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## Much ado about nothing? Do domestic firms really benefit from foreign direct investment?

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November 2003

# **Much Ado About Nothing? Do Domestic Firms Really Benefit from Foreign Direct Investment?**

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## **ABSTRACT**

### **Much Ado About Nothing? Do Domestic Firms Really Benefit from Foreign Direct Investment?\***

Governments the world over offer significant inducements to attract inward investment, motivated by the expectation of spillover benefits to augment the primary benefits of a boost to national income from new investment. This paper begins by reviewing possible sources of FDI induced spillovers. It then provides a comprehensive evaluation of the empirical evidence on productivity, wages and exports spillovers in developing, developed and transitional economies. Although theory can identify a range of possible spillover channels, robust empirical support for positive spillovers is, at best, mixed. The reasons for this are explored and the paper concludes with a review of policy aspects.

JEL Classification: F21, F23

Keywords: foreign direct investment, multinationals, spillovers, productivity, wages, exports

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## 1. Introduction

Of all the drivers of globalisation - armslength trade, migration of workers and cross border investment - the last is probably the most visible. This presumably explains why public anxiety about globalisation often manifests itself as hostility towards multinationals (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 the globalisation process. Annual flows of FDI now exceed \$700 billion and the total stock exceeds \$6 billion. Over the last decade FDI flows have grown at least twice as fast as trade.

As with armslength trade, the FDI environment is policy distorted, but has been gradually becoming more liberalised. Thus, in 1998, of 145 regulatory changes made by 60 countries, 94% created more favourable conditions for FDI (UN 1999). In many cases intervention has extended beyond creating a more liberal environment, to providing substantial public subventions. 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 British Government provided an estimated \$30,000 and \$50,000 per employee to attract Samsung and Siemens respectively to the North East of England in the late 1990s (Girma, Greenaway and Wakelin 2001). Some countries also provide tax incentives. For example, Ireland offers a corporate tax rate of 10 percent to all manufacturing firms locating there.

There seems to be a widely held assumption that foreign firms more than 'pay their way' not only do they bring new investment which boosts national income, they are expected to bring secondary spillovers to the host economy, resulting in productivity growth, or export growth being higher than otherwise. Much econometric work has been done in this area that provides, at best, mixed results as to the importance of spillovers. There is some supportive evidence from case studies of spillover benefits to domestic firms (e.g., Moran 2001) although there is, even at that level, disagreement in particular instances.<sup>1</sup>

The failure to find unambiguously positive effects in econometric work could be due to (one or more of) a number of factors. First, despite theoretical arguments pointing to their existence, spillovers may simply be unimportant in reality. In practice, MNEs may be effective at ensuring firm specific assets and advantages do not spill over. A

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<sup>1</sup> For example, Larrain, Lopez-Calva and Rodriguez-Claré (2000) conclude that the location of Intel in Costa Rica has had positive effects on the local economy, Hanson (2000) argues that there is little evidence for spillovers from Intel on domestic firms. Hanson (2000) also argues that the location of Ford and General Motors in Brazil have failed to show the expected spillover benefits.

second possibility is that spillovers exist and are some part of the ‘residual’ which appears in all growth equations, but we have simply failed to develop the statistical methods and/or do not have the datasets 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/plant level datasets is a serious impediment to research and it is at this level that we should be searching for evidence.

This paper examines in detail the evidence for intra-industry productivity spillovers in both theory and econometric analyses.<sup>2</sup> We not only provide an update on earlier surveys such as Blomström and Kokko (1998) and Lipsey (2002), we also highlight methodological issues and the scope for policy makers in enhancing potential spillover effects. Also, the paper is more focussed on spillovers from FDI than related studies by Keller (2001) or Saggi (2002) who discuss more generally the scope and evidence for international technology diffusion without going into too much detail on FDI.

In Section 2 we begin by asking what guidance theory can give, on two counts: first, what are the possible channels for transmission of spillover benefits; second, are host country characteristics likely to make a difference to the extent or speed with which spillovers occur? Section 3 examines the empirical evidence on spillovers in developed, developing and transitional economies. In Section 4 we focus on policy: should governments intervene? If so, what policies should they use? Does policy make any difference? Finally, Section 5 concludes.

## **2. What Does Theory Tell Us?**

### ***2.1 Context***

There is a well developed literature which tries to explain why multinational enterprises (MNEs) set up overseas rather than export directly and/or licence their product/technology. The most persuasive explanations are those that emphasise the co-existence of proprietary knowledge of some form and market failures in protecting that knowledge. Thus the firm internalises certain transactions to protect its brand/technology/marketing advantages. This literature has been extensively surveyed (see Caves, 1996 and Markusen, 1995) and we take these motives as given. In particular, we take as given the existence of some kind of firm specific asset,

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<sup>2</sup> This paper, thus, takes essentially a microeconomic and microeconometric view on these issues. A related literature examines the macro effect of inward FDI on growth in the framework of cross-country growth regressions. See, for example, Balasubramanyam, Salisu and Sapsford (1996), Borensztein, DeGregorio and Lee (1998) and Alfaro, Chanda, Kalemli-Ozcan and Sayek (2003) for recent evidence. DeMello (1997) provides a review of that literature.

usually some kind of technological advantage.<sup>3</sup> The first question is then, having chosen a particular location how might any advantages spill over to the local economy via firms in the same industry? Having identified potential transmission channels, we then need to ascertain whether particular host economy characteristics will make a specific host more or less likely to benefit from spillovers.

## **2.2 Spillover Channels**

When a firm sets up a plant overseas, or acquires a foreign plant, it does so in the expectation of realising a higher rate of return than a given domestic firm with an equivalent investment. The source of the higher return is the technological advantage alluded to above. Whatever its source, the only way in which indigenous firms can gain from external benefits is if some form of *indirect* technology transfer takes place - MNEs will not hand over the source of their advantage voluntarily. The theoretical literature identifies four channels through which the host might boost its productivity via spillovers, as set out in Table 1: imitation; skills acquisition; competition; exports.

