

**Working Group on the Relationship
between Trade and Investment**

**THE EFFECTS OF FOREIGN DIRECT INVESTMENT ON DEVELOPMENT:
TECHNOLOGY AND OTHER KNOW-HOW TRANSFERS AND SPILLOVERS¹**

Note by the Secretariat²

INTRODUCTION

1. This Note has been prepared in response to a request from the Working Group for additional information on the effects of foreign direct investment ("FDI") on economic development.³ It focuses on technology and other know-how transfers and spillovers to host, developing countries, and is based on a review of the literature on this issue. This is only one aspect of the range of effects of FDI, but as noted in an earlier synthesis paper compiled by the Secretariat (WT/WGTI/W/38), it is widely regarded as possibly the most important contribution that FDI makes to the economic development of host economies, especially developing countries, and probably the most unique in that there are few transmission mechanisms other than FDI through which these transfers and spillovers are made.

2. It is important to state at the outset that it is difficult to paint an unambiguous picture of the effects of FDI in the abstract, particularly in the context of the economic development of developing countries which is itself a richly varied area of economic analysis and does not lend itself easily to generalisations or simple labels such as "positive" or "negative". The effects of FDI, overall and in their particular details, depend very much upon the economic characteristics of the host country, and even more so upon the prevailing policy environment. Nevertheless, the bulk of the economic analysis and empirical evidence reviewed in this Note suggests that the technology and other know-how transfers and spillovers effects of FDI are capable of making a significant contribution to the economic development of manufacturing and services sectors in developing countries. That is for several reasons. One is that beyond being a financial capital flow, the key feature of FDI is that it represents the capitalization of technology, knowledge, skills and other resources that represent the intangible assets of multinational enterprises. These are as much factors of production as are capital and labour, and they are the ones that tend to be in shorter supply in many developing countries. Various transmission mechanisms exist to transfer these assets directly into a host economy, or indirectly through spillover effects, and it is a mistake to believe that it is against the self-interest of a foreign direct investor that these transfers and spillovers should occur. Where this does not happen automatically, a range of policy measures are available to host countries to stimulate and secure them, in particular policies to support local technological capability and to encourage competition between foreign affiliates and local firms.

¹ The present Note supersedes the preliminary informal note circulated in Job No. 5229 dated 30 September 1998 which has been revised to include a more comprehensive discussion of empirical studies on different types of spillover effects (see section C).

² This Note has been prepared with the assistance of Magnus Blomström and Ari Kokko, Professor and Associate Professor respectively of the Stockholm School of Economics.

³ See WT/WGTI/M/5, paragraph 12.

3. It should be emphasized that, while conceptually it is important to distinguish between spillovers that arise from the diffusion of technology to host country firms and spillovers that occur because of the impact of FDI on managerial skills, domestic entrepreneurship and competition in the host country, such a distinction is difficult to make in empirical analysis. For example, it is seldom possible in empirical studies to distinguish between effects on productivity of local firms that come about because MNEs bring new technology and effects on productivity that occur because the competition from MNEs forces local firms to become more effective. For this reason, the third section of the study, which provides an overview of empirical research on spillover effects, adopts a broad concept of technology spillovers as including for example the spread of managerial practices, and also deals with "spillovers" resulting from the impact of inward FDI on competition and industry structure in host countries.

A. MULTINATIONAL ENTERPRISES IN THE INTERNATIONAL PRODUCTION OF TECHNOLOGY

4. Multinational enterprises ("MNEs") undertake a major part of the world's private research and development (R&D) efforts and produce, own, and control most of the world's advanced technology. This is heavily concentrated in a few home countries, unlike MNE investment, production, and employment, which are more widely spread across both industrialized and developing economies.

5. Statistics demonstrate this clustering of technology production. Over four fifths of the global stock of FDI originates from some half dozen home countries that dominate the world's research and technology: the United States, the United Kingdom, Japan, Germany, Switzerland, the Netherlands and France. On average, about a third of the total sales and the total employment of the MNEs based in these countries were accounted for by their foreign affiliates in the mid-1990s.⁴ However, in the case of US manufacturing MNEs for example, less than 10 per cent of the R&D expenditures were undertaken in their majority-owned foreign affiliates, and more than half of this was recorded by the affiliates located in the United Kingdom and Germany. Detailed data on the R&D expenditures of the multinationals based in the other main home countries are not available, but the pattern is likely to be similar. For most developing countries, therefore, foreign MNEs are the most important sources of modern technology.

6. Although it is known that multinational firms produce and own the bulk of the world's modern technology, it is not obvious how exactly MNE technology spreads across international borders and what role MNEs play in the process. One reason, of course, is that "technology" is an inherently abstract concept, and therefore difficult to observe and evaluate. None of the available measures of technology and technology production - such as R&D expenditures, numbers of new patents, payments for licences and royalties, stocks of capital equipment, and so forth - covers more than a part of this.

