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# Determinant Factors of FDI Spillovers – What Do

## We Really Know?

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**Summary.** — The evaluation of aggregate FDI spillovers to domestic firms has yielded mixed results. However, analysis has recently taken a step forward with the evaluation of the factors determining the existence, dimension, and sign of FDI spillovers. We survey the arguments that support these factors and the empirical evidence already produced. FDI spillovers depend on many factors, frequently with an undetermined effect. The absorptive capacities of domestic firms and regions are preconditions for incorporating the benefits of these FDI externalities. Regarding the remaining factors, the results show contrary effects or, in some cases, are still insufficient to draw reliable conclusions.

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### 1. INTRODUCTION

In most countries, foreign direct investment (FDI) is considered to be an important component of development strategy and policies are designed accordingly in order to stimulate inward flows. A strong motivation for this interest is the possible existence of FDI productivity spillovers, a concept that embodies the fact that MNEs (multinational enterprises) own technology, interpreted in a broad sense that includes “both product, process, and distribution technology,” as well as management and marketing skills” (Blomström & Kokko, 1998, p. 247), which can be transmitted to domestic firms and thereby raise their productivity level. In fact, the literature on the determinants of FDI emphasizes that multinational firms generally have firm-specific advantages that might be related to their large endowments of intangible assets, such as superior technologies, patents, trade secrets, brand names, management techniques, and marketing strategies, among others (Dunning, 1993). Once a multinational has set up a subsidiary,

some of these advantages may not be totally internalized and thus spill over to domestic firms. The spread of productivity spillovers is thus a matter of externalities being transmitted from established foreign producers to domestic ones.

Obviously, FDI presents a greater potential for knowledge transfer through spillover effects if MNEs display higher productivity levels than the domestic firms. In spite of the well-known problems associated with their measurement (see, for instance, Arnold & Javorcik, 2004, p. 6), there is a relative consensus in the empirical literature on the superiority of MNEs’ productivity, as shown, for example, in Dinnels and Louvi (2002), Torvik (2004), and Prencea,

Fontoura, and Crespo (2006).<sup>1</sup> It has also been demonstrated that multinational companies tend to invest more in personnel training in host countries than local firms.<sup>2</sup>

Since the pioneering study of Caves (1974), the occurrence of FDI productivity spillovers has been widely investigated.<sup>3</sup> However, empirical evidence, as surveyed, for instance, by Görg and Greenaway (2004) and Crespo and Fontoura (2006), has provided mixed results. With regard to the studies that were carried out with what is generally considered to be the appropriate data, that is, panel data with disaggregation at the firm level, the former survey found evidence of positive productivity spillovers in only seven cases. The latter authors, surveying a wider sample, reported a negative impact in 12 studies, while the existence of productivity spillovers was not confirmed in 31 cases and only 17 studies pointed to the existence of a positive impact.

Perhaps the most important lesson to be learned from the existing studies is that it is necessary to advance the “global evaluation” of whether aggregate FDI spillovers exist or not by conducting a detailed analysis of “the different circumstances and policies of countries, industries, and firms that promote or obstruct spillovers” (Lapsey, 2002, p. 32). In fact, tangible efforts have recently been made to increase knowledge of the factors that determine the existence, sign, and magnitude of FDI spillovers. This literature allows us to conclude that positive spillovers may affect only a subset of firms, so that aggregate studies may underestimate the true significance of such effects.

While the main focus of previous surveys was the above-mentioned “global evaluation” of FDI productivity spillovers, this paper aims to provide a comprehensive description of the determinant factors of this phenomenon, both in terms of the arguments that have been proposed so far and the empirical evidence already produced.

The remainder of the paper is organized as follows: Section 2 presents the channels through which domestic firms may benefit from FDI spillovers; Section 3 analyzes the factors that determine these spillovers; Section 4 focuses on the empirical evidence on this question; and Section 5 concludes.

### 2. CHANNELS OF TECHNOLOGICAL DIFFUSION

FDI spillovers can occur through five main channels: demonstration/imitation, labor

mobility, exports, competition, and backward and forward linkages with domestic firms.

Demonstration (by MNEs)/imitation (by domestic firms) is probably the most evident spillover channel (Das, 1987; Wang & Blomström, 1992). The introduction of a new technology into a given market may be too expensive and risky for a domestic firm to undertake, due to the costs inherent in acquiring its knowledge and the uncertainty of the results that may be obtained. If a technology is successfully used by a MNE, domestic firms will be encouraged to adopt it. Barrios and Strobl (2002) suggest that the relevance of this effect increases with the similarity of the goods produced by the two types of firms in the case of spillovers related to product and process technology. There are, however, other types of technology that may also spill over, such as management and marketing technology; in these cases, similarity of products may not be important.

The second channel is related to the possibility of domestic firms hiring workers who, having previously worked for a MNE, have knowledge and experience of the technology and are able to apply this in the domestic firm (Fosfuri, Motta, & Ronde, 2001; Glass & Saggi, 2002).<sup>4</sup> Nevertheless, it is important to stress a possible negative impact arising through this channel, as MNEs may attract the best workers from domestic firms by offering higher wages (Sinani & Meyer, 2004). The influence of labor mobility on the efficiency of local firms is difficult to evaluate, as it involves tracking the workers in order to investigate their impact on the productivity of other workers (Saggi, 2002). Consequently, it is not surprising that there is a shortage of detailed studies in relation to this particular aspect.

Exports are a third channel through which the presence of MNEs may benefit domestic firms (Aitken, Hanson, & Harrison, 1997; Greenaway, Sousa, & Wakelin, 2004). Several studies have highlighted the positive impact of MNEs on the export capacity of domestic firms (Aitken *et al.*, 1997; Kokko, Zejan, & Tansini, 2001; Rhee, 1990). Among other aspects, export activity involves costs associated with the establishment of distribution networks, transport infrastructures or knowledge of consumers’ tastes in foreign markets (Greenaway *et al.*, 2004), which MNEs are more able to afford. By following the export processes of foreign firms (through imitation or, in specific circumstances, through collaboration), domestic

firms may reduce the entry costs into the foreign market.<sup>5</sup> The gains obtained in this way may have favorable repercussions on the productive efficiency of domestic firms.

The increased competition induced by MNEs is a fourth channel of FDI spillovers (Markusen & Venables, 1999; Wang & Blomström, 1992). Competition in the domestic economy between MNEs and domestic firms is, on the one hand, an incentive for the latter to make a more efficient use of existing resources and technology or even to adopt new technologies. On the other hand, it may restrict the market power of domestic firms.<sup>6</sup> However, the efficiency of domestic firms may also be negatively affected through this channel, as the presence of MNEs may imply significant losses of their market shares, forcing them to operate on a less efficient scale, with a consequent increase of their average costs (Aitken & Harrison, 1999; Harrison, 1994).

A final channel concerns the relationships that domestic firms establish in local markets as suppliers to MNEs (backward linkages) or customers of intermediate inputs produced by them (forward linkages),<sup>7</sup> as pointed out, for instance, by Lall (1980) and formalized by Rodríguez-Clare (1996), Markusen and Venables (1999), and Lin and Saggi (2004).

Let us first consider the case of backward linkages. With increasing returns to scale, the presence of MNEs may benefit domestic suppliers if it increases the demand for local inputs. In their attempts to assure a certain quality pattern, MNEs may also benefit domestic suppliers in several ways: providing technical support for the improvement of the quality of goods, or for the introduction of innovations (e.g., through personnel training), providing support for the creation of productive infrastructures, and for the acquisition of raw materials, as well as support at the organizational and management levels, among other aspects (Lall, 1980). We should also consider the possible increase in the efficiency of domestic firms brought about by the competition among them to become MNE suppliers. Furthermore, Matouschek (1999) considers that the benefits for domestic suppliers resulting from the presence of MNEs may be extended to other domestic firms that produce end-user consumer goods.

