

FDI SPILLOVER BETWEEN MANUFACTURING-SERVICE SECTORS: MYTH OR REALITY?

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Abstract

There is a rich body of research on FDI spillovers, however, the findings are not conclusive. The mixed results suggest that FDI spillovers may come from different sources other than three mostly mentioned in literature (i.e. demonstration, competition, and employee movement). This paper proposes that the external effects also happen between different sectors. Put differently, local manufacturing firms can be, either positively or negatively, impacted by foreign service firms; and local service firms can be, in the same vein, affected by foreign manufacturing firms. The mechanism for this is described via three new channels: servitization, manufacturization, and knowledge-intensive business service. The findings show that there exists FDI spillovers between manufacturing and service sectors.

Keywords: *FDI spillovers, servitization, manufacturization, knowledge-intensive business service.*

1. Introduction

Theory suggests that impacts of Foreign Direct Investment (FDI) manifest themselves in the form of spillovers (or externalities) that have important influences on the performance of domestic firms (Eapen, 2012). However, empirical findings on FDI spillovers are conflicting. Although many studies find positive and significant FDI spillovers, other analyses find that FDI spillovers have either negligible or even negative influence on firm performance (Barbosa & Eiriz 2009). These mixed results hold for both developed and developing economies (Görg & Greenaway 2004), suggesting that there is no universal relationship between inward FDI and host firm performance.



These mixed results and the need for better perception of FDI spillovers encourage the author to conduct this study. There are many studies in literature investigating FDI spillovers

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in the manufacturing sector, however few researches examines the interaction between the manufacturing and services sectors in shaping FDI spillovers and performance outcomes. While firm performance depends on a spectrum of factors (Mors, 2010), firms in two sectors are often considered as independent from each other. In other words, the two sectors might be seen as independent ones so no impact from one to the other sector can be observed. Thus, it is likely that earlier studies are distorted by the fact that they do not account for all channels of FDI spillovers.

MNEs in service sector are initially viewed as less capable of transferring knowledge to indigenous firms than manufacturing ones. MNEs in service sector are often the driving force behind the transfer of new technologies and skills (Miozzo & Grimshaw 2008). Our study examines FDI spillovers between manufacturing and service industries in the UK. This may enable us to better understand the interaction between the two sectors and may assist host-country policy to balance the contribution of both sectors, rather than focus on the services – which is what typically happens in developed countries such as the US and the UK (Pisano & Shih 2009).

To this end, we develop a theoretical framework to explain and test cross-sector FDI spillovers. To conceptualize how FDI spillovers impact firm performance, the framework accounts for diverse sources of external knowledge that local firms may access. By conceptualising the spillovers that take place through the interaction between the manufacturing and service sectors, it extends prior theory on FDI that largely focuses on three channels of spillovers (namely, competition, demonstration effects and

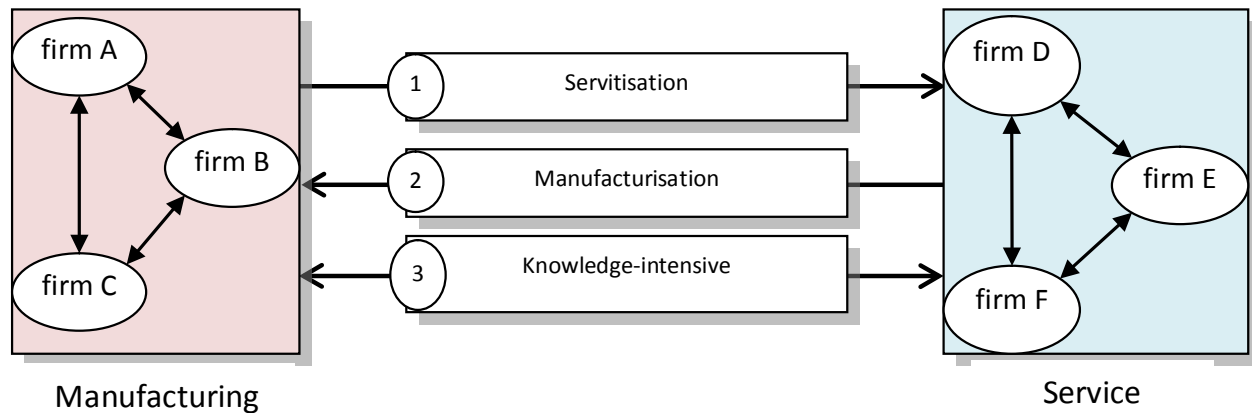
employees mobility). This is important for international business (IB) theory and also offers meaningful empirical knowledge as to how managers and policy makers can enhance the positive impact and minimize the negative influence of the inward FDI.