[Table 1 here]

**Imitation** is the classic transmission mechanism for new products and processes. A mechanism commonly alluded to in the theoretical literature on ‘North-South’ technology transfer is reverse engineering (e.g. Das, 1987; Wang and Blomström, 1992). Its scope depends on product/process complexity, with simple manufactures and processes easier to imitate than more complex ones. The same principle applies to managerial/organisational innovations, though in principle, at any rate, these are easier to imitate. Imitation is, of course, not the same as replication and it would be surprising if the rents accruing to MNEs 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.

Adoption of new technology can also occur through ***acquisition of human capital***. Even when the locational pull for MNE investment is relatively low wages they nevertheless tend to demand relatively skilled labour in the host country. Generally they will invest in training and in the absence of slavery, it is impossible to lock-in such resources completely.<sup>4</sup> As a result, the movement of labour from MNEs to existing firms, or to start new firms can generate productivity improvement via two mechanisms. First, a direct spillover to complementary workers; second, workers that move may carry with them knowledge of new technology or new management

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<sup>3</sup> Note that ‘technological advantage’ should be interpreted broadly to include innovative management and organisational processes as well as new production methods and technologies.

<sup>4</sup> It is interesting to note that this inability to protect investment in human capital fully has long been seen as an argument for infant industry protection as a response to potential first mover disadvantages (see Baldwin 1968).

techniques. Some argue this is the most important channel for spillovers: Haaker (1999) and Fosfuri, Motta and Ronde (2001), for instance. Moreover, some empirical work supports this, e.g. Djankov and Hoekmann (1999) and Görg and Strobl (2002a).

Many models emphasise 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 the latter are unable to imitate the MNE's technology/production processes, they are under pressure 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 armslength trade and is frequently identified as one of the major sources of gain.<sup>5</sup> In addition, of course, competition may increase the speed of adoption of new technology or the speed with which it is imitated.

A further indirect source of productivity gain might be via *export spillovers*. Crudely, domestic firms can learn to export from multinationals (see Aitken, Hanson and Harrison, 1997, Barrios, Görg and Strobl, 2003 and Greenaway, Sousa and Wakelin, 2004). Exporting generally involves fixed costs in the form of establishing distribution networks, creating transport infrastructure, learning about consumers' tastes, regulatory arrangements and so on in overseas markets. MNEs will generally establish already armed with such information and exploit it to export from the new host. Through collaboration, or more likely imitation, domestic firms can learn how to penetrate export markets. There is a growing literature that links exporting and productivity. Recent work for example on Mexico, Morocco and Venezuela, the US, Spain, Germany and the UK suggests that productivity levels of exporting firms are higher than non-exporting firms.<sup>6</sup>

### **2.3 Host Country Characteristics and Spillovers**

The literature on the determinants of FDI emphasises locational characteristics as important factors in the multinationals' decisions on where to invest (e.g., Wheeler and Mody, 1992, Brainard, 1997, Görg, 2002). But this is a different issue entirely, relating to features of the host economy which attract inward investment in the first instance. Our focus is the issue of whether there are locational characteristics which affect the speed of adoption of new technology/ spill over of productivity gains.

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<sup>5</sup> For instance, the Cecchini Report on the benefits of completing the Single Market in Europe identified such pro-competitive effects as the single most important source of gain.

<sup>6</sup> See Clerides, Lach and Tybout (1998), Bernard and Jensen (1999), Bernard and Wagner (1997), Delgado, Fariñas and Ruccino (2003) and Girma, Greenaway and Kneller (2004). An issue central to this literature is whether firms self-select into exporting, or increase their productivity after entering into export markets. The first three papers stress the self-selection explanation, while the latter two find some evidence consistent with learning by exporting.



A pioneering contribution is Findlay (1978) who emphasised the importance of *relative backwardness* and *contagion*. The former refers to the distance between two economies in terms of development. Findlay's model suggests that the greater this distance, the greater the backlog of available opportunities to exploit in the less advanced economy, the greater the pressure for change and therefore the more rapidly new technology is imitated/adopted. Moreover, speed of adoption is also a function of contagion, or the extent to which the activities of the foreign firm pervades the local economy. Thus, if the MNE quickly establishes upstream and downstream networks, technology transfer will be more rapid as a result of domestic firms involved in supply and distribution chains gaining exposure to and familiarity with new technology and promoting its diffusion.

Glass and Saggi (1998) also see a role for technological distance between the host and home country, but a different one to Findlay. Any technology gap signals something to the MNE about *absorptive capacity*. The bigger it is, 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 indigenous firms are actually able to access them.

## **2.4 Summary**

Economic theory gives some guidance in terms of what to expect where cross-border investment and spillovers are concerned. In general, MNEs have firm specific advantages which might be related to the production methods they use, the way they organise their activities, the way they market their products/services and so on. Once they have set up a subsidiary, they may be unable to prevent some of the benefits of these advantages from spilling over to indigenous firms via imitation, labour mobility, competition or local firms learning to export. Such spillovers have the potential to raise productivity and their exploitation might be related to the structural characteristics of the host economy, in particular absorptive capacity.

### 3. What Does the Evidence Tell Us?

#### 3.1 Overview

The empirical literature was pioneered by Caves (1974), Globerman (1979) and Blomström (1986) using data for Australia, Canada and Mexico, respectively. Since then, their empirical models have been extended and refined although the basic approach is still, by and large, similar. Most econometric analyses are undertaken in a framework in which labour productivity or total factor productivity of domestic firms is regressed on a range of independent variables. To measure productivity spillovers from multinationals a variable is included which proxies the extent of foreign firms' penetration, usually calculated as the share of employment or sales in multinationals over total industry employment/sales in a given sector.<sup>7</sup> In other words, the regression allows for an effect of FDI on 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 MNEs to domestic firms.<sup>8</sup> Most studies use either the contemporaneous level of foreign penetration, or relatively short lags (most commonly a one year lag) as their explanatory variables. If anything therefore, these studies usually measure short run effects of foreign presence on domestic productivity.

