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Abstract

This paper reviews arguments and empirical findings on positive effects of FDI on host country firms. With the exception of the only unambiguous result of microeconomic studies, which is the superior productivity of foreign firms, the main conclusion extracted from empirical studies is the diversity of results. This diversity suggests that FDI will have different effects depending on the ‘technological congruence’ and ‘social capability’ of the host economy, as well as the familiarity of indigenous firms to products and technology of a given multinational corporation.

Keywords: Economic Growth, Foreign Direct Investment, Multinational Corporations, Spillovers, Technology Transfer.

JEL Classification: D21; D62; F21; F23; F43

FDI AND HOST COUNTRY PRODUCTIVITY: A REVIEW

1. INTRODUCTION

Multinational Corporations (MNCs) and Foreign Direct Investment (FDI) have become a much-discussed topic in recent years. The current wave of globalization on the one hand, and the worldwide-generalized wave of public sector intervention reform attracting investment to replace the public divestiture on the other, are among the main explanations for that increased attention. Both causes have carried out a rise in FDI importance as a source of investment funds for a growing number of countries (for the world as a whole, inward FDI flows as a percentage of Gross Fixed Capital Formation rose from 2.33 in 1970 to 9.45 in 2005, which represent an increase from \$13,417 million to \$916,277 million — UNCTAD, 2006)¹. But the alleged foremost reason is that FDI often involves the transfer of knowledge from one country to another (*e.g.*, Carr *et al.*, 2001), making it a potentially important vehicle for international diffusion of technology, as some theoretical models of foreign investment suggest (Caves, 1974, 1996; Markusen, 1995).

The favorable impacts predicted by theoretical models, and documented by some empirical studies, have been driving a considerable change in the attitude towards inward FDI over the last couple of decades, as most countries have liberalized their policies to attract investments from foreign MNCs. Accordingly, in the expectation that some of the knowledge brought by foreign companies may spill over to the receiving country's domestic firms, governments across the world have lowered various entry barriers and opened up new sectors to foreign investment. Furthermore, an increasing number of national governments also provide a variety of forms of investment incentives to encourage foreign owned companies to invest in their countries.

The economic explanation for offering special incentives to attract FDI derives from the frequent conviction that foreign investment produces positive externalities in the indigenous

¹ Although most of FDI flows occur among industrialized nations, nowadays, the main source of international finance to developing countries is FDI.

firms and enhances host country's economic growth². Romer (1993), for example, argues that there are significant 'idea gaps' between rich and poor countries, being foreign investment an important instrument in transferring technological and business know-how to poorer countries, with substantial spillover effects for the poorer economy as a whole.

The most common theoretical justification for the existence of positive externalities is that overseas investors possess certain advantages that local firms can capture. For the host country, these benefits derive from the accidental leakage of knowledge and technology to competing and unrelated firms as well as from the intentional development of forward and backward linkages between local and foreign firms. For example, local firms may learn with the practice of MNCs, or MNCs may transfer technology and know-how to local suppliers in order to improve the quality of inputs (Rodriguez-Clare, 1996). Alternatively, local competitors might benefit by attracting employees with firm-specific knowledge from the foreign affiliate (Fosfuri *et al.*, 2001). Local firms that are customers of the foreign affiliate may also benefit from the supply of more sophisticated intermediate inputs.

However, while the potential importance of FDI in international technology diffusion is widely recognized, the actual role FDI plays as a channel for technology diffusion in various contexts is still the subject of a significant debate and ongoing research efforts. Accordingly, it is time to survey the recent literature on the topic. We begin by exposing some theoretical arguments about the relationship between FDI and host country productivity and proceed with a review of the empirical literature.

So, the remainder of the paper is structured as follows. Section 2 discusses the relationship between FDI and productivity. Beginning with the reasons that explain the existence of MNCs, the section goes on presenting the channels through which FDI enhances host country productivity with special emphasis on spillovers. The distinction between horizontal and vertical spillovers is also highlighted in what concerns the industrial organization, and the section ends with the role that the absorptive capacity plays in the international diffusion of technology. Section 3 reviews the empirical evidence about the effects of FDI on productivity of host-country firms. Because empirical tests are limited by the available data, we begin by considering the data used in empirical research. Before a short review of the case studies and of econometric analyses, we shall present the empirical evidence of the superior productivity of foreign firms and we end the section with a review of the determinants of spillover

² As it is well known, in absence of externalities, there is no reason for policy to differentiate between FDI and other forms of investment, including domestic investment.

magnitudes trying to answer the question: if spillovers exist, what determines its amplitude? Section 4 concludes.

2. THE RELATIONSHIP BETWEEN FDI AND HOST COUNTRY PRODUCTIVITY

2.1 Why does a firm become an MNC?

The theory of FDI explains why a firm becomes an MNC using the OLI (ownership, location and internalization) paradigm (see, for instance, Dunning, 1977; 1981; 1988). Given that indigenous firms certainly have superior knowledge of the local market, consumer preferences, and business practices, the MNC candidate must enjoy three compensating advantages³: i) it must possess ownership of some firm-specific tangible or intangible asset or skill that gives it a benefit over other firms (ownership advantage) — otherwise, it would not be able to overcome the additional costs of foreign production such as the costs of dealing with foreign administrations, regulatory and tax systems, and customer preferences, and would become non-competitive in comparison with indigenous firms; ii) it must be more profitable to use these advantages in combination with at least some factor inputs located abroad (locational advantage) — if not, the foreign market could be served exclusively through exports; iii) it must be more beneficial for the firm to use or exploit the firm-specific asset itself than to sell them or lease and license them to other firms — for example, the firm-specific asset might be a brand name or a non-patentable managerial skill or process, which the firm might find in its interest to keep internally instead of licensing (internalization)— in order to prevent the asset from being replicated by competitors.

From an MNC viewpoint and respecting to internalization decision, both licensing and intra-firm transfer of firm-specific assets have their advantages and disadvantages. For example, licensing to an independent firm will be convenient when the licensor lacks some assets other than the intangibles which are required for FDI, such as capital, a widespread trade and support network, and so on. Furthermore, licensing decreases the risks deriving from political changes in the host-country (for example expropriation), and it has a shorter lead-time than starting a subsidiary from the beginning. On the other hand, intra-firm transfer avoids any outflow of technology to other firms and it is more favorable than licensing when arms length transactions are complex and difficult to enforce. Another situation in which intra-firm transfer is convenient with respect to licensing arises as a consequence of the transfer process

³ On compensating advantages, see also Graham and Krugman (1991)

itself, namely in the presence of no negligible transfer costs⁴. But, as argued by Mansfield and Romeo (1980), in some cases MNCs transfer technologies of new vintages through direct investment and they license or transfer their older technologies through joint ventures. A policy designed to attract FDI must have these points in consideration, because they mold the amount of incentives offered and the resulting effect on total factor productivity (TFP).

In recent years theoretical approaches to FDI have turned to the possibility of the so-called ‘technology sourcing’, that is, that FDI occurs not to exploit advantages generated in the home country, but to access technology that is created in the host country⁵. Whereas it is likely that, in a given host region, foreign-owned corporations may not be the most technologically advanced firms in a given sample, it is difficult to consider this hypothesis without the assumption that MNCs have other compensating advantages. Although this paper is focused on the effects of FDI on host country firms, and so it does not directly deal with ‘technology sourcing’, one must recognize that the possibility of this hypothesis to occur makes it difficult to interpret the estimates from empirical tests of technology spillovers.