2. Theoretical framework and research hypotheses

The key premise of this study is that cross-sector spillovers from MNE manufacturing affiliates to local service firms and from MNE service affiliates to domestic manufacturing firms play a role in explaining variations in performance of firms in the two sectors. This proposition rests upon the view that there is a strong relationship between manufacturing and service, as the two often have to be integrated to offer innovative products to the market. Manufactured products rely on various services such as design, software, market research and financial services. Similarly, it is often impossible to deliver services without the use of manufactured goods (Daniels & Bryson 2002). For this reason, we argue that the ability successfully to integrate the two can be a strong source of competitive advantage for a firm, and a starting point for cross-sector spillovers. We conceptualize that such cross-sector spillovers between manufacturing and service firms take place through three channels, depicted in Figure 1. These channels foster the relationship of, and decrease the borders between, manufacturing and service. This interaction facilitates learning and knowledge exchange from one sector to another, thus generating spillover effects. The next sections flesh out these aspects of our framework.

The role of servitisation and manufacturisation

Figure 1: Theoretical framework for cross-sector spillovers



The term servitisation refers to the fact that service is increasingly integrated into manufacturing products to add more value to traditionally pure manufacturing goods (Baines et al. 2009). Manufacturing firms move vertically (downstream & upstream) to have more control over their supply chain by increasing the range of services offered. This makes them closer to their customers, able to satisfy their needs and enhance the performance of the business. For example, while cars are traditionally seen as manufacturing products, they now come with various embedded services like GPS navigation system, security tracking devices, integrated mobile phones and financial services (Daniels & Bryson 2002).

The embedded services in manufactured products may start from the simplest discrete forms such as book keeping and administration to the most complicated ones such as R&D, marketing and product design (Schmenner 2009). Due to the development of mass production and transportation technology as well as the requirement of customisation, selected services have gradually been bundled into the manufacturing system by integrating forward into distribution and sometimes backward into supply. There has been an

acceleration of servitisation in manufacturing where “the manufacturing process is becoming a service process” (Daniels & Bryson 2002, p. 987).

Service was traditionally seen as a necessary evil of marketing strategy (Gebauer et al. 2006), and/or simply as an add-on to manufacturing products (Gebauer & Friedli 2005). However, this perception has changed dramatically in favour of the opinion accepting service as an integral part of the corporate strategy of manufacturing companies, acting as a profit driven and differentiating factor in an entirely integrated product and service bundle (Baines et al. 2009). Manufacturing firms consider service as a critical part adding value to their final products (Gebauer et al. 2006) where the manufactured product is only a part of the offering (Oliva & Kallenberg 2003). It may act as the most powerful tool to open the door to future business (Wise & Baumgartner 1999). Competition and institutional changes encourage manufacturing firms to move up and down the value stream adding service components to create desired outcomes for customers (Miller et al. 2002).

In parallel to servitisation, *manufacturisation* is the process where service is systematically

planned to offer more designed, standardized outputs as in manufacturing (Sundbo 1994). Manufacturisation is an inevitable trend in the service industry and can be a strong competitive weapon of firms. It pushes service companies closer to manufacturing firms, facilitating knowledge exchange between two sectors. Increasing competition requires service companies to utilise both types of technology (hard and soft) originating from manufacturing. As knowledge generated by manufacturing MNE affiliates is relevant and useful to service firms, it can easily be absorbed, generating cross-sector FDI spillovers. This process materializes via the presence of *tangibilisation*.