Regarding the channel of forward linkages, the most evident link is observed in the MNEs' supply of higher quality inputs and/or at a lower price to domestic producers of end-user con-

sumer goods (Markusen & Venables, 1999). Nevertheless, the possibility cannot be excluded that the upgrade of production quality may lead to an increase in prices. If domestic firms do not have the capacity to benefit from this upgrade of quality, they will suffer the negative effects associated with increased costs (Javorcik, 2004b).

This short summary of the spillover channels clearly shows the existence of several, and frequently opposing, effects, making it difficult to formulate a clear expectation as to their global impact. Besides, "it is (...) difficult to distinguish one from the other, since the mechanism of technology spillovers from FDI is complex and often interdependent" (Kinoshita, 2001, p. 5).

### 3. DETERMINANT FACTORS OF FDI SPILLOVERS - THE MAIN ARGUMENTS

It has recently been shown that the existence, sign, and magnitude of FDI spillovers to domestic firms depend on a multiplicity of factors related to the characteristics of the MNEs and of foreign investment, as well as on the characteristics of the host countries, sectors, and firms. In this section, we summarize the various factors that have so far been taken into consideration.<sup>8</sup> We organize them according to five categories: absorptive capacity and technological gap, regional effect, domestic firm characteristics, FDI characteristics, and other factors.<sup>9</sup>

#### (a) Absorptive capacity and technological gap

The determinant factor of FDI spillovers that has been analyzed in most detail is the absorptive capacity of domestic firms, together with the influence of the technological gap between foreign and domestic firms. Using the definition of Narula and Marin (2003), "absorptive capacity includes the ability to internalize knowledge created by others and modifying it to fit their own specific applications, processes, and routines" (Narula & Marin, 2003, p. 23). It is maintained that domestic firms must have a moderate technological gap *vis-à-vis* MNEs in order to benefit from the higher technology associated with MNEs. If the technological gap is too small, MNEs will transmit few benefits to the domestic firms (Kokko, 1994). According to several authors (Findlay, 1978; Wang & Blomström, 1992), the magnitude of

FDI spillovers will increase with the technological gap, as it increases the opportunities for domestic firms to obtain higher levels of efficiency *via* imitation of foreign technology (technological catch-up hypothesis). However, the gap must not be too wide, as this will impede the domestic firm from absorbing the MNEs' technological advantage. The argument is that technology diffusion is not an automatic and direct effect deriving from the existence of a knowledge base in the possession of other firms: it also requires the recipient to have the capacity to absorb and adopt such technology (Kinoshita, 2001; Lapan & Bardhan, 1973; Perez, 1997; Wang & Blomström, 1992). A commonly used indicator of the absorptive capacity of domestic firms is their level of R&D spending (Cohen & Levinthal, 1989; Griffith, Redding, & Reenen, 2003).<sup>10</sup>

The concept of absorptive capacity has been expressed not only at the microeconomic level, but also at the macroeconomic level. It has usually been associated with the development level of a particular country (Borenstein, Gregorio, & Lee, 1998; Xu, 2000) and specifically with its human capital stock. Moreover, Blomström, Kokko, and Zejan (1994) and Kokko and Blomström (1995) show that MNEs use more advanced technology in countries and sectors that have a higher proportion of skilled labor.

Other factors, which we can label as "support infrastructures," have also been included in the concept of absorptive capacity. For example, Hermes and Lensink (2003) argue that a developed financial system favors the occurrence of FDI spillovers as it reduces the risks inherent in the investment made by domestic firms seeking to imitate the MNEs' technologies or to upgrade the qualifications of their employees.<sup>11</sup>

The relationship between the development level of the host country and the magnitude of FDI spillovers has been established through two additional arguments. Firstly, in the context of the labor mobility channel, a lower spillover level should occur in less developed countries. On average, MNEs pay higher wages than domestic firms, among other reasons in order to avoid high labor turnover (Lipsey & Sjöholm, 2004). In less developed countries, this wage differential is usually higher, making more difficult the transfer of workers from MNEs to domestic firms. Secondly, it is considered less likely that less developed countries (with a lower absorptive capacity) will attract MNEs that have strong linkages with local suppliers and customers (Rodríguez-Clare, 1996).

#### (b) Regional effect

Recently, it has been suggested that spillovers have a circumscribed geographical dimension or, at least, that they decrease with distance (Audretsch, 1998; Audretsch & Feldman, 1996). The reason is related to the fact that the channels of technological diffusion analyzed in Section 2 are reinforced at the regional level (Girma, 2003; Girma & Wakelin, 2001; Jordaan, 2005; Torvik, 2004): labor turnover and demonstration effects are limited in space; vertical linkages are mainly regionally confined, due to transport costs; finally, the competition effect is stimulated at a more circumscribed scale, both in its positive and negative dimensions.

#### (c) Domestic firm characteristics

Another factor that may affect the occurrence of spillovers is related to the export capacity of domestic firms. It has been argued that domestic exporting firms already face significant competitive pressure in the foreign market and thus, MNEs operating in the domestic market are not expected to create relevant additional pressures (Blomström & Sjöholm, 1999). An additional reason is that as a firm increases its exporting capacity, the relevance of the domestic market decreases and the positive effects associated with the competition from MNEs become less important. In view of this, FDI spillovers will be more evident in the case of non-exporting domestic firms. In contrast to this relationship, it is suggested that domestic firms already exposed to foreign competition will probably have a greater capacity not only to absorb foreign technology but also, as emphasized by Barrios and Strobl (2002) and Schoors and van der Tol (2002), to counter the competition provided by MNEs in the local market, thereby, precluding a negative impact through the competition channel.

The size of domestic firms has also been linked to their capacity to obtain the benefits associated with the presence of MNEs. Small firms (in terms of employment or production) may be less apt to compete with MNEs, suffering more significant losses (Aitken & Harrison, 1999). Furthermore, such firms may not have a sufficient production scale to imitate some of the technologies introduced by MNEs. Therefore, larger firms can be expected to benefit more from the presence of foreign companies.

There is also some discussion on the capacity of different kinds of recipient firms to benefit from the spillover effect (Li, Liu, & Parker, 2001; Sinani & Meyer, 2004). In particular, it has been shown that FDI in transition economies seems to have a different impact on privately owned and state-owned local firms, on account of their distinct characteristics.

#### (d) FDI characteristics

Is FDI from different countries equally likely to generate spillovers to domestic firms? The different sources of FDI can be associated to several factors, such as culture, language, levels of technology, modes of technology transfer, distance, and the sectoral structures of FDI, among other aspects. Barga (2003) argues that differences according to nationality are expected, since FDI from distinct sources may come with different levels of technology and different modes of transfer. Considering the cases of Japanese and US FDI to domestic firms in Indian manufacturing, the author assumes that Japanese FDI is usually a transfer of technology of standardized products, which begins in those industries where the technological gap between the providing and receiving countries is small. For its part, the US FDI is usually undertaken in more technologically sophisticated industries, with as yet undifferentiated products that are more capital-intensive, which implies a large gap between the existing technology of the host developing country and that which is transferred through the US FDI. Accordingly, FDI spillovers to the domestic firms are expected to be greater in the Japanese case.

