HOST COUNTRY IMPACTS OF INWARD FDI: WHY SUCH DIFFERENT ANSWERS?

by
Robert E. Lipsey & Fredrik Sjöholm
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Postal address: P.O. Box 6501, S-113 83 Stockholm, Sweden. Office address: Sveavägen 65
Telephone: +46 8 736 93 60 Telefax: +46 8 31 30 17 E-mail: japan@hhs.se Internet: http://www.hhs.se/eijs

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Robert E. Lipsey
City University of New York and National Bureau of Economic Research

Fredrik Sjöholm
Stockholm School of Economics

Abstract

A substantial literature has grown up around the issue of how inward direct investment affects host countries. On almost every aspect of this question, there seems to be a wide range of empirical results in academic literature, and little sign of convergence. It is our purpose here to try to understand why contradictory results seem to be found by different investigators. Is it that the statistical techniques are different? Or are the countries they examine different? Or are they asking different questions under the same labels of wages, productivity, or spillovers? We try to answer these questions in two ways. One is to review the individual studies themselves to clarify the questions asked and the data used. The other is to survey studies on data for Indonesia, which cover a long period and are detailed and accessible, to test the implications of different definitions and methods.

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Host Country Impacts of Inward FDI: Why such Different Answers?

Robert E. Lipsey

Fredrik Sjöholm

Introduction

A substantial literature has grown up around the issue of how inward direct investment (FDI) affects host countries. On almost every aspect of this question, there seems to be a wide range of empirical results in academic literature, and little sign of convergence. At the same time, policy makers seem to have made their own judgments that inward FDI is valuable to their countries. UNCTAD publishes annual data on "changes in national regulations of FDI" and reports that from 1991 through 2002, there were over 1500 changes making regulations more favorable to FDI and fewer than 100 making regulations less favorable (UNCTAD, 2003, Table 1.8, p. 21). The same document reports that "The use of locational incentives to attract FDI has considerably expanded in frequency and value." (*ibid,* p. 124).

Why has the academic literature made so little impression on policy making? Are all these countries foolishly pursuing an ephemeral fad? Is it that the questions asked in the academic literature have not been relevant to policy? Are the relevant questions answerable? What are the relevant questions?

There are many possible effects of an inflow of FDI on a host country. It is generally taken for granted that the investing firms possess some technology superior to that of local, host country firms. One possible impact would be the production of goods and services of higher quality than previously available or at lower prices, resulting in higher consumer welfare. That topic seems to be almost completely absent from the literature and may be of little interest to policy makers, although it should be of interest to economists. Another possibility, not

dependent on the technological superiority of investing firms, would be that the inward investment adds to the host country capital stock and in doing so raises the level of output. That issue has been explored, especially in earlier literature on whether inward investment or aid supplements or displaces local investment, but is not specific to direct investment. Most attention specific to direct investment has been devoted to the question of whether inward investments do involve higher levels of technology and, if they do, whether that superior technology is not retained entirely by the foreign- owned firms but "spills over" to domestically-owned firms. A related set of questions is whether the foreign- owned firms pay higher wages for domestic labor, whether those higher wages raise the average wage level, and whether these higher wages spill over to domestically- owned firms. For both wages and productivity, the spillovers to domestically- owned firms or establishments could be either positive or negative. Wage spillovers could be negative, for example, if the foreign- owned firms hired the best workers, at their going wages or higher ones, leaving only lower- quality workers for the domestically- owned firms. Productivity spillovers could be negative if foreign- owned firms took market shares from domestically- owned firms, leaving the latter to produce at lower, less economical, production levels.

Survey articles have found the literature to be inconclusive on most important impacts of inward FDI, especially with respect to spillovers. On wage spillovers, Görg and Greenaway (2001) reported that panel data showed negative spillovers, but cross- sectional data, positive ones. The same paper found, with respect to productivity spillovers from foreign- owned to domestically- owned firms "…only limited evidence in support of positive spillovers…Most work fails to find positive spillovers, with some even reporting negative spillovers…" (p. 23). Görg and Strobl (2001) concluded that the crucial determinant of the findings in twenty- one

studies was whether cross- section or time series data had been used, with the former typically finding positive spillovers and the latter often negative ones. Lipsey (2003) stated that "…the evidence for positive spillovers is not strong." (p. 304) and Lipsey (2004) concluded a review of the literature by saying that "…the evidence on spillovers is mixed. No universal relationships are evident." (p. 365). With respect to effects on host- country economic growth, Carkovic and Levine (2000) found no significant effect of FDI inflows over the whole period, 1960 to 1995, and only irregularly significant effects in five- year periods. None of the variables found in other studies *consistently* determine the effect of FDI on growth, although some are significant in some combination of conditioning variables. Lipsey (2003) found it "…safe to conclude that there is no universal relationship between the ratio of inward FDI flows to GDP and the rate of growth of a country." (p. 297).

