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Do Foreign Ownership Modes Matter for FDI Spillovers?

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Introduction

The welfare-enhancing role of spillovers from foreign direct investment (FDI) in a host country generates significant interests and debates among policymakers, long after a wide range of regulatory changes in favour of FDI in the late 1980s and the 1990s. The expectation of positive spillovers reinforces the development of government policies to attracts multinational enterprises (MNEs) to the host country. However, as is documented in surveys of the literature on FDI spillovers (Görg and Strobl, 2001; Havránek and Irsová, 2012; Meyer and Sinani, 2009; Wooster and Diebel, 2010), the empirical evidence on FDI spillovers is rather mixed. The surveys highlight two important factors that might offer the explanations of 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 and Spatareanu, 2008). As argued by Görg and Greenaway (2004), MNEs may be effective at preventing spillover effects of firm-specific assets. This is connected to the ownership strategies of MNEs that often use wholly owned subsidiaries (WOS) to better control the technologies they transfer to their foreign locations. Second, absorptive capacity of domestic firms and the strength of linkages between domestic and foreign firms are critical for spillovers. However, studies taking these factors into consideration are sparse. According to Havránek and Irsová (2012), among 1205 horizontal spillover estimates from 52 studies, only 5.7 per cent and 7.8 per cent control for absorptive capacity of domestic firms.

Three generic foreign ownership modes are possible. Besides WOS, firms can also use majority foreign-owned joint ventures (MAJVs) or minority foreign-owned joint ventures (MIJVs). A few studies that consider foreign ownership mode to be an important factor in influencing spillovers (e.g. Abraham, Konings and Slootmaekers, 2010; Javorcik and Spatareanu, 2008) argue that spillovers from foreign-owned joint ventures (JVs) may be higher than those from

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WOS because the network connections of domestic partners in JVs to other domestic firms provide effective mechanisms for the diffusion of technologies from foreign-owned affiliates (FOAs) to domestic firms. In the case of WOS, the control of knowledge-based assets (KBAs) limits spillover effects (Javorcik and Spatareanu, 2008). The connection between ownership mode and spillovers is, however, more complicated than is implied by this view. Although the ability of domestic firms to gain access to the MNEs' pools of knowledge is likely to be better in the case of JVs, the pool of knowledge available for spillovers is possibly more conducive in WOS than in JVs. The greater degree of control afforded by WOS is likely to induce MNEs to transfer more and higher quality technologies, thereby creating a larger 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. Moreover, there may be differences between MAJVs and MIJVs. The linkages that domestic partners in JVs have to other domestic firms may be stronger in MIJVs than in MAJVs (Ramachandran, 1993) because the domestic partner in a MIJV often has frequent and deeper interactions with domestic agents (domestic competitors, suppliers etc.). As a result, the potential for diffusion of knowledge externalities from MIJVs may be higher. On the other hand, MAJVs may be more likely to receive newer and more advanced technologies than MIJVs are, providing better knowledge pools that permit access to a higher quantity and quality of KBAs than is the case for MIJVs. Existing studies consider either MAJVs vs. MIJVs (Dimelis and Louri, 2004) or WOS vs. JVs without clearly distinguishing between MAJVs and MIJVs (Abraham et al., 2010; Javorcik and Spatareanu, 2008). This study includes all three generic ownership modes and uses a better definition of foreign-ownership mode than existing studies used. The improvement in definition in this study (following Ayyagari, Dau and Spencer, 2009 and 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 and 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.

In addition to the knowledge pool of FOAs and their linkages to domestic firms, the role of absorptive capacity is also considered to be of importance in the existing studies (e.g. Barrios and Strobl, 2002; Damijan, Knell, Majcen and Rojec, 2003; Girma, 2005; Griffith, Redding and Reenen, 2003; Haskel, Pereira and Slaughter, 2007; Kokko, 1996; Liu and Buck, 2007; Zhang, Li, Li and Zhou, 2010). Absorptive capacity refers to the ability of an organisation to identify, assimilate and exploit

knowledge from the environment (Cohen and Levinthal, 1989). It is contended that firms must have an adequate level of absorptive capacity to benefit from FDI spillover effects. However, the empirical findings are mixed. In many of these studies, absorptive capacity is proxied by the technology gap between the foreign and the domestic firms, R&D intensities of domestic firms or human capital embodied in domestic firms. The strength of such approaches lies in the focus on technological ability or resources required for knowledge absorption. However, whether such measures are effective in capturing absorptive capacity is debatable. Haskel et al. (2007), Girma (2005), Zhang et al. (2010) and Damijan, Rojec, Majcen and Knell (2013) use an alternative approach to control for absorptive capacity by splitting the sample in terms of firm size, and they find smaller firms or plants with a low share of skilled workers in the workforce lack the necessary absorptive capacity to benefit from FDI. Studies using samples of large firms are therefore more likely to capture domestic firms that have absorptive capacity capable of benefiting from spillovers.

