
Much Ado about Nothing? Do Domestic Firms Really Benefit from Foreign Direct Investment?

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Governments the world over offer significant inducements to attract investment, motivated by the expectation of spillover benefits to augment the primary benefits of a boost to national income from new investment. There are several possible sources of induced spillovers from foreign direct investment. This article evaluates the empirical evidence on productivity, wage, and export spillovers in developing, developed, and transition economies. Although theory can identify a range of possible spillover channels, robust empirical support for positive spillovers is at best mixed. The article explores the reasons and concludes with a review of policy aspects.

Of all the drivers of globalization—arm's length trade, migration of workers, and cross-border investment—the last is probably the most visible. This is probably why public anxiety about globalization often manifests itself as hostility toward multinational firms (see Deardorff 2003 for a recent appraisal of such anxieties). From an economic standpoint, cross-border investment may also be at the margin the most important manifestation of globalization. Annual flows of foreign direct investment (FDI) now exceed \$700 billion, and the total stock exceeds \$6 billion. Over the past decade FDI flows have grown at least twice as fast as trade.

As with arm's length trade, the FDI environment is policy distorted, but it is gradually becoming more liberalized. Of 145 regulatory changes made by 60 countries in 1998, 94 percent created more favorable conditions for FDI (UN 1999). In many cases interventions have extended beyond creating a more liberal environment to providing substantial public subsidies. For example, Head (1998) reports that the government of Alabama paid the equivalent of \$150,000 per employee to Mercedes for locating its new plant in the state in 1994. Across the Atlantic the UK government

provided an estimated \$30,000 per employee to attract Samsung to the northeast of England in the late 1990s and \$50,000 per employee to attract Siemens (Girma and others 2001). Some countries also provide tax incentives. For example, Ireland offers a corporate tax rate of 12.5 percent to all manufacturing firms locating there.

There seems to be a widely held assumption that foreign firms more than pay their way, bringing not only new investment that boosts national income but also secondary spillovers, resulting in productivity growth or higher export growth. Much econometric work has been done in this area, but the results on the importance of spillovers are mixed at best. There is some evidence from case studies of spillover benefits to domestic firms (see Moran 2001), but even at that level there is disagreement in particular instances.¹

The failure of econometric work to find unambiguously positive effects could be due to a number of factors. Despite theoretical arguments supporting spillovers, they may simply be unimportant in reality. Multinational corporations may be effective at ensuring that firm-specific assets and advantages do not spill over. Another possibility is that spillovers exist and make up some part of the residual that appears in all growth equations, but current statistical methods and data sets are unable to identify them. Furthermore, there may be much heterogeneity in spillovers, and aggregate studies may therefore fail to detect them. Moreover, the lack of good-quality, comprehensive firm- and plant-level data sets is a serious impediment to research.

This article examines in detail the evidence for intraindustry productivity spillovers in theory and in econometric analyses, taking essentially a microeconomic and microeconomic view.² It updates earlier surveys, such as Blomström and Kokko (1998) and Lipsey (2002) and highlights methodological issues and the scope for policymakers to enhance potential spillover effects. The review is more focused on spillovers from FDI than are related studies by Keller (2001) or Saggi (2002), who discuss the scope and evidence for international technology diffusion more generally, without much detail on FDI.

This article looks first at what guidance theory can give, on two counts: the possible channels for transmission of spillover benefits and whether host country characteristics are likely to make a difference in the extent or speed with which spillovers occur. It examines the empirical evidence on spillovers in developed, developing, and transition economies and then draws some implications for policy. Should governments intervene, and if so, how? Does policy make any difference?

What Does Theory Tell Us?

A well-developed and extensively surveyed (see Caves 1996; Markusen 1995) body of literature tries to explain why multinational corporations set up overseas rather than export directly or license their product or technology. The most persuasive

explanations emphasize the coexistence of proprietary knowledge and market failures in protecting that knowledge. Thus the firm internalizes certain transactions to protect its brand, technology, and marketing advantages. These motives are taken as given, in particular, the existence of some kind of firm-specific asset, usually some kind of technological advantage, including innovative management and organizational processes as well as new production methods and technologies.

The first question, then, is having chosen a particular location, how might any advantages spill over to the local economy through firms in the same industry? Then, with potential transmission channels identified, are there particular host economy characteristics that make benefits from spillovers more or less likely?

Spillover Channels

When a firm sets up a plant overseas or acquires a foreign plant, it does so in the expectation of realizing a higher rate of return than a given home country firm with an equivalent investment. The source of the higher return is the technological advantage alluded to. Whatever its source, the only way domestic firms can gain from external benefits is if some form of indirect technology transfer takes place—multinational firms will not simply hand over the source of their advantage. The theoretical literature identifies four channels through which spillovers might boost productivity in the host country: imitation, skills acquisition, competition, and exports (table 1).

Imitation. Imitation is the classic transmission mechanism for new products and processes. One mechanism commonly alluded to in the theoretical literature on technology transfer from developed to developing economies is reverse engineering (Das 1987; Wang and Blomström 1992). Its scope depends on the complexity of products and processes, with simple manufactures and processes easier to imitate than more complex ones. The same principle applies to managerial and organizational innovations, although these are thought to be easier to imitate. Imitation is, of course, not the same as replication, and it would be surprising if the rents accruing

Table 1. Potential Channels for Spillover from Foreign Direct Investment	
Driver	Sources of productivity gain
Imitation	Adoption of new production methods. Adoption of new management practices.
Skills acquisition	Increased productivity of complementary labor. Tacit knowledge.
Competition	Reduction in X-inefficiency. Faster adoption of new technology.
Exports	Scale economies. Exposure to technology frontier.
Source: Authors' compilation; see text for details.	

to multinational firms were entirely dissipated by the process. However, any upgrading to local technology deriving from imitation could result in a spillover, with consequent benefits for the productivity of local firms.

