S. 2003. Diversity Matters: The Economic Geography of Industry Location in India *World Bank Policy Research Working Paper* 3072

LEVINSOHN, J. & PETRIN, A. 2003. Estimating production functions using inputs to control for unobservables. Review of Economic Studies, 70, 317-342.

MA, X, FITZA, T.W. & TONG, M. 2013. How much does subnational region matter to foreign subsidiary performance? Evidence from Fortune Global 500 Corporations' investment in China *Journal of International Business Studies*, 44: 66–87

MA, X., DELIOS, A., & LAU, C-M. 2013, Beijing or Shanghai? The Strategic Location Choice of Large MNEs' Host-Country Headquarters in China. *Journal of International Business Studies*, 44(9) - 953-961

MARIN, A. & SASIDHARAN, S. 2010. Heterogeneous MNC subsidiaries and technological spillovers: Explaining positive and negative effects in India. *Research Policy*, 39, 1227-1241.

MCDERMOTT, G. A., & CORREDOIRA, R. A. 2010. Network and composition, collaborative ties, and upgrading in emerging market firms: Lessons from the Argentine autoparts sector. *Journal of International Business Studies*, 41, 308–329.

MCEVILY, B., & ZAHEER, A. 1999. Bridging ties: A source of firm heterogeneity in competitive capabilities. *Strategic Management Journal*, 20, 1133–1156

MUKIM, N. & NUNNENKAMP, P. The Location Choices of Foreign Investors: A District-level Analysis in India *World Economy*, 886-918

OPP, M.M. 2010 Expropriation risk and technology *Journal of Financial Economics*, 103, 113-129

RUGMAN, A. 2010. Reconciling internalization theory and the eclectic paradigm *Multinational Business Review*, 18 (2): 1-12

SAJARATTANOCHOTE, S. & POON, J. P. H. 2009. Multinationals, Geographical Spillovers, and Regional Development in Thailand. *Regional Studies*, 43, 479-494.

SIA NEWSLETTER, DEPARTMENT OF INDUSTRIAL POLICY AND PROMOTION. 2010. Accessed online at http://dipp.nic.in/English/Publications/SIA_Statistics/AnnualIssue/2010-11/index.htm on 28th June, 2011.

SIDDHARTHAN, N. S. & LAL, K. 2004. Liberalisation, MNE and Productivity of Indian Enterprises. *Economic and Political Weekly*, 39, 448-452.

SMEETS R. 2008. Collecting the pieces of the FDI knowledge spillovers puzzle. *World Bank Research Observer* 23(2): 107-138.

SJOHOLM, F. 1999. Technology gap, competition and spillovers from direct foreign investment: Evidence from establishment data. J*ournal of Development Studies*, 36, 53-73.

SPENCER, J. W. 2008. The impact of multinational enterprise strategy on indigenous enterprises: Horizontal spillovers and crowding out in developing countries. *Academy of Management Review*, 33, 341–361.

STORPER, M. & VENABLES, A. J. 2004. Buzz: face-to-face contact and the urban economy. *Journal of Economic Geography*, 4, 351-370.

UN POPULATION DIVISION WORLD URBANIZATION PROSPECTS (2009) Accessed online at http://esa.un.org/unpd/wup/index.htm on 20th June, 2011.

WANG, C., DENG, Z., KAFOUROS, M. I., CHEN, Y 2012. Reconceptualizing the spillover effects of foreign direct investment: A process-dependent approach *International Business Review*, 21, 452-464

WEI, Y. & LIU, X. 2006. Productivity spillovers from R&D, exports and FDI in China's manufacturing sector. *Journal of International Business Studies*, 37, 544-557.

WOOLDRIDGE, M. J. 2002. Econometric Analysis of Cross Section and Panel Data, Cambridge, The MIT Press.

WOOSTER RB, DIEBEL DS. 2010. Productivity spillovers from foreign direct investment developing countries: A meta-regression analysis. *Review of Development Economics*, 14(3): 640-655.

ZHANG, Y., LI, H., LI, Y., ZHOU, L-A. (2010) FDI Spillovers In in Emerging Market: The Role Of Foreign Firms' Country Origin Diversity And Domestic Firms' Absorptive Capacity S*trategic Management Journal*, 31, 969-989