A crucial feature of these surveys is that the studies summarized do not individually find that spillovers of wages or productivity do not exist. Mostly, they find evidence for either positive or negative spillovers. It is our purpose here to try to understand why contradictory results seem to be found by different investigators. Is it that the statistical techniques are different? Or are the countries they examine different? Or are they asking different questions under the same labels of wages, productivity, or spillovers? We try to answer these questions in two ways. One is to review the individual studies themselves to clarify the questions asked and the data used. The other is to survey studies on data for Indonesia, which cover a long period and are detailed and accessible, to test the implications of different definitions and methods.

The studies we are reviewing in the paper examine the effects of FDI on firms and their workers. They are all producer-oriented. Another type of statistical study might be to look at consumption effects. For example, has the growth of FDI in retailing reduced the prices paid by

consumers for food and other consumer goods? Has the growth of FDI in utilities reduced the price consumers pay for telephone service or home heating and lighting? These possible effects are almost totally absent from the literature.

Wage spillovers

We begin with the studies of wages, which are not as numerous as those on productivity. There are several general issues that run through almost all the wage studies. One of these is that the wage levels are calculated as total wages or total compensation per worker. The only measure of skill is a division between production and non- production or blue- collar and white collar workers. Within those categories, almost no studies can separate differences in skill or education or differential changes in them from differences in wages for identical workers or changes in them. A second issue is whether wage comparisons should take account of firm or establishment characteristics that are correlated with foreign ownership but not intrinsically related to it. For example, foreign- owned firms or establishments are typically much larger on average than domestically-owned ones, even in developed countries. They are in many countries, especially developing countries, more capital-intensive and also more intensive in the use of purchased materials or components. Should these characteristics be treated as controls, and their influence eliminated, or are they so bound up with foreign ownership that they should not be controlled for. As is pointed out in Aitken *et al.* (1996), p. 368), a host country may not care whether higher wages in foreign-owned plants result from the fact that they are foreign-owned or from the fact that they are large or use capital-intensive technology or import-intensive technology. Size, capital intensity, and import intensity may all be elements of the foreign firm's technology.

Emprical studies provide strong evidence of a wage premium in foreign-owned firms (Lipsey, 2004). Foreign firms pay higher wages in both developed and developing countries, and after controlling for firm specific characteristics. It is of course possible that high wages in foreign-owned firms are caused, or at least biased, by foreign takeovers of high-wage domestic firms. Lipsey and Sjöholm (2002), using a 25-year panel of Indonesian manufacturing establishment data, lacking labor force education data but including most of the typical independent variables, were able to lay this issue to rest, at least for this one country. Foreign firms did tend to acquire domestic plants with higher than average blue-collar wages for their industries, but the margins over the averages were far too small to account for the wage differential between domestically- owned and foreign-owned plants. Thus, selectivity in takeovers could not account for the wage gap. Further evidence for that fact was the finding that after a foreign takeover of a domestically-owned plant, both blue-collar and white-collar wages rose strongly, in absolute terms and relative to their industries. Takeovers of foreign-owned plants by domestic firms had the opposite effect on wages, showing that it was takeovers by foreigners, rather than takeovers in general, that produced wage increases. Econometric analyses using the whole panel of establishments found large wage differences in favor of foreign firms at every level of industry and geographical detail, and the differentials remained large even when plant characteristics, such as size and the use of purchased inputs, were introduced into the wage equations. The finding that wages were higher in foreign-owned plants and became higher when domestically-owned plants became foreign-owned was not dependent on the use of cross-section rather than panel data.

Whereas the literature on wage comparisons between foreign- and domestically-owned firms is large, there are relatively few studies that examine the effect of FDI on wages in

domestically-owned firms. Görg and Greenway (2001) list six studies on wage spillovers, and report that of those with conclusions, three panel studies found negative spillovers and two cross-section studies found positive ones. They do not include the information that some of the cross-section estimates for Mexico and Venezuela also give negative coefficients for spillovers, suggesting that the choice of cross-section or panel estimation may not be so crucial.

Other studies, some published after the summary above, have reported more indication of wage spillovers. Figlio and Blonigen (2000) concluded that the effect of a large new foreign investment in South Carolina on aggregate wage levels was so large that it could not have been the result only of the high wages in the foreign-owned plants but must involved spillovers to domestically-owned plants. Their study differed from most others in that it concentrated on geographical effects, not on effects within the industry of the investment.

Lipsey and Sjöholm (2004b) made a variety of calculations of spillovers in Indonesian manufacturing in a cross-section of manufacturing establishments in which the quality of the labor force, as measured by education, could be accounted for, the only wage study we know of where that was done. Assuming national labor markets within broad industry groups, they found significant spillovers to wages in domestically- owned plants. Narrower industry groups still revealed significant spillovers, but smaller ones, and assuming that an industry within an individual province represented a labor market still revealed spillovers to domestically-owned establishments. The combination of higher wages in foreign-owned plants and spillovers to domestically-owned plants of course meant higher overall wages associated with foreign ownership.