Tangibilisation refers to the increasing trend of tangibility in service, which plays a critical role in the success of service firms (Tarn 2005). Tangibility is an integral part of service and has been widely examined in service marketing literature (Parasuraman et al. 1988; Chang & Tarn 2008). Although tangible and intangible aspects are normally considered to be two ends of manufacturing-service spectrum, most services are today offered as a mixture of tangible and intangible elements that forms the continuum of the two (McQuarrie & Phillips 2005). Globally, fierce competition puts more pressure on service companies to increase the tangible contents of many aspects of their service product as they try to win customers' hearts and minds. Levitt (1981) points out that service firms assure prospective customers about their non-pretestable intangible products by going beyond the prescribed presentation of specifications and advertisements. Tangibilising and concretising services by making routinely intangible promises tangible help to improve

competitiveness. For example, hotels tangibilise their intangible product by wrapping drinking glass with fresh transparent plastic bags and placing "sanitized" bands on toilet seats, signalling that the room is totally cleaned and ready for use. They also provide other visible materials embedded with their corporate images such as brochures, leaflets, toothbrushes and toothpaste, etc. for their customers.

Servitisation and tangibilisation blur the boundary between manufacturing and service, facilitating knowledge spillovers across sectors. These two processes strengthen and enrich the internal capacity of local firms by borrowing and internalising the shared and non-shared resources of their foreign partners. They also enhance cross-sector collaboration, helping to improve the knowledge base of businesses, which strengthens the local service firms' ability to internalise FDI externalities.

The role of knowledge-intensive business service (KIBS)

Knowledge-intensive business service (KIBS) is defined as "economic activities which are intended to result in the creation, accumulation or dissemination of knowledge" (Miles et al., 1995, p.18). KIBS is widely used to refer to a group of business services which offer knowledge-content services to other organisations, for example: accounting and management consulting services, advertising and marketing research, IT services, research and development, engineering and technical services. They are "private companies or organisations who rely heavily on professional knowledge, i.e., knowledge or expertise related to a specific discipline or functional domain to supply intermediate products and

services that are knowledge based” (den Hertog, 2000, p.505).

The increasing role of KIBS is representative of the increasing importance of the knowledge-based economy, where human capital is central to economic development (Hipp & Grupp, 2005) and knowledge is a basic core of competencies. In addition, the trend of outsourcing services that were previously built in-house, the internationalisation of services, the increasing level of global competition and the increasing demand of certain services facilitate the growth of KIBS (Miles, 2005). The growth of KIBS also reflects the upward demand of knowledge inputs in industry, helping them to focus on core competencies and to emphasis intangible elements of products (Miles, 2005), as previously discussed in servitisation section. We argue that KIBS may act as an intermediary, conveying knowledge spillovers from MNE affiliates to local firms.

The importance of KIBS as an agent of innovation is commonly discussed. For example, García-Quevedo & Mas-Verdú (2008) argue that KIBS firms are carriers, facilitators, creators, moulders, and a source of innovation transferring knowledge to their clients when supporting the innovation processes of firms. They collect knowledge from various sources, co-produce knowledge with clients, enrich their internal knowledge base, and disseminate it to other organisations (He & Wong, 2009). KIBS serves as a dynamic source of quasi-generic knowledge, capturing and absorbing the tacit and generic knowledge available in an economy and then spreading it to knowledge seekers (Antonelli, 1998). It links various factors together unintentionally by collecting and sharing knowledge. The

mechanism under which KIBS facilitates knowledge spillovers from foreign firms to local businesses is explained in the following paragraphs.

KIBS are crucial to both foreign and domestic firms. Foreign firms face numerous institutional challenges when doing business in a new host country. The pressure is stronger still in developed countries where the competitiveness of firms depends increasingly on knowledge content of the products (Corrocher, Cusmano, Morrison, 2009). Acting as a “bridge of innovation”, the KIBS helps them to comply with legal regulations (Miles, 2003), to understand better the local markets, customer taste and consumption patterns. KIBS is also beneficial to local firms when offering advice and suggestions on managerial and organisational issues, especially for larger firms (García-Quevedo & Mas-Verdú, 2008). The intermediate role of KIBS in knowledge spillovers is presented through three stages, namely knowledge acquisition, knowledge combination and knowledge transfer.

From the above mentioned section, we will test the following hypothesis:

FDI in the services sector affects the performance of local firms in the manufacturing sector and vice versa (FDI in the manufacturing sector affects the performance of firms in the service sector).

3. Empirical Analysis

Sample and data

Using Thomson One Banker, a panel data of 10-year period (1997–2006) is created including wide range of variables of firms’ value added, capital, employees, and R&D expenditure. Industry-level data

for 16 industries of the UK's inward FDI was collected from the Office for National Statistics (ONS). The datasets were cleaned and depreciated with appropriate depreciation indices, also obtained from the ONS.