Still regarding the role of nationality, Rodriguez-Clare (1996) posits that backward linkages depend positively on transport costs (and, hence, probably on distance) between the home country of the MNE and the host country. If these costs are high enough, the MNE may have an incentive to buy inputs in the host country. According to Rodriguez-Clare (1996), cultural, social, and legal differences have a similar effect. Nevertheless, we should also consider that differences in cultures and languages may limit the domestic firms' capacity to assimilate the new technologies and that therefore, the net impact of these elements is ambiguous. Additionally, Javorcik, Saggi, and Spataranu (2004) suggest that preferential trade agreements of which some, but not all, investor-countries are members are also likely

to affect the sourcing patterns of foreign affiliates. MNEs of countries excluded from these agreements are likely to prefer a larger share of intermediate inputs sourced by host country suppliers to those that may trade them on preferential terms.

FDI spillovers to domestic firms are also influenced by the entry mode of FDI. It has been asserted that when the MNE enters through a merger or acquisition, technological transfer occurs gradually, restricting, or at least delaying, spillovers. On the contrary, when FDI occurs through greenfield investment, the introduction of the new technology is instantaneous (Bracconi, Elholm, & Midekfar-Knarvik, 2001). Note, however, that in the latter entry mode, the MNE typically adopts the host country's technology and establishes a technological system that may differ substantially from that in the host country, thus limiting the scope for spillovers. When FDI occurs through a merger or acquisition, the starting point is the host country's technology, which creates a wider potential for FDI spillovers through demonstration.

In addition, it should be considered that if FDI takes place through a merger or acquisition, the MNE, due to its pre-integration in the local economy, is expected to establish wider inter-sectoral linkages with domestic firms than when entry occurs through greenfield investment, thus expanding the scope for spillovers.<sup>12</sup>

Another determinant factor of FDI spillovers is the degree of foreign ownership of investment projects (Blomström & Sjöholm, 1999; Dimelis & Louri, 2002; Javorcik & Spataranu, 2003). Minority foreign ownership reduces the incentive for the parent firm to transfer more advanced technology to its affiliate due to its reduced control over the management. In view of this, the technology transferred increases with the degree of foreign ownership, making it more possible for spillovers to occur (Ramachandran, 1993). However, one can also assume that a larger share of domestic ownership allows for easier access to foreign technology, as in this case it is more difficult for the parent to control personnel assignments in order to prevent leakage of important technology (Takti, 2005). Furthermore, affiliates with a greater degree of domestic participation can be expected to create more inter-sectoral linkages with the local economy, as was confirmed by Toth and Serjien (1999) in the Hungarian case.

#### (e) Other factors

Some authors have stipulated a relation between the trade policy environment and the indirect benefits from FDI. Bhagwati (1978) has hypothesized that compared to an import-substituting strategy, an outward-oriented regime will probably attract a greater volume of FDI,<sup>13</sup> since the size of the domestic market is not a constraint and investment resources may be more efficiently used, considering that the environment is relatively free from distortions. Both reasons contribute to the expectation that FDI spillovers are likely to be positive under a regime geared to export promotion and far less so, or even negative, under an import substitution regime.

However, Kolko *et al.* (2001) assert that in order to succeed in countries with an inward-oriented trade policy, MNEs are likely to use technologies that are not available to domestic firms (or, at least, only in a weakly developed form), thus creating a vast potential for the existence of demonstration and learning effects. With an outward-oriented trade policy, MNEs will base their advantage mainly on their international distribution and marketing networks, and less on new production technologies, although in this case FDI spillovers can also occur through exports, the expectation is that they will be of lesser importance than with a restrictive trade policy regime. It has also been argued that MNEs that are more focused on the local market establish greater inter-sectoral relationships with domestic firms, increasing the possibility of spillovers (Altenburg, 2000).

Moreover, it has been observed that if MNEs produce for the foreign market and domestic firms for the local market, the possibility of spillovers *via* imitation will be diminished if goods produced for the local market use different production processes to goods produced for export (due to differences in quality or other characteristics), as emphasized by Javorcik (2004b). However, if the requirements imposed by MNEs serving foreign markets are greater, more significant adjustments may be induced in local suppliers and the potential for spillovers will be increased.

Intellectual property rights are another important factor, not only increasing the probability of MNEs investing in a given country (Lee & Mansfield, 1996), but also increasing the likelihood of the occurrence of spillovers, since if protection is weak, there will be a tendency to attract FDI mainly of a low-technol-

ogy level (Javorcik, 2004a). Furthermore, MNEs will tend to opt for fully owned investment projects (Sherwood, 1990).<sup>14</sup> Javorcik (2004a) also suggests that a weak protection of intellectual property rights will induce MNEs to prefer investment projects centered preferentially on distribution and not on local production. All these factors work against the emergence of spillovers. Nevertheless, intellectual property rights can be considered an additional cost for those who imitate and consequently, they will be seen as a restriction on the potential benefits for domestic firms. In the context of a model in which MNEs choose between exports and FDI, Markusen (2001) concludes that the optimal solution for the domestic economy is a level of intellectual property rights equal to the minimum amount needed to guarantee entry.

Two other factors that determine the existence of FDI spillovers can be inferred from the model of Fosfuri *et al.* (2001). The first concerns the type of training received by workers at MNEs. If the worker receives training in a more firm-specific technology, local firms have less advantage in obtaining that technology, as it is more costly to adapt it to their own production process. The second is connected with the existence of restrictions on labor mobility, as they limit the transfer of workers from MNEs to domestic firms and, as such, the occurrence of spillovers through the labor mobility channel.

In the model proposed by Wang and Blomström (1992), if MNEs face stronger competition in the local market, they will be forced to use more advanced technology in order to assure their market share.<sup>15</sup> In such case, spillovers can be expected to increase with competition in the local market. However, the high level of competition may also lead MNEs to protect their technological advantage in a more active way, as shown, for instance, in the model of Fosfuri *et al.* (2001).

Another element obviously affecting the possible emergence of inter-sectoral spillovers is an intensive use of intermediate inputs by MNEs, since this is a critical condition for the occurrence of spillovers through backward linkages (Rodriguez-Clare, 1996).

What motivates a MNE when it decides to locate abroad also affects the existence of FDI spillovers. The motivation implicit in most studies in this literature is based on the argument of traditional FDI theories that "when firms establish affiliates abroad and become

multinational (...), they bring with them some amount of firm-specific technology that constitutes their firm-specific advantage and allows them to compete successfully with local firms which have a superior knowledge of local markets, consumer preferences, and business practices" (Blomström & Sjöholm, 1999, pp. 915-916). FDI is thus technology-exploiting, according to this view. Nevertheless, there is empirical evidence showing that FDI may rather be technology-sourcing, in the sense that it is attracted by the wish to gain access to the technological advantages of the host country (Kogut & Chang, 1991; Neven & Siotis, 1996). Fosturi and Motta (1999) consider this latter possibility in theoretical terms. In their model, the affiliate of a MNE, by locating abroad close to technologically advanced local firms, may benefit from spillovers induced by the latter (which may then be transferred to the parent firm). The expectation is, therefore, that spillovers from MNEs to domestic firms will more obviously occur when the traditional motivation for investing abroad prevails, that is, when FDI is technology-exploiting (Driffeld & Love, 2003a, 2003b).

The "value" of the technology (which includes, amongst other elements, its level of innovation) is another determinant factor (and possibly, the most obvious one) of FDI spillovers. On the one hand, it stimulates domestic firms to try to gain access to the technology but on the other hand, it motivates MNEs to protect it (Blomström, Globerman, & Kokko, 2000). Therefore, the impact of this factor is ambiguous.

Finally, there are at least three arguments relating the MNEs' impact to the length of time elapsing after their entry into the local market. Firstly, the MNEs that are more recently established in the host economy will probably make use of more advanced technology (Karpaty & Lundberg, 2004). Assuming that the technological gap of local firms *vis-à-vis* foreign firms allows the former to absorb the newest technology of the latter, this argument points to a negative relation. Secondly, the most recent investments probably have the strongest impact on competition. Note, however, that the impact through the competition channel is ambiguous, as shown in Section 2. Thirdly, spillovers are not instantaneous, since it takes some time before local firms are able to absorb, learn, and copy. This last argument suggests a positive relation, but it may not be necessarily valid, since technology associated with older foreign

investments may already have been learned, absorbed, and copied. To sum up, the relation analyzed is ambiguous. One may conclude that in the context of this time-related determinant factor, a crucial variable that should be identified is the time lag that is required to elapse in order for MNEs' benefits to spill over to local firms.