Skills Acquisition. Adoption of new technology can also occur through the acquisition of human capital. Even when the locational pull for FDI is relatively low wages, multinational firms tend to demand relatively skilled labor. Generally, they will invest in training, and it is impossible to lock in such resources completely. (This inability to fully protect investment in human capital has long been an argument for infant industry protection as a response to potential first-mover disadvantages; see Baldwin 1969.) The movement of labor from multinational firms to other existing or new firms can generate productivity improvements through two mechanisms: through a direct spillover to complementary workers and through knowledge carried by workers who move to another firm. Haacker (1999) and Fosfuri and others (2001) argue that the knowledge that workers bring with them is the most important channel for spillovers, and some empirical work supports this (Djankov and Hoekmann 1999; Görg and Strobl 2002c).

Competition. Many models emphasize the role of competition (Wang and Blomström 1992; Glass and Saggi 2002). Unless an incoming firm is offered monopoly status, it will produce in competition with indigenous firms. Even if indigenous firms are unable to imitate the multinational's technology and production processes, entry of the multinational firm puts pressure on them to use existing technology more efficiently, yielding productivity gains. Greater competition leading to a reduction in X-inefficiency is analogous to one of the standard gains from arm's length trade and is frequently identified as one of the major sources of gain. In addition, competition may increase the speed of adoption of new technology.

Exports. A further indirect source of productivity gain might be through exports. Crudely, domestic firms can learn to export from multinationals (Aitken and others 1997; Barrios and others 2003; Greenaway and others forthcoming). Exporting generally involves fixed costs to establish distribution networks, create transport infrastructure, and learn about consumers' tastes, regulatory arrangements, and so on in overseas markets. Multinational firms generally come already armed with such information and exploit it to export from the new host country. Through collaboration, or more likely imitation, domestic firms can learn how to penetrate export markets. There is a growing body of literature that links exporting and productivity. Recent work on Germany, Mexico, Morocco, Spain, the United Kingdom, the United States, and Venezuela suggests that productivity levels are higher in exporting firms than in nonexporting firms (Clerides and others 1998; Bernard and

Jensen 1999; Bernard and Wagner 1997; Delgado and others 2003; and Girma and others forthcoming). Central to this literature is whether firms self-select into exporting or increase their productivity after entering export markets.

Host Country Characteristics and Spillovers

The literature on the determinants of FDI emphasizes locational characteristics as important factors in multinationals' decisions on where to invest (Wheeler and Mody 1992; Brainard 1997; Görg 2002). The focus here, however, is on whether there are locational characteristics that affect the speed of adoption of new technology and the spillover of productivity gains.

In a pioneering contribution Findlay (1978) emphasizes the importance of relative backwardness and contagion. Findlay's model suggests that the greater is the distance between two economies in terms of development, the greater the backlog of available opportunities to exploit in the less advanced economy, and so the greater the pressure for change and the more rapid the uptake of new technology. Speed of adoption is also a function of contagion or the extent to which the activities of the foreign firm pervade the local economy. Thus technology transfer will be more rapid if the multinational firm quickly establishes upstream and downstream networks, because domestic firms involved in supply and distribution chains gain exposure to new technology, promoting its diffusion.

Glass and Saggi (1998) also see a role for technological distance between the host and home country, but a different one from Findlay's. Any technology gap signals something to the multinational firm about absorptive capacity. The bigger the gap, the less likely the host is to have the human capital, physical infrastructure, and distribution networks to support inward investment. This influences not only the decision to invest but also what kind of technology to transfer. Specifically, the bigger the gap, the lower the quality of technology transferred and the lower the potential for spillovers. This seems more plausible than Findlay's notion of a lack of absorptive capacity as the driver. Clearly, technological distance will be directly related to the potential gains from spillovers, but it is also likely to be inversely related to the probability that domestic firms are actually able to access them.

Summary

Economic theory gives some guidance on what to expect from cross-border investment and spillovers. In general, multinational firms have firm-specific advantages that might be related to the production methods they use, the way they organize their activities, the way they market their products and services, and so on. Once a multinational has set up a subsidiary, it may be unable to prevent some of the benefits of these advantages from spilling over to indigenous firms through imitation, labor

mobility, competition, or export. Such spillovers have the potential to raise productivity, and exploitation of these potential channels of spillovers might be related to the structural characteristics of the host economy, in particular its absorptive capacity.

What Does the Evidence Tell Us?

Empirical studies on spillovers from FDI were pioneered by Caves for Australia (1974), Globerman for Canada (1979), and Blomström for Mexico (1986). Since then, their empirical models have been extended and refined, although the basic approach remains. Most econometric analyses use a framework that regresses the labor productivity or total factor productivity of domestic firms on a range of independent variables. To measure productivity spillovers from multinational firms, a variable is included that proxies the extent of foreign firms' penetration, usually calculated as the multinational's share of total employment or sales in a given sector.³ In other words, the regression allows for an effect of FDI on the productivity of domestic firms in the same industry. If the regression analysis yields a positive and statistically significant coefficient on the foreign presence variable, this is taken as evidence that spillovers have occurred from multinational firms to domestic firms.⁴ Most studies use either the contemporaneous level of foreign penetration or relatively short lags (most often one year) as their explanatory variables. If anything, therefore, these studies usually measure short-run effects of foreign presence on domestic productivity.