2.2. Inflow of FDI and the flow of technology

Broadly speaking, it is possible to identify three main channels through which inward FDI is thought to improve the productivity of a host-country: a) *direct* improvement in efficiency through the redirection of local resources towards more productive uses, including within purchased firms; b) increase in domestic market competition; and c) *indirect* impact via spillovers and other externalities associated with interactions between the foreign affiliate and the host country economy. All the three channels can contribute to reduce the substantial gaps existing between countries.

Given the limited level of resources within the host economy, the entry of a foreign firm, whether by acquisition or physical investment, is likely to be associated with a shift of resources and effort away from a less productive activity. In this way, FDI is expected to make an increase in overall productivity within the economy possible. The dimension of the host country’s benefits depends on the action of a large bulk of linkages between foreign owner(s) and domestic local firms and customers, as well as on the effectiveness of the

⁴ Teece (1977) showed that transfer costs can be considerable and can in particular situations account for more than 20 per cent of the cost of developing the technology.

⁵ Theoretical approaches to technology sourcing can be seen in Fosfuri and Motta (1999) or Siotis (1999). Driffield and Love (2003) test empirically the existence of technology sourcing for a panel of UK manufacturing industries.

foreign firm to prevent the potential gains to be totally transferred to the host country's firms and consumers. Additionally, a foreign-owned firm may contribute directly to the productivity of domestic firms by lowering input costs, or by increasing the demand for inputs produced by local suppliers.

The entrance of foreign affiliates is usually seen as a way of strengthening domestic market competition, thereby leading eventually to higher productivity, lower prices and more efficient resource allocation, but it can also lead to greater market concentration and to reduce domestic market competition. The risk of the latter is exacerbated not only if the entrant has an important international market position, if the barriers to entry into the industry are high, but also because of host country characteristics: either a small market or markets unconnected geographically, competition laws weak or weakly enforced (OECD, 2002). On the other hand, some international trade literature suggests that national welfare can be constricted by FDI inflows if MNCs capture market share from indigenous firms and reduce the latter's supernormal profits (see for example, Krugman and Venables, 1995).

So, the increase in domestic market competition is not always an assured outcome of the FDI entry, and where that outcome is achieved it can either decrease the productivity of domestic firms, as suggested by Aitken and Harrison (1999) and Konings (2001), or have positive effects, as noted by Kokko (1996) and Driffield (2001). In order to assess the existence and the dimension of direct and indirect effects of FDI on productivity, and in face of possible contradictory effects of market competition, there is a large ground for empirical investigation, both at the micro and at the macro level.

If MNCs use a higher level of technology and technology, or knowledge, has some characteristics of public goods (Caves, 1996; Markusen, 1995), there is scope for technological externalities and local firms to capture part of the advantages of the former through spillovers from MNCs, being this *indirect* impact rationalized usually as positive externalities. These positive externalities may be associated to backward and forward linkages, or they may be the simple resulting effect of more informal mechanisms. For example, MNCs may transfer cost-free technology and know-how to local suppliers in order to improve the quality of inputs (Rodriguez-Clare, 1996). Conversely, local firms may benefit from the acquisition of goods of superior quality produced by MNCs.

2.3. Spillovers

Productivity externalities from FDI may take place when the entry or presence of multinational corporations increases the productivity of domestic firms in a host country, and the MNCs do not fully internalize the value of these benefits. This is the case when local firms improve their efficiency by copying technologies of foreign affiliates operating in the local market or merely by learning with the practice of MNCs, the so-called 'demonstration effect', based only on observation. Complementarily, indigenous firms may benefit from foreign affiliate's embodied firm-specific knowledge (Fosfuri *et al.*, 2001) when hiring workers trained by the foreign affiliates (Blomström and Kokko, 1998). These are knowledge spillovers in nature. Another kind of spillovers occurs if multinational entry leads to more severe competition in the host country market, which forces local firms to use their existing resources more efficiently or to search for new technologies⁶.

The linkages between the MNC affiliate and its local suppliers and customers offer a particularly significant channel for spillovers. Lall (1980) identifies four interactions between MNCs and their suppliers that can help increase the productivity and efficiency of local firms: i) MNCs can help prospective suppliers to set up production facilities; ii) MNCs can have need of reliable, high quality products that are delivered on time, and so they provide the suppliers with technical assistance or information to help improve the products or facilitate innovations; iii) MNCs can make available training and help in management and organization; and iv) MNCs can help suppliers to find additional customers including their sister affiliates in other countries, which offers some useful learning to start to exporting to other independent external purchasers.

The linkages between the MNCs and indigenous firms allow the division between horizontal and vertical spillovers. This distinction is important because if MNCs try to prevent technology leakage and spillovers from taking place, the MNCs behavior may be different in face of each one of them. In general, this goal can be achieved through diverse ways: formal protection of their intellectual property, trade secrecy, paying higher wages or locating in countries characterized by limited imitative capacities of their domestic firms. Of course, to prevent the occurrence of spillovers through these instruments is much easier in the case of horizontal spillovers. If there are horizontal productivity spillovers, the presence of MNCs

⁶ This distinction must be made for policy purposes because knowledge spillovers present a rationale for government action to subsidise FDI inflows, and such rationale is absent when the improved productivity of local firms is due to increased competition.

leads to productivity increases in domestic firms of the same industry, allowing them to become more efficient⁷. In case of vertical spillovers, that is, productivity spillovers that take place due to linkages between foreign firms and their local suppliers⁸ it may be impossible to prevent the action of positive externalities.

2.4. Impact of FDI on host country industrial organization

Theoretical literature about the impact of FDI on host-country industrial organization has shown that FDI spillovers are more likely to operate at the inter-industry rather than at the intra-industry level. Since the MNC can benefit from knowledge diffusion when it reaches downstream clients and upstream suppliers, it will encourage vertical flows of generic knowledge leading to inter-industry spillovers. Consequently, linkages can be a propagation mechanism for technological externalities above and beyond the pecuniary externalities highlighted by Hirschman (1977).

This body of literature shows that it is in the interest of the MNC to minimize the likelihood of imitation, particularly under imperfect intellectual property rights in the host-country. In this case, trade secrecy and efficiency wages are usually used to lessen technology leakage from FDI. Additionally, MNC can organize production in order to maximize the imitation lag if the intra-industry spillovers are likely to materialize the dissipation of technical knowledge rents (Ethier and Markusen, 1996). On the other hand, the vertically integrated nature of MNCs (Helpman, 1984) can be a reply to the economies of scale arising from product-specific R&D. Also, in the presence of incomplete contracts environment, MNC minimize transaction costs with inside transfer of resource and information (Ethier, 1986). The location of the MNC subsidiary is also selected in order to minimize rent erosion due to imitation by local firms. Since the closeness to potential competitors (either with absorptive capacity or with capacity to reverse engineering of proprietary technology) would be detrimental to the MNC, it locates subsidiaries where potential competitors cannot wear away its market share (Markusen and Venables, 1998).

⁷ According to Blomström and Kokko (1998) productivity spillovers can occur through three main channels. First, as a consequence of movements of highly skilled staff from MNCs to domestic firms. Second, as 'demonstration effects' if there are arm's-length relationships between MNCs and host country firms and the latter learn superior production technologies from the former. Third, as 'competition effect' if competition from MNCs force domestic rivals to update production techniques and other technologies in order to become more productive.