Further evidence that the distinction between cross-section and panel data studies is not the crucial determinant of results on wage spillovers can be found in Driffield and Girma (2002),

which uses a panel of establishments in the U.K. electronics industry from the Annual Respondents Database (ARD) for 1980 to 1992. They found intra-industry and intra-region wage spillovers from FDI on wages in general, larger for skilled than for unskilled workers. A study by Girma, Greenaway, and Wakelin (2001), using firm, rather than establishment, panel data for almost 4,000 firms in the UK for 1991 to 1996, also found some evidence for wage spillovers. On average, when spillovers were assumed to be identical across industries and firms, they found no significant evidence for them. However, when the effects were permitted to vary across industries, wage spillovers were found and were higher in industries where the productivity gap between foreign and domestic firms was lower. One difference between this study and Lipsey and Sjöholm (2002) is that it excludes firms that changed ownership, eliminating one part of the effect of foreign ownership on wages. These had been found in an earlier study to be positive in the UK, as they were in Indonesia.

The accumulation of studies since the earlier surveys seems to have put to rest the suspicion that the findings of wage spillovers were solely the result of ignoring firm differences in cross-section studies, since the spillovers did appear in panel studies. Something else must account for the lack of spillovers or negative ones found in some developing countries. The positive spillovers have been found most frequently in developed countries, aside from Indonesia, but even in the UK, large differences in productivity between foreign-owned and domestically- owned firms reduced or eliminated spillovers. One candidate for explaining negative results is that in some countries the gap between the foreign-owned and domestically-owned firms is too large for one group to influence the other.

Another possibility is that the labor markets in some developing countries are too segmented for wages in one group to influence the other. If we compare Mexico and Venezuela,

two countries reported to show negative wage spillovers from foreign firms, with Indonesia, the United Kingdom, and the United States, for which positive spillovers were found, labor market conditions do seem to have been different. An "employment laws index" produced by the World Bank (2003), following Botero et al (2003), where a high number indicated very restrictive labor laws on hiring, firing, and conditions of employment, put Mexico and Venezuela among the most restrictive countries, with index numbers of 77 and 75, compared with the United Kingdom at 28 and the United States at 22. Indonesia was in between at 57, not flexible by developed country standards, but relatively flexible for a developing country.

Another topic not always taken into consideration is the definition of the relevant labor market. Most of the studies in effect defined a labor market as an industry, at whatever level of detail industry is reported. Some define the market as an industry within the narrowest geographical area at which industry data are available. That may be appropriate for some countries or industries, but there may also be national labor markets within an industry, or local labor markets that straddle many industries, or national labor markets that do so. Differences in the definition of the labor market are another possible source of differences in results. Some thinking about the industry- and geographic construction of the FDI measures is needed, and the conclusion might be different for wages from what it is for productivity. In the case of wage determination, the question is of the range of a labor market within which wages tend to be equalized, or at least within which one firm's wages influence those in other firms. The answers might be different in different countries, or industries, or at different times. A test of the effect of different definitions of a labor market is to use different industry and geographic classifications to examine the sensitivity of the results. This was done in Lipsey and Sjöholm (2004), where FDI measures at 2-, 3- and 5-digit industry levels, and at both national and

province level, were constructed to examine the effect of foreign presence on the wages in locally-owned plants. The results for these various definitions of a labor market are shown in table 1. The coefficients vary substantially, but they remain statistically significant in all specifications.[1] The largest coefficients are for definitions of the relevant market as either national, at the 2-digit industry level, or at the province level, for all manufacturing industries combined. The worry about these coefficients is that they may represent the tendency of foreign firms to move into high-wage geographical locations or to move into high-wage industries. Those possible biases are reduced by moving to a finer geographical breakdown, by province, and to successively greater industry detail, culminating in breakdowns by 5-digit industry and province. The coefficients are greatly reduced in size, but remain strongly significant, showing margins of a quarter for blue-collar and over a third for white-collar workers. The most detailed breakdown is not necessarily the truth, however. It may miss the effect of higher wages and increased employment in foreign-owned establishments in one industry or province on wages in other industries and provinces, possibly a more important effect than any within the same industry and province. Even the more aggregate measures may understate the wage effect because they are confined to manufacturing, ignoring any impacts on agriculture, services, and trade.

Table 1 here.

Productivity spillovers

Many of the same issues that affect studies of wage spillovers come up in the much larger literature on productivity spillovers. In addition, there are broader problems with the

[1] See Lipsey and Sjöholm (2004b) for the complete empirical specifications and results.

productivity measurements. The objective is often described as measuring the spillovers of technology, or knowledge, from foreign-owned to domestically-owned firms. In order to make measurement simpler, the definition of technology is narrowed to measures of labor productivity, total factor productivity, or differences in production functions. All of these are reflections of technology, but they may be both too broad and too narrow. The comparison of production functions, often cited as an ideal, assumes that there are no differences in technological knowledge involved in choices about factor combinations or plant size. The operation of a large plant, as opposed to operation of a small plant, requires no different technological mastery. The operation of a capital-intensive plant requires no technological skill beyond that required for a small plant. The use of intermediate inputs from abroad or from a parent company involves no technology beyond that of using locally available inputs. These are assumptions implicit in production function comparisons, but if they are invalid, and locally-owned plants do not have the technological skill to operate at the scale and factor combinations of foreign-owned plants, true technological differences between foreign-owned and domestically-owned plants are hidden, disguised as differences in scale of production or factor combination choices.