Table 2 sets out details of 40 studies of horizontal productivity spillovers in manufacturing industries in developing, developed, and transition economies. Of those, 22 report unambiguously positive and statistically significant horizontal spillover effects (2 of which find positive and significant effects for only one of several countries studied). All but eight of those reporting unambiguously positive spillovers use cross-sectional data, which may lead to biased results.

Görg and Strobl (2001) argue that panel data using firm-level data are the most appropriate estimating framework for two reasons. First, they permit investigation of the development of domestic firms' productivity over a longer time period, rather than at one point in time. Second, they allow investigation of spillovers after controlling for other factors. Cross-section data, particularly if aggregated at the sectoral level, fail to control for time-invariant differences in productivity across sectors that might be correlated with foreign presence without being caused by it. Thus coefficients on cross-section estimates are likely to be biased. For example, if productivity is higher in the electronics sector than in the food sector, multinationals may be attracted to the electronics sector. Cross-sectional data would show a positive and statistically significant relationship between the level of foreign investment and productivity consistent with spillovers, even though foreign investment did not cause high levels of productivity but rather was attracted by them.

Table 2. Papers on Intraindustry Productivity Spillovers

<i>Author</i>	<i>Country</i>	<i>Period</i>	<i>Data</i>	<i>Aggregation level^a</i>	<i>Result^b</i>
<i>Developing economies</i>					
1 Blomström and Persson (1983)	Mexico	1970	Cross-sectional	Industry	+
2 Blomström (1986)	Mexico	1970/1975	Cross-sectional	Industry	+
3 Blomström and Wolff (1994)	Mexico	1970/1975	Cross-sectional	Industry	+
4 Kokko (1994)	Mexico	1970	Cross-sectional	Industry	+
5 Kokko (1996)	Mexico	1970	Cross-sectional	Industry	+
6 Haddad and Harrison (1993)	Morocco	1985–89	Panel	Micro and industry	?
7 Kokko and others (1996)	Uruguay	1990	Cross-sectional	Micro	?
8 Blomström and Sjöholm (1999)	Indonesia	1991	Cross-sectional	Micro	+
9 Sjöholm (1999a)	Indonesia	1980–91	Cross-sectional	Micro	+
10 Sjöholm (1999b)	Indonesia	1980–91	Cross-sectional	Micro	+
11 Chuang and Lin (1999)	Taiwan	1991	Cross-sectional	Micro	+
12 Aitken and Harrison (1999)	Venezuela	1976–89	Panel	Micro	–
13 Kathuria (2000)	India	1976–89	Panel	Micro	?
14 Kokko and others (2001)	Uruguay	1988	Cross-sectional	Micro	?
15 Kugler (2001)	Colombia	1974–98	Panel	Industry	?
16 López-Córdova (2002)	Mexico	1993–99	Panel	Micro	–, ?
17 Görg and Strobl (2002c)	Ghana	1991–97	Panel	Micro	+
<i>Developed countries</i>					
18 Caves (1974)	Australia	1966	Cross-sectional	Industry	+
19 Globerman (1979)	Canada	1972	Cross-sectional	Industry	+
20 Liu and others (2000)	United Kingdom	1991–95	Panel	Industry	+
21 Driffeld (2001)	United Kingdom	1989–92	Cross-sectional	Industry	+
22 Girma and others (2001)	United Kingdom	1991–96	Panel	Micro	?
23 Girma and Wakelin (2001)	United Kingdom	1980–92	Panel	Micro	?
24 Harris and Robinson (2004)	United Kingdom	1974–95	Panel	Micro	?
25 Girma and Wakelin (2002)	United Kingdom	1988–96	Panel	Micro	?

(Continued)

Table 2. (Continued)

<i>Author</i>	<i>Country</i>	<i>Period</i>	<i>Data</i>	<i>Aggregation level^a</i>	<i>Result^b</i>
26 Haskel and others (2002)	United Kingdom	1973–92	Panel	Micro	+
27 Girma (2002)	United Kingdom	1989–99	Panel	Micro	?
28 Girma and Görg (2002)	United Kingdom	1980–92	Panel	Micro	?
29 Ruane and Ugur (2002)	Ireland	1991–98	Panel	Micro	+
28 Barrios and Strobl (2002)	Spain	1990–94	Panel	Micro	?
29 Dimelis and Louri (2002)	Greece	1997	Cross-sectional	Micro	+
30 Castellani and Zanfei (2002b)	France, Italy, Spain	1992–97	Panel	Micro	+ for Italy; – for Spain; ? for France
31 Keller and Yeaple (2003)	United States	1987–96	Panel	Micro	+
32 Görg and Strobl (2003)	Ireland	1973–96	Panel	Micro	+
<i>Transition economies</i>					
33 Djankov and Hoekman (2000)	Czech Republic	1993–96	Panel	Micro	–
34 Kinoshita (2001)	Czech Republic	1995–98	Panel	Micro	?
35 Bosco (2001)	Hungary	1993–97	Panel	Micro	?
36 Konings (2001)	Bulgaria	1993–97	Panel	Micro	–
	Poland	1994–97			?
	Romania	1993–97			–
	Bulgaria, Czech Republic, Estonia, Hungary, Poland, Romania, Slovakia, Slovenia	1994–1998			? or – + only for Romania
37 Damijan and others (2001)					
38 Li and others (2001)	China	1995	Cross-sectional	Industry	+
39 Smarzynska-Javorcik (forthcoming)	Lithuania	1996–2000	Panel	Micro	?
40 Zukowska-Gagelmann (2000)	Poland	1993–97	Panel	Micro	–

^aMicro data are at the firm, plant, or establishment level.

^bA + indicates positive and statistically significant, – indicates negative and statistically significant, and ? indicates mixed or statistically insignificant results on the foreign presence variable for the aggregate sample.