#### 4. DETERMINANT FACTORS OF FDI SPILLOVERS - THE EMPIRICAL EVIDENCE

In view of the contrasting arguments in the case of many factors presented in the previous section, empirical analysis becomes even more important in order to clarify the determinant factors of FDI spillovers. In this section, we consider the empirical evidence produced in this area.<sup>16</sup>

As the knowledge content of the spillover effect is inherently an abstract concept and thus not directly measurable, the approach usually adopted in the empirical literature consists of capturing this effect in the framework of an econometric analysis in which the labor productivity (or total factor productivity) of domestic firms is regressed on a number of covariates assumed to have an effect on productivity, including the presence of foreign firms. In the present context, we take into account a range of studies which divide the sample in order to evaluate if the impact of the foreign presence on the domestic productivity differs according to the specific factor that determines that division.

##### (a) *Absorptive capacity and technological gap*

As mentioned in Section 3, the determinant factors of FDI spillovers that have been most widely investigated are absorptive capacity (both at firm and country level) and the influence of the technological gap. Hence, it is not surprising that this topic is also the most abundantly analyzed in empirical terms.

The importance of absorptive capacity emerges as a solid conclusion in most studies on this subject. Kinoshita (2001) confirms, with statistical information for the Czech Republic, that domestic firms only benefit from the presence of MNEs when they conduct R&D activities, that is, when they develop the ability to imitate new technologies. R&D activity and

FDI thus appear to be complementary in their effect on the productivity of domestic firms. Similarly, Keller and Yeaple (2003) conclude, for the case of USA, that only firms operating in high technology sectors, that is, in which more is invested in R&D, benefit from positive FDI spillovers. In a sequence of studies analyzing the Indian case, Kanturia (2000, 2001, 2002) separates "scientific" from "non-scientific" sectors and notes that in respect of the "scientific sectors" there is a positive impact in the case of firms with a higher absorptive capacity. The importance of absorptive capacity is also stressed by a vast group of additional studies that also proxy it by the size of firms' R&D expenditure, including those undertaken by Barrios, Dimelis, Louri, and Strobel (2002), Girna (2003), and Karpaty and Lundberg (2004). The work of Danijian *et al.* (2003) is a partial exception to this evidence, as they obtain a positive relation in the cases of Hungary and Slovakia, but a negative one in the cases of Estonia and Latvia.

It has also been shown that the particular characteristics and development level of the region/country are relevant to the occurrence of the spillover phenomenon. According to Ponomareva (2000) and Yudaeva, Kozlov, Malenteva, and Ponomareva (2003), using data for Russia, FDI spillovers depend positively on educational levels in the region considered. Imbrtani and Reganati (1999) consider three large regions in the context of the Italian economy. The results show that only the North-West region (the most dynamic region of the country, in which a large part of the R&D activity carried out by large firms is concentrated) benefits from the foreign presence. Sgard (2001), in a study examining the Hungarian case, also analyzes the differences in the impact of FDI in geographical terms. He considers two regions, one situated between Budapest and the border with Austria, which is more developed than other parts of the country and contiguous with the EU frontier (as it existed, prior to the 2004 EU enlargement), and another region comprising the remaining area toward the borders with Yugoslavia, Romania, and Ukraine. Despite the fact that FDI has a positive impact in both regions, it is stronger in the first one. This last group of studies emphasizes an important observation, namely, that although FDI may work as a convergence mechanism at the national level if it produces significant gains in efficiency for domestic firms, it can also increase domestic inequalities at a re-

gional level. This is a result that certainly justifies further research.

In spite of the strong evidence concerning the relevance of absorptive capacity at both levels of the analysis (micro and macro), "the full potential of the concept of absorptive capacity is yet to be exploited. Future research should explore the concept in more detail to assert what contributes to a strong absorptive capacity on the firm as well on the national level" (Meyer, 2003, p. 22). For instance, Alfaro *et al.* (2004) show the importance of a developed financial system as a condition for obtaining benefits from the presence of MNEs.

As regards the impact of the technological gap between domestic firms and MNEs, Kokko (1994) represents a pioneering contribution. In order to investigate the influence of the technological characteristics of the sectors on the extent of spillovers, he considers three variables: the level of technological complexity (proxied by the amount of patent fees per employee in different industries), the average capital intensity of MNEs and the technological gap (evaluated by the difference in labor productivity between domestic firms and MNEs). The results suggest that an increase in technological complexity and capital intensity makes the occurrence of FDI spillovers less likely, but that the influence of the technological gap is neutral. However, Kokko (1994) also concludes that wide technological gaps, together with large foreign market shares, generate less favorable conditions for the emergence of spillovers since, in this case, MNEs may operate in "enclaves," without connections to domestic firms. Other studies do not allow us to generalize the neutrality of the technological gap as drawn by Kokko (1994). Using data for Uruguay, Kokko, Tansini, and Zejan (1996) distinguish between domestic establishments with small and large technological gaps *vis-à-vis* MNEs operating in the same sector and obtain evidence of positive spillovers only in the first group. The same result emerges from the studies of Kanturia (1998), Girna and Walklin (2000), and Dimelis (2005). In Sjöholm (1999a), the results differ according to the dependent variable used, thereby precluding a clarifying conclusion.

Flôres, Fontoura, and Santos (2002) and Proença, Fontoura, and Crespo (2002) try to identify, for the Portuguese case, the range in terms of productivity within which spillovers are maximized. The results of Flôres *et al.* (2002) suggest that spillovers are maximized

when the average level of domestic productivity is between 50% and 80% of the corresponding productivity level of foreign firms.<sup>17</sup> Proenca *et al.* (2002) conduct a similar exercise, obtaining a range between 60% and 95%. This non-coincidence of results may be due mainly to the different proxies used for the technological gap.

#### (b) Regional effect

The consideration of whether FDI spillovers have a local/regional dimension is one of the factors that enjoys a wider empirical evaluation, although the results are varied.<sup>18</sup> Sjöholm (1999b), Aitken and Harrison (1999), and Yudaeva *et al.* (2003) do not confirm this geographically circumscribed dimension. The first of these studies considers the case of Indonesia and concludes that the variable that measures intra-sectoral spillovers has a positive coefficient at the national level but a negative one when the evaluation is confined to a regional level. Similar results are obtained by Aitken and Harrison (1999) for the case of Venezuela and by Yudaeva *et al.* (2003) with data for Russia.

Other studies draw conclusions to the contrary. Ponomareva (2000), also analyzing the Russian economy, confirms the hypothesis of a regional dimension in the spillover effect. Considering the case of the UK, Girma and Wakeelin (2001) detect a positive impact on the productivity of domestic firms caused by a foreign presence in the same region, both in the sector defined at a 4-digit level (intra-sectoral spillovers) and in the one defined at a 2-digit level (inter-sectoral spillovers),<sup>19</sup> although the effect of the foreign presence outside the region is found to be non-significant. This result is corroborated by Girma (2003).

Torjak (2004) follows the same line of research using statistical information for five countries. The existence of positive spillovers at the regional level is detected in the cases of the Czech Republic and Poland. Nevertheless, when the so-called agglomeration effect is controlled (by taking into account the total number of firms in the region, as an additional independent variable), the positive influence at the regional level only holds firm in the case of the Czech Republic, whilst a negative effect is even detected in the Bulgarian case.