The initial sample includes 2,092 firms in various industries in the UK for 10 years from 1997 to 2006. We exclude 420 firms that do not report any of the following variables for the entire 10 years period: employee compensation, net/gross fixed capital stock, R&D expenditure. We exclude another 572 firms that have only one observation (which does not allow us to execute the GLS technique). We also drop 128 outliers of value added that is reported larger than sales. After cleaning, the workable sample includes an unbalanced data set of 1,230 firms with 7,769 observations (an average of 6.3 observations per group).

The model

The econometric framework of production function employed in this study has been extensively used for nearly four decades. We adopt the notion of spillovers used by the Globerman (1979), Blomström & Persson (1983), Kokko (1994), Kafouros & Buckley (2008) and Kafouros et al., (2012). If the presence of foreign investment is found to have a significant positive (or negative) effect on the performance of local enterprises (after accounting for the effects of other variables), it is then concluded that spillovers exist. The logarithmic transformed model after accounting for time (t), industry (j), and firm (i) differences is:

$$q_{ijt} = \beta_0 + \beta_1 k_{ijt} + \beta_2 l_{ijt} + \beta_3 r_{ijt} + \beta fdi_{jt-1,intra} + \beta fdi_{jt-1,inter} + \beta fdi_{jt-1,cross} + D_{time} + D_{industry} + \varepsilon_{ijt} \quad (1)$$

where: k, l, r are capital, labour, and internal knowledge stock of firm.

$fdi_{jt,intra}$ is intra-industry FDI (FDI stocks of industry j at time t where the firm i belongs to)

$fdi_{jt,inter}$ is inter-industry FDI (forward inter-industry FDI stocks of industry j at time t , measured by weighted FDI from industries other than j , which are in the same sector, i.e. manufacturing or services)

$fdi_{jt,cross}$ is cross-sector FDI (forward cross-sector FDI stocks of industry j at time t , measured by weighted FDI from industries other than j of other sector)

The attraction of Equation [1] is that we can measure cross-sector spillovers while controlling for the effects of intra-industry spillovers and inter-industry spillovers and vice versa. This takes consideration of the fact that firms have links with other firms in both the same and outside industries, reflecting a more complete account of the impacts of FDI on firm performance.

Method of estimation

Using the test for autocorrelation in the panel data proposed by Wooldridge (2002), the result rejects the null hypothesis that there is no first-order autocorrelation ($F(1, 1186) = 126.424$; $p = 0.000$). This test indicates the presence of first-order autocorrelation (AR1), implying that the use of OLS regression is least appropriate for our study. In addition, the AR1 may be heterogeneous across panel which might lead to the problem of panel specific AR1 (PSAR1). The likelihood ratio test rejects the null hypothesis that the AR1 coefficients are common across sectors. Moreover, the Breusch-Pagan/Cook-

Weisberg test for heteroskedasticity also rejects the null hypothesis that the variance of the disturbances are homoskedastic ($\chi^2(1) = 565.70, p= 0.000$). Thus, it is likely that both panel specific autocorrelation and heteroskedasticity are present in the data. To deal with these econometric problems, we use the FGLS regression with the appropriate options.

4. Results

Table 1 presents descriptive statistics and correlations for the key variables of the study. Our sample consists of 7,769 observations from 1,230 cases. The correlations among independent variables indicate that there are three cases that are higher than 0.5. The correlations between labour and capital and firm size are high as are the nature of production function and

the close relationship between production inputs and the scale of operation. The correlations between other variables are sufficiently low, therefore not posing significant multicollinearity problems.

The results presented in Table 2 concern the main variables only. The results indicate that indigenous firms experience negative intra- and inter-industry spillovers but enjoy positive externalities from cross-sector spillovers. Foreign investment in one sector positively impacts upon the performance of local firms in other sector. The empirical results of each type of FDI spillovers (i.e. cross-sector, inter-industry, and intra-industry spillovers) in model 1, 2, and 3 are robust. They are also confirmed by an integrated model in Table 2 that includes all the variables simultaneously.