[Table 2 here]

Table 2 sets out details of 40 studies of horizontal productivity spillovers in manufacturing industries in developing, developed and transition economies.<sup>9</sup> Of those, 19 report statistically significant and positive horizontal spillover effects. Note, however, that all but eight of those reporting positive spillovers use cross sectional data which may lead to biased results, as argued by Görg and Strobl (2001). They argue that panels, using firm level data are the most appropriate estimating framework for two reasons. Firstly, panel data studies allow us to investigate the development of

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<sup>7</sup> In a recent paper, Castellani and Zanfei (2002a) argue that one should use the *absolute* level of foreign activity in the sector, rather than the *proportion* of foreign relative to total activity, since using a ratio imposes the restriction that changes of the same magnitude in foreign and aggregate activities within a sector have no effect on the dependent variable. While this is an interesting (econometric) argument it is not clear what the economic rationale for using absolute rather than relative FDI penetration would be.

<sup>8</sup> The 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, i.e., we need to assume that there is a full vector of productivity augmenting activities included in the empirical model. While this may be problematic in some of the studies reviewed herein, it is beyond the scope of this paper to discuss this in detail and we, therefore, assume in the remainder of the paper that the estimated FDI coefficient adequately reflects spillovers.

<sup>9</sup> Given the surge in papers on productivity spillovers recently it is possible that this survey misses out on a few recent papers, which are not published yet.

domestic firms' productivity over a longer time period, rather than relying on one data point. Secondly, they allow us to investigate spillovers after controlling for other factors. Cross sectional data, in particular if they are aggregated at the sectoral level, fail to control for time-invariant differences in productivity across sectors which might be correlated with, but not caused by, foreign presence. Thus coefficients on cross-section estimates are likely to be biased. For example, if productivity in the electronics sector is higher than, say, the food sector, multinationals may be attracted into the former. In a cross section, one would find 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.

Taking this into consideration, the evidence on positive horizontal spillovers is much weaker. There are only seven papers employing panel data which find some positive evidence in the aggregate, none of which is for developing countries: Liu, Siler, Wang and Wei (2000) and Haskel, Pereira and Slaughter (2002) for the UK, Castellani and Zanfei (2002) for Italy, Keller and Yeaple (2003) for the US, Ruane and Ugur (2002), Görg and Strobl (2003) for Ireland and Damijan *et al.* (2001) for Romania. Liu *et al.*, however, use industry level data that aggregates over heterogeneous firms, which may lead to biased results.<sup>10</sup> This leaves only six studies using appropriate data and estimation techniques which report positive evidence for aggregate spillovers.

For example, the papers by Aitken and Harrison (1999), Castellani and Zanfei (2002), Djankov and Hoekman (2000), Konings (2001), Zukowska-Gagelmann (2002) and Damijan *et al.* (2001) find some evidence of negative effects of the presence of multinationals on domestic firms in the aggregate. These papers use firm level panel data for manufacturing industries in Venezuela, Spain, the Czech Republic, Bulgaria, and Romania, Poland and seven CEE countries respectively. It is interesting to note that many studies for transition economies find at least some evidence of negative results. Fifteen of the studies do not find any statistically significant effects, on average, of multinationals on domestic productivity.<sup>11</sup>

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<sup>10</sup> This has been pointed out by, for example, Dunne, Roberts and Samuelson (1989) for the case of measuring the growth performance of manufacturing plants in the US.

<sup>11</sup> 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 (data, variables used, countries covered, etc.) as explanatory variables.

### ***3.2 How can we explain negative or neutral effects?***

Explanations have been offered to explain negative results. 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, forcing them to reduce production and move up their (given) average cost curve.

Of course in Section 2 we discussed how competition may actually be one of the channels through which *positive* spillovers are transmitted. This is not necessarily inconsistent with the above. There may be negative competition effects on some firms in the short run (moving up a given average cost curve), while other firms improve efficiency (shifting down their average cost curve) due to increased competition in the short as well as in the long run. Evidence for positive effects of competition are found by Kokko (1996) for Mexico and Driffield (1999) for the UK.

There are also other explanations for a failure to find any evidence for positive aggregate spillovers in the short run. Firstly, there may be lags to domestic firms' learning from multinationals which short run analyses do not pick up. Secondly, MNEs may be able to guard their firm specific advantages closely to prevent leakages to domestic firms and, therefore, no spillovers occur. Thirdly, positive spillovers may only affect a sub-set of firms and aggregate studies, therefore, underestimate the true significance of such effects. Fourthly, spillovers do not occur horizontally (i.e., intra-industry) but through vertical relationships which are missed in conventional spillover studies.

The first and second point are quite straightforward and plausible and we do not dwell on them. However, more detailed discussion of the third and fourth points is warranted.

#### **Absorptive Capacity**

As discussed in Section 2, the theoretical literature suggests that not all firms should be expected to benefit equally from knowledge spillovers from multinationals. Instead, whether or not a firm benefits depends on its relative backwardness and its absorptive capacity for assimilating knowledge. These ideas have also been taken into account by some of the empirical literature.