This chapter examines the effects of foreign ownership modes on spillovers and, by use of a sample of large domestic firms, takes account of the absorptive capacity factor. A conceptual model explores the possible implications for knowledge pools, linkages with domestic firms and the level of ~~competitions~~ associated with different foreign ownership modes. A sample of large firms of the Indian manufacturing industry provides the data to test for the relationship between foreign ownership modes and spillovers. The chapter is organised as follows. Section 2 reviews the existing literature on FDI spillovers in terms of foreign ownership modes, which leads to the development of a conceptual model. Section 3 describes data and research methodology. It is followed by section 4, which discusses how the findings relate to the research propositions along with the theoretical and policy implications of the results. Section 5 provides a conclusion.

FDI spillovers: theoretical review and context-setting

International business theory suggests that MNEs must possess firm-specific advantages (FSAs) in the form of new or advanced technologies and/or marketing and management know-how to overcome '*liability of foreignness*' (Dunning and Lundan, 2008). Such FSAs, particularly in the form of KBAs, imply that there is potential for spillovers because of the public goods nature of non-proprietary knowledge and/or market failures of some form in protecting proprietary knowledge. These FSAs not only exert competitive pressures on domestic firms but also enhance the existing knowledge pool of the host country and thereby increase the potential for spillovers to domestic firms in the host country. In this process, the net impact of competitive pressure and unintended knowledge transfer by FOAs to domestic firms defines spillovers.

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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 imitate product and process technologies possessed by FOAs through 'reverse engineering'. Akin to this '*reverse engineering*', the domestic firms may also benefit from the presence of FOAs through imitation of managerial and organisational innovation (Ben Hamida and Gugler, 2009). Labour mobility effects arise when skilled employees that are trained in FOAs move away from their employers to commence with entrepreneurial ventures or work for other local employers (Lipsey and Sjöholm, 2004). The entry of MNEs into an industry could also generate '*fresh winds of competition*'. However the net impact could be ambiguous. On one hand, the entry of MNEs 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 MNEs increases competition in output and input markets. Competition in output market may reduce a domestic firm's market share, forcing them to produce less output and thereby pushing up their average costs (Aitken and Harrison, 1999). Competition in input market such as labour markets may lead to an increase in wages and better employee compensation (Driffield and Taylor, 2000). This is likely to be unfavourable to domestic firms and can have a negative effect on their productivity.

Foreign ownership modes and FDI spillovers

The conventional argument is that spillovers from JVs are higher than those from WOS (Abraham et al., 2010; Javorcik and Spatareanu, 2008). This is because the network connections of domestic partners in JVs to other domestic firms provide an effective mechanism for diffusion of technology and know-how from FOAs to domestic firms, whereas WOS are used by MNEs to maintain control of their KBAs and prevent leakage of know-how (Desai, Foley and Hines, 2004; Ramachandran, 1993), which limits spillovers from WOS. However the link between foreign ownership modes and FDI spillovers is more complicated and will be considered in more depth below.

The empirical evidence on spillovers from foreign ownership modes is scant and the findings are mixed. Dimelis and Louri (2004) detect no significant effect from MAJVs in Greece but find positive effects for '*small*' Greek firms from the presence of MIJVs. Blomström and Sjöholm (1999) reveal insignificant intra-industry spillovers from both JVs and WOS in Indonesia, whereas Javorcik and Spatareanu (2008) show negative spillovers for both JVs and WOS. In the case of China, Abraham et al. (2010) find evidence of positive spillover effects for JVs and negative effects from WOS, whereas in another study on China, Tian (2010) reports positive spillovers from both equity and non-equity JVs and no significant effects from WOS. The inconclusive empirical findings again point

out the need for a conceptual model to elucidate the possible effects of foreign ownership modes on FDI spillovers. This requires consideration of the characteristics of knowledge pools, the strength of linkages and the competition effects associated with foreign ownership modes.