Table 1: Descriptive statistics and correlation matrix

		N	Mean	S.D.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	Value-added	7769	2.4	2.6	-6.9	10.9	1								
(2)	Capital	7769	1.8	3.1	-4.6	11.0	0.8	1							
(3)	Labour	7769	2.1	2.5	-4.6	9.2	0.9	0.8	1						
(4)	Internal knowledge	7769	-2.2	2.1	-5.2	9.6	0.3	0.2	0.3	1					
(5)	Firm size	7769	0.3	0.4	0.0	1.0	0.7	0.7	0.8	0.4	1				
(6)	Market competition	7769	-5.6	2.5	-10	-0.5	0.2	0.3	0.3	0.1	0.2	1			
(7)	Intra-industry FDI	7769	10.2	0.9	6.7	11.8	-0.2	-0.2	-0.2	-0.2	-0.2	0.0	1		
(8)	Inter-industry FDI	7769	9.0	1.1	6.1	10.7	-0.1	-0.1	0.1	0.0	0.0	-0.1	0.4	1	
(9)	Cross-sector FDI	7769	8.2	0.7	7.0	10.6	0.2	0.1	0.1	0.4	0.3	0.0	-0.4	-0.1	1

Note: Firm size is a dummy. All other statistics are in logarithmic form.

Cross-sector FDI spillovers

Consideration of cross-sector FDI spillovers is of particular importance as it can contribute to IB literature by connecting

research on the manufacturing with that on services sectors. Model 1 of Table 2 presents the findings for cross-sector FDI spillovers.

Table 2: Intra-, inter-industry and cross-sector FDI spillovers

Variable	Model 1	Model 2	Model 3	Model 4
Cross-sector FDI	0.04025			0.0304
	(2.903)**			(2.11)*
Inter-industry FDI		-0.1154		-0.1376
		(-36.6)***		(-37.5)**
Intra-industry FDI			-0.0538	-0.06965
			(-13.13)**	(-18.07)***
<i>Control variables</i>				
Capital	0.2655	0.2637	0.2646	0.2644
	(194.7)***	(180.2)***	(232.7)***	(166.5)***
Labour	0.6963	0.6974	0.6992	0.696
	(333.1)***	(311.9)**	(360.3)***	(337.7)***
Knowledge stocks	0.01671	0.01458	0.01419	0.0167
	(10.49)***	(9.041)***	(9.858)***	(9.3)***
firm size	0.09824	0.09656	0.08978	0.09793
	(15.34)***	(13.72)***	(11.16)***	(17.9)***
Market concentration	-0.01204	-0.01272	-0.01159	-0.0111
	(-50.92)***	(-19.1)***	(-42.46)***	(-18.36)***
Time & industry dummies	Included	Included	Included	Included
Observations	7769	7769	7769	7769
Ward chi2	2384905	2084769	4223117	1597120
<i>p</i>	0.000	0.000	0.000	0.000

Note:

a) The dependent variable is value added. Figures in parentheses are t statistics.

b) * 5% level of significance, ** 1% level of significance, *** 0.1% level of significance

Table 2 shows that the effect of cross-sector FDI spillovers is positive and statistically significant. This finding indicates that when cross-sector FDI increases by a 1 percent (with all other inputs held constant), local firm performance will increase by 0.04025 percent. The fact that the t-statistic of this coefficient is 2.903 indicates that the impact of cross-sector FDI on indigenous firm performance is statistically significant at 1 percent level ($p < 0.01$). Thus, Hypothesis 1 cannot be rejected at this stage. Local firms benefit from

FDI that occurs in cross-sector industries. Any increase in international investment in the services sector, for example, leads to an increase in performance of local firms in the manufacturing sector.

The result confirms the theoretical predictions of our framework that the interaction between manufacturing and services positively affects local firm performance. This is because services are embedded automatically in tangible products that are, in turn, becoming important inputs for

service providers. A large proportion of value added in manufacturing output is attributable to services and vice versa (OECD 1992). The results also support the underlying assumption of our framework that firms not only draw on their own knowledge base but also search for a reservoir of external knowledge, pointing to the importance of distant knowledge in improving firm performance. Because of the increasing complexity of new technology, firms find it is necessary to acquire complementary resources from other sector. The finding plays an important role in helping us understand the inter-connection between firms in the manufacturing sector and the services sector. Positive cross-sector FDI spillovers suggest that spillovers are largely endogenous outcomes of the interactions between foreign and local firms in the two sectors (Wang & Blomström 1992). This finding advances IB literature, in which prior research on vertical spillovers has often focused on the linkages between different players in a value chain. Our research broadens our understanding about the importance of the interaction between the two sectors.