Kokko (1994) advances the idea that spillovers depend on the complexity of the technology transferred by multinationals, and the technology gap between domestic firms and MNEs. Using cross-section industry level data for Mexico he finds no evidence for spillovers in industries where multinationals use highly complex

technologies (as proxied by either large payments on patents or high capital intensity). A large technology gap *per se* 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, Tansini and Zejan (1996) hypothesise that domestic firms can only benefit if the technology gap is not too wide so that domestic firms can absorb the knowledge available from the multinational – an argument similar to Glass and Saggi (1998). Thus domestic firms using very backward production technology and low skilled workers may be unable to learn from multinationals. Using a cross-section of firm-level data for Uruguay, Kokko *et al* find evidence for productivity spillovers to domestic firms with moderate technology gaps, (measured as the difference between the firm's labour productivity and the average labour productivity in foreign firms) but not for firms which use considerably lower levels of technology.<sup>12</sup>

Girma, Greenaway and Wakelin (2001) use firm-level panel data to examine productivity spillovers in UK manufacturing. They find no evidence for spillovers on average, i.e., under the assumption that spillovers are homogeneous across different types of domestic firms. There is, however, evidence for spillovers to firms with a low difference between the firm's productivity level and the industry frontier productivity level (termed "technology gap"). Firms with a technology gap of 10 per cent or less appear to increase productivity with increasing foreign presence, while firms with higher gaps seem to suffer reductions in productivity. Girma (2002) and Girma and Görg (2002) extend their analysis of the role of absorptive capacity. The former uses threshold regression techniques to quantify the significance of absorptive capacity, and the latter also allows for different effects of FDI on establishments located at different quantiles of the productivity distribution by using conditional quantile regression techniques. Both papers find support for the hypothesis that only firms with some level of absorptive capacity benefit from productivity spillovers.

In a similar vein, Barrios and Strobl (2002) find little evidence for any aggregate horizontal spillovers from MNEs in their firm level panel for Spanish manufacturing. There is only evidence for positive spillovers from foreign presence to domestic exporters but not to non-exporters, which they interpret as evidence that absorptive capacity matters. They argue that exporting firms are more exposed to international competition are likely, therefore, to use more advanced technologies and hence more likely to benefit from positive spillovers than non-exporters. Kinoshita (2001) also

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<sup>12</sup> By contrast, Sjöholm (1999a) finds that, in cross-sectional data for Indonesian manufacturing firms, productivity spillovers from foreign to domestic firms are larger the larger the technology gap (also defined in terms of differences in labour productivity) between those groups of firms and the higher the degree of competition in the industry.

finds no evidence on average in firm level panel data for the Czech Republic. However, there are positive spillovers for local firms that are R and D intensive. She interprets this as evidence that absorptive capacity is important.

Damijan *et al* (2001) also define absorptive capacity in terms of local firms' R&D activities. In their firm level panel for a number of Central and Eastern European transition economies they fail to detect evidence for productivity spillovers affecting the average firm. Taking into account absorptive capacity, through interacting the foreign presence variable with a firm's R&D expenditure, yields some differences in results. For the Czech Republic and Poland, there is now evidence for negative spillovers but positive spillovers for Romania and no evidence for all other countries.

### **Regional Dimensions**

Given that human capital acquisition and imitation are among the important channels for knowledge spillovers, domestic firms that are located near to multinationals may also be more likely to benefit than other firms. For example, Audretsch (1998) argues that geographical proximity is necessary to facilitate knowledge spillovers as *"knowledge is vague, difficult to codify, and often only serendipitously recognized"* (p. 21). Therefore transmission costs are assumed to increase with distance.

The geographic dimension to horizontal spillovers has been investigated in a number of studies. Calculating proxies for foreign presence at the regional level and using cross-sectional data for Indonesia, Sjöholm (1999b) fails to find evidence for a regional component. Aitken and Harrison (1999) using firm level panel data for Venezuela also fail to find positive spillovers from the multinationals in a region on domestic firms in the same region, though they find negative spillovers from multinationals located 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 located in the same region and sector as domestic firms in the UK. However, they are only significant for firms that have a low technology gap *vis-à-vis* multinationals.

### **Importance of vertical linkages**

If multinationals are successful at preventing the leakage of their firm specific knowledge to domestic competitors in the same industry there is no scope for intra-industry knowledge spillovers. It is possible, however, that MNEs voluntarily or involuntarily help to increase efficiency of domestic suppliers or customers through vertical input-output linkages. In the case of the former, multinationals may provide technical assistance to enable suppliers to raise the quality of the intermediate product

they produce,<sup>13</sup> or they may simply provide high quality standards for local inputs, which provide incentives for local suppliers to upgrade their technology. Similarly, multinationals may provide active assistance or passive guidelines to domestic customers to enable them to use most effectively the product supplied by the MNE.

A number of recent studies, which are detailed in Table 3 have empirically investigated vertical spillovers.<sup>14</sup> Kugler (2001) works with industry-level panel data for ten Colombian manufacturing sectors for the period 1974 to 1998. His estimation framework allows him to distinguish intra- and inter-industry spillovers. He finds widespread evidence for positive inter-industry spillovers, while horizontal spillovers appear only to be important in one sector (machinery equipment). However, his framework does not allow him to distinguish spillovers through backward or forward linkages. Smarzynska (2002) addresses this using firm level panel data for Lithuania over the period 1996 – 2000 and considers only spillovers through backward linkages. Her results do not provide evidence for aggregate horizontal spillovers, while productivity spillovers through backward linkages appear to take place. 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, Munday and Roberts (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 for the period 1984 to 1992. Their econometric estimations show evidence for positive spillovers through forward linkages, but not of statistically significant backward spillovers. Also, the result on horizontal spillovers is inconclusive. In a further study for the UK, Harris and Robinson (2003) use plant level panel data and estimate productivity equations for twenty manufacturing sectors separately. Like Kugler (2001) they only distinguish horizontal and vertical spillovers, but do not separate the latter into backward or forward linkages. Their results suggest that inter-industry spillovers are much more prevalent than horizontal intra-industry spillovers. None of the spillovers is always positive, however and there is evidence of negative spillovers in many of the sectors. Girma, Görg and Pisu (2003) also find from UK firm level data that there are

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<sup>13</sup> Moran (2001) provides a number of case studies indicating that this in fact happens.