Knowledge pools and FDI spillovers

The transfer of KBAs enhances knowledge pools in FOAs, which enable them to offset 'liability of foreignness' when competing in a host country (Dunning and Lundan, 2008). Since WOS enable better internalisation of KBAs and provide greater control over these assets than JVs (Buckley and Casson, 1976), MNEs are likely to transfer technologies of newer vintage through WOS and older technologies through JV (Mansfield and Romeo, 1980). MNEs may also commit more resources to transfer KBAs to WOS (Blomström and Sjöholm, 1999) and thus increase the quality, volume and speed of technology transfer in WOS compared to JVs (Mansfield and Romeo, 1980). Moreover, the source of technological know-how in WOS that is available, albeit imperfectly (because of the low level of localisation), for domestic firms to access and to learn from is more potent (Tortoriello and Krackhardt, 2010).

While WOS receive newer and sophisticated technologies than do MAJVs (Ramachandran, 1993), MAJVs receive more mature technologies than MIJVs (Almeida and 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, increase with the degree of foreign ownership in FOAs – that is, pools are smaller in MIJVs, intermediate in MAJVs and larger in WOS.

Linkages and FDI spillovers

The linkages or network connections of FOAs with other domestic firms in an industry can also affect the extent of FDI spillovers. Although knowledge pools play a vital role, the extent of their '*diffusion*' or '*leakage*' is likely to occur when these linkages/network connections are deep enough to permit knowledge diffusion. Linkages are likely to affect FDI spillovers in two ways. First, they provide opportunities for domestic firms to catch up technologically (Meyer and 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 information flow conduits that channel non-redundant information benefits to host-country firms – for example, learning about new best practices and techniques (McEvilly and 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. WOS have weaker linkages than JVs as their degree of local embeddedness is low, and they also tend to protect their KBAs by minimising threats to the appropriability of know-how. Thus, the opportunities for spillovers from WOS through linkages is likely to be marginal, whereas JVs tend to facilitate spillovers as they are more embedded in the host-country market (Belderbos, Capannelli and Fukao, 2001; Chen, Chen and Ku, 2004; Eberhardt, McLaren, Millington and Wilkinson, 2004; Wei, Liu, Wang and Wang, 2012) and can quickly respond to local conditions (Inkpen, 2000; Zhou and 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, relative to MAJVs. For example, 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.

Competition effects and FDI spillovers

Chen (1996) introduces two firm-specific and theory-based constructs – market commonality and resource similarity. 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) posits that the severity of competition co-determines the degree of commonality and resource similarity. A JV with stronger linkages is likely to facilitate knowledge diffusion and exploit compatible resource/assets between partners (Inkpen, 2000; Kogut and Zander, 1993) than is a WOS. Thus, a JV is likely to tap into the sourcing networks of its domestic partners, leading to high-level resource similarity with other domestic firms (e.g. Belderbos et al., 2001; Eberhardt et al., 2004; Wei et al., 2012).

In terms of market commonality, JVs are more likely to exert stronger competitive pressure on domestic firms than WOS, 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 and Chen, 2005). Within WOS, greenfield WOS are keen on launching standardised product lines belonging to their corporate parents to better exploit FSAs (Rugman, Verbeke and Nguyen, 2011). This might augment the extent of

Table 13.1 Postulated effects on foreign ownership modes of key factors affecting spillovers

Ownership Modes	MIJV	MAJV	WOS
Knowledge Pool	Low	Intermediate	High
Linkages	High	Intermediate	Low
Competition	High	Intermediate	Low

'*liability of foreignness*' in WOS, thereby thwarting their efforts to compete for higher sales compared to JVs. WOS established through acquisition are more likely to have higher level local embeddedness than greenfield WOS and could embark on the transfer of KBAs more suited to local conditions, which might stimulate greater degree of industry competition. That said, in terms of market similarity, the competition effect resulted from the presence of WOS is likely to be severe and could be a similar level to that from the presence of JVs if acquisitions account for a majority of WOS in a host country[1].

In the context of FDI spillovers, industry competition is likely to display both positive and negative effects (Blomström and Kokko, 1998). Positive effects emerge when domestic firms are able to adjust input costs *vis-a-vis* their output and respond effectively to growing market share of FOAs, the failure of which leads to the loss of market share, the reduction in profit and ultimately the exit from the market. In line with the discussion above, it is postulated that MIJVs display higher competition effects, followed by MAJVs and then by WOS, subject to the mix of greenfield or acquisition WOS.