There is another respect in which the definitions of technology are too narrow. If the foreign investors' technological superiority consists of knowledge about the tastes of consumers in foreign markets, or in how to market a product in local or foreign markets, it will not be visible in productivity or production function comparisons. It might be seen in comparisons of export performance, but those are a different literature, not usually characterized as technology.

A very different type of study that takes a broad view of technology is exemplified by the country studies for Asia in Dobson and Chia (1997), country- and industry- specific case studies in Rhee and Belot (1990) of "…the critical role of transnational corporations (TNCs) in the

transfer of technical, marketing, managerial know-how to developing countries," and many examples of technology transfer cited by Moran (2001) and (2002). All of these are basically case studies of particular transfers of technology, but not confined to either intra -industry or inter-industry transfers, and not confined to specific measures of technology. All of them find evidence for transfers of technology, but it is difficult to confront their evidence with that from the statistical studies described below because the questions asked are so different. The case studies ask whether there are examples where technology can be seen to have been transferred from foreign-owned to domestically-owned firms, and the answer is "Yes." The statistical studies ask whether on average domestically-owned firms gain in a particular measure of technology from the presence of foreign-owned firms, usually in the same industry, and the same country, or the same region, and the answer is "Not universally." Both of these answers could be true; neither one contradicts the other because they are answers to different questions.

One feature of case studies is their great flexibility. The exact nature of the technology transfer can differ from example to example, from industry to industry, and from country to country. The length of time for the transfer to take place and be measured need not be specified in advance, and can vary widely. The transfer can be within an industry, to supplying industries, or to consuming industries. This flexibility is an advantage of the case study method, but it comes with costs. Impacts on firms that do not receive the foreign technology are often left out of the accounting for the effects. The universe over which impacts are to be measured is not always delineated, and the universe from which the case studies are drawn is not always defined.

In contrast, statistical studies tend to be rigid in specifying the length of time over which effects are to be looked for, whether it is a year or a specified number of years. They specify some particular definition of a technology transfer, perhaps ignoring other important dimensions.

And they specify whether differences among countries or industries are to be studied. They assume the relevance of some particular measure of FDI and some functional form for its effects. The great advantage is that these studies tend to examine effects on whole industries, including the unlucky or less competent losers, as well as the winners. With microdata, they can look at the characteristics of firms forced out of an industry as well as those entering and those remaining, and at firms changing ownership.

A goal for case studies might be to assemble a collection of unsuccessful ventures and to compare them with the successful ones, with respect to their own characteristics but also, even more, with respect to country and industry environments. Baranson's (1967) book on Cummins' experience in India, for example, contains an analysis of the effects of import substitution policies that can be compared with experiences under more liberal regimes.

A general problem with productivity comparisons and spillover studies, as compared with wage studies, is the much greater data needs. Productivity studies require output measures, usually sales or value added. Sales by foreign-owned firms, particularly if they are exports, are frequently intra-company transactions. The values may not be the same as market values because there are many incentives to alter them to minimize tax liabilities, and the incentives may be very different for foreign-owned firms from any that domestically-owned firms face. Any manipulation of sales values would affect value added even more, and there are incentives to manipulate the profit portion of value added in addition to those affecting sales values. Furthermore, since value added includes profits, it may fluctuate far more over time than any physical measure of production. The use of production functions requires measures of capital input, often missing from Census data. If they are present, they are often of doubtful meaning,

especially in countries that have suffered major inflations, because it is uncertain if and how historical values have been adjusted to current price levels.

As with wage spillovers, the Görg and Strobl (2001) and Görg and Greenaway (2001) surveys conclude that the negative results from panel data studies are more reliable than those for cross-sections, and that there is, therefore, little evidence of positive spillovers from FDI. Since those surveys, a number of new studies of productivity spillovers based on panel data have appeared. As is true for wage spillovers, these find more evidence for positive spillovers than the earlier ones. Haskel *et al.* (2002) use a panel of UK manufacturing plants between 1973 and 1992 and find a positive and robust spillover effect of inward FDI on productivity in local plants. Keller and Yeaple (2003) find positive and robust effects of inward FDI in the United States on productivity in U.S. manufacturing plants between 1987 and 1996. Girma, Greenaway, and Wakelin (2001), using the firm data described above, find that there are spillovers, and that they are greater for firms in sectors in which local firms are closer in technology to the foreign firms. Spillovers of labor productivity and total factor productivity are similar in size. As with wage spillovers, the accumulation of studies has eroded the basis for the hypothesis that the distinction between cross-section and panel data studies explains the wide range of findings.