Taking this into consideration, the evidence on positive horizontal spillovers is much weaker. There are only eight studies employing panel data that find unambiguously positive evidence in the aggregate, and almost all of these are for developed economies: Liu and others (2000) and Haskel and others (2002) for the United Kingdom, Castellani and Zanfei (2002b) for Italy, Keller and Yeaple (2003) for the United States, Ruane and Ugur (2002) and Görg and Strobl (2003) for Ireland, Damijan and others (2001) for Romania, and Görg and Strobl (2002c) for Ghana. Liu and others (2000), however, use industry-level data that aggregates over heterogeneous firms, which may lead to biased results.⁵ This leaves only seven studies using appropriate data and estimation techniques that report positive evidence for aggregate spillovers.

Several studies using firm-level panel data find some evidence of negative effects of the presence of multinationals on domestic firms in the aggregate. These include Aitken and Harrison (1999) for Venezuela, López-Córdova (2002) for Mexico, Castellani and Zanfei (2002b) for Spain, Djankov and Hoekman (2000) for the Czech Republic, Konings (2001) for Bulgaria, Zukowska-Gagelmann (2000) for Poland, and Damijan and others (2001) for seven countries in Central and Eastern Europe. Many studies on transition economies find at least some evidence of negative results. Nineteen of the studies find no statistically significant effects on average of multinationals on domestic productivity.⁶

What Explains the Negative or Neutral Effects?

There have been several explanations for the negative results found by some studies. The most plausible is that foreign firms reduce the productivity of domestic firms through competition effects, as suggested by Aitken and Harrison (1999) and Konings (2001). They argue that multinationals have lower marginal costs due to some firm-specific advantage, which allows them to attract demand away from domestic firms, thus forcing the domestic firms to reduce production and move up their (given) average cost curve.

This argument is not necessarily inconsistent with the theoretical discussion in the previous section, which presented competition as one of the channels through which positive spillovers are transmitted. Some firms may experience negative competition effects in the short run (moving up a given average cost curve), whereas other firms may improve efficiency (shifting down their average cost curve) because of increased competition in the short run as well as the long run. Evidence for positive effects of competition are found by Kokko (1996) for Mexico and Driffield (2001) for the United Kingdom.

There are also other explanations for a failure to find evidence of positive aggregate spillovers in the short run. There may be lags in domestic firms' learning from multinationals, which short-run analyses do not pick up. Multinational firms may

be able to guard their firm-specific advantages closely, preventing leakages to domestic firms and therefore spillovers as well. Positive spillovers may affect only a subset of firms, so that aggregate studies underestimate the true significance of such effects. Spillovers may occur not horizontally (intraindustry) but vertically through relationships that are missed in conventional spillover studies.

The first two explanations are straightforward and plausible and require little comment. More detailed discussion is warranted for the last two explanations.

Absorptive Capacity. As discussed, the theoretical literature suggests that not all firms would be expected to benefit equally from knowledge spillovers from multinationals. Whether a firm benefits depends on its relative backwardness and its capacity for assimilating knowledge—its absorptive capacity. Some of the empirical literature has also considered these issues.

Kokko (1994) advances the idea that spillovers depend on the complexity of the technology transferred by multinationals and on the technology gap between domestic firms and multinational firms. Using cross-section industry-level data for Mexico, he finds no evidence for spillovers in industries in which multinationals use highly complex technologies (as proxied by large payments on patents or high capital intensity). A large technology gap on its own does not appear to hinder technology spillovers on average, although industries with large gaps and a high foreign presence experience lower spillovers than others. Expanding on Kokko (1994), Kokko and others (1996) hypothesize that domestic firms can benefit only if the technology gap is not too wide so that domestic firms can absorb the knowledge available from the multinational—an argument similar to that of Glass and Saggi (1998). Thus domestic firms using very backward production technologies and low skilled workers may be unable to learn from multinationals. Using a cross-section of firm-level data for Uruguay, Kokko and others find evidence for productivity spillovers to domestic firms with moderate technology gaps (measured as the difference between the domestic firm's labor productivity and the average labor productivity in foreign firms) but not for firms that use considerably lower levels of technology.⁷

Girma and others (2001), using firm-level panel data, find no evidence of productivity spillovers in UK manufacturing on average—under the assumption that spillovers are homogeneous across different types of domestic firms. There is evidence for spillovers to firms with a small gap between their productivity level and the industry frontier productivity level (called the technology gap). Productivity appears to increase with increasing foreign presence for firms with a technology gap of 10 percent or less, whereas it appears to diminish in firms with larger gaps. Girma (2002) uses threshold regression techniques to quantify the significance of absorptive capacity, and Girma and Görg (2002) use conditional quantile regression techniques to allow for different effects of FDI on establishments at different quantiles of the productivity distribution. Both studies find support for the hypothesis that only

firms with some minimum level of absorptive capacity benefit from productivity spillovers.

In a similar vein, Barrios and Strobl (2002), in firm-level panel data for Spanish manufacturing, find little evidence for any aggregate horizontal spillovers from multinational firms. There is evidence for positive spillovers from foreign presence to domestic exporters but not to nonexporters, which they interpret as evidence that absorptive capacity matters. They argue that exporting firms are more exposed to international competition and therefore are more likely to use more advanced technologies and to benefit from positive spillovers than are nonexporters. Kinoshita (2001), using firm-level panel data for the Czech Republic, also finds no evidence of spillovers on average but finds positive spillovers for local firms that are research and development (R&D) intensive. She interprets this as evidence that absorptive capacity is important.