The findings indicate that increases in international capital in manufacturing enhance the business performance of local service firms and vice versa. The inter-connection between manufacturing and services signals that a healthy economy could be obtained only when there is a balance in development of the two sectors. This view challenges the common position and practice in developed countries, which emphasises service industries and the notion of knowledge-based economy, and outsources the majority of manufacturing activities to developing countries. This common practice might be harmful to the economy in the long run. It not only diminishes

the manufacturing industries but also weakens the service sector.

The findings can also be interpreted from a different angle. With the positive cross-sector FDI spillovers, a manager of a foreign firm might simply see the research efforts or any technological development of his firm leads to an improvement of performance of his local counterpart in the other sector (Kafouros & Buckley 2008). If the manager considers the risk of technological leakage is low due to indirect competition, he might facilitate the collaboration, which leads to a win-win situation for both firms. Reversely, if he is concerned about the possibility of the technology passing from the local counterpart onto direct local competitors in his sector, he might consider stopping doing business with local firms in the other sector.

Obviously, the positive significant result of cross-sector FDI spillovers offers an insightful view on the importance of FDI in one sector to the performance of local firms in the other sector. We therefore are unable to capture the entire impacts of FDI on national economic development without incorporating cross-sector spillovers in FDI externalities studies.

Inter- and intra-industry FDI spillovers

Model 2 shows the findings for inter-industry spillovers, which stand in direct contrast with several prior studies. The coefficient of inter-industry FDI is negative and significant at 0.1 percent level ($\beta_{\text{inter-industry FDI}} = -0.1154$, $p = 0.000$). The negative impact of inter-industry FDI spillovers in this paper is consistent with the studies of Yudaeva et al. (2003) for the case of Russia, and Javorcik (2004) for the case of minority owned foreign firms in Lithuania but contradicts Buckley et al. (2006) and Liu et al. (2009). Similarly, Model 3 shows that the

parameter of the intra-industry FDI variable is negative and statistically significant ($\beta_{\text{intra-industry FDI}} = -0.0583, p = 0.000$). Local firms are negatively influenced by the presence of foreign firms in the same industry. The negative effect of intra-industry FDI is in line with Aitken & Harrison (1999) and Djankov & Hoekman (2000), who argue that local firms are unable to benefit from FDI spillovers in the same industry.

5. Discussion and conclusions

Our study rests upon the proposition that indigenous firm performance is a function of external knowledge generated by MNEs in the other sector. This paper develops a theoretical and empirical framework on cross-sector FDI spillovers. The study finds strong evidence to support the notion that FDI spillovers do exist. However, in contrast to the belief that FDI brings benefits to local businesses, this study shows that FDI spillovers are a multi-dimensional phenomenon: while the effects of intra- and inter-industry spillovers are negative, indigenous firms enjoy positive externalities from cross-sector FDI. The findings indicate that local firms benefit from the presence of foreign firms in unrelated sectors. The interaction and collaboration between the manufacturing and service sectors plays a key role in facilitating positive externalities. The positive and significant results indicate the availability of the construction of cross-sector FDI spillovers, which has significant power in explaining the variance of local firm performance.

The contribution lies in demonstrating that FDI spillovers are not only limited to the impacts of intra- and inter-industry FDI but also broadened to cross-sector FDI, pointing to the importance of the distant knowledge in improving performance. Prior studies

focus on intra-industry and/or inter-industry externalities, and overlook the impact on performance arising from economic activities of MNEs in the other sector. Our framework overcomes this limitation by incorporating all three types of FDI spillovers into a single research framework, better capturing the impacts of FDI on domestic firm performance. This helps deepen our understanding of how three types of FDI spillovers jointly shape performance. This study extends prior work by exploring, theoretically and empirically, the inter-connection between manufacturing and services in explaining cross-sector FDI spillovers. It adds to the current literature by capturing more fully the theory and impacts of FDI in the host country, enabling us to connect scattered research on manufacturing and services. This study is related to, but distinct from, the literature on specific channels of FDI spillovers. The benefit of this approach is that it takes into consideration various dimensions of FDI and, thus, provides a more complete account of its impacts on indigenous firms. Therefore, our study is a step forward in evaluating the influence of foreign firm business activities on local firm performance.