⁸ For the several forms of operation of vertical spillovers see Smarzynska (2004)

Traditionally, trade theory has emphasized the change in the utilization of the host-country factor endowment that improves allocative efficiency. Likewise, some of the literature on backward linkages calls attention to the static effect of the increased demand by the MNC for local intermediate inputs (Rivera-Batiz and Rivera-Batiz, 1990). But, the impact of FDI goes beyond the type of static effect traditionally emphasized, and may include improvements in technical efficiency, as it is highlighted in some more recent models, where the dynamic effect on host-country productivity results of both the demand and supply of intermediate inputs and services (Markusen and Venables, 1999). In these models, not only do incumbent upstream sector producers benefit but also the MNC may start providing goods or services that were previously unavailable in the host-country. Thus, MNC operations can induce local availability of new intermediate services and inputs, and in that way to elucidate the relationship between FDI penetration and growth in the productivity of downstream manufacturers (Romer, 1994; Rodriguez-Clare, 1996). So, one can expect an increase in specialization of downstream local firms and a direct inducement on demand of upstream sectors, as the result of the supply of new intermediate inputs with a consequent recovery of productivity (Kugler, 2006).

The capacity to transform the potential benefits of FDI in actual impacts depends on the market structure in the host-country. When demand in the host-country is inelastic because of reduced availability of substitute goods, FDI yields higher rents for the MNC as local presence facilitates market penetration. Then, limited domestic competition relative to international competition means that FDI is more profitable to the MNC. Furthermore, competition from imports limits the attractiveness of imitation for domestic enterprises (Bardhan, 1982). Other things equal, the MNC will seek to set up subsidiaries in countries in which the market structure yields less direct competition within its industry but in which upstream sectors are competitive. Hence, FDI will be associated with situations in which there are few direct competitors and many input suppliers resulting in limited intra-industry spillovers but a positive impact at the inter-industry level.

So, the abovementioned models imply that inter-industry positive externalities to host-country producers are much more likely than intra-industry gains in productivity. From the MNC viewpoint, technological spillovers 'represent a benefit when they diffuse downstream and upstream but a loss when they diffuse inside the subsidiary's industry' (Kugler, 2006, p. 448). This has a consequence in the location decision: the subsidiary will be installed so as to

minimize horizontal spillovers of industry-specific know how to competitors while encouraging vertical flows of generic knowledge to complementary sectors.

2.5. Absorptive capacity

The occurrence of knowledge spillovers is not an automatic outcome of the presence of MNCs' affiliates in a host country. Although Findlay (1978), as well as other authors of the 'technological catching up theory' (e.g., Abramovitz, 1979, 1986), suggests that the greater the distance between two economies in terms of development, the greater the accumulation of available opportunities to take advantage of in the less advanced economy⁹, it is well accepted that the assimilation of the knowledge spillovers is so much larger as the absorptive capacity would be. In fact, the technological 'gap' affects the growth potential, but there are two sorts of constraints to the growth potential of a laggard economy: the limitations of 'technological congruence' and its 'social capability'¹⁰.

The limitations of technological congruence arise because the frontiers of technology advance in an unbalanced and biased way. The evolution of technology reflects the direct influence of past science and technology on the evolution of useful knowledge but also the complex adaptation of that evolution to factor availabilities, as well as to the scale of markets, consumer demands and technical capabilities of those relatively advanced economies operating at or near the frontiers of technology (David, 1975)¹¹. It can simply happen that the resource availabilities, factor supplies, technical capabilities, market scales and consumer demands in laggard countries do not conform well to those required by the technologies and organizational arrangements that have emerged in the leading economy or economies. These may render it extremely difficult if not prohibitively costly, for firms, industries, and economies to switch quickly from an already established technological regime, with its associated trajectory of technical development, to exploit a quite distinct technological regime that had emerged elsewhere, under a different constellation of economic and social conditions.

On the other hand, the 'social capability' of a country is dependent on: i) its level of general education and technical competence; ii) its institutions (industrial, commercial and financial)

⁹ That is, they can employ technologies elsewhere in use without the cost of inventing them.

¹⁰ The expression 'social capability' was first used by Ohkawa and Rosovsky (1972).

¹¹ See David (1975, Ch. 1) for an introduction to the theory of 'localized' technological progress and its relation to the global bias of factor-augmenting technical change, as well as for a synthesis of some of the relevant historical evidence.

and their skills to support and operate modern, large-scale business; and iii) its political and social characteristics that influence the risks, the incentives, and the personal rewards of economic activity, including those rewards in social appreciation that go beyond money and wealth. So, one of the main determinants of 'social capability', but not the only one, which influences the 'absorptive capacity' of a laggard country is the level of a country's human capital, as emphasized by the seminal paper of Nelson and Phelps (1966).

Building on Nelson and Phelps (1966), several authors (for example, Cohen and Levinthal, 1989) have argued that human capital plays a dual role in promoting TFP growth: first, it enables a country to directly influence productivity by determining the capacity to innovate; second, a higher level of human capital increases the capacity of an economy to absorb foreign technology allowing a country to close the gap between the existing level of productivity and that of the leading country faster. So, a more highly educated workforce can better not only render FDI more fruitful for foreign investors, but also take advantage of foreign R&D-induced ideas and use capital goods imports (embodying advanced foreign technologies) more effectively.

From the above said, countries and firms may take advantages of their backwardness, although the restraints highlighted make the importance of relative backwardness in technology absorption empirically controversial if such restrictions are not controlled. Perhaps because of failure in controlling all the above-mentioned restraints, explanations differ for the significance of the 'gap'. While Findlay (1978) identifies the 'gap' with the pressure for change, that is, the rate of the technological externality from FDI is an increasing function of the technology gap, expressing the idea that the greater the distance between two economies in terms of development, the greater the pressure for change and the faster the assimilation of new technology is¹², Glass and Saggi (1998) argue that the larger the gap, the lower the quality of the technology transferred and, consequently, the lower the potential for spillovers is. On the other hand, Lapan and Bardhan (1973) highlight a certain precedence between opportunities and absorptive capacity — firms must have a certain absorptive capacity before they can profit from new technologies discovered elsewhere. So, the controversial predictions make the need for empirical evidence mandatory to help inform the design of more effective inward investment promotion policies.

¹² In the same line, the model of Wang and Blomström (1992) predicts a positive relationship between the degree of spillovers from FDI and the size of the technology gap between foreign and domestic firms.

3. EMPIRICAL EVIDENCE

3.1. Introduction

There is an extensive literature on the mechanisms by which the inflow of FDI enhances the flow of technology across frontiers. However, the bulk of academic debates about the possible role of inward investment refer to the spread of superior technology from foreign affiliates to host country firms. Theories of the effect of FDI on host countries have generally assumed that the former own superior technology and that some of that technological knowledge spills over to the latter economy.

Additionally, it is usually also assumed that there is some automatic mechanism which rules the spread of technology. For instance, Findlay (1978) assumed that the rate of change of technical efficiency in host country firms is an increasing function of the comparative extent to which the activities of foreign firms pass through the local economy. On the other hand, the assumption that positive effects of FDI are carried by technology is not unquestionable, since the effects of MNCs over host country productivity are more extensive. All these assumptions offer fertile ground for empirical tests. But, empirical tests are obviously limited by the available data. So we begin by a comment on available FDI data and on the way data restrict empirical research. Some questions guide the subsequent analysis in this section. Do foreign owned firms present higher productivity than domestically owned ones? Does some of that difference spill over to other firms either in the same or in other industries?