7. Another reason is that technology is diffused in many different ways. Apart from FDI, MNE technology can also spread to new users through joint ventures, licensing agreements and international trade. It is an open question which of these other transfer modes is the most important, because it is difficult to compare the technology content of the different transactions, and because there are no comprehensive data available to measure the magnitude of the informal transfers. However, FDI can be indirectly an important condition also for these alternative transfer modes. MNEs are the main source of technology supplies by virtue of their ownership of proprietary technologies, but they also account for a significant share of the demand, via their foreign affiliates. This is most apparent for the transfers of technology that are captured by data on trade in royalties, licences, and patent rights. Over 80 per cent of the registered payments to the United States for

⁴ See Lipsey, et al. (1998).

technology sales during the 1970-1985 period were made by foreign affiliates of United States firms.⁵ More than 90 per cent of the technology payments from developing countries to Germany in the early 1980s, and over 60 per cent of the payments to Japan, originated from their own foreign affiliates.⁶ Also the intra-firm character of the technology transfers that take place through trade in capital equipment and other products is distinguishable. Moreover, a significant share of the exports and imports of the major home countries flow between MNE parents and affiliates.

8. Thus, it seems safe to conclude that much of the international dissemination of technology and other know-how, no matter in which form, is connected to FDI. A large share of both licence sales and sales of technologically advanced products are directed to MNE affiliates, and FDI therefore seems to be more important for the geographical spread of technologies than a first look would suggest. In addition, many informal contacts are easier and more important when MNE affiliates are present in the market than when contacts have to be made across international borders. Keeping this in mind, it is not surprising that FDI is probably the transfer mode that has received the most attention.

9. However, there are important questions related to the role of FDI as a source of technology for host countries. What, for example, are the actual technological benefits of FDI and how do they come about? A distinguishing characteristic of direct investment is that the control and ownership of the technologies used by the affiliate stay in the possession of the MNE. Is there any significant diffusion of technology to new users or is the affiliate able to protect its technology from spreading to outsiders? This question is the subject of the next section.

B. DIFFUSION OF TECHNOLOGY THROUGH SPILLOVERS

10. In the debate on the role of MNEs in international technology transfer, it has sometimes been suggested that the most significant channels for the dissemination of modern, advanced technology are external effects or "spillovers" from FDI, rather than formal technology transfer arrangements.⁷ It is argued that when firms establish affiliates abroad and become multinational, they differ from the existing firms in the host country for two reasons. One is that they bring with them some amount of the proprietary technology that constitutes their firm-specific advantage and allows them to compete successfully with local firms that have superior knowledge of local markets, consumer preferences, and business practices. In industries with rapidly changing technologies (and, more generally, in developing host countries) the competitive assets of MNEs are likely to be related to new products and production processes. In more mature industries, MNEs may base their competitiveness more on marketing skills and organizational advantages, such as the ability to specialize across international borders, in order to exploit the local competitive advantages of various host countries. Another reason for spillovers is that the entry and presence of MNE affiliates disturbs the existing equilibrium in the market and forces local firms to take action to protect their market shares and profits. Both these changes are likely to cause various types of spillovers that lead to productivity increases in local firms.

11. Generally, spillovers are said to take place when the entry or presence of MNE affiliates lead to productivity or efficiency benefits for the host country's local firms, and the MNEs are not able to internalize the full value of these benefits. The simplest example of such a spillover is perhaps the case where a local firm improves its productivity by copying some business practice or technique used by MNE affiliates operating in the local market. Another kind of spillover occurs if the entry of an affiliate leads to more severe competition in the host economy, so that local firms are forced to use existing technology and resources more efficiently. A third type of spillover effect takes place if the

⁵ Grosse (1989).

⁶ UNCTC (1988), p.177.

⁷ Blomström (1989).

competition forces local firms to search for new, more efficient technologies. These effects may take place either in the foreign affiliate's own industry or in other industries, among the affiliate's suppliers or customers.