The arguments outlined above provide the basis for a conceptual framework on potential spillovers under different foreign ownership modes (see Table 13.1).

Data and methodology

Data sources

The main data source is the Prowess database of the Centre for Monitoring Indian Economy (CMIE). This database provides information on domestic firms and FOAs of MNEs listed on India's Stock Exchanges. It includes large firms that account for 75 per cent of all corporate taxes, more than 95 per cent of excise duty and 60 per cent of all savings of the Indian corporate sector (Marin and Sasidharan, 2010), 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 the management of human capital, to improve firm productivity (Bloom and Van Reenen, 2007). As a result, 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 FDI spillovers with a focus on large firms could

be considered as the most plausible scenario. The Prowess database is extensively used, and there is a large number of firm-level published studies using this database (e.g. Balakrishan, Pushpangadan and Babu, 2000; Kathuria, 2002; Kumar and Aggarwal, 2005; Marin and Sasidharan, 2010; Topalova, 2004).

National Industrial Classification (NIC) 2008 code for the manufacturing sector is used in this study to categorise industrial groupings. The definition of foreign ownership is foreign equity is equal to or is greater than 10 per cent of the total equity. To supplement missing information in Prowess on the level of foreign ownership, company websites and annual company reports are used. Furthermore, the adjustment of nominal data for sales, assets and expenditures are deflated using the gross domestic product (GDP) deflator and the wholesale price index obtained from the Reserve Bank of India.

In the data cleaning and inputting process, firms that did not report or that 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.

Model estimation

The assessment of FDI productivity spillover effects – that is, productivity growth of domestic firms caused by FDI presence – requires estimates of the total factor productivity (TFP) of firms. Problems 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 that might result from negative values in the proxy investment variable. Very few firms exited the dataset, which provides another reason to use the LP method. The LP method of estimating TFP for two-digit level industry production functions provides the data for the dependent variable.

The control variables include competitive characteristics of industries (industry concentration and import penetration ratios (IMP)) and key conditions in domestic firms that affect absorptive capacity (R&D intensity (RD) and firm scale (SCALE)). Industry concentration is measured with Herfindahl index

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(HHI). The RD and SCALE variables are proxies for the firms' own innovation effort and scale effect, respectively.

The baseline model is:

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

$\ln TFP_{ijst}$ is the logarithm of the TFP of domestic firm i in industry j, in state s, at time t. 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 three-digit industry (employment); the share of total sales by MNEs in the three-digit industry (total sales) and the share of MNEs fixed assets in the three-digit industry (fixed assets). The study measures spillovers from WOS, MAJVs and MIJVs in the same way as FDI spillovers, by changing the shares of all MNEs to the shares of WOS, MAJVs and MIJVs in the three-digit industry, respectively. The measurement of foreign ownership modes in this study updates Javorcik and Spatareanu (2008) by using foreign ownership levels of promoters' equity share rather than both promoters' and non-promoters' equity share. This definition allows for the determination of the degree of direct control over KBAs that are likely to be exercised by foreign parents. A majority of the existing studies have failed to address this issue and therefore are likely to elicit biases on the extent of control of KBAs in FDI spillover. This leads to the following model:

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

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

Equations (1) and (2) are estimated 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. These factors could be connected to things such 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.

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Following Aitken and Harrison (1999), Javorcik (2004) and Haskel et al. (2007), the first-differencing model is estimated, which involves the loss of 225 firms from the sample but generates 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). As argued by Javorcik (2004), 'the examination of longer differences gives relatively more weight to more persistent changes in the variables of interest and hence reduces the influences of noise'. This approach is consistent with previous studies on FDI spillovers, and thus, the discussion involves the use of first differencing.

Another econometric issue is selection bias, which may occur due to firm entry and exit but may simply reflect some firms choosing not to report. To address this issue, we maintain the use of original unbalanced panel, as suggested by Levinsohn and Petrin (2003). The final econometric issue is the multicollinearity between explanatory variables. We checked both the correlation matrix and variance inflationary factors and found this is not a concern. For brevity, the test results are not reported but are available upon request.

Results and discussions

TFP estimation results

Table 13.2 presents a summary of TFP in terms of industry and ownership mode. It is clear that FOAs do not always have higher productivity than domestic firms have. 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 are higher than that of FOAs. This trend is prominent in the case of highly concentrated industries and industries employing low-income and unskilled workers (Chari and Gupta, 2008). A possible explanation is that 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. The FOAs in these industries encounter effective monitoring of labour regulations and therefore are unable to utilise similar strategies.