There are two general types of data concerning foreign direct investment. One is the financial data from balance of payments accounting. These data show evidence of inward and outward flows of direct investment and the resulting stocks. The second type of data concerns the actions of FDI affiliates in their host countries and the actions of their parents in their home countries. Actions could include their sales, production, employment, wages, assets, R&D workforce and R&D outlays and expenditures for plant and equipment. None of these characteristics are revealed by the financial data from the balance-of-payments. They are obtained from surveys of parent companies, in their home countries, or, from surveys of affiliates, in their host countries, often by identifying foreign-owned establishments in economic censuses.

These two types of data are usually associated to two broad approaches to the investigation of the effects of FDI, covering two related but different sets of subjects or activities, explained

by different theories and by different branches of economics. The first might be denoted as the industrial organization, or micro, view. The second might be referred to as the international finance, or macro, view. The micro view was the first in order of emergence and it is the one that deals with the large majority of studies. It tries to explain the motivations for locating the investment abroad from the viewpoint of the investor. It also looks at the consequences to the investor, and to home and host countries, of the MNCs' actions and/or of the affiliates created by these investments. These consequences arise from their employment, production, trade, and their flows and stocks of intellectual capital. These motivations and consequences are intrinsically related both to the control of the affiliates by investing firms and to the ability of the MNCs in coordinating the activities of parents and affiliates.

On the other hand, the macro view sees FDI as a particular form of the flow of capital across national borders, from home countries to host countries, measured in Balance of Payments Statistics. Those flows generate a specific form of stocks of capital in host countries, namely the value of home country investment in entities, typically corporations, controlled by a home country owner, or in which a home country owner holds a certain share of voting rights. In this view, the interest is focused on the flow of financial capital, on the value of the stock of capital that is accumulated by the investing firms, and on the flows of income from the investments.

3.2. The micro view. Comparisons of productivity between foreign-owned and domestically-owned firms

As we have seen in section 2, much of the literature on comparisons of productivity between foreign-owned and domestically-owned firms intend to answer the question of whether there are spillovers to domestic firms, but that question itself implies the prospect that foreign firms are more efficient, and thus that there is some productivity advantage that might spill over to domestic firms. So a first question arises: Do foreign owned firms present higher productivity than domestically owned ones?

Table 1 summarizes the results of various studies about differences in value added and different measures of productivity between foreign owned and host country plants in developing countries.

Table 1.
Evidence on higher productivity for foreign-owned plants in developing countries

Study	Country and Time data	Results
Blomström and Wolff (1994)	Mexican manufacturing data 1970	Value added, and gross output per worker, is more than twice as high in MNCs-owned plants overall than in private domestic plants, and higher in each of 20 individual manufacturing industries.
Sjöholm (1999)	Indonesian establishment data 1980 and 1991	The estimated technology differences were found higher in the foreign-owned establishments in 26 out of 28 industries.
Blomström and Sjöholm (1999)	Indonesian establishment data 1991	Labor productivity is higher in establishments with foreign equity than in purely domestically owned companies.
Kokko, <i>et al.</i> (2001)	Uruguayan firms 1988	Value added per worker, was about twice as high on average in foreign firms than in domestic firms.
Haddad and Harrison (1993)	Morocco 1985-89	Output per worker is higher, in foreign-owned firms than in domestically owned firms in 12 out of 18 industries.
Harrison (1996)	Morocco and Venezuela	Joint ventures exhibit higher productivity levels than their domestic counterparts.
Okamoto and Sjöholm (1999)	Indonesian manufacturing microdata 1990 to 1995	Higher foreign shares of gross output than of employment in almost every industry. An implication of this finding is that labor productivity was higher in the foreign owned plants.
Kathuria (2000)	Indian firms in 26 manufacturing industries From 1975-76 to 1988-89	In 13 of the 26 industries, a foreign firm is the technological leader, and in 15 industries, foreign firms are, on average, more efficient.
Chuang and Lin (1999)	Random sample of manufacturing firms in Taiwan 1991	Labor productivity is significantly higher in foreign-owned manufacturing firms than in domestically owned firms.
Ramstetter (1999)	Five East Asian countries 15-20 year periods	Value added per worker was higher in the foreign-owned plants in all the countries.
Erdilek (2002)	Turkish plants 1993-1995	Foreign-owned plants had higher productivity than domestically owned plants, even when various elements of the production function are taken account of, and higher level of productivity persisted through a variety of statistical tests of the regressions.

There have been less examinations of the productivity of foreign-owned and domestically owned firms within developed countries, despite their large share of direct investment. Table

2 summarizes the evidence of higher productivity for foreign-owned plants in developed countries.

Table 2.
Evidence on higher productivity in developed countries for foreign-owned plants.

Study	Country and data	Results
Dunning (1958)	United Kingdom (U K)	Comparing output per man-year in a sample of U S affiliates with that in the average U K firm (including the affiliates) in 10 industrial groups and concludes US affiliates' productivity was higher in every one
Dunning and Rowan (1970)	US and UK-owned firms in the U K	Greater efficiency in the US- owned firms
Howenstine and Zeile (1994)	US BEA and Census establishment data for manufacturing	Foreign-owned plants have higher labor productivity than domestically owned ones.
Doms and Jensen (1998)	United States plant data	Foreign-owned plants were superior to the US-owned plants of non-multinational firms, even large firms, in both labor productivity and TFP.
Conyon <i>et al.</i> (1999)	United Kingdom ARD	Acquisitions of UK firms by foreigners led to increases in their profitability.
Girma <i>et al.</i> (2001)	United Kingdom ARD	Foreign- owned firms in the U K had labor productivity about 10 per cent above that for domestically owned firms and TFP about 5 per cent higher. Labor and total factor productivity growth rates in foreign-owned plants were higher by about 1 and 1/2 per cent per year.

As is apparent from the above tables, the evidence on productivity, whatever the measure, is close to unanimous on the higher productivity of foreign-owned plants in both developed and developing countries. But, what are the reasons for such difference in productivity?

Several authors attributed some of that higher productivity, to higher capital intensity or larger scale of production in the foreign-owned plants (Blomström and Wolff, 1994; Sjöholm, 1999; Chuang and Lin 1999; Howenstine and Zeile, 1994; Harris and Robinson, 2002). But, other comparisons of productivity between foreign and domestic plants, such as that by Griffith (1999), suggest that there is a total factor productivity component in the foreign productivity

differential, although the determinants of this remain unexplored. Griffith and Simpson (2004) show that foreign firms have higher levels of skill intensity than domestic firms, and therefore that their productivity is higher.

Additionally, Girma (2005b) studied foreign acquisitions in the U.K. manufacturing, combining propensity score-matching techniques with difference-in-differences analysis and found that on average acquisition FDI originating from the U.S. and Europe causes an increase in total factor productivity. Since these two regions are the major sources of foreign take-over activity in the UK, he concluded: 'as far its direct productivity effect is concerned, the recent wave of acquisition FDI has been largely beneficial' (p. 185). Noteworthy the relationship found is not linear: the rate of technology transfer from foreign multinationals increases with the absorptive capacity of the firms which are object of take-over up to some critical point, beyond which it starts to decline.

There are some opposite views to explain the superior MNC productivity. While Howenstine and Zeile (1994) attribute the within-industry differences to plant size, capital intensity, and employee skill level — rather than foreign ownership *per se*, Doms and Jensen (1998) find multinationality of the firm to be strongly associated to productivity levels, beyond the association with size and other plant characteristics. Additionally, Driffield and Taylor (2005) identify differences in technology intensity across different nationalities of foreign firms relative to their UK counterparts.