The central message of this article is that domestic firms experience negative externalities from intra- and inter-industry FDI, but enjoy positive spillovers from cross-sector FDI. This indicates that firm performance is positively affected by international investment in unrelated sectors. At the same time it decreases when there is a presence of foreign firms in the same or related industries. In our sample, the negative effects of inter- and intra-industry spillovers are strong enough to offset the benefits of positive cross-sector externalities. The negative results of intra-industry and inter-industry FDI

externalities may be caused by the power of market competition, technological leakage and/or the ‘localisation’ of foreign firms in setting up their own economic clusters. The results offer both theoretical and practitioner oriented implications.

Implications for theory

Empirical findings of this study offer an insightful explanation of the complicated nature of externalities. We extend previous findings by offering insights into the relationship between manufacturing and service sectors which up until now have remained under-theorized. The results complement other studies as they show that FDI spillover is a complicated phenomenon that generates some positive effects through one type of interaction between businesses (i.e. cross-sector) and simultaneously produces negative effects via other types (i.e. inter- and intra-industry). In other words, local firms benefit substantially from the knowledge generated by foreign firms in the opposite sector, but do not reap rewards from foreign businesses in the same or related industries. The findings also challenge the current research strand on FDI spillovers. To provide a complete account of FDI spillovers, we examine three types of spillovers (i.e. intra-, inter-industry and cross-sector) simultaneously. This is important because if only one or two types are examined without controlling for the others, we may end up with biased results. Put differently, it would be misleading if we fail to separate international capital into subcategories of intra-industry, inter-industry, and cross-sector FDI. It is therefore advisable to examine the indirect effects of FDI in all three channels, and most importantly cross-sector spillovers. The findings of the study suggest that FDI technology spillovers involve complicated

processes. Both positive and negative effects exist concurrently. Each of the specific channels should be clearly identified, and each of the specific effects carefully examined, before any meaningful conclusions about FDI technology spillovers can be reached.

Further, we contribute to the literature by expanding the theory of the three channels of spillovers. We theorise that FDI spillovers take place not only within and between industries in the manufacturing sector, but also between industries in different sectors. Although we are unable to test each channel proposed in this study (a common drawback of prior studies and also a suggestion for future research), it helps bridge the gap in explaining the mechanisms of knowledge flow between the manufacturing and service industries.

Implications for practice

This study offers interesting findings concerning the gains or losses from inward FDI. The results show that it is may be too naive to conclude that inward FDI is the ‘Holy Grail’ for all economies. Obviously, spillovers have multiple dimensions, and local firms can either benefit or suffer from the presence of foreign firms. Therefore, gains from inward FDI, if any, are not free, especially for developed countries that are rich in technology. In our study, the negative effects are strong enough to offset the benefits. The findings have several implications for policy-makers. Central and local government spend significant resources on schemes that attract inward FDI, hoping to help indigenous firms improve performance via externalities (Barbosa & Eiriz 2009). The negative results indicate that they should not simply take for granted the idea that inward FDI can generate positive spillovers. FDI may have potential costs in the form of negative intra- and inter-industry spillovers. However,

local firms do benefit from international investment in the other sector. Therefore, to help local firms obtain the most from FDI, FDI policy should pay attention to the balance between manufacturing and services.

When resources shift to technologically stagnant industries (i.e. services), the national aggregate growth rate will decline accordingly (Baumol et al. 1989). As such, to prevent the occurrence of this negative effect, the government should encourage international investors to boost the development of the manufacturing sector in order to have the best interaction between the two sectors and to facilitate positive externalities to local firms. By promoting coordination between the two sectors, the government can intervene in order to maximise positive (and minimise negative) aspects of spillovers from FDI.

The most important issue that policymakers should consider is how government can create favourable conditions in which spillovers can take place. If we consider a broader perspective, negative spillovers can be seen as a reasonable “cost” to the host country as they obtain other benefits, which are not limited to the positive externalities of cross-sector FDI. The negative externalities of FDI can be seen as a process of “natural selection” that helps dismiss weak firms and retain strong firms. This is an effective selection mechanism that will keep the most efficient firms in business (Barbosa & Eiriz 2009). Competitive pressure from the presence of foreign companies offers strong firms momentum to become stronger by upgrading their current technology and management skills, but increases the vulnerability of weak firms. □

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