#### (c) Domestic firm characteristics

Bloomström and Sjöholm (1999) investigate if the effect of the presence of MNEs differs

according to whether domestic firms export or are oriented instead toward the domestic market. Using statistical information for Indonesia, they detect a positive effect (significant at the 1% level) in the case of non-exporting firms while, by contrast, the variable is not significant when exporting firms are considered. Following the same line of analysis, Ponomareva (2000) includes a dummy variable equal to one if the domestic firm belongs to a sector exporting over 30% of its production and observes that the spillover effect is higher for non-exporting firms (or those with a low level of exports), thus confirming the results obtained by Bloomström and Sjöholm (1999). However, Sinani and Meyer (2004) fail to find any remarkable difference concerning the impact on the two groups of domestic firms. Schoors and van der Tol (2002) divide their sample into three groups: "closed" sectors (exporting less than one-third of their production), "open" sectors (exporting between one- and two-thirds of their production), and "very open" sectors (exporting more than two-thirds of their production) and find that positive intra-sectoral spillovers only occur in the more open sectors. In the case of inter-sectoral spillovers through backward linkages, the influence of the degree of openness is also clear: it is positive in both the open and very open sectors, but more particularly so in the latter. As far as spillovers through forward linkages are concerned, the effect is negative in both the closed and very open sectors and non-significant in the intermediate group.

Summing up, the contradictory results preclude a clear-cut conclusion with regard to this factor.

Aitken and Harrison (1999) analyze the impact of the firms' size on the existence of FDI spillovers. They distinguish between firms with more than and less than 50 workers and conclude that the impact on the efficiency of domestic firms of the foreign presence at the sectoral level is negative in both cases, but only significant for the smaller firms. This result confirms the idea that such firms have a lower capacity for obtaining positive effects from the presence of MNEs and are less suited to facing competition from MNEs. Nevertheless, considering FDI from Japan and from the rest of the world (mainly Europe), Girma and Wakeelin (2001) conclude that it is small-sized firms which benefit most from FDI spillovers, even if, in the case of FDI from the USA, the impact is not significant for either small or large domestic firms. Similarly, Sinani and Meyer

(2004) find that only small-sized domestic firms (with less than 50 workers) and medium-sized domestic firms (employing between 50 and 100 workers) benefit from FDI spillovers, the effect being greater in the first case; the impact is not significant when larger firms are considered. In short, the evidence concerning this determinant factor is, once more, inconclusive.

Finally, in the case of local firms, private or state ownership appears to determine their capacity to absorb foreign externalities, as shown by Li *et al.* (2001) and Sinani and Meyer (2004). Li *et al.* (2001), in a study on China, observed that state-owned firms gain from FDI through competition with private firms, while the remaining local firms benefit from demonstration and contagion effects from the foreign presence.

#### (d) FDI characteristics

A factor that appears to determine the magnitude of the spillover effect is related to the national origin from which the FDI emanates. Banga (2003) has confirmed that Japanese FDI is more likely to create spillovers for Indian domestic firms than US FDI, as suggested by the differences in the levels of technologies and modes of transferring technologies described above. Using data for the Swedish economy, Karpaly and Lundberg (2004) distinguish between FDI from the USA, Japan, and the rest of the world and, in spite of the fact that FDI spillovers are always significant, the greatest effect occurs with the Japanese FDI. However, Haskel *et al.* (2002) do not confirm the positive role of the Japanese national origin in the UK case. This last study detects evidence of positive spillovers associated with FDI from the USA and France (greater in the French case), a non-significant effect in the case of German MNEs and a negative effect when Japanese FDI is considered. In a study on Romania, Javorcik *et al.* (2004) find that FDI inflows from source countries that do not belong to the same preferential trade agreement as the host country are more likely to be associated with positive inter-sectoral spillovers, thus confirming their hypothesis.

Hu and Jefferson (2002) provide additional evidence in respect to nationality but at the sectoral level. Examining the electronic and textile sectors in China, they found relevant differences between the impact of FDI from Macao, Hong-Kong, and Taiwan in comparison with

FDI from OECD countries. The results show that only FDI from OECD countries has a significant (and negative) effect on the productivity of local firms, which the authors relate to the higher technological level of firms from those countries and the consequent stronger competition in the local market.

Some studies have evaluated the influence on the spillover effect of the degree of foreign ownership of the MNEs' affiliates. The results are mixed. Bloomström and Sjöholm (1999) do not find a significant impact of this determinant factor. This result differs from that obtained by Dimelis and Louri (2002) for Greece. In order to give greater robustness to the results, they use three alternative variables to measure the foreign presence (sales, employment, and capital) and find that the impact of MNEs with minority foreign ownership is clearly greater. Takti (2005), with data for the Indonesian manufacturing sector, also concludes that a greater presence of majority-owned or wholly owned foreign plants reduces the magnitude of spillovers. However, Javorcik and Spatzreanu (2003), working with data for Romania, found that in the case of intra-sectoral spillovers, the impact is positive only when there is no domestic participation. With reference to inter-sectoral spillovers through backward linkages, they obtain a positive effect in the case of firms with domestic participation and a negative one in the opposite case. This last result is corroborated by Javorcik (2004b).

#### (e) Other factors

In order to test whether FDI spillovers are conditioned by the nature of the trade policy regime, Kolko *et al.* (2001), analyzing the Uruguayan manufacturing sector, separated the MNEs established during an import substitution regime (i.e., before 1973) from those established in a more open regime (i.e., after 1973). They obtain a positive coefficient for the variable related to the period and a negative one in the case of the MNEs established in the subsequent period. Therefore, an inward-oriented regime appears to favor the impact of MNEs on the productivity of local firms. However, Kohpaiboon (2006), in a study on Thai manufacturing, by using two alternative measures to proxy the nature of trade policy in an industry (the nominal rate of protection and the effective rate of protection), provides support for Bhagwati's hypothesis that FDI spillovers are

likely to be greater in a policy regime geared to export promotion.

Moreover, other recent studies have indicated that the spillover benefits from FDI may vary according to the market-orientation of the foreign MNEs. Li *et al.* (2001), using Chinese data, distinguished between domestic market-motivated and export-oriented FDI and concluded that domestic firms only benefit, in terms of increased efficiency, in the case of export-oriented FDI. Furthermore, this study shows that the negative effect of competition for domestic firms is restricted to those sectors in which FDI is preferentially oriented toward the domestic market, thus reinforcing the previous conclusion. On the contrary, Javorcik (2004b), with data for Lithuania, find some evidence (albeit weak) to suggest that FDI projects oriented toward the domestic market generate more spillovers.

To sum up, once again, the conclusions from this set of studies do not legitimate an unequal local interpretation.

Another factor that has been analyzed, although to a scarce extent, concerns the MNEs' motivation for investing abroad. The analysis of this factor is, however, faced with an important difficulty: how to measure this motivation? Driffeld and Love (2003a) proxy it with the R&D intensity differential between the host country and the home country, at the sectoral level. The assumption is that if this differential is positive, FDI is technology-sourcing, whereas if the differential is negative, FDI is technology-exploiting. It has been argued that the latter type of FDI is likely to produce greater productivity spillovers to domestic firms, as mentioned in Section 3. Driffeld and Love (2003a) verify this assumption by considering FDI inflows into the UK from 13 countries. They obtain a positive sign in the case of FDI with the traditional motivation (technology-exploiting) and a negative sign in the case of technology-sourcing FDI. Both results are highly significant. Girna (2003) conducts a similar exercise, but with an analysis at the firm level, and broadly confirms these results.

Finally, there is also some evidence, although scant once again, as to whether FDI spillovers depend on the length of time elapsing after the MNEs' entry into the local market. Karpaty and Lundberg (2004), using data for the Swedish economy, show that only the more recently established MNEs (therefore, probably using more advanced technology) generate positive spillovers.