<sup>14</sup> Related theoretical models by Rodríguez-Clare (1996) and Markusen and Venables (1999) show that multinationals can have positive effects on the development of domestic firms through vertical input-output linkages, although these models are strictly speaking not dealing with productivity spillovers in the sense of those discussed in this paper. They are more concerned with the development of the number of local firms. Based on these models, Görg and Strobl (2002b,c) show empirical evidence that the presence of MNEs has fostered the entry and development of domestic firms in the Republic of Ireland. Furthermore, Alfaro and Rodríguez-Clare (2003) point out that the Rodríguez-Clare (1996) model makes a case for expecting *horizontal* (i.e., intra-industry) rather than *vertical* spillovers.

substantial differences in whether or not domestic firms benefit from vertical linkages, depending on the their export activities.

[Table 3 here]

### 3.3 *Wages Spillovers*

If there are positive productivity spillovers to domestic firms and if some of this is due to increasing labour productivity, domestic firms will pay higher wages in competitive labour markets. Another field of empirical research focuses on this, again, thus far emphasising horizontal spillovers.<sup>15</sup> Productivity spillovers are not the only channel for such so-called wage spillovers, however. Multinationals often pay higher wages, even after controlling for size and other firm and sectoral characteristics (Girma, Greenaway and Wakelin, 2001, Lipsey and Sjöholm, 2001, Görg, Strobl and Walsh, 2003). This is attributed to the MNEs' ownership of firm specific assets implying that they use higher levels of technology than domestic firms. If multinationals and domestic firms compete on the same labour 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.

Like empirical work on productivity, identifying wage spillovers usually involves estimating the determinants of wages in domestic firms and including a measure of foreign presence (eg. share of employment in multinationals) in the industry as a covariate.

[Table 4 here]

Table 4 reports details of studies on wages spillovers. Aitken *et al* (1996) use industry level (four digit) data for manufacturing industries for 1984 to 1990 (Mexico), 1977 to 1989 (Venezuela) and 1987 (US). While they find positive effects in the US, they report negative effects in the first two countries.<sup>16</sup> As with productivity spillovers, the result for the US should be treated with caution as it is obtained using cross sectional data. Lipsey and Sjöholm (2001) study the same effect for the Indonesian manufacturing sector using plant level data for 1996 and find that higher foreign presence in a sector leads to higher wages in domestic firms in the same sector. However, this again uses cross section data. Girma, Greenaway and

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<sup>15</sup> A related yet different issue is whether foreign direct investment contributes to the shift in labour demand towards skilled labour in the host country; see, for example, Feenstra and Hanson (1997), Figini and Görg (1999), Blonigen and Slaughter (2001) and Taylor and Driffield (2004) for empirical analyses for Mexico, Ireland, US and the UK, respectively.

<sup>16</sup> While they have plant level data available for Mexico and Venezuela these are aggregated up in order to make them comparable to the US data where only industry level data are available. However, they reestimate their empirical models using the plant level data for the two countries and results are very similar to those obtained using industry level data. Note also that the specifications for Mexico and Venezuela include sectoral dummies which control for unobserved sector specific effects.



Wakelin (2001) use firm level panel data for UK manufacturing for the period 1991 to 1996. They find that, on average there is no effect of multinationals in a sector on the wage *level* in domestic firms but there is some weak evidence of a negative effect on wage *growth*.

### 3.4 *Export Spillovers*

A third strand in the literature focuses on whether multinationals dissipate their knowledge of global markets to domestic firms and hence enable them to become more successful exporters. Domestic firms can be affected through three main channels. First, if multinationals have better access to information about foreign markets this can spill over through their export activities. Second, there are demonstration effects whereby domestic firms can learn the multinationals' superior production or management techniques, which in turn enable them to compete more successfully on export markets. Third, competition between domestic firms and multinationals on both home and foreign markets can induce domestic firms to improve their export performance.

Work completed thus far is summarised in Table 5. Aitken, Hanson and Harrison (1997) estimate a probit model and include a proxy for export information externalities, namely the export activity by multinationals in the industry and region.<sup>17</sup> The model is estimated using plant level data for Mexican manufacturing industries for 1986 and 1989. They find that export activities of MNEs in a sector have positive effects on the probability of whether a firm in the same sector, either foreign or domestic, is an exporter.

*[Table 5 here]*

Using firm level panel data for the UK for 1992 to 1996, Greenaway, Sousa and Wakelin (2004) also investigate whether spillovers affect a firm's probability of exporting but extend the analysis to examining what affects a firm's export ratio. They estimate a two-step Heckman selection model which first estimates the probability of exporting, then estimates the factors that affect a firm's export ratio. They include in both steps three measures of multinational presence to capture the three spillover channels discussed above. Their results suggest that MNEs' exports have a positive effect on a domestic firm's probability of being an exporter but do not impact on their export ratio. On the other hand, R&D spillovers from multinationals to domestic firms and the presence of MNEs in the sector positively affect both the decision to export and the choice of export ratio. Thus, export information externalities appear to matter only for the decision of whether or not to export. This

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<sup>17</sup> This variable is calculated as "the share of state-industry MNE exports in national industry exports, relative to the state share of national manufacturing exports" (Aitken et al, 1997, p. 117).

may not come as a surprise as 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.

Barrios, Görg and Strobl (2003) also focus on export information externalities versus demonstration effects through R&D spillovers. Using firm level panel data for Spanish manufacturing for 1990 to 1998 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 for any effects of either R&D activity or export activity by multinationals in a sector on the probability that domestic firms export, although they find spillovers from both types of activity on other foreign-owned firms. The tobit estimations, however, indicate that there is evidence for positive effects of multinationals' R&D activity on domestic firms' export ratios, while they again fail to detect any spillovers from MNEs export activities on domestic firms. Other foreign firms again benefit from both types of spillovers in terms of their export ratios as well. In an extension Barrios *et al.* discover that R&D spillovers only increase domestic firms' exports to other EU/OECD countries. Thus domestic firms learn from multinationals to increase their exports to other developed countries which are generally markets with a superior technological capability.