On the other hand, Harris and Robinson (2002) provide another explanation for the higher productivity of MNC affiliates when compared with its domestic counterparts. These authors, analyzing the UK ARD data, show that plants sold by UK firms to foreign firms in 1982-1986 or 1987-1992 were more productive, than plants sold by one UK firm to another. They also argue that the plants sold by domestic firms to foreign ones had much higher capital/labor ratios than those changing domestic owners. So the authors observe that plant turnover in general seemed to involve relatively productive plants and conclude that foreign firms selected relatively high productivity plants for acquisition. The conclusions of the above quoted papers bring to light the need to empirically test many of the currently used assumptions, specifically the importance of firm level characteristics in technology and productivity studies. However, the main question is: Does the superior productivity of foreign owned enterprises spill over to other firms?

As was clarified in the preceding section, there could be effects of FDI on productivity without the presence of spillovers. However, the empirical literature on growth effects of FDI, both at an industry level and at a firm or plant level, relies almost exclusively on the occurrence of spillovers from foreign owned to domestically owned firms (see the surveys of Blomström and Kokko, 1998; Lipsey, 2002; Saggi, 2002; and Görg and Greenaway, 2004). Until recently, partly due to data limitations, empirical evidence on FDI spillovers was made up of case studies.

3.3. Case studies

Case studies are specially useful in describing the interactions between multinationals and host country players, such as the particular forms assumed by technical assistance, control of quality, management training, and organization of the production process that are key aspects of the relationship of MNCs with their local suppliers (Moran 2001). The cases studied by Mansfield and Romeo (1980) and Rhee and Belot (1990) for example, illustrate various channels through which spillovers are assumed to occur, with a particular emphasis on technology transfer to domestic firms. Case studies have also documented the importance of local skills and in-house technological capacity to adapt and use techniques developed elsewhere (Lall, 1992; Evenson and Westphal, 1995).

This research emphasizes usually linkages, labor turnover and demonstration effects. But case studies are also illustrative of the mechanisms whereby MNC entry and presence can affect industrial sectors in the host-country. The changes in the automotive industry in Mexico and in the electronics/computer industry in Asia are illustrative examples of the transformations pushed by inward FDI. Both in the Mexican case and in the Asian one the foreign direct presence was crucial in transforming the local structure of production, based on small-scale plants producing mostly for the undersized domestic market, into a dynamic export-led sector with prosperous locally owned exporter firms of parts and accessories. In both cases, this result was partly due to the introduction of industry best practices resulting from the contacts between foreigner investors and their local suppliers and to the technical assistance provided by the former to the latter¹³.

In general, case studies have revealed significant positive externalities from FDI. For example, Larrain *et al.* (2000) show substantial spillover benefits for the local economy

¹³ For a more complete picture of both cases, see Lim (2001) and the references therein.

generated by Intel's investment in Costa Rica in 1997 (specifically, creating new training programs in higher education institutions; producing important signaling effects on other investors; and attracting new suppliers to Costa Rica)¹⁴. Although the picture that has emerged from the case study literature has been important in guiding progress in the theory of FDI, the evidence from case studies is inconclusive. On the one hand it is, at best, mixed. On the other hand, case studies do not always offer quantitative information and do not easily generalize. The mixed nature of evidence can frequently be seen. For example, Rhee and Belot (1990) suggest that foreign entrants led to the creation of booming domestic textile industries in Mauritius and Bangladesh. In contrast, Mansfield and Romeo (1980) surveyed 26 US-based MNCs and reported that in only a few cases had FDI accelerated the access of local competitors to new technology. Likewise, the conclusion about Intel's investment in Costa Rica made by Hanson (2001) is very different from the one of Larrain *et al.* (2000). In face of the drawbacks of case studies, the research is usually based on industry-level and micro-level studies, and is done through statistic analyses searching horizontal and vertical productivity spillovers, using either cross-section in former analysis or panel data in more recent studies.

3.4. Statistical analysis

3.4.1. Efficiency spillovers

Is the productivity of domestically owned firms positively related to the presence of foreign firms? Early efforts to carry out econometric tests of FDI spillovers were constrained because researchers only had access to cross-section data. In the earlier empirical literature, the explanatory variables usually included capital intensity, skill capacity, and the scale of operations, apart from nationality of ownership. This is the case of two groundbreaking studies searching for intra-industry spillovers in Australia (Caves, 1974) and Canada (Globerman, 1975). They estimated sectoral production functions, with the share of foreign firms as an explanatory variable and have found, in both cases, that the productivity of the host-country firms and the productivity of foreign firms were positively correlated¹⁵.

¹⁴ Other examples include a case study of three electronics investors in Singapore (Lim and Fong, 1982); a case study of the investments of General Motors and Ford in Brazil and the investment of Intel in Costa Rica (Hanson, 2001); and a survey of 72 senior managers in Kenyan manufacturing firms (Gershenberg, 1987).

¹⁵ Blomström and Persson (1983) have found the same pattern in the Mexican data.

Subsequently, Kokko (1994) analyzing the Mexican manufacturing in 1970 and Kokko *et al.* (1996) dealing with the Uruguayan micro data in 1990 found that there is a positive correlation between foreign presence and local productivity only in sectors where the market share of foreign firms is small. This fact was interpreted as evidence that a wide technology gap between local manufacturers and foreign firms, hold back externalities from FDI to occur. This research also found a negative correlation between high barriers to entry and the motivations to transfer modern technology. Blomstrom *et al.* (1994) found that in consumer goods industries, with relatively low capital and low technological intensity, MNCs install more advanced technologies to overcome the disadvantages of their foreign condition, since the way for MNCs to surpass competitors is to keep one step ahead. So, the authors conclude that a more competitive local market structure helps the potential for spillovers due to the increase in technology flows.

As we may see in table 3 and table 4, which summarize evidence on FDI efficiency spillovers for developed and developing countries, respectively, the evidence is not conclusive.

Table 3.
Evidence on efficiency spillovers in developed countries

Positive	Country	Negative or inconclusive	Country
Caves (1974)	Australia	Girma <i>et al.</i> (2001)	UK
Globerman (1979)	Canada	Girma and Wakelin (2001)	UK
Liu <i>et al.</i> (2000)	UK	Harris and Robinson (2004)	UK
Driffield (2001)	UK	Girma and Wakelin (2002)	UK
Haskel <i>et al.</i> (2002)	UK	Girma and Görg (2002)	UK
Ruane and Ugur (2002)	Ireland	Girma (2005a)	UK
Görg and Strobl (2003)	Ireland	Barrios and Strobl (2002)	Spain
Castellani and Zanfei (2002)	Italy	Castellani and Zanfei (2002)	Spain
Keller and Yeaple (2003)	US	Castellani and Zanfei (2002)	France

Table 4.
Evidence on efficiency spillovers in developing countries

Positive	Country	Negative or inconclusive	Country
Blomström and Persson (1983)	Mexico	Haddad and Harrison (1993)	Morocco
Blomström (1986)	Mexico	Kokko <i>et al.</i> (1996)	Uruguay
Blomström and Wolf (1994)	Mexico	Harrison (1996)	Venezuela
Kokko (1994)	Mexico	Aitken and Harrison (1999)	Venezuela
Kokko (1996)	Mexico	Harrison (1996)	Morocco
Aitken <i>et al.</i> (1997)	Mexico	Kathuria (2000)	India
Blomstrom <i>et al.</i> (1994)	Uruguay	Kokko <i>et al.</i> (2001)	Uruguay
Blomström and Sjöholm (1999)	Indonesia	López-Córdova (2002)	Mexico
Sjöholm (1999)	Indonesia	Kugler (2006)	Colombia
Chuang and Lin (1999)	Taiwan		
Görg and Strobl (2002)	Ghana		

As it is apparent from the tables even though the number of studies is high, the number of countries where the spillovers are searched is fairly smaller. But another possible conclusion emerges from the tables: at the beginning the limited evidence available, particularly in developed countries, seems to indicate somewhat consistently that the productivity of domestically owned firms was positively related to the presence of foreign firms but, in more recent times, other studies are much more pessimistic about such relationship. However, as was concluded by Blomström and Kokko (1998) there has never been a strong consensus on the associated magnitudes.