## 5. FINAL REMARKS

In this paper, we have shown that the existence of productivity FDI spillovers to domestic firms depends on a multiplicity of factors associated with the characteristics of foreign investment, in addition to those of the recipient countries, sectors, and firms. Furthermore, these determinant factors may produce contrary effects, making the overall result difficult to establish. Thus, the observation of a neutral or even a negative spillover effect at the aggregate level does not preclude the possibility of a positive impact at a more detailed level.

Unfortunately, empirical evidence does not allow us to draw definitive conclusions for the majority of the factors. The most robust empirical result relates to the importance of the absorptive capacity of domestic firms, which appears to be a fundamental precondition for enabling them to capture these indirect benefits from FDI. Moreover, as yet limited body of empirical evidence suggests that FDI spillovers appear to be greater in the more developed regions. This last result points to the possibility that inward foreign investment may increase inequalities among regions within each country. Concerning the remaining factors, the evidence is inconsistent in some cases, or is still insufficient to allow for unequivocal conclusions.

An obvious implication of this survey is that research on FDI spillovers should move forward from evaluation of the phenomenon at the aggregate level, as conducted by the majority of previous studies. This should take the form of a systematic, detailed analysis of the determinant factors of these externalities.

Clearly, this more recent approach to the evaluation of FDI spillovers still has much to accomplish in order to clarify the circumstances which allow the effects of foreign investment to occur. The present survey points to the need to enlarge the body of available empirical studies, with a view to achieving the following objectives: (i) to provide empirical evidence in the case of the factors suggested as possible determinants of FDI spillovers that have not yet been empirically tested, as well as with regard to those with ambiguous results; (ii) to deepen the analysis concerning the expected impact when the determinant factors of FDI spillovers are interacted (for instance, to cross the regional effect with others, such as firms' dimension, the technological gap, or the export capacity).

Moreover, any improvement in empirical modeling should be based not only on appropriate data sets (the need to use a panel with data at the firm level is consensual), but also on adequate statistical techniques.<sup>30</sup> In addition, the compilation of harmonized databases for different countries in order to allow comparable tests—in line with the preliminary efforts of Barrios *et al.* (2002)—as well as the division of the sample with comparable criteria, could help to solve some of the ambiguous results that this survey has shown to exist.

## NOTES

- For additional references, see Lipsey (2002).
- See Arnold and Javorcik (2004), Note 9.
- Some studies focus on FDI wages and export spillovers, as reported, for instance, in Görg and Greenaway (2004).
- Görg and Strobl (2002) have confirmed the relevance of this mechanism for the case of Ghana, in the period 1991–97.
- On this subject, see Görg and Greenaway (2004).
- Furthermore, due to the significant costs involved, the technology transferred to affiliate companies depends positively on the level of competition in the market (Kokko & Bjornström, 1995).
- Danjian, Knell, Majcen, and Rojec (2003) defend that the extent of this effect is smaller because MNEs are largely involved in the production of end-user consumer goods.
- Note that while some of these theoretical arguments have been derived from "pure" theoretical models, the majority are presented in papers that discuss the existence of FDI spillovers in alternative circumstances without using mathematically formalized models.
- Note that there is an inevitable degree of overlap in the theoretical argumentation that supports some of these factors. See, for instance, the study of Banga (2003), which observes that the nationality of the foreign investor is of importance for FDI spillovers and relates the distinct sources with different levels of technology and different modes of transfer.
- Of course, this empirical effort should be complemented by increasing theoretical modeling (insufficient in the case of the majority of determinant factors) in order to obtain a more clear picture not only of the impact of the determinant factors of FDI spillovers, but also of their interaction.
- Overall, this agenda is likely to allow a better comprehension of this phenomenon and to contribute to a more appropriate delineation of economic policies aiming to promote FDI benefits.
- Some authors have proxied the absorptive capacity through the technological gap, a procedure that has been criticized by Jordaan (2005).
- See Alfaro, Chanda, Kalemli-Ozcan, and Sayek (2004).
- Considering 272 Japanese MNEs operating in 24 countries, Belderbos, Capannelli, and Fukao (2001) confirm this hypothesis.
- Balsubramanyam and Saitou (1991) provide empirical support for this hypothesis.
- Furthermore, Nunnenkamp and Spatz (2004) find that R&D expenditure by US affiliates increases with the level of protection afforded by intellectual property rights (IPR). This result is confirmed in a recent study by Branstetter, Fisman, and Foley (2005). With data concerning changes in IPR regimes implemented by 16 countries over the 1982–99 period, they conclude that US multinationals increase technology transfer to the countries that carry out these reforms.
- This is empirically confirmed by Bjornström *et al.* (1994) for the Mexican economy.
- It is consensual that empirical analysis should be based on firm-level panel data studies. This is the case of the majority of the studies mentioned in this survey. The few exceptions are included either because of their pioneering contribution or because of the scarcity of other studies on that specific determinant factor (see Crespo & Fontoura, 2006, Table 1, for a list of studies on FDI spillovers according to the characteristics of the data).
- Of course, this is a data-driven range and as such, we should be cautious with regard to its generalization.

18. A distinct question is evaluated by Konings (2001), Harris and Robinson (2002) and Haskel, Pereira, and Slaughter (2002). Instead of capturing the foreign presence with the MNE's share in the sector and region, these studies consider the MNE's presence in the region as a whole (without sectoral disaggregation). This empirical evidence is not, in general, in favor of a positive impact. However, as Grima (2003) has pointed

out, this evaluation is more related to the agglomeration effect than to intra-sectoral spillovers.