Damijan and others (2001) also define absorptive capacity in terms of local firms' R&D activities. In their firm-level panel data for a number of Central and Eastern European transition economies, they fail to detect evidence of productivity spillovers affecting the average firm. Taking into account absorptive capacity, by interacting the foreign presence variable with a firm's R&D expenditure, they find evidence of negative spillovers for the Czech Republic and Poland but positive spillovers for Romania, and no evidence for all other countries.

Regional Dimensions. Because human capital acquisition and imitation are considered important channels for knowledge spillovers, domestic firms located near multinationals may be more likely to benefit than other firms. For example, Audretsch (1998:21) argues that geographic proximity is necessary to facilitate knowledge spillovers because "knowledge is vague, difficult to codify, and often only serendipitously recognized." Therefore, transmission costs are assumed to increase with distance.

Several studies have investigated the geographic dimension of horizontal spillovers. Calculating proxies for foreign presence at the regional level and using cross-sectional data for Indonesia, Sjöholm (1999a) fails to find evidence of a regional component. Aitken and Harrison (1999), using firm-level panel data for Venezuela, also fail to find positive spillovers from multinationals to domestic firms in the same region, though they find negative spillovers from multinationals in the same sector in any region in the country. From firm-level panel data, Girma and Wakelin (2002) find evidence for positive spillovers from FDI in the same region and sector as domestic firms in the United Kingdom, but the results are significant only for firms that have a low technology gap vis-à-vis multinationals.

Importance of vertical linkages. If multinationals prevent the transfer of their firm-specific knowledge to domestic competitors in the same industry, there is no scope for intraindustry knowledge spillovers. It is possible, however, that multinational

firms voluntarily or involuntarily help increase the efficiency of domestic suppliers or customers through vertical input-output linkages. Multinationals may provide technical assistance to suppliers to help them raise the quality of the intermediate products they produce (Moran 2001), or they may simply insist on high quality standards for local inputs, providing incentives for local suppliers to upgrade their technology. Multinationals may also provide active assistance or passive guidelines to domestic customers on the most effective way to use the products the firms supply.

Several recent studies have empirically investigated vertical spillovers (table 3).⁸ Kugler (2001) worked with industry-level panel data for 10 Colombian manufacturing industries during 1974–98, using an estimation framework that distinguishes intraindustry and interindustry spillovers. He finds widespread evidence for positive interindustry spillovers, but finds evidence for intraindustry spillovers only in one sector (machinery equipment). However, his framework does not distinguish spillovers through backward or forward linkages. Smarzynska-Javorcik (forthcoming) uses firm-level panel data for Lithuania for 1996–2000 to consider spillovers through backward linkages. Although she found no evidence for aggregate horizontal spillovers, she does find productivity spillovers through backward linkages. Blalock and Gertler (2003) also find results suggesting positive productivity spillovers through backward linkages in their analysis of Indonesian plant-level panel data. They do not find evidence for horizontal spillovers, however.

Driffield and others (2002) allow for spillovers through horizontal, backward, and forward relationships. They examine the relative importance of each using industry-level panel data for UK manufacturing during 1984–92. Their econometric estimations show evidence for positive spillovers through forward linkages but not of statistically significant spillovers through backward linkages. The results for horizontal spillovers are inconclusive. In a further study for the United Kingdom, Harris and Robinson (2004) use plant-level panel data to estimate productivity equations for 20 manufacturing sectors separately. Like Kugler (2001), they distinguish only horizontal and vertical spillovers; they do not separate vertical spillovers into backward or forward linkages. Their results suggest that interindustry spillovers are much more prevalent than intraindustry spillovers. None of the spillovers are always positive, however, and there is evidence of negative spillovers in many sectors. Girma and others (2003), using UK firm-level data, also find substantial differences in whether domestic firms benefit from vertical linkages, depending on their export activities.

Wage Spillovers

If there are positive productivity spillovers from multinational firms to domestic firms and if some of these spillovers are due to increasing labor productivity, domestic firms will pay higher wages in competitive labor markets. Another field of empirical

Table 3. Studies on Vertical Spillovers

Author	Country	Period	Data	Aggregation level ^a	Result ^b		
					Horizontal	Backward	Forward
1 Kugler (2001) ^c	Colombia	1974–98	Panel	Industry	?	Many +	NA
2 Smarzynska-Javorcik (forthcoming)	Lithuania	1996–2000	Panel	Micro	?	+	NA
3 Driffeld and others (2002)	United Kingdom	1984–92	Panel	Industry	?	?	+
4 Harris and Robinson (2002) ^c	United Kingdom	1974–95	Panel	Micro	?	?	?
5 Blalock and Gertler (2003)	Indonesia	1988–96	Panel	Micro	?	+	NA

^aMicro data are at the firm, plant, or establishment level.

^bA + indicates positive and statistically significant, – indicates negative and statistically significant, and ? indicates mixed or statistically insignificant results on the foreign presence variable for the aggregate sample. NA = not applicable.

^cDo not distinguish backward and forward spillovers.

Table 4. Studies on Wage Spillovers

<i>Author</i>	<i>Country</i>	<i>Period</i>	<i>Data</i>	<i>Aggregation level^a</i>	<i>Result^b</i>
1 Aitken and others (1996)	Mexico	1984–90	Panel	Industry	–
	Venezuela	1977–89	Panel	Industry	–
	United States	1987	Cross-sectional	Industry	+
2 Lipsey and Sjöholm (2001)	Indonesia	1996	Cross-sectional	Micro	+
3 Girma and others (2001)	United Kingdom	1991–96	Panel	Micro	?
4 Driffield and Girma (2003)	United Kingdom	1980–92	Panel	Micro	?

^aMicro data are at the firm, plant, or establishment level.