Probably the strongest evidence for negative productivity spillovers is in Aitken and Harrison (1999), a panel data study for Venezuela. A rise in the foreign share of ownership in a sector reduced the output of individual domestically-owned establishments and reduced their total factor productivity over periods from one to three years. The first year negative effect was particularly severe for small domestically-owned plants, suggesting that they were the least efficient and most vulnerable to the competition from the increasing efficiency associated with rises in foreign ownership. Since Venezuela had been a relatively closed economy to both trade

and inward direct investment in manufacturing during this period, it might have accumulated a larger than average stock of small, competitively weak firms.

Another panel study of a relatively closed economy was that of Kathuria (2000) using data for large firms in India, from 1975-76 to 1988-89, before the period of liberalization. Technical efficiency was measured from a function with value added as the production measure and labor and capital as inputs, and is taken to be the distance between a firm and the most efficient firm in its industry. The indication of a spillover is a reduction in the dispersion of efficiency levels among domestically-owned firms in the industries studied, those industries in which foreign-owned firms were the efficiency leaders. The foreign source of the spillovers was measured in two ways: the extent of foreign participation in the industry, represented by the foreign-owned firms' share of sales, and the stock of cumulated purchases of foreign technology by local firms. Foreign participation had a negative effect on the dispersion of efficiency among domestically-owned firms. This effect was interpreted by the author as indicating negative spillovers. He points out, however, that a negative spillover in these terms could result if both the foreign firms and the domestically-owned firms gained in efficiency, but the foreign-owned firms gained more, a result that would have been interpreted as a positive spillover in the Aitken and Harrison framework. The stock of foreign technological capital of the local firms was positively related to their gains in efficiency. When the sample was split between "scientific" and "non-scientific" industries, the spillover effects were confined to the "scientific" group" but were offset by a positive coefficient for the cross-product of foreign presence and the local firm's R&D effort. The interpretation was that R&D-intensive local firms might have gained, or lost less, from foreign presence than firms that did less R&D.

Productivity Spillovers in Indonesia

One way of understanding the variety of results would be to apply the same techniques to the identical types of data in different countries. Since we do not have access to data from many countries, we instead review studies of Indonesia and test alternative methods on that country's data. One advantage of using Indonesian data as a type of laboratory for experimentation is that it collects good micro data on manufacturing industry and has been increasingly used by a number of authors for plant level studies.A number of studies on Indonesia show foreign plants to have higher productivity than locally-owned plants (Takii and Ramstetter, 2003; Okamoto and Sjöholm, 2004) and that plants that change ownership from local to foreign ownership increase their level of productivity (Anderson, 2000). In addition, there are several plant level studies on spillovers from FDI in Indonesian manufacturing. These studies are summarized in Table 2.

Table 2 here.

The first three papers on spillovers from FDI in Indonesia used cross-section analysis. For instance, Sjöholm (1999a) examined plants in 1980 and 1991 and found both the level and growth of labor productivity to be higher for locally-owned plants in sectors with a high foreign share of output. There was no evidence of regional intra-industry spillovers from FDI, but some indications of regional inter-industry spillovers.

Sjöholm (1999b) used the same data as the study above to examine possible determinants of spillovers. The results suggested that spillovers were positively affected by the technology gap between domestic and foreign plants and by the degree of competition within the sector.

Blomström and Sjöholm (1999) examined spillovers from FDI in 1991. Their study differed in design from the previous two mainly in the use of capital stocks rather than investment ratios to control for capital intensity. There were positive spillovers from FDI, and no differences in the spillovers from joint ventures with minority or majority foreign ownership.

Takii (2001) was the first study on spillovers in Indonesia that used panel data, which allowed him to control for plant specific effects. He examined spillovers in the period 1990-95 using a translog production function and found positive effects on value added in local firms from the share of foreign employment in the same 3-digit ISIC industry. Moreover, the results suggested that spillovers were relatively large in sectors with relatively new foreign plants and with low gaps in labor productivity between foreign- and domestic plants. R&D positively affects spillover in locally owned plants.

The study by Todo and Miyamoto (2002) differ from most other papers on spillovers by the construction of the FDI variable as the absolute amount of FDI in a sector. They argued that this measure is more strongly related to the foreign knowledge stock and therefore preferred over the foreign share of a sector. The result showed a positive effect of FDI on local firms' labor productivity after controlling for R&D and training of the work force.

Blalock and Gertler (2002) also used a translog production function to examine spillovers between 1988 and 1996. Local firms in region-sectors with a high foreign share of output have high levels of productivity. Moreover, they found a positive effect on spillovers from the technology gap between domestic and foreign plants, and spillovers were also positively affected by local firms R&D, and by high education of workers in local firms.

In a second paper by Blalock and Gertler (2003), using the same data and a very similar translog production function, there is no longer evidence of positive intra-industry spillovers

from FDI. The main difference between the two studies is a second measure on FDI in the latter; a measure on FDI in upstream markets that aims at capturing spillovers from FDI to local suppliers. Downstream FDI was highly significant in the econometric estimations. This variable is constructed with the use of an Input-Output table at a sector level, which also includes purchases from the own sector. One possibility is therefore that the variable on downstream FDI captured also the effect of horizontal spillovers.