The early econometric literature, which used no more than cross-section data, was important as a first approximation to quantify the mechanisms documented in case studies. However, the conclusions that can be drawn in these studies, based solely on contemporary effects have severe limitations. Since technological diffusion is essentially a dynamic phenomenon, more recent studies have provided dynamic analysis based on panel data, at the same time as panel data have replaced cross-section data.

The literature on horizontal and vertical spillovers was recently surveyed by Görg and Greenaway (2004). These authors analyzed 42 studies on horizontal productivity spillovers in manufacturing industries in developed, developing and transition economies, being 16 with cross-sectional data and 26 with panel data. In the 26 studies which employ panel data, justly the most appropriate estimating framework (see, Görg and Strobl, 2003), surveyed by Görg and Greenaway (2004) only eight studies find unambiguously positive evidence and are almost all of them for developed countries, seven show evidence of negative effects of MNCs on host-country firms and the remainder present mixed or statistically insignificant results¹⁶.

As it is shown by the literature on the strategy of optimal market penetration, MNCs have usually not the same interest in spillovers at the intra-industry level that they have at the inter-industry level. However, the higher expected propensity for inter-industry effects has not deserved the center stage in empirical research about the impact of FDI on host-country manufacturing. Görg and Greenaway (2004) also surveyed studies on vertical spillovers and

¹⁶ Among the studies employing panel data that report unambiguous positive FDI effects the vast majority is related to developed countries: the US (Keller and Yeaple, 2003); the UK (Liu *et al.*, 2000; Haskel *et al.*, 2002); Ireland (Görg, and Strobl, 2003); the US and Sweden (Braconier *et al.*, 2005); the US and Japan (Branstetter, 2006). In contrast, studies using firm level panel data find evidence of negative effects only in developing countries or transition economies: Bulgaria (Konings, 2001); Czech Republic (Djankov and Hoekman, 2000); Venezuela (Aitken and Harrison, 1999), for instance. This calls the attention to the level of development as an important factor in making possible or obstructing the appearance of FDI impacts.

among the five studies using panel data only two indicate positive and statistically significant results: the one of Smarzynska (2004) with evidence for backward spillovers and the other made by Driffield *et al.* (2002) searching for forward spillovers.

Görg and Greenaway are tending to point the variety of findings on spillovers mainly to the difference between cross-section and panel data studies. A more formal ‘meta-analysis’ of spillover findings from 21 studies by Görg and Strobl (2001), using the t-statistic in spillover equations as the dependent variable, concluded that the use of cross-section data was a strong positive influence. Of the eight studies that used panel data, four found significant negative spillovers, confirming the importance of the distinction between panel data and cross-section results. However, there are many other differences that may be important explanations for this diversity of results: firms vary in their capabilities, industries have different characteristics, and there can be differences among countries in both capabilities and policies.

Görg and Greenaway conclude: The evidence on spillovers reported in their survey ‘is mixed at best’ (p. 188). More recent studies do not provide sufficient evidence that can modify this statement; however a trend in recent studies is noteworthy: absence of intra-industry spillovers consistent with the presence of inter-industry externalities has been highlighted, as for instance in Bwalya (2006) and Kugler (2006).

3.4.2. Evidence from panel data

Recent development in data availability has allowed the possibility of econometric testing on spillovers. The empirical framework to assess FDI spillovers usually utilizes a constant returns to scale Cobb-Douglas production function specified as:

$$y_{it} = \sum_{m=1}^m \beta_m x_{mit} + v_i + u_{it} \quad (1)$$

where y is the logarithm of labor productivity (output per worker), β is the vector of input share parameters to be estimated, x is the vector of logarithms of inputs except labor (e.g., total cost of materials, service value of physical capital stock), i and t are firm and time subscripts, and m denotes the number of production inputs. v_i controls for unobserved firm-specific effects and u_{it} is the usual equation error term. Some authors include in equation (1)

the lagged logarithm of output — y_{it-1} — to control for adjustments to demand shocks as well as to explain part of the serial correlation in the equation error (Bwalya, 2006). In this case, α may be interpreted as the speed of adjustment to long-run output following a production or demand shock. In the empirical tests two productivity spillovers variables, S_H (horizontal spillovers), S_V (vertical spillovers) are then included in the model to estimate their effects on productivity¹⁷. So, the full augmented Cobb-Douglas production function is stated in its first difference as:

$$\Delta y_{it} = \alpha \Delta y_{it-1} + \sum_{m=1}^m \beta_m \Delta x_{mit} + \delta \Delta S_{Hjt} + \gamma \Delta S_{Vjt} + u_{it} \quad (2)$$

Where S_H intends to capture horizontal (intra-industry) productivity spillovers and it is usually defined as a ratio of labor employed by foreign firms to total labor in the sector. S_V , a proxy for vertical spillovers, may be calculated (as in Smarzynska, 2004) as the proportion of output produced by downstream sectors and supplied to upstream sectors weighted by the share of foreign employment (or sales) to total employment (sales) in the industry.

As stated in the previous section, foreign presence can raise the productivity of local firms through technology diffusion, measured by horizontal (intra-industry) spillovers from foreign firms to local firms and by linkages with local firms in downstream or upstream sectors (vertical spillovers). Foreign presence can also induce greater competition in both the product and factor markets, thereby forcing domestic firms to back up their average cost curves and reduce capacity utilization and productivity or even to lead to the end of the activity of some host-country firms. But the increased competition can also help provide incentives for domestic firms to become more innovative and productive, and thereby raise efficiency within the industry. These two effects are expected to exert a negative and positive impact, respectively, on domestic firm productivity. If positive productivity effects occur, either through horizontal spillovers or backward and forward linkages, the overall effect of FDI on the productivity of local firms will be positive. The actual overall impact will depend on the relative magnitude of benefits generated through intra-industry spillovers and inter-industry

¹⁷ In some studies (for instance, Bwalya, 2006) regional or agglomeration spillovers are also included.

linkages. As such, the expected sign on δ and γ in equation (2) cannot be established a priori and so there it is large ground for empirical investigation.

In general, the first panel studies about FDI spillovers in less developed countries fail to find positive intra-industry productivity effects from panel data of manufacturing plants. This is the case of Haddad and Harrison (1993) for Morocco, Harrison (1996) for Cote d'Ivoire, Aitken and Harrison (1999) for Czech Republic, and Djankov and Hoekman (2000) for Venezuela. These studies revealed an empirical pattern — the 'enclave' situations — where increases in the market share of foreign firms are harmful to host-country producers in the same industry. However, these studies have a noteworthy failure: none of them consider the empirical hypothesis of inter-industry externalities in its econometric framework. If the true econometric model is the one of equation (2), the estimates of the above studies suffer from an omitted variable bias with the usual consequences: the OLS estimators of the variables retained in the model are not only biased but are inconsistent as well.