19. In this case, the sector at the 4-digit level is excluded.

20. For a discussion of this topic, see Proenca *et al.* (2006).

## REFERENCES

- Aitken, B., Hanson, G., & Harrison, A. (1997). Spillovers, foreign investment and export behaviour. *Journal of International Economics*, 43, 103-132.
- Aitken, B., & Harrison, A. (1999). Do domestic firms benefit from direct foreign investment? Evidence from Venezuela. *American Economic Review*, 89(3), 605-618.
- Alfaro, L., Chanda, A., Kalemli-Ozcan, S., & Sayek, S. (2004). FDI and economic growth: the role of local financial markets. *Journal of International Economics*, 64, 89-112.
- Altenburg, T. (2000). Linkages and spillovers between transnational corporations and small and medium-sized enterprises in developing countries: opportunities and policies. In *Proceedings of the UNCTAD X special round table "TNC-SME linkages for development"*.
- Arnold, J., & Javorcik, B. (2004). Gifted kids or pushy parents? Foreign acquisitions and plant performance in Indonesia. *World Bank policy research working paper 3597*. Washington, DC: The World Bank.
- Andrietsch, D. (1998). Agglomeration and the location of innovative activity. *Oxford Review of Economic Policy*, 14, 18-29.
- Andrietsch, D., & Feldman, M. (1996). Knowledge spillovers and the geography of innovation and production. *American Economic Review*, 86(3), 630-640.
- Balanburaunyan, V., & Saitou, M. (1991). EP, IS and direct foreign investment in LDC's. In A. Koekoek, & L. Menes (Eds.), *International trade and global development*. London: Routledge.
- Banga, R. (2003). Do productivity spillovers from Japanese and US FDI differ? *Mimeo*, Delhi School of Economics.
- Barríos, S., Dimelis, S., Louri, H., & Ströbl, E. (2002). Efficiency spillovers from foreign direct investment in the EU periphery: a comparative study of Greece, Ireland and Spain. *FEDEA working paper 2002-02*.
- Barríos, S., & Ströbl, E. (2002). Foreign direct investment and productivity spillovers: evidence from the Spanish experience. *Weltwirtschaftliches Archiv*, 138(3), 459-481.
- Balduros, R., Capannelli, G., & Fukao, K. (2001). Backward vertical linkages of foreign manufacturing affiliates: evidence from Japanese multinationals. *World Development*, 29(1), 189-208.
- Bhagwati, J. (1978). *Anatomy and consequences of exchange control regimes*. New York: Ballinger Publishing.
- Bloomström, M., Globerman, S., & Kokko, A. (2000). The determinants of host country spillovers from foreign direct investment. *CEPR discussion paper 2350*. London: Centre for Economic Policy Research.
- Bloomström, M., & Kokko, A. (1998). Multinational corporations and spillovers. *Journal of Economic Surveys*, 12(3), 247-277.
- Bloomström, M., Kokko, A., & Zejan, M. (1994). Host country competition, labour skills, and technology transfer by multinationals. *Weltwirtschaftliches Archiv*, 130(3), 521-533.
- Bloomström, M., & Sjöholm, F. (1999). Technology transfer and spillovers: Does local participation with multinationals matter? *European Economic Review*, 43, 915-923.
- Borenstein, E., Gregorio, J., & Lee, J. (1998). How does foreign direct investment affect economic growth? *Journal of International Economics*, 45, 115-135.
- Braconier, H., Ekholm, K., & Middelart-Kaarrik, K. (2001). In search of FDI - transmitted R&D spillovers: a study based on Swedish data. *Weltwirtschaftliches Archiv*, 137(4), 644-665.
- Branstetter, L., Fisman, R., & Foley, C. (2005). Do stronger intellectual property rights increase international technology transfer? Empirical evidence from US firm-level data. *NBER working paper 11516*. Cambridge, MA: National Bureau of Economic Research.
- Caves, R. (1974). Multinational firms, competition and productivity in host-country markets. *Economica*, 41, 176-193.
- Cohen, W., & Levinthal, D. (1989). Innovation and learning: two faces of R&D. *Economic Journal*, 99, 569-596.
- Crespo, N., & Fontoura, M. (2006). 30 Anos de investigação sobre externalidades do IDE para as empresas domésticas - que conclusões? *Working paper 212006/DECISEP/ISEG - Technical University of Lisbon*, Department of Economics.
- Damijan, J., Knell, M., Malczen, B., & Rojec, M. (2003). Technology transfer through FDI in Top-10 transition countries: how important are direct effects, horizontal and vertical spillovers? *William Davidson working paper 549*.
- Das, S. (1987). Externalities and technology transfer through multinationals corporations - a theoretical analysis. *Journal of International Economics*, 22, 171-182.
- Dimelis, S. (2005). Spillovers from foreign direct investment and firm growth: technological, financial and market structure effects. *International Journal of the Economics of Business*, 12(1), 85-104.
- Dimelis, S., & Louri, H. (2002). Foreign ownership and production efficiency: a quantile regression analysis. *Oxford Economic Papers*, 54, 449-469.
- Driffield, N., & Love, J. (2003a). Does the motivation for foreign direct investment affect productivity spillovers to the domestic sector? *Mimeo*, University of Birmingham.
- Driffield, N., & Love, J. (2003b). Foreign direct investment, technology sourcing and reverse spillovers. *The Manchester School*, 71(6), 659-672.
- Dunning, J. (1993). *Multinational enterprises and the global economy*. Wokingham: Addison-Wesley Publishing Company.
- Findlay, R. (1978). Relative backwardness, direct foreign investment, and the transfer of technology: a simple dynamic model. *Quarterly Journal of Economics*, 92(1), 1-16.
- Flores, R., Fontoura, M., & Santos, R. (2002). *Foreign direct investment and spillovers: additional lessons from a country study*. Brasão Econômico de EPGE 455. Rio de Janeiro: Fundação Getúlio Vargas.
- Fosfuri, A., & Motta, M. (1999). Multinationals without advantages. *Scandinavian Journal of Economics*, 101(4), 617-630.
- Fosfuri, A., Motta, M., & Ronde, T. (2001). Foreign direct investment and spillovers through workers' mobility. *Journal of International Economics*, 55(1), 205-222.
- Girma, S. (2003). Absorptive capacity and productivity spillovers from FDI: a threshold regression analysis. *Working paper 252/003*. European Economy Group.
- Girma, S., & Wakelin, K. (2000). Are there regional spillovers from FDI in the UK? *GEP Research paper 2000/16*. University of Nottingham.
- Girma, S., & Wakelin, K. (2001). Regional underdevelopment: Is FDI the solution? A semi-parametric analysis. *GEP research paper 2001/11*. University of Nottingham.
- Glass, A., & Saggi, K. (2002). Multinational firms and technology transfer. *Scandinavian Journal of Economics*, 104(4), 495-513.
- Görg, H., & Greenaway, D. (2004). Much ado about nothing? Do domestic firms really benefit from foreign direct investment? *The World Bank Research Observer*, 19(2), 171-197.
- Görg, H., & Ströbl, E. (2002). Spillovers from foreign firms through worker mobility: an empirical investigation. *Mimeo*, University of Nottingham.
- Greenaway, D., Sousa, N., & Wakelin, K. (2004). Do domestic firms learn to export from multinationals? *European Journal of Political Economy*, 20(4), 1027-1043.
- Griffiths, R., Redding, S., & Reenen, J. (2003). R&D and absorptive capacity: theory and empirical evidence. *Scandinavian Journal of Economics*, 105(1), 99-118.
- Harris, R., & Robinson, C. (2002). Spillovers from foreign ownership in the United Kingdom - estimates for UK manufacturing using the ARD. In *Paper presented at the "RES 2002 conference"*.
- Harrison, A. (1994). Productivity, imperfect competition and trade reform. *Journal of International Economics*, 36, 53-73.
- Haskel, J., Pereira, S., & Slaughter, M. (2002). Does inward foreign direct investment boost the productivity of domestic firms? *Working paper 452*. Department of Economics, Queen Mary, University of London.
- Hermes, N., & Lensink, R. (2003). Foreign direct investment, financial development and economic growth. *Journal of Development Studies*, 40(1), 142-163.
- Hu, A., & Jefferson, G. (2002). FDI impact and spillover: evidence from China's electronic and textile industries. *The World Economy*, 25(8), 1063-1076.
- Imbricani, C., & Reganati, F. (1999). Productivity spillovers and regional differences: some evidence on the Italian manufacturing sector. *Discussion paper 48*. Centro di Economia del Lavoro e di Politica Economica, Università degli Studi di Salerno.
- Javorcik, B. (2004a). The composition of foreign direct investment and protection of intellectual property rights: evidence from transition economies. *European Economic Review*, 48(1), 39-62.
- Javorcik, B. (2004b). Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages. *American Economic Review*, 94(3), 605-627.
- Javorcik, B., & Spatareanu, M. (2003). To share or not to share: does local participation matter for spillovers from foreign direct investment? *World Bank policy research working paper 3118*. Washington, DC: The World Bank.
- Javorcik, B., Saggi, K., & Spatareanu, M. (2004). Does it matter where you come from? Vertical spillovers from foreign direct investment and the nationality of investors. *World Bank policy research working paper 3449*. Washington, DC: The World Bank.
- Jordan, J. (2005). Determinants of FDI-induced externalities: new empirical evidence for Mexican manufacturing industries. *World Development*, 33(12), 2103-2118.
- Kanuri, V. (1998). Technology transfer and spillovers for Indian manufacturing firms. *Development Policy Review*, 16(1), 73-91.
- Kanuri, V. (2000). Productivity spillovers from technology transfer to Indian manufacturing firms. *Journal of International Development*, 12, 343-369.
- Kanuri, V. (2001). Foreign firms, technology transfer and knowledge spillovers to Indian manufacturing firms: a stochastic frontier analysis. *Applied Economics*, 33, 625-642.
- Kanuri, V. (2002). Liberalisation, FDI, and productivity spillovers - an analysis of Indian manufacturing firms. *Oxford Economic Papers*, 54, 688-718.
- Karpaty, P., & Lundberg, L. (2004). Foreign direct investment and productivity spillovers in Swedish manufacturing. *FIEF Working paper series 194*.
- Keller, W., & Yeaple, S. (2003). Multinational enterprises, international trade, and productivity growth: firm-level evidence from the United States. *NBER working paper 9504*. Cambridge, MA: National Bureau of Economic Research.