Kokko *et al* (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 MNE presence (not export activity) in terms of the output share of MNEs in an industry and it is, thus, not clear which channel leads to spillovers. However, they distinguish between MNE presence in import-substituting and export-orientated industries and find that there is only evidence for spillovers from the latter group of multinationals. This suggests that the trade regime within which multinationals operate may determine their potential for generating positive export spillovers.

### **3.5 Summary**

As we have seen, there is an extensive array of empirical studies that 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/firm is the most appropriate level of scrutiny; second, there are several methodological shortcomings associated with applying cross-section techniques.

Much of the work fails to find positive horizontal spillovers on aggregate, with some reporting negative effects of multinational presence on domestic productivity. Evidence on horizontal wages and export spillovers is also mixed. However, studies

that further disaggregate data into more homogenous groups of firms or plants, find more encouraging results. In particular, there is evidence that the absorptive capacity of domestic firms and geographic proximity to multinationals are important determinants of whether or not domestic firms benefit from FDI in the same sector. This suggests that spillovers may not affect all firms equally but only certain firms, i.e., those with high levels of absorptive capacity and/or located close to multinationals, are able to benefit. Furthermore, the few studies that have looked at the potential for vertical (inter-industry) spillovers find evidence suggesting that the latter may be a more important channel for knowledge externalities than the former.<sup>18</sup>

## **4. Is There a Role for Policy?**

### ***4.1 Context***

In general, FDI would be seen by most governments as having the potential to impact on total factor productivity to a greater extent than an equivalent amount of indigenous investment. This would be taken as axiomatic in developing and transitional economies and, depending on the origin of the MNE, in at least some developed countries. Add to this potential spillovers from MNEs to domestic firms which are believed to raise their productivity, thereby 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 maximise the potential for spillovers, both in terms of encouraging multinationals to transfer technologies, and improving the absorptive capacity of domestic firms? Do targeted policies yield net benefits?

### ***4.2 Policy, 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 and Hanson 2001). Most work relates to developing countries because, in general, policy has been more active, though a growing volume of research relates to industrialised countries, where of course most FDI originates and is located. The key points that emerge from this work are:

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<sup>18</sup> This is also argued in a number of case-studies, see Moran (2001).

- i) 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, see Balasubramanyam, Salisu and Sapsford (1996).
- ii) While there is some evidence that investment incentives can affect the location choice of multinationals the effect appears to be small (Coughlin, Terza and Arromdee, 1991; Head, Ries and Swenson, 2001). Head et al. (2001) even argue that competition between host governments may render incentives ineffective as they offset each other. Also, this form of competition for FDI may have impacted on the distribution of incentives and is highly likely to have redistributed income from host countries to MNEs, see Haaland and Wooton (1999).
- iii) Trade related investment measures (TRIMs), like local content requirements and minimum export requirements, are often introduced as a device to recapture some of the rents which accrue to MNEs. Although they can have positive welfare effects on the host country, the evidence does not point to major effects on levels of inward investment in developing countries (see Greenaway, 1992).
- iv) The quality of local infrastructure is vitally important, in particular communication and transportation facilities, both in attracting initial investments and in sustaining clusters (Coughlin et al., 1991; Coughlin and Segev, 2000).
- v) Availability of relatively skilled labour is an important magnet (Coughlin and Segen, 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 labour (Keller, 1996) and domestic firms have a high level of technological capacity (Glass and Saggi, 1998).

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

### ***4.3 Policy and Spillovers***

The evidence on spillovers reported in Section 3 is at best mixed and there are no clear results that domestic firms always and unambiguously gain from the presence of MNEs. As pointed out in the Introduction, this may be due to a number of factors. If we take the most 'optimistic' view, i.e. that spillovers are impacting but we simply do not have fine enough measurement instruments to identify them, we can ask the question: are there policies governments can implement to maximise the prospects of extracting benefits from MNEs? In addressing this, we first of all need to distinguish

between general and specific policies. The former refer to policies designed to change the environment within which multinationals operate. These include industrial policy, infrastructure development, the orientation of trade policy, exchange rate policy and so on. These we have already mentioned and there is evidence to suggest that they are related to the *overall* level of inward investment into an economy over a given period of time. We mention them again here because they may turn out to be the most effective devices for raising 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 sets out an illustrative list of input and output TRIMs and their intended effects. Local content requirements, which are widely used, are intended to raise the share of local value added in subsidiary production and in the process encourage upstream development, with the intention of stimulating inter-industry spillovers. As we saw earlier, one could argue that spillovers are more likely if there is some local ownership, which is what local equity requirements are geared to achieve. Local hiring targets/expatriate quotas are intended to raise the share of total employment accounted for locally, with a view to encouraging spillovers through the transfer of human capital. R and D and technology transfer requirements are intended to have MNEs commit to some minimum level of R and D expenditures and/or transfer technology to local firms.<sup>19</sup>

*[Table 6 here]*

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 the latter is more efficient. What little work has so far been completed on TRIMs has failed to establish a direct link between their presence and the transfer of useful technologies, (see Blomström et al. 1994, Greenaway 1992). This appears to be because many of the measures are difficult to specify precisely and difficult to monitor. But it is also because the more general policies referred to above are in practise rather more important.

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<sup>19</sup> Until the Uruguay Round, TRIMs were either legal or extra-legal and as a consequence proliferated. The Uruguay Round Agreements proscribed the use of a number of instruments as well as laying out a range of reporting requirements. In addition, they placed an obligation to phase out certain TRIMs (those which violate Articles III and XI of the GATT), with local content requirements being the most prominent. The key issue from the standpoint of this paper is whether they work.