Additionally, the failure in finding FDI spillovers in the earlier panel studies can have resulted from other lapses, as for instance, considering either an incorrect specification on the relevant technology to be diffused or taking into account the immediate diffusion of technology rather than the need of an adjustment lag. In fact, when Aitken *et al.* (1997), take into account the diffusion of generic rather than industry specific technology, their study detected the occurrence of FDI spillovers: the operation of export oriented foreign firms in Mexico was associated with a higher tendency for domestic firms to enter foreign markets. This finding highlights the potential positive effect on host-country manufacturing of the diffusion of foreign generic knowledge about how to export, including information on standards, market access and distribution channels. On the other hand, in their study about the impact of FDI on domestic productivity, using panel data for the UK manufacturing sector, Haskel *et al.* (2002) actually find evidence of a positive intra-industry effect when a sufficiently spread lag is allowed for. This finding illustrates the importance of absorptive capacity to benefit from diffusion, even if with a delay.

The sectoral pattern described above (subsection 2.4) about the impact of FDI on host-country industrial organization needs to be empirically tested. So, recently the need to allow for inter-industry effects in panel data studies was recognized by several authors. Since then, the finding of restricted intra-sectoral spillovers but profuse inter-sectoral effects from FDI via backward linkages has been documented for several countries, such as, Indonesia (Blalock, 2001), Lithuania (Smarzynska, 2004), Mexico (Lopez, 2003) and Zambia (Bwalya, 2006).

The estimation of the extent of new technological opportunities for domestic producers stemming from MNC operations includes potential effects within the sector of the foreign firm as well as across other sectors, but these must not be limited to backward linkages. FDI affects domestic producers both directly through backward linkages to suppliers, as documented in the papers mentioned above, but it also affects indirectly through enhanced input availability (a pecuniary externality). By stimulating upstream sectors, MNCs may also benefit other downstream local producers as cheaper inputs become available, as pointed out in the structural estimation framework specified in Kugler (2006) to analyze Colombian manufacturing data. Another finding of this study is that FDI complements domestic investment¹⁸.

3.4.3. Ownership structure

It is well recognized that sharing possession with a local partner can reveal the ownership advantage of a multinational and, in that way, give rise to technology spillovers. Consequently, MNCs are frequently confronted with limitations to the ownership structure of their foreign operation by local governments. In particular, developing and transition economies often impose joint ownership expecting advantages from technology spillovers. MNCs, on the other hand, don't appreciate such forced international joint ventures, precisely because of the risk of involuntary spillovers¹⁹.

It is also usually assumed that, the larger the risk of spillovers, the less the multinational is inclined to transfer technology. So the extent of such technology spillovers depends not only on the nature of the technology transferred but also on the limitations imposed by host country governments and particularly on the ownership structure in the joint venture. Moran (1998) shows that FDIs launched under mandatory joint partnerships and licensing requests are less likely to be integrated into the MNCs' global/regional sourcing and production network — mainly owing to concerns over quality controls, leakage or stealing of the latest proprietary technology, possible conflicts with partners over transfer prices, market allocations and rationalization of international production. In the meantime, FDIs launched under domestic satisfied requests suffer from being non-competitive internationally because

¹⁸ As Kugler (2006, p. 472) concluded: 'the conjecture that FDI complements domestic investment through spillovers is borne out by the evidence in this paper'.

¹⁹ Such restrictions have been and still are well known in countries like Russia, China, India, Indonesia, the Republic of Korea and many others (UNCTC, 1987). Furthermore, in cases of privatization, governments have often retained a significant share of the privatized firms (Bortolotti *et al.*, 2004; Maw, 2002).

the foreign investors have been forced to substitute more expensive host country goods for cheaper imports—leading again toward production for the host market. Being non-competitive, these FDI operations typically also operate under heavy import protection, tend to be highly inefficient, and unless the domestic market happens to be very large, are also unable to achieve sufficient plant size to enjoy scale economies (Lim, 2001).

These FDI operations — being less efficient, host-market-oriented, and out of the MNCs' global production sphere — thus tend to be less dynamic and receive much less attention from the parent firms, leading to slower rates of new technology transfer and developmental resources. For instance, Mansfield and Romeo (1980), in a study of 31 firms and 65 technologies, find that parent firms transfer technology to wholly owned subsidiaries (in developing countries) one-third faster on average than to joint ventures or licensees. Lim (2001) illustrates lags in the utilization of advanced management systems, including quality control systems and just-in-time inventory control as well as other problems of delays in technology transfer prevalent in Malaysia's automotive industry. Kokko and Blomström (1995) find that in general the imposition of host country permissions on the behaviour of foreign affiliates is negatively correlated with technology inflows into the host country. Consequently, spillovers from FDI operations under the above mentioned restrictions are likely to be smaller and may even be negative.

Persuasive case study evidence shows that restrictions imposed by host countries contribute to lower the potential benefits of FDI. However despite the credible case study evidence, there does not appear yet to be direct systematic evidence that spillovers from wholly owned subsidiaries free of restrictions are greater than those under domestic content requirements or those from joint ventures and licensees, mandatory or not. Usually, the empirical studies on spillovers do not separate FDI by type of restrictions. However some exceptions exist.

Among such exceptions, we find the study of Blomström and Sjöholm (1999). These authors argue that local participation in international joint ventures makes the existence of spillovers possible. But this, in turn, reduces the incentive for MNCs to transfer technology and management skills. Accordingly, they examined the interaction of spillovers and the ownership structure in joint ventures, trying to answer two questions. Does minority and majority ownership of establishments matter in terms of productivity levels? Secondly, does the degree of spillover differ with the degree of ownership in the FDI? Their empirical results confirm that domestic establishments benefit from spillovers in terms of productivity levels because foreign establishments have comparable high levels of labor productivity. However,

the degree of foreign ownership doesn't affect either the level of labor productivity in foreign establishments, or the degree of spillovers. In contrast, Dimelis and Louri (2002) find evidence that the degree of foreign ownership matters, and that productivity spillovers are stronger when foreign firms are in minority positions. Similarly, Smarzynska (2004) reports positive spillovers from joint ventures with shared ownership in Lithuania but not from fully owned foreign investments.

Müller and Schnitzer (2006) reanalyzed this topic recently. These authors argued that the extent of the effective spillover depends not only on the ownership structure but also on the transfer of technology and on the host country's policy. These latter factors depend on country specific and industry-specific determinants. Whether or not a larger ownership share of the host country firm leads to more spillovers is a priori not clear and can differ across countries and industries. This observation may help explain why the empirical evidence on this issue is mixed. Additionally, Müller and Schnitzer (2006) have shown that joint ventures may be in the interest of both host country and multinational, even if the multinational cannot be directly compensated for giving up part of its cash flow rights. This is the case if the host country is induced to support the investment through policy measures. On the other hand, there are circumstances where a joint venture is not in the interest of the host country. This conclusion should be of particular interest to countries in Central and Eastern Europe and to other transition countries where host country governments often force the sharing of ownership.