To sum up the results from studies on spillovers in Indonesian manufacturing, all cross-section studies and three out of four panel data studies find statistically significant intra-industry spillovers. The one study that fails to find intra-industry spillovers finds instead inter-industry spillovers from FDI. Judging from studies on Indonesia, it does not seem to be the design of econometric studies that causes the different results found in the spillover literature. This indicates that it might instead be differences between countries or firms that explain the extent of spillovers . The studies on Indonesia might shed some further light on what such factors could be. Previous literature suggests that competition, the trade regime, technology gap and local firms' absorptive capacity will affect the extent of spillovers. Starting with competition, the studies by Sjöholm (1999b) and by Blalock and Gertler (2003) show that spillovers are highest in sectors with high competition. The former study suggests that it is domestic competition, as captured by a Herfindahl index, rather than the degree of protection from imports that affects spillovers. The second study suggests that competition will benefit upstream local suppliers.

The results on technology gap are unclear. Takii (2001) found a negative effect on spillovers from the technology gap between local- and foreign-owned plants, which has also been found in other countries (Kokko, 1994; 1996). Sjöholm (1999b) and Blalock and Gertler (2002) find a positive relation between the technology gap and the degree of spillovers. One

explanation for the different results could be that the measure on technology gap differs between studies. Takii measured the technology gap as the difference in labor productivity between domestically-owned and foreign-owned plants.[2] Sjöholm used the difference in labor productivity in foreign-owned and domestically-owned plants, after controlling for the scale of operation and the investment per worker ratio.[3] Blalock and Gertler used the plant's fixed effect in comparison to the mean fixed effect in the same industry. Hence, the methodologies differ substantially, which is likely to cause the different results. Another reason why these, and other studies, differ with respect to the result on technology gap and spillovers could be that the relationship is non-linear. Some technology gap is presumably required for any useful technology spillovers to take place. However, it is also plausible that if the gap is too large, the technology in foreign plants will be of little practical use in locally-owned plants pursuing very different types of operations.

Another cause of differences in spillovers between countries is differences in sectors' and plants' absorptive capacity. The studies on Indonesia confirm that such capacity might be important for benefits from spillovers. Takii (1991), Todo and Miyamoto (2002), and Blalock and Gertler (2002) found that a firm's own R&D positively affected its ability to benefit from spillovers. The latter study also found that plants with more highly educated employees benefit more from the presence of foreign MNCs. A related issue is if the type of activities pursued by the foreign subsidiaries affects spillovers to domestically owned firms? This issue has been rather neglected in the spillover literature but Todo and Miyamoto (2002) find a positive effect on spillovers from R&D and human resource development in the foreign subsidiaries.

[2] He also used the difference in capital-labour ratios and the difference in size as alternative measures on technology gaps. These measures gave inconclusive results.
[3] The difference in investment ratios was used as an alternative measure but provided no clear results.

As seen from the earlier discussion, considerable attention has been devoted to differences between econometric methodologies as one possible explanation to why the results on spillovers differ between countries. A related, but so far rather neglected, issue is how one should construct measures on FDI. Most studies use the foreign share of a sector's economic activity as a measure of FDI.[4] One problem with this measure is that the foreign share of a sector might be endogenously determined if productivity spillovers expand activity in local firms. Moreover, this measure assumes that increases of foreign and aggregate activity in the same proportion should have no effect on local firms. Castellani and Zanfei (2002) argue that this assumption might produce a downward bias on the estimate of spillovers from FDI. Finally, it is not clear why we would assume the effect from FDI to be linear in the foreign share of an industry's economic activity: spillovers are not obviously maximized at a 100 percent foreign ownership share (Lipsey, 2004).

Although the foreign share is widely used as an FDI measure, productivity spillover studies still differ in how this share is constructed. Some measure it as the foreign share of employment, others as a share of value added or output. Moreover, the foreign share is calculated at different sector levels, ranging between 2-digit to 5-digit levels of ISIC. Finally, some studies use the foreign industry share at a national level, others at a regional level.

The more narrow the definition of an industry, the more restrictive is our assumption on how widely applicable knowledge from FDI can be for local firms, and our assumption on which domestically-owned plants that face increased competition form FDI. If we construct the FDI measure on a 2-digit level of ISIC, it implies that productivity spillovers might be present between industries at a 3- and 5-digit level of ISIC but not from one 2-digit industry to another.

[4] There are exceptions, see e.g. the previously discussed paper by Todo and Miyamoto (2002). See also Barrel and Pain (1997) who use aggregate FDI in a CES production function and find positive effects from FDI on technical progress in EU countries.