^bA + indicates positive and statistically significant, – indicates negative and statistically significant, and ? indicates mixed or statistically insignificant results on the foreign presence variable for the aggregate sample.

research focuses on this connection, emphasizing horizontal spillovers (table 4).⁹ Productivity spillovers are not the only channel for such wage spillovers, however. Multinationals often pay higher wages, even after controlling for size and other firm and sectoral characteristics (Girma and others 2001; Lipsey and Sjöholm 2001; Görg and others 2003). This is attributed to the multinational firms' ownership of firm-specific assets, implying that they use higher levels of technology than domestic firms. If multinationals and domestic firms compete in the same labor market, domestic firms have to pay higher wages to attract workers. Wage spillovers can also be negative, however, if there are negative productivity spillovers from multinationals.

As with productivity, identifying wage spillovers usually involves estimating the determinants of wages in domestic firms and including a measure of foreign presence (multinationals' share of total employment) in the industry as a covariate. Aitken and others (1996) use industry-level data for manufacturing industries for Mexico (1984–90), Venezuela (1977–89), and the United States (1987). They find positive effects in the United States, but negative effects in Mexico and Venezuela. As with productivity spillovers, the result for the United States should be treated with caution because the study uses cross-sectional data. Lipsey and Sjöholm (2001) study the same effect for the Indonesian manufacturing sector using plant-level cross-sectional data for 1996 and find that higher foreign presence in a sector leads to higher wages in domestic firms in the same sector. Girma and others (2001), using firm-level panel data for UK manufacturing for 1991–96, find no effect on average of multinationals in a sector on the wage level in domestic firms but weak evidence of a negative effect on wage growth.

Export Spillovers

A third strand in the literature focuses on whether multinationals spread their knowledge of global markets to domestic firms, thus enabling them to become more

successful exporters. Domestic firms can be affected through three primary channels. First, if multinationals have better access to information about foreign markets, this can spill over through their export activities. Second, domestic firms can learn the multinationals' superior production or management techniques through observation (demonstration effects), enabling the domestic firms to compete more successfully in export markets. Third, competition with multinational firms at home and in foreign markets can induce domestic firms to improve their export performance.

Several studies have examined export spillovers (table 5). Aitken and others (1997) estimate a probit model using export activity by multinationals in the industry and region as a proxy for export information externalities. Using plant-level cross-section data for Mexican manufacturing industries for 1986 and 1989, they find that export activities by multinational firms in a sector positively affect the probability of a firm in the same sector, foreign or domestic, being an exporter.

Using firm-level panel data for the United Kingdom for 1992–96, Greenaway and others (forthcoming) also investigate whether spillovers affect a firm's probability of exporting but extend the analysis to examine what affects a firm's export ratio. In a two-step Heckman selection model, they first estimate the probability of exporting and then estimate the factors that affect a firm's export ratio. They include three measures of multinational presence to capture the three spillover channels.

Their results suggest that multinational firms' exports have a positive effect on domestic firms' probability of exporting but do not affect their export ratio. They also find that R&D spillovers from multinationals to domestic firms and the presence of multinational firms in the sector positively affect the decision to export and the export ratio. Thus, export information externalities appear to matter only for the decision of whether to export. This is not surprising because these externalities can be expected to aid domestic firms in overcoming the sunk costs of exporting, which should affect their probability of exporting but not their export ratio.

Table 5. Papers on Export Spillovers

<i>Author(s)</i>	<i>Country</i>	<i>Period</i>	<i>Data</i>	<i>Aggregation level^a</i>	<i>Result^b</i>
1 Aitken and others (1997)	Mexico	1986/1989	Cross-sectional	Micro	+
2 Kokko and others (2001)	Uruguay	1998	Cross-sectional	Micro	?
3 Greenaway and others (forthcoming)	United Kingdom	1992–96	Panel	Micro	+
4 Banga (2003)	India	1994–2000	Panel	Micro/industry	+
5 Barrios and others (2003)	Spain	1990–98	Panel	Micro	?

^aMicro data are at the firm, plant, or establishment level.

^bA + indicates positive and statistically significant, – indicates negative and statistically significant, and ? indicates mixed or statistically insignificant results on the foreign presence variable for the aggregate sample.

Barrios and others (2003) also focus on export information externalities and on demonstration effects through R&D spillovers. Using firm-level panel data for Spanish manufacturing for 1990–98, they estimate a probit model to explain why firms export and a tobit model to estimate what determines the firm's export ratio. They find no evidence that either R&D activity or export activity by multinationals in a sector affects the probability that domestic firms export, although they find spillovers from both types of activity on other foreign-owned firms. The tobit estimations, however, find evidence for positive effects of multinationals' R&D activity on domestic firms' export ratios, but no spillovers from multinationals' export activities on domestic firms. The export ratios of other foreign firms again benefit from both types of spillovers. In an extension Barrios and colleagues (2003) discover that R&D spillovers increase domestic firms' exports only to other developed economies, which are generally markets with a superior technological capability.

Kokko and others (2001) investigate the decision to export by domestic firms in Uruguay using cross-sectional firm-level data for 1998. They include only a simple measure of the presence of multinational firms—their output share in an industry, not their export activity—and it is thus not clear which channel leads to spillovers. However, they distinguish between the presence of multinational firms in import-substituting and export-orientated industries and find evidence only for spillovers from export-oriented multinationals. This suggests that the trade regime within which multinationals operate may determine their potential for generating positive export spillovers.