3.5. Other determinants of spillover magnitudes

As we have seen in the previous section, the amount of spillover benefits is dependent on the ability and motivation of local firms to interact with, learn from, and invest in, the technology and ideas that can be spilt out by the foreign firm. On the other hand, it is usually alleged that spillovers will only accrue if technology, knowledge or any other 'gap' between foreign and local firms is not too large²⁰. So, two questions arise: Do domestic firms need to possess some level of initial productive efficiency to benefit from the presence of MNCs? If FDI spillovers exist, what does determine its dimension? The literature has emphasized the following factors:

²⁰ Furthermore, the absorptive capacity required is likely to depend on the character of the technology to be diffused: specific technologies must have different absorptive requirements from the generic ones.

a) Size of the technology gap between domestic and foreign firms. Where there is no technological congruence, that is, where foreign and domestic technologies are very dissimilar, there is little scope for learning and spillovers. On the other hand, spillovers magnitude appears to depend on the capability of the indigenous firms to ‘absorb’ the foreign technology. For instance, Blomström (1986) finds that a foreign presence lowers the average dispersion of a Mexican sector's productivity but the effect is more significant in sectors with simpler technology. Blomström interprets this finding as indicating that foreign presence forces local firms to become more productive in sectors where ‘best practice technology’ is within their capacity. Kokko (1994) and Kokko, *et al.* (1996) find similar results for Mexico and Uruguay, concluding that spillovers are more difficult to identify where foreign affiliates have much higher productivity levels than local firms (for instance, as situations like some resource-processing enclaves). Similarly, Imbriani and Reganati (1997) show that efficiency spillovers for a set of Italian firms are the greater, the smaller the size of the technology gap is²¹. Balasubramanyam *et al.* (1996) also find tentative evidence regarding the importance of a certain threshold of the host’s human capital.

b) Type of host investment climate. A liberal investment climate would tend to generate stronger spillovers because it is more likely to attract more dynamic FDI, that is, the one that has the desirable attributes: large, with economies of scale and best management practices, innovative, and highly efficient Moran (1998). On the other hand, a restrictive investment climate with conditions such as mandatory joint partnerships, licensing, or domestic content requirements have a propensity to attract less efficient, technologically old-fashioned FDI. Identically, Eaton and Gersovitz (1984) show that the threat of nationalization may induce the foreign investor to choose an inefficient technology that makes nationalization less attractive to the host country.

c) The establishment of export-oriented operations with capacity to force a ‘clustering’ effect (Moran, 1998). Usually the export-oriented FDI is tied to the global/ regional sourcing and production network of MNCs (with the aim of enhancing the parent firm’s competitive position in international markets). By itself, it is in the parent firm’s interest to provide these affiliates with newer technology, more rapid technological upgrading, and persistent parental supervision in the areas of cost and quality control as well as in the areas of the development of managerial/ human resources. Once these export-oriented FDIs are set up, they also tend to

²¹ A related issue is the speed of adoption of foreign technology by local firms. Here, the important factor appears to be the degree of competition introduced by the MNC. Chen (1983) finds a positive association between the speed of technological diffusion and the share of foreign ownership in four Hong Kong industries.

attract other foreign investors into the location (in a ‘clustering’ effect). The combination of advanced technology, exporting into competitive world markets, and clustering of foreign investor activity will then tend to generate substantial spillovers and externalities through strong backward linkages to indigenous suppliers²².

3.6. Is the micro view conclusive?

As firm-level studies of particular countries (*e.g.*, Germidis, 1977; Aitken and Harrison, 1999) fail in finding evidence of positive technology spillovers from foreign firms to domestically owned ones, several authors (*e.g.*, Wheeler and Mody, 1992; Harrison, 1996; Aitken *et al.*, 1997; De Mello, 1997; Carkovic and Levine 2002) are driven to conclude that there are no reasons to believe that FDI accelerates economic growth overall. However, this conclusion is not indisputable. The failure in finding spillovers at the micro level is not sufficient to discard the positive influence of FDI on long-term economic growth.

The non-appearance of spillovers in microeconomic literature may be due to several reasons, from data problems to specification or selection bias. For example, the lack in finding spillovers may be due to the fact that the influence of FDI on TFP is the resulting effect of reallocation of resources and not the result of expected technological spillovers. Conversely, when technologically more advanced foreign affiliates first enter a market, their presence may erode the market power of indigenous incumbents while simultaneously introducing new production techniques and technologies from which these same incumbents learn. Real knowledge spillovers can take place, yet their effects may be masked in the data by changes in appropriability conditions. Additionally, as we have emphasized in section 2, FDI can contribute to productivity growth due to other reasons than technology transfer.

However, many other difficulties arise. As it is well known, some problems have affected the microeconomic empirical studies of inward FDI spillover effects. Firstly, because data problems are particularly acute with regard to service industries, most research on FDI at the firm level focuses exclusively on production of material goods, overlooking the effect on the productivity of services. This lack of empirical research on FDI in the services sector is increasingly troublesome, owing to the growing importance of services in production, in trade, and in investment. Secondly, empirical work on FDI is generally overwhelmed by the limited availability and quality of the data. As a result, empirical research on FDI at firm level

²² Another determinant is the type of trade regime involved, as referred to in the next section.

is largely limited to firms from just a few countries. Furthermore if, as Cantwell (1989) and Aitken and Harrison (1999) argue, positive technology spillovers do not occur in all industries, the estimates of empirical studies at the firm level may be more or less biased, according to the type of industry included in the sample of firms, and its transposition to the macro level is likely to enforce the biases.

4. CONCLUDING REMARKS

A number of countries have policies that encourage or even subsidize multinational investment. Often, as has been the case in Singapore and Malaysia, these policies are deliberately biased in favor of multinational firms in technology intensive industries. Such preferences are based on the view that production and/or research activities undertaken by multinational affiliates within national borders confer spillover benefits. But, in spite of the predictions of theoretical models, and current policy arguments, the main conclusion of this review of empirical literature is that the only unambiguous result is the superior productivity of foreign firms.

So, empirical literature on the occurrence of positive effects of inward FDI is, at best, controversial. If, on the one hand, early studies using industry-level data, such as Blomström and Persson (1983), find that foreign presence in an industry positively influences domestic labor productivity, and the earliest statistical analyses of inter-industry effects of FDI claim that technical progress did not only take place in the FDI own industries, but also in other sectors (Katz, 1969), on the other hand, some more recent studies using firm-level data are less supportive of the existence of positive spillovers. Furthermore some authors, as Aitken *et al.* (1997), Haddad and Harrison (1993) and Djankov and Hoekman (2000), find that foreign investment has a negative effect on the performance of domestically owned firms.

The mechanisms by which FDI may influence productivity are complex. These mechanisms suggest that multinational activity will have different effects on different indigenous firms, depending on their closeness to a given multinational in the product space and the technology space. In principle at least, these differential effects can be measured with sufficiently detailed firm, or plant-level data, shedding light on the pathways and mechanisms by which foreign firms affect local industries. So, researchers are increasingly focused on identifying specific channels in the data. However, the great bulk of productivity assessment relating MNCs with host country firms is an attempt to measure technology gaps and changes in technology

usually limited to manufacturing. That is a narrow view of MNCs' technology advantages, which may consist more of their knowledge of world markets or methods of coordinating production over many countries (Lipsey, 2002). Furthermore, the most significant part of the literature on MNCs emphasizes technology as a driving force for the internationalization of the operations of such firms. As powerful as technology might be in driving the internationalization of firms, it is not the only intangible asset that firms may seek to exploit worldwide.

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