## 5 Conclusions

FDI is a key driver of economic growth and economic development. Most governments regard attracting it as a priority, particularly in developing and transitional economies. It is given such emphasis not just because it boosts capital formation but because of its potential to enhance the quality of the capital stock. The reason for this is that in general multinationals are assumed to bring with them best practice or, as a minimum, better practice technology and management. Moreover, it is possible, perhaps even probable, that a given MNE will not be able to protect its superior technology/management fully and prevent some elements 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.

We have reviewed the theoretical reasons why spillovers may occur, then surveyed the empirical evidence of their presence. Theory does point to reasons why they might arise, but finding robust empirical evidence to support their existence is more difficult. In fact, supporting evidence is limited. Conceivably, this indicates that they are in fact illusory in that MNEs are effective in protecting their assets. The other possibility is that we are looking in the wrong place and with the wrong microscope. With regard to the former, as we have seen, many studies are at the industry/sector rather than the firm/plant level where we should be focusing. With the growing availability of firm and plant level survey information, this is improving. With regard to methodology, most studies are cross-section when what is required is a panel based analysis. Since the stock of serious research on disaggregated data with both cross-section and longitudinal variation is still somewhat limited, the message is clear: more systematic research is needed. More discriminating work is also required, analysis which probes whether form of entry (greenfield or acquisition), ownership characteristics, corporate governance, absorptive capacity of domestic firms and so on matter.

The consensus from the literature on policy is so far also clear: 'general' policies aimed at altering the fundamentals are more important than specific policies geared to particular investments. The latter seem to affect primarily the distribution of rents. On the one hand, governments compete in offering investment incentives and in the process dissipate rents to MNEs. On the other hand, they then use (at least some) TRIMs to try to reclaim some of those rents. Both econometric evidence and survey/case study work suggests that in general the characteristics of the economic environment are much more important: infrastructure, local labour 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 MNEs will stand willing to accept them. This too is therefore an area for potential future work. We know very little about the comparative impact of alternative instruments.

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**Table 1: Spillover Channels**

| <b>Driver</b> | <b>Sources of Productivity Gain</b>   |
|---------------|---|
| Imitation     | <ul style="list-style-type: none"><li>• Adoption of new production methods.</li><li>• Adoption of new management practices.</li></ul> |
| Competition   | <ul style="list-style-type: none"><li>• Reduction in X-inefficiency.</li><li>• Faster adoption of new technology.</li></ul>           |
| Human Capital | <ul style="list-style-type: none"><li>• Increased productivity of complementary labour.</li><li>• Tacit knowledge</li></ul>           |
| Exports       | <ul style="list-style-type: none"><li>• Scale economies.</li><li>• Exposure to technology frontier.</li></ul>                         |

**Table 2: Papers on intra-industry productivity spillovers**

|    | Author(s)                          | Country              | Year      | Data  | Aggregation  | Result |
|----|------------------------------------|----------------------|-----------|-------|--------------|--------|
|    | <b><i>Developing Countries</i></b> |                      |           |       |              |        |
| 1  | Blomström & Persson (1983)         | Mexico               | 1970      | cs    | industry     | +      |
| 2  | Blomström (1986)                   | Mexico               | 1970/1975 | cs    | industry     | +      |
| 3  | Blomström & Wolff (1994)           | Mexico               | 1970/1975 | cs    | industry     | +      |
| 4  | Kokko (1994)                       | Mexico               | 1970      | cs    | industry     | +      |
| 5  | Kokko (1996)                       | Mexico               | 1970      | cs    | industry     | +      |
| 6  | Haddad & Harrison (1993)           | Morocco              | 1985-1989 | panel | micro & ind. | ?      |
| 7  | Kokko et al. (1996)                | Uruguay              | 1990      | cs    | micro        | ?      |
| 8  | Blomström & Sjöholm (1999)         | Indonesia            | 1991      | cs    | micro        | +      |
| 9  | Sjöholm (1999a)                    | Indonesia            | 1980-1991 | cs    | micro        | +      |
| 10 | Sjöholm (1999b)                    | Indonesia            | 1980-1991 | cs    | micro        | +      |
| 11 | Chuang & Lin (1999)                | Taiwan               | 1991      | cs    | micro        | +      |
| 12 | Aitken & Harrison (1999)           | Venezuela            | 1976-1989 | panel | micro        | -      |
| 13 | Kathuria (2000)                    | India                | 1976-1989 | panel | micro        | ?      |
| 14 | Kokko et al (2001)                 | Uruguay              | 1988      | cs    | micro        | ?      |
| 15 | Kugler (2001)                      | Colombia             | 1974-1998 | panel | industry     | ?      |
| 16 | López-Córdova (2002)               | Mexico               | 1993-1999 | Panel | Micro        | -,?    |
| 17 | Görg and Strobl (2002c)            | Ghana                | 1991-1997 | panel | micro        | +      |
|    | <b><i>Developed Countries</i></b>  |                      |           |       |              |        |
| 18 | Caves (1974)                       | Australia            | 1966      | cs    | industry     | +      |
| 19 | Globerman (1979)                   | Canada               | 1972      | cs    | industry     | +      |
| 20 | Liu et al. (2000)                  | UK                   | 1991-1995 | panel | industry     | +      |
| 21 | Driffield (2001)                   | UK                   | 1989-1992 | cs    | industry     | +      |
| 22 | Girma et al. (2001)                | UK                   | 1991-1996 | panel | micro        | ?      |
| 23 | Girma and Wakelin (2001)           | UK                   | 1980-1992 | panel | micro        | ?      |
| 24 | Harris and Robinson (2001)         | UK                   | 1974-1995 | panel | micro        | ?      |
| 25 | Girma and Wakelin (2002)           | UK                   | 1988-1996 | Panel | Micro        | ?      |
| 26 | Haskel et al. (2002)               | UK                   | 1973-1992 | panel | micro        | +/?    |
| 27 | Girma (2002)                       | UK                   | 1989-1999 | panel | micro        | ?      |
| 28 | Girma and Görg (2002)              | UK                   | 1980-1992 | panel | micro        | ?      |
| 29 | Ruane and Ugur (2002)              | Ireland              | 1991-1998 | panel | micro        | +      |
| 28 | Barrios and Strobl (2002)          | Spain                | 1990-1994 | panel | micro        | ?      |
| 29 | Dimelis and Louri (2002)           | Greece               | 1997      | cs    | micro        | +      |
| 30 | Castellani and Zanfei (2002)       | France, Italy, Spain | 1992-1997 | panel | micro        | + for  |