Summary

An extensive array of empirical studies have searched for productivity spillovers from multinationals of various forms. Much of this work has relied on cross-section methods. With the growing availability of longitudinal data at the plant and firm level, however, more analysts are using panel techniques. This is a helpful development for two reasons: first because the plant or firm is the most appropriate level of scrutiny, and second because there are methodological shortcomings associated with applying cross-section techniques.

Much of the work fails to find positive horizontal spillovers on aggregate, with some studies reporting negative effects of multinational presence on domestic productivity. Evidence on horizontal effects on wages and export spillovers is also mixed. However, studies that further disaggregate data into more homogeneous groups of firms or plants find more encouraging results. In particular, there is evidence that the absorptive capacity of domestic firms and their geographic proximity to multinationals are important determinants of whether domestic firms benefit from FDI in the same sector. This suggests that

spillovers may not affect all firms equally but may benefit only firms with high levels of absorptive capacity or close proximity to multinationals. Furthermore, the few studies that have looked at the potential for vertical (interindustry) spillovers find evidence suggesting that vertical spillovers may be a more important channel for knowledge externalities than horizontal spillovers (see also Moran 2001).

Is There a Role for Policy?

In general, most governments see FDI as having greater potential to improve total factor productivity than an equivalent amount of domestic investment. This would be taken as axiomatic in developing and transition economies and, depending on the origin of the multinational firm, in at least some developed economies. Add to this the potential spillovers from multinational firms to domestic firms that are believed to raise their productivity, yielding a second growth bonus, and it becomes clear why attracting inward investment figures prominently in the policy priorities of so many governments. This leads naturally to three questions: Can active policy intervention influence the level and composition of inward investment? Can particular policies maximize the potential for spillovers, both by encouraging multinationals to transfer technologies and by improving the absorptive capacity of domestic firms? Do targeted policies yield net benefits?

Policy and the Level and Composition of FDI

The role of policy in influencing the level and composition of FDI has been reviewed extensively (see, for example, Balasubramanyam and Salisu 2001; Pain 2000; Hanson 2001). Most work relates to developing economies because policy interventions there have in general been more active, though a growing volume of research relates to industrial countries, where most FDI originates.

Several key points emerge from this work.

- Trade policy is relevant. In general, economies with more open trade regimes have done better at attracting FDI and benefiting from it than countries with inward-oriented regimes (Balasubramanyam and others 1996).
- Although there is some evidence that investment incentives can affect the location choice of multinationals, the effect appears to be small (Coughlin and others 1991; Head and others 2000). Head and colleagues (2000) even argue that competition between potential host governments may render incentives ineffective as they offset each other. Also, this form of competition for FDI may have

affected the distribution of incentives and is likely to have redistributed income from host countries to multinational firms (Haaland and Wooton 1999).

- Trade-related investment measures (TRIMs), such as local content requirements and minimum export requirements, are often introduced to recapture some of the rents that accrue to multinational firms. Although these measures can have positive welfare effects on the host country, the evidence does not point to major effects on levels of inward investment in developing economies (Greenaway 1992).
- The quality of local infrastructure is vitally important, in particular communication and transportation facilities, both in attracting initial investments and in sustaining clusters (Coughlin and others 1991; Coughlin and Segev 2000).
- The availability of relatively skilled labor is an important magnet (Coughlin and Segev 2000) as well as a key driver of agglomeration (Ottaviano and Puga 1998). It has also been argued that host countries are more likely to benefit from spillovers if they have a large supply of skilled labor (Keller 1996) and if domestic firms have a high level of technological capacity (Glass and Saggi 1998).

Overall the evidence seems to suggest that interventions should strive largely to provide a supportive economic environment. More specifically, this flags a role for education and training policies aimed at upgrading general skills, technology policies aimed at developing clusters, and public investment policies aimed at developing efficient and reliable transportation and communication networks.

Policy and Spillovers

The evidence on spillovers reported here is mixed at best. There are no clear results that domestic firms always and unambiguously gain from the presence of multinational firms. Several factors could be at play. Under the optimistic view that spillovers occur but measurement instruments are not fine enough to identify them, the question is whether governments can implement policies to maximize the prospects for extracting benefits from multinational firms. General policies—designed to change the environment within which multinationals operate—include industrial policy, infrastructure development, trade policy, exchange rate policy, and so on. There is evidence to suggest that such policies are related to the overall level of inward investment into an economy over a period of time. General policies may turn out to be the most effective means of boosting the probability of positive spillovers. If, for example, absorptive capacity is the critical driver, education and training policy is likely to be key to facilitating spillovers.

As for specific policies, many TRIMs are targeted at encouraging spillovers (table 6). Local content requirements, which have been widely used, are intended to raise the share of local value added in subsidiary production and in the process encourage

Table 6. TRIMS Targeted at Spillovers

<i>Instrument</i>	<i>Intended effect</i>
Input TRIMS	
Local content requirements	Specify that some proportion of value added or intermediate inputs is locally sourced.
Local equity participation	Specifies that some proportion of the equity must be held locally.
Local hiring targets	Ensure specified employment targets are hit.
Expatriate quotas	Specify a maximum number of expatriate staff.
National participation in management	Specifies that certain staff must be nationals or sets a schedule for the 'indigenisation' of the management.
R&D requirements	Commit multinationals to investment in research and development.
Technology transfer	Commits multinationals to local use of specified foreign technology.
Output TRIMS	
Export controls	Specify that certain products may not be exported.
Licensing requirements	Oblige the investor to license production of output in the host country.
Technology transfer	Commits multinationals to a specified embodied technology.