If we construct our measure on FDI at a 5-digit level of ISIC, it implies that productivity spillovers can only be captured if they take place within these industries but not if they cross from one 5-digit industry to another. It is unclear what a properly defined industry is for an analysis of productivity spillovers. It seems that most studies favor a disaggregated definition of FDI, possibly to increase the variance in the FDI variable. However, this might come at some costs if we miss out on spillovers across narrowly defined industries. Some technologies, such as computer use in tracking sales and inventories, may be very general and easily transmitted across industries, while others may be specific to particular production processes. Clearly, the industry definition will also have implications for what we attribute to inter-industry versus intra-industry spillovers.

The choice to construct the FDI measure at a national level or at a regional level might also be important. What the most appropriate level is depends on if spillover has a spatial dimension, i.e. that it primarily benefits plants within the same region. Jaffee et al (1993) is often referred to when a regional measure of FDI is used.[5] Their study shows that university R&D primarily benefits other inventors within the same geographic area. Hence, their study relates to innovation and it is possible, but not certain, that the same result exist also for spillovers. Whether or not spillovers are geographically concentrated depends on, for instance, if imitation, competition, or supply of linkage industries are enhanced by geographic proximity to the foreign firms.

If we believe that technology spillovers are geographically concentrated, the next question will be what is an appropriate geographic aggregation level? Studies on Indonesia have used both districts (Sjöholm, 1999a) and provinces (Sjöholm, 1999a; Blalock, 2002, 2003). One methodological problem is that spillovers are not likely to follow administrative units even if

[5] See Sjöholm (1999a), Blalock and Gertler (2002), and Lipsey and Sjöholm (2004b).

they are localized. For instance, the largest share of Indonesian manufacturing is located in the province Western Java. This is largely due to an industry sector that has grown out of its original base in Jakarta. Jakarta and the West Java cities of Bogor, Tanggerang, and Berakasi, constitute one industrial cluster, the Jabotabek area (Henderson et al, 1996). If technology spillovers from FDI exist, and even if such spillovers are only effective with geographic proximity, a foreign firm in Jakarta is likely to have positive effects on local firms within the whole Jabotabek area. However, Jabotabek spreads out over two provinces and about ten districts, which indicates the problem of using administrative geographic units in constructing measures on regional FDI.

Spatial concentration of FDI may provide an obstacle to the analysis of regional FDI measures. Such concentration is common in most countries, including Indonesia. For instance, about 80 percent of all FDI in Indonesian manufacturing is located in three out of 27 provinces (East Java, West Java, and Jakarta), which is a higher concentration than for manufacturing in general (Sjöholm, 2002; Sjöberg and Sjöholm, 2004). If, for instance, we construct our FDI measure at a province level and at a 5-digit level of ISIC – including about 300 industries – less than 25 percent of the region-industry combinations will have FDI. It may be desirable to take account of that selection of locations in analyzing the effects of FDI.

An experiment with different industry and geographical definitions of the relevant scope for productivity spillovers is described in Table 3. Spillovers are estimated at the national level and the province level, and for all sectors combined, as well as at 2-digit, 3-digit, and 5-digit industrial breakdowns. More specifically, we used Indonesian plant level data for 1996 to estimate the following expression:

$$\text{Laborprod}_{ij} = \text{constant} + \text{FDI} + \text{Education}_{ij} + \text{Capital}_{ij} + \text{Size}_{ij} + \text{Public}_{ij}$$

where *Laborprod* is value added per employee, *Capital* is energy consumption per employee, *Size* is the total number of workers, *Public* is a dummy variable for public ownership, and *Education* is the share of employees with primary, junior, senior, and university education, for both blue- and white-collar workers. For sake of clarity, we show only the coefficients of the different FDI variables in Table 3.

Table 3 here.

The main impression from the results in Table 3 is that geographical influences are minor; the spillover coefficients at the national level are almost identical to those at the province level at each level of industry detail. The industry level does make a difference. The coefficient is highest at the all- sector level, indicating a greater influence of foreign presence on domestic establishment productivity for manufacturing as a whole, than within 2-, 3-, or 5-digit industries. The coefficient is higher at the 3-digit level than at the 2-digit level, as one would expect if spillovers tended to be largest within a narrow industry. However, the effect becomes smaller when we move to the 5-digit industries. The behavior of productivity spillovers contrasts with that of wage spillovers, where going from the national to the province level raised the spillover coefficient at the 3-digit and 5-digit industry levels. The difference between the wage and productivity spillovers is mostly, although not entirely, consistent with the idea that wage spillovers come through competition for labor in geographically narrow labor markets while productivity spillovers result from competition in country-wide product markets.

Conclusions

Why do studies of spillovers come to such diverse conclusions? With respect to wage spillovers, the use of cross-section or panel data does not seem to be the cause. As far as we can judge from Indonesia, the tendency of foreign-owned firms to gravitate to high-wage industries, while it exists, does not explain the apparent spillovers and neither does any tendency of foreign firms to take over high-wage local firms within industries. Aside from Indonesia, most of the evidence for wage spillovers comes from developed countries, particularly the United States and the United Kingdom. One hint that differences in labor market institutions might be important for the degree of wage spillovers is that two countries found to have negative spillovers were countries with very restrictive labor laws, while the United States and the United Kingdom were among the least restrictive.