|    |                                    |  |           |       |          |  |
|----|------------------------------------|--|-----------|-------|----------|--|
|    |                                    |  |           |       |          | Italy, -<br>for<br>Spain,<br>? for<br>France |
| 31 | Keller and Yeaple (2003)           | US   | 1987-1996 | panel | Micro    | +  |
| 32 | Görg and Strobl (2003)             | Ireland  | 1973-1996 | panel | micro    | +  |
|    | <b><i>Transition Countries</i></b> |  |           |       |          |  |
| 33 | Djankov & Hoekman (2000)           | Czech Republic   | 1993-1996 | panel | micro    | -  |
| 34 | Kinoshita (2001)                   | Czech Republic   | 1995-1998 | Panel | micro    | ?  |
| 35 | Bosco (2001)                       | Hungary  | 1993-1997 | Panel | Micro    | ?  |
| 36 | Konings (2001)                     | Bulgaria   | 1993-1997 | panel | micro    | -  |
|    |                                    | Poland   | 1994-1997 |       |          | ?  |
|    |                                    | Romania  | 1993-1997 |       |          | -  |
| 37 | Damijan et al (2001)               | Bulgaria, Czech Republic,<br>Estonia, Hungary, Poland,<br>Romania, Slovakia,<br>Slovenia | 1994-1998 | Panel | Micro    | ? or -,<br>+ only<br>for RO                  |
| 38 | Li et al. (2001)                   | China  | 1995      | cs    | industry | +  |
| 39 | Smarzynska (2002)                  | Lithuania  | 1996-2000 | panel | Micro    | ?  |
| 40 | Zukowska-Gagelmann (2002)          | Poland   | 1993-1997 | panel | micro    | -  |

Notes:

(i) Data: *CS* denotes cross-sectional data, while *panel* denotes use of combined cross-sectional time-series data in the respective analysis

(ii) Aggregation: Use of either *industry* or *micro* (i.e., firm, plant, or establishment) level data in the analysis

(iii) Result: Regression analysis finds a + positive and statistically significant, - negative and statistically significant, ? mixed results or statistically insignificant sign on the foreign presence variable for the aggregate sample.

**Table 3: Papers on vertical spillovers**

|   | Author(s)                  | Country   | Year      | Data  | Aggreg.  | Result         |              |         |
|---|----------------------------|-----------|-----------|-------|----------|----------------|--------------|---------|
|   |                            |           |           |       |          | Horizo<br>ntal | backwa<br>rd | forward |
| 1 | Kugler (2001)              | Colombia  | 1974-1998 | Panel | Industry | ?              | many +       | n.a.    |
| 2 | Smarzynska (2002)          | Lithuania | 1996-2000 | Panel | micro    | ?              | +            | n.a.    |
| 3 | Driffield et al (2002)     | UK        | 1984-1992 | panel | industry | ?              | ?            | +       |
| 4 | Harris and Robinson (2002) | UK        | 1974-1995 | panel | micro    | ?              | ?            | ?       |
| 5 | Blalock and Gertler (2003) | Indonesia | 1988-1996 | Panel | Micro    | ?              | +            | n.a.    |

Notes: See Table 2

Kugler (2001) and Harris and Robinson (2002) do not distinguish backward and forward spillovers

n.a. not applicable

**Table 4: Papers on wage spillovers**

|   | Author(s)                           | Country   | Year      | Data  | Aggregation | Result |
|---|-------------------------------------|-----------|-----------|-------|-------------|--------|
| 1 | Aitken et al (1996)                 | Mexico    | 1984-1990 | Panel | Industry    | -      |
|   |                                     | Venezuela | 1977-1989 | Panel | Industry    | -      |
|   |                                     | US        | 1987      | cs    | industry    | +      |
| 2 | Lipsey and Sjöholm (2001)           | Indonesia | 1996      | cs    | micro       | +      |
| 3 | Girma, Greenaway and Wakelin (2001) | UK        | 1991-1996 | Panel | Micro       | ?      |
| 4 | Driffield and Girma (2003)          | UK        | 1980-1992 | Panel | Micro       | ?      |

Notes: See Table 2

**Table 5: Papers on export spillovers**

|   | Author(s)              | Country | Year      | Data  | Aggregation    | Result |
|---|------------------------|---------|-----------|-------|----------------|--------|
| 1 | Aitken et al (1997)    | Mexico  | 1986/1989 | cs    | micro          | +      |
| 2 | Kokko et al (2001)     | Uruguay | 1998      | cs    | Micro          | ?      |
| 3 | Greenaway et al (2003) | UK      | 1992-1996 | Panel | micro          | +      |
| 4 | Banga (2003)           | India   | 1994-2000 | panel | Micro/industry | +      |
| 5 | Barrios et al (2003)   | Spain   | 1990-1998 | panel | micro          | ?      |

Notes: See Table 2

**Table 6: TRIMs Targeted at Spillovers**

| <b>Instrument</b>                    | <b>Intended effect</b>  |
|--------------------------------------|---|
| <b><i>Input TRIMs</i></b>            |   |
| 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.  |
| <b><i>Output TRIMs</i></b>           |   |
| 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).

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