Source: Derived from Greenaway (1992).

upstream development, with the intention of stimulating interindustry spillovers. Because one can argue that spillovers are more likely if there is some local ownership, local equity requirements are geared to that end. Local hiring targets and expatriate quotas are intended to raise the share of employment accounted for locally, with a view to encouraging spillovers through the transfer of human capital. R&D and technology transfer requirements are intended to make multinational firms commit to some minimum level of R&D expenditures or transfer technology to local firms.¹⁰

The economics of TRIMS is not straightforward. In general they are second-best measures. For example, analytically a local content requirement is equivalent to an input tariff, though less efficient. What little work has so far been completed on TRIMS has failed to establish a direct link between them and the transfer of useful technologies (Blomström and others 1994; Greenaway 1992). This appears to be because many of the measures are difficult to specify precisely and to monitor. But it is also because the more general policies referred to are in practice rather more important.

Conclusions

FDI is a key driver of economic growth and development. Most governments consider attracting FDI a priority, particularly in developing and transition economies. It is given this emphasis not just because it boosts capital formation but also because it can enhance the quality of the capital stock. The reason is that multinationals are

assumed to bring with them best practice or, as a minimum, better practice technology and management. Moreover, it is possible (even probable) that a given multinational firm will not be able to protect its superior technology or management fully to prevent some elements from being absorbed by indigenous firms. If spillovers occur, they provide an external benefit from FDI, one that governments are hoping to secure when they offer inducements.

Theory points to reasons why spillovers might arise, but finding robust empirical evidence to support their existence is more difficult. This could indicate that the benefits are in fact illusory, in that multinational firms are effective in protecting their assets. But it could as well be that researchers are looking in the wrong place and with the wrong lens. Many studies focus on the industry rather than the firm or plant. The growing availability of survey data at the firm and plant level makes such study increasingly feasible. Most studies use cross-section data when panel data are required for proper analysis.

Because research on disaggregated data with both cross-sectional and longitudinal variation is still limited, the message is clear: More systematic research is needed. More discriminating work is also required, analysis that probes what really matters—form of entry (greenfield or acquisition), ownership characteristics, corporate governance, absorptive capacity of domestic firms, and so on.

The consensus in the policy literature is also clear: General policies aimed at altering the fundamentals are more important than specific policies aimed at attracting particular investments. Such specific policies seem to affect primarily the distribution of rents. Governments compete in offering investment incentives and in the process create rents for multinational firms. They then use (at least some) TRIMS to try to reclaim some of those rents.

Both econometric evidence and survey and case study work suggest that the characteristics of the economic environment are generally much more important: infrastructure, local labor market conditions, reliability of communications systems, and so on, as well as the overall macroeconomic and trade policy climate. That, of course, does not mean that selective interventions will cease to be extensively deployed. Governments will no doubt continue to see opportunities for targeted measures, and multinational firms will stand ready to accept them. This is another area for future work. Very little is known about the comparative impact of different instruments.

Notes

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1. For example, Larrain and others (2000) conclude that the location of Intel in Costa Rica has had positive effects on the local economy. Hanson (2001) argues that there is little evidence for spillovers from Intel on domestic firms. He also argues that Ford and General Motors plants in Brazil have failed to show the expected spillover benefits.

2. A related body of literature examines the macro effect of inward FDI on growth in the framework of cross-country growth regressions. See, for example, Balasubramanyam and others (1996), Borensztein and others (1998), and Alfaro and others (forthcoming) for recent evidence. DeMello (1997) provides a review of that literature.

3. Castellani and Zanfei (2002a) argue for the use of the absolute level of foreign activity in the sector rather than foreign activity as a proportion of total activity, because changes of the same magnitude in foreign and aggregate activities within a sector would have no effect on the dependent variable. Although this is an interesting econometric argument, it is not clear what the economic rationale for using absolute rather than relative FDI penetration would be.

4. Interpretation of this coefficient of course hinges on the assumption that the FDI variable does not merely pick up the effect of other correlated factors on productivity—it assumes that a full vector of productivity-augmenting activities is included in the empirical model. Although this may be problematic in some of the studies reviewed herein, it is beyond the scope of this article to discuss this in detail. The article therefore assumes that the estimated FDI coefficient adequately reflects spillovers.

5. Dunne and others (1989) note this for the case of measuring the growth performance of manufacturing plants in the United States.

6. The magnitude of the coefficients, which indicates the strengths of the spillovers, also differs across studies. Görg and Strobl (2001) attempt to explain the differences in magnitude in a meta-regression analysis, using characteristics of the studies (such as data, variables used, countries covered) as explanatory variables.

7. By contrast, Sjöholm (1999b), using cross-sectional data for Indonesian manufacturing firms, finds that productivity spillovers from foreign to domestic firms are larger the larger the technology gap (also defined in terms of differences in labor productivity) and the higher the degree of competition in the industry.

8. Related theoretical models by Rodríguez-Claré (1996) and Markusen and Venables (1999) show that multinationals can have positive effects on the development of domestic firms through vertical input-output linkages. Görg and Strobl (2002a, b) show empirical evidence that the presence of multinational firms has fostered the entry and development of domestic firms in the Republic of Ireland. Alfaro and Rodríguez-Claré (forthcoming) point out that the Rodríguez-Claré (1996) model makes a case for expecting horizontal (intraindustry) rather than vertical spillovers.

9. A related issue is whether FDI contributes to the shift in labor demand toward skilled labor in the host country. See, for example, Feenstra and Hanson (1997) for empirical analysis for Mexico, Figini and Görg (1999) for Ireland, Blonigen and Slaughter (2001) for the United States, and Taylor and Driffield (forthcoming) for the United Kingdom.

10. The Uruguay Round obligated countries to phase out certain TRIMS (those that violate Articles III and XI of the General Agreement on Trade and Tariffs), with local content requirements being the most prominent. The key issue here, however, is whether they work.

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