- Kinoshita, Y. (2001). R&D and technology spillovers through FDI: innovation and absorptive capacity. *CEPR discussion paper* 2775. London: Centre for Economic Policy Research.
- Kogut, B., & Chang, S. (1991). Technological capabilities and Japanese direct investment in the United States. *Review of Economics and Statistics*, 73(3), 401-413.
- Kolpatnook, A. (2006). Foreign direct investment and technology spillover: a cross-industry analysis of Thai manufacturing. *World Development*, 34(3), 541-556.
- Kokko, A. (1994). Technology, market characteristics, and spillovers. *Journal of Development Economics*, 43(2), 279-293.
- Kokko, A., & Blomström, M. (1995). Policies to encourage inflows of technology through foreign multinationals. *World Development*, 23(3), 459-468.
- Kokko, A., Tansini, R., & Zejan, M. (1996). Local technological capability and productivity spillovers from FDI in the Uruguayan manufacturing sector. *Journal of Development Studies*, 32(4), 602-611.
- Kokko, A., Zejan, M., & Tansini, R. (2001). Trade regimes and spillover effects of FDI: evidence from Uruguay. *Weltwirtschaftliches Archiv*, 137(1), 124-149.
- Konings, J. (2001). The effects of foreign direct investment on domestic firms: evidence from firm-level panel data in emerging economies. *Economics of Transition*, 9(3), 619-633.
- Lall, S. (1980). Vertical inter-firm linkages in LDCs: an empirical study. *Oxford Bulletin of Economics and Statistics*, 42(3), 203-226.
- Lapan, H., & Bardhan, P. (1973). Localized technical progress and transfer of technology and economic development. *Journal of Economic Theory*, 6, 585-595.
- Lee, J., & Mansfield, E. (1996). Intellectual property protection and US foreign direct investment. *Review of Economics and Statistics*, 78(2), 181-186.
- Li, X., Lin, X., & Parker, D. (2001). Foreign direct investment and productivity spillovers in the Chinese manufacturing sector. *Economic Systems*, 25, 305-321.
- Lin, P., & Saggi, K. (2004). *Multinational firms and backward linkages: a survey and a simple model*. Mimeo: Lingnan University and Southern Methodist University.
- Lipsey, R. (2002). Home and host country effects of FDI. *NBER working paper* 9293. Cambridge, MA: National Bureau of Economic Research.
- Lipsey, R., & Stöhl, F. (2004). Foreign direct investment, education and wages in Indonesian manufacturing. *Journal of Development Economics*, 73, 415-422.
- Markusen, J. (2001). Contracts, intellectual property rights, and multinationals investment in developing countries. *Journal of International Economics*, 53, 189-204.
- Markusen, J., & Venables, A. (1999). Foreign direct investment as a catalyst for industrial development. *European Economic Review*, 43, 335-356.
- Matouschek, N. (1999). Foreign direct investment and spillovers through backward linkages. *CEPR discussion paper* 2283. London: Centre for Economic Policy Research.
- Meyer, K. (2003). FDI spillovers in emerging markets: a literature review and new perspectives. *DRG working paper* 15. Centre for New and Emerging Markets, London Business School.
- Narula, R., & Martin, A. (2003). FDI spillovers, absorptive capacities and human capital development: evidence from Argentina. *MERT research memorandum* 2003-016.
- Neven, D., & Stolis, G. (1996). Technology sourcing and FDI in the EC: an empirical evaluation. *International Journal of Industrial Organization*, 14(5), 543-560.
- Nunnenkamp, P., & Spatz, J. (2004). Intellectual property rights and foreign direct investment: a disaggregated analysis. *Review of World Economics*, 140(3), 393-414.
- Perez, T. (1997). Multinational enterprises and technological spillovers: an evolutionary model. *Journal of Evolutionary Economics*, 7(2), 169-192.
- Ponomareva, N. (2000). Are there positive or negative spillovers from foreign-owned to domestic firms? *Working paper* BSP00/042. Moscow: New Economic School.
- Proenca, I., Fontoura, M., & Crespo, N. (2002). Productivity spillovers from multinational corporations in the Portuguese case: evidence from a short time period panel data. *Working paper* 06/2002. ISEG - Technical University of Lisbon, Department of Economics.
- Proenca, I., Fontoura, M., & Crespo, N. (2006). Productivity spillovers from multinational corporations: vulnerability to deficient estimation. *Applied Econometrics and International Development*, 6(1), 87-96.
- Ramachandran, V. (1993). Technology transfer, firm ownership, and investment in human capital. *Review of Economics and Statistics*, 75(4), 664-670.
- Rhee, Y. (1990). The catalyst model of development: lessons from Bangladesh's success with garment exports. *World Development*, 18(2), 333-346.
- Rodriguez-Clare, A. (1996). Multinationals, linkages, and economic development. *American Economic Review*, 86(4), 852-873.
- Saggi, K. (2002). Trade, foreign direct investment, and international technology transfer: a survey. *The World Bank Research Observer*, 17(2), 191-235.
- Schoors, K., & van der Tol, B. (2002). Foreign direct investment spillovers within and between sectors: evidence from Hungarian data. *Working paper* 2002/157. University of Gent.
- Sgaard, J. (2001). Direct foreign investments and productivity growth in Hungarian firms, 1992-1999. *William Davidson Institute working paper* 425.
- Sherwood, R. (1990). *Intellectual property and economic development*. Boulder: Westview Press.
- Shani, E., & Meyer, K. (2004). Spillovers of technology transfer from FDI: the case of Estonia. *Journal of Comparative Economics*, 32, 445-466.
- Stöhl, F. (1999a). Technology gap, competition and spillovers from direct foreign investment: evidence

- from establishment data. *Journal of Development Studies*, 36(1), 53-73.
- Stöhl, F. (1999b). Productivity growth in Indonesia: the role of regional characteristics and direct foreign investment. *Economic Development and Cultural Change*, 47(3), 559-584.
- Takii, S. (2005). Productivity spillovers and characteristics of foreign multinational plants in Indonesian manufacturing 1990-1995. *Journal of Development Economics*, 76, 521-542.
- Torvik, E. (2004). Foreign direct investment technology transfer, and productivity growth in transition countries - empirical evidence from panel data. *Cege discussion paper* 26.
- Toth, I., & Semjen, A. (1999). Market links and growth capacity of enterprises in a transforming economy: the case of Hungary. In I. Toth, & A. Semjen (Eds.), *Market links, tax environment and financial discipline of Hungarian enterprises*. Budapest: Institute of Economics, Hungarian Academy of Sciences.
- Wang, J., & Blomström, M. (1992). Foreign investment and technology transfer: a simple model. *European Economic Review*, 36, 137-155.
- Xu, B. (2000). Multinational enterprises, technology diffusion, and host country productivity growth. *Journal of Development Economics*, 62, 477-493.
- Yudaeva, K., Kozlov, K., Malentseva, N., & Ponomareva, N. (2003). Does foreign ownership matter? The Russian experience. *Economics of Transition*, 11(3), 383-409.

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