With respect to productivity spillovers, an accumulation of panel data studies has erased the previous unanimity of panel data results in showing negative or no spillovers. As with wages, firm-specific characteristics do not explain all the higher productivity found for domestic firms in industries where foreign-owned firms were important. The econometric method does not seem to be the crucial determinant of the result.

An explanation that seems plausible at this point is that countries, and firms within countries, might differ in their ability to benefit from the presence of foreign- owned firms and their superior technology. There might be countries or industries in which the domestically-owned sector is too small or too backward to learn from foreign-owned firms. In those cases, the domestic sector may be crushed by competition from the superior foreign-owned firms. The state of the domestically-owned sector might depend not only on the stage of development of the

economy, but also on the type of trade regime. A heavily protected domestically-owned sector might be inefficient and lacking in entrepreneurship.

It makes sense that the arrival of foreign firms with technology greatly superior to that of domestically-owned firms should inflict damage on at least some domestic firms. The least efficient, perhaps often the smallest, might become unprofitable or be forced out of the industry. One might view that outcome as favorable for the host country as a whole if the average productivity of foreign-owned and domestically-owned firms together increased. Few studies take account of both exits and the entrance of new firms, both important for judging the overall impact of inward FDI.

If country and industry differences are important to the impact of inward FDI on host countries, the main lesson might be that the search for universal relationships is futile. In that case, the question shifts from how inward FDI affects every host country and industry to which types of industries and which types of host countries are affected, and what the impact is on each. It is in searching for the characteristics of firms, industries, and countries that promote the transfer of technology that case studies can be most valuable. Their flexibility with respect to assumptions regarding timing and types of technology transfer suggests what statistical studies should look for and how the variables should be defined, especially if they encompass a wide range of both successful and unsuccessful ventures.

Why has academic skepticism about the impact of FDI not influenced policy more strongly? One reason is probably the diversity of findings. Another is the narrow scope of technology in the statistical tests. It relies on the assumption that the scale of operations and the import of components from abroad, and particularly from other related firms, do not constitute

part of affiliate technology, but are simple inputs, accessible to local as well as foreign firms. Policy makers may have found these assumptions implausible.

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Table 1. Coefficients for Impact of FDI on Wages in Indonesian Manufacturing.

FDI variables	Blue Collar Wages	White Collar Wages
FDI-2digit-national	1.07	1.04
	(21.83)***	(16.42)***
FDI-3digit-national	0.28	0.34
	(6.20)***	(5.43)***
FDI-5digit-national	0.16	0.35
	(7.48)***	(11.46)***
FDI-all sectors-province	1.05	1.22
	(32.81)***	(28.27)***
FDI-2digit-province	0.47	0.53
	(13.85)***	(12.26)***
FDI-3digit-province	0.39	0.44
	(12.93)***	(12.12)***
FDI-5digit-province	0.24	0.38
	(11.34)***	(13.12)***

Source: Lipsey and Sjöholm (2004b). Note: t-statistics within brackets. ***) Significant at the 1 percent level.

Table 2. Studies on Productivity Spillovers from FDI in Indonesian Manufacturing.

Author(s)	Year	Dependent variable	Measure on foreign presence	Independent variables	t-stat for foreign share
Blomström and Sjöholm (1999)	1991	Value added per employee	Output (5-digit level)	Capital White/Blue Capital-Utilization. Scale Ind. dummies	+***
Sjöholm (1999a)	1980; 1991	Growth in value added Value added per employee	Output (5-digit level)	Employment Investment Industry- and Regional Characteristics	+***
Sjöholm (1999b)	1980; 1991	Growth in value added Value added per employee	Output (5-digit level)	Employment Investment Scale	+***
Takii (2001)	1990-95	Value added	Employment (3-digit level)	(translog) Employment Capital Plant specific effect	+***
Todo and Miyamoto (2002)	1995-97	Value added per employee	Absolute amount of FDI output (2-digit level)	Capital Capacity-utilization Plant specific effect	+***
Blalock and Gertler (2002)	1988-96	Output	Output (4-digit level; region-industry)	(translog) Employment Capital Raw materials Plant specific effect	+***
Blalock and Gertler (2003)	1988-96	Output	Output (4-digit level; region-industry)	(translog) Employment Capital Raw materials Energy Downstream FDI Plant specific effect	?

Note: *** - Significant at the 1 % level. ? - Not statistically significant.

Table 3. Productivity spillovers in Indonesian manufacturing (dependent variable – value added per employee)

FDI variables	Coefficient of FDI
FDI-2digit-national	0.28
	(3.94)***
FDI-3digit-national	0.44
	(5.55)***
FDI-5digit-national	0.19
	(5.25)***
FDI-all sectors-province	0.94
	(19.05)***
FDI-2digit-province	0.27
	(5.44)***
FDI-3digit-province	0.44
	(9.79)***
FDI-5digit-province	0.23
	(6.44)***

Source: Note: t-statistics within brackets. ***) Significant at the 1 percent level.