FDI spillovers estimation results

Table 13.3 reports the results for FDI spillovers. Columns 1–3 present the results without reference to foreign ownership modes and columns 4–6 show evidence with reference to foreign ownership modes. Columns 1–3 reveal that there are

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Table 13.2 TFP estimation results

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

significant and positive spillover effects on domestic firms' TFP when total sales and fixed assets measures are used. Columns 4–6 reveal the identification of both negative and positive spillovers when using a comprehensive definition of foreign ownership modes that includes WOS, MAJVs and MIJVs. WOS have positive spillovers with total sales and fixed assets measures, and MAJVs have positive spillover effects in all three measures. The findings of positive spillovers from MAJVs are consistent with Abraham et al. (2010) and Tian (2010). However, in contrast to findings of negative effects from WOS in Javorcik and Spatareanu (2008) and Abraham et al. (2010), this study finds that WOS are also

Table 13.3   Foreign ownership modes and FDI spillovers

FDI Spillover Variable Measurement	(1) Employment	(2) Total sales	(3) Fixed assets	(4) Employment	(5) Total sales	(6) Fixed assets
FORFP	0.038	0.158**	0.154**			
	[0.059]	[0.063]	[0.066]			
WOS				0.028	0.167**	0.322***
				[0.077]	[0.065]	[0.096]
MAJV				0.136**	0.249***	0.232***
				[0.065]	[0.083]	[0.085]
MIJV				−0.424***	−0.355***	−0.119
				[0.156]	[0.120]	[0.115]
HHI	0.027	0.013	0.019	0.022	−0.001	−0.014
	[0.073]	[0.072]	[0.073]	[0.074]	[0.074]	[0.076]
IMP	0.231**	0.229**	0.240**	0.205**	0.246**	0.234**
	[0.102]	[0.101]	[0.101]	[0.096]	[0.102]	[0.096]
RD	0.116***	0.112***	0.130***	0.115***	0.115***	0.137***
	[0.042]	[0.040]	[0.042]	[0.043]	[0.042]	[0.041]
SCALE	−0.014*	−0.012*	−0.013*	−0.012*	−0.011	−0.012*
	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Regional effects	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
N	3652	3652	3652	3652	3652	3652
R^2	0.281	0.281	0.282	0.283	0.282	0.284

Note: 1. Dependent variable is the logged TFP calculated using Levinsohn and Petrin (2003) procedure; 2. Robust standard errors clustered by industry-year in brackets; 3. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

associated with positive spillover effects. Finally, MIJVs display negative and significant effects for employment and fixed assets measures. This contradicts previous studies, such as by Dimelis and Louri (2004), which reveal positive and significant spillovers for MIJVs. The results for MAJVs are perhaps more robust because positive associations were identified for all measures of spillovers, whereas WOS and MIJVs are picked up by two of the measures.

The results for control variables reveal that industry competition effects (Herfindahl index and import penetration) are consistent across all specifications, with the former having insignificant effects and latter being positive and significant. R&D intensity has a positive effect on TFP, whereas the impact of SCALE is negative across all specifications.

Discussion

The findings reported in this chapter add to the literature that suggests that models of spillovers need further development to enable better identification of spillovers (Crespo and Fontoura, 2007; Marin and Sasidharan, 2010). This

study finds that spillovers are contingent on foreign ownership modes of MNEs. Positive intra-industry spillovers exist for large Indian firms from WOS and MAJVs, but negative effects arise from MIJVs. The results suggest that accounting for foreign ownership modes, based on a fuller and appropriate classification (promoters rather than non-promoters equity share), enables a more detailed identification of spillovers than seems to be the case in studies that do not account for this factor in deciding on foreign ownership mode.

The results indicate that MAJVs have robust spillover effects on domestic firms compared to WOS. This could be because MAJVs are characterised by well-developed linkages and fairly large and high-quality knowledge pools. It is likely that WOS have larger and better quality knowledge pools than MAJVs, but they perhaps have lower linkages to domestic firms. Moreover, moderate competition arising from the presence of MAJVs also incentivises domestic firms to better adapt to competition and improve their productivity. The results of the positive spillover effects for WOS in Indian industries imply that the large knowledge pools offset the lower level of linkages. The higher level of competition, when compared to MAJVs, that's generated by WOS also favours domestic spillovers from these types of JVs.

The capture of spillovers from WOS through only two measures may arise from differences in protection of intellectual property and in competition, as compared with MAJVs. It is possible that WOS 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, WOS may be associated with the transfer of inferior (non-proprietary) technologies, and therefore, the quality of knowledge pools might be low. On the other hand, 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 and Tingvall, 2011). While the competition effects arise from rivalry between MIJVs and domestic firms for market share, the spillover effect arises from the presence of knowledge pools and linkages with domestic firms (Chang and Xu, 2008). 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 and Spatareanu, 2010). Another way of interpreting this is that the high competition effects and the presence of strong linkages in MIJVs are not enough to offset the likelihood of lower knowledge pools in MIJVs, relative to WOS and MAJVs. In essence, the findings provide support for some of the key arguments developed in the conceptual model.

Conclusion

Governments in developing countries, including India, often favour JVs over WOS, believing that the active participation of domestic firms will bring greater benefits to other domestic firms. The findings of this study provide partial support for this. Policymakers, however, also need to understand that restrictions on foreign ownership could prevent accumulation of larger and deeper knowledge pools associated with technology transfer in WOS. Spillovers from these knowledge pools are likely to result in higher benefits to domestic firms when compared to JVs. Our findings reveal that the overall outcomes for knowledge spillovers may depend on whether there is high knowledge transfer potential in WOS, which may outweigh the lower transfer of KBAs but better network linkages in JVs. In the case of India, 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 FOAs do not, in most cases, overcome the disadvantages of the lower knowledge transfers that MIJVs receive. For MAJVs, however, it is possible that these network linkages compensate or indeed outweigh the benefits of higher knowledge transfers in WOS. The findings undermine conventional wisdom in Indian FDI policy targeted at restricting foreign ownership to JVs in certain industries in order to protect domestic firms from adverse competition. This policy may, however, reduce the quality of technology transfer that is possible in the case of WOS.

The interpretation of the results requires caution. First, our findings draw on a specific spectrum of the Indian economy – that is, 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. Third, the results may be affected by specific characteristics of the Indian business environment arising from the nature of institutional systems leading to particular business and organisational cultures, extensive protection of some industries, low levels of technological dynamism and weak enforcement of some regulations. Fourth, the conceptual model is based the arguments that both knowledge transfer potential and linkages of FOAs are important for spillovers, and competition effects generated by FOAs influence the extent to which domestic firms will learn and enhance productivity. Unfortunately the data needed to test for the presence and weight of the above qualitative factors for spillovers is unavailable. Therefore, it is not possible to identify the relative importance of these factors.

Despite these limitations, we believe our findings could help discussions on how to improve FDI and related policies in order to enable higher spillovers to domestic firms. Policies to encourage domestic firms to effectively interact with

WOS might enhance the prospects of positive spillovers from the deep knowledge pools that such FOAs are likely to develop in host locations.

Appendix: variable definition and measurment

Variable	Definition and measurement
LTFP	log(TFP)
HHI	The sum of squared firm shares of sales in a three-digit industry
IMP	The ratio of imports to domestic demand in a three-digit industry
RDINT	The ratio of domestic firm's R&D expenses to sales
SCALE	The ratio of domestic firm's sales to average three-digit industry-level sales
FORFP	Foreign spillover variable proxied by the share of FOAs in a three-digit industry total or in a three-digit industry within a region, excluding the focal firm
WOSFP	WOS spillover variable proxied by the share of wholly foreign-owned subsidiary in a three-digit industry total or in a three-digit industry within a region, excluding the focal firm
MAJVFP	MAJV spillover variable proxied by the share of MAJVs in a three-digit industry total or in a three-digit industry within a region, excluding the focal firm
MIJVFP	MIJV spillover variable proxied by the share of MIJVs in a three-digit industry total or in a three-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 per cent in the Prowess database and who are defined as a wholly owned subsidiary by the firm's website and secondary sources.
- Majority foreign-owned joint ventures (MAJVs): firms whose foreign promoters' equity share ranges from 51 per cent to 99 per cent in the Prowess database.
- Minority foreign-owned joint ventures (MIJVs): firms whose foreign promoters' equity share ranges from 10 per cent to 50 per cent in the Prowess database.

Information regarding foreign 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 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

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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 and 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 reputable website http://www.securities.com to check the information found on the SEBI website.

Note

1. This applies to the knowledge pools, linkages and resource similarity arguments as well but to a lesser extent.

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