12. A first reason to suspect that spillovers are important is that the technologies and other know-how used by MNE affiliates are not always available in the market.⁸ Abstracting from the fact that several means of extracting technology rents may occur simultaneously in reality, the MNE has three alternative ways to exploit its technological advantages internationally. The MNE can produce for export in the home country; it can sell its technology to foreigners; or it can establish an affiliate abroad and control foreign production directly.⁹ However, markets for technology and other know-how are typically imperfect, which makes the transaction costs for sales of technology to outsiders high.¹⁰ The reason may be that the relevant technologies and know-how are not easily codifiable in the form of patents and blueprints, or that it is difficult to value the technology and agree about prices and licensing costs that are acceptable to both parties.¹¹ MNEs therefore often prefer direct investment to licensing, and the preference for FDI may be particularly strong when the newest and most profitable technologies (or those that are very close to the MNEs' principal line of business) are exploited. A technology that is exploited through FDI may not be licensed to the local competitors in the host country. Thus, local firms' only chances to gain access to the technology and know-how may lie in reverse engineering or hiring of former MNE employees with special skills, or some other type of spillover. This reason for the importance of spillovers may be most valid for the more developed host countries and industries, because the technical skills required to imitate the newest and most profitable technologies are typically higher.¹²

13. The preference for internal use of technology may be present even when there are no explicit imperfections in the market for technology. Some technologies and know-how are simply more valuable when internalized in the foreign affiliates of the MNEs that have developed them than when used by outsiders – the technology in question may have been developed for the specific purposes of the MNE, the operationalization of the technology may require an organization whose members have some specific skills, or the adaptation of the technology to a new environment may be significantly less costly when done by the MNE that developed the technology in the first place. In these cases, it may be unprofitable for local firms to acquire the technologies in the open market, unless there are some simultaneous spillovers of skills to facilitate the adoption of the new technology. It should, of course, be noted that spillovers may be important even where local firms are able to acquire MNE technologies through licensing and other market transactions. In fact, when local industry is dynamic and innovative, it is not unusual to observe "virtuous cycles" of cross-licensing and spillovers between local firms and affiliates of foreign MNEs.¹³

14. Another reason why spillovers may be significant is that direct contact with users appears to be a principal factor explaining technology and other know-how diffusion. Before a new process or product innovation is widely spread in the market, potential adopters have limited information about the costs and benefits of the innovation and may therefore associate it with a high degree of risk. As the potential adopters come in contact with existing users (e.g. MNE affiliates) information about the technology and know-how is diffused, the uncertainty regarding the pros and cons of the innovation is reduced, and the likelihood of imitation or adoption increases. In this way, the entry of foreign

⁸ See e.g. Conklin and Lecraw (1997) and Ramachandran (1993).

⁹ The determinants of the MNE's choice between exports, licensing and FDI are not discussed in this study, but are treated in detail by e.g. Blomström and Zejan (1991), Contractor (1984), Davidson (1980, 1983), Davidson and McFetridge (1985), Stobaugh (1988), Telesio (1979), Vernon and Davidson (1979) and Zander (1991).

¹⁰ Buckley and Casson (1976); Caves (1996); Teece (1981).

¹¹ See e.g. Buckley and Casson (1976) and Teece (1981).

¹² See Blomström (1991b) and Blomström and Zejan (1991).

¹³ See Cantwell (1995).

affiliates may demonstrate the existence and profitability of new products and processes, and encourage local firms to adopt some of them: these diffusion processes may even be repeated every time innovations are transferred from the MNE parent to the affiliate. This is an argument for spillovers even when access to new technology is not restricted by proprietary factors, because information about foreign technology is generally more expensive for local firms than for MNE affiliates. In addition, it can be assumed that "familiarization" effects are more important for developing host countries, where indigenous skills and information are in shorter supply.¹⁴

15. A third reason to expect positive external effects from FDI is related to the typical features of MNEs - scale economies, high initial capital requirements, intensive advertising, and, not least, advanced technology. These are also industry characteristics that signal high barriers to entry, high concentration, and perhaps some inefficiency that follows from low levels of competition. Entry by new domestic firms into such industries in potential host countries is likely to be difficult; multinationals, on the other hand, are both likely to enter just those industries and be well equipped to overcome the entry barriers. They can coordinate their international operations and concentrate specific processes to few locations if scale economies are important entry barriers. If the barriers are made up of high capital costs, MNEs may have larger own funds than local firms, or access to cheaper financing on international markets. Barriers related to product differentiation and technology, finally, are not likely to stop a multinational, since these features often characterize MNEs themselves.

16. The entry of MNEs into this kind of monopolistic or oligopolistic industry is likely to increase the level of competition and force existing firms to become more efficient. Foreign entry may, of course, also lead to a fall in the number of firms in the industry if the least efficient local companies are forced out of business. This raises the fear that foreign MNEs may outcompete all local firms and establish positions of market power that are even greater than those of local firms beforehand. In addition to restricting competition, there is a risk that MNE monopolies may also repatriate profits and avoid taxation through transfer pricing.

17. The actual outcome is likely to vary between industries, depending on the ability of domestic firms to respond to the foreign challenges. However, it is often argued that competition is likely to become more fierce, because the MNE affiliates' strategies typically stir up the established patterns of "gentlemanly competition". Hence, it has been asserted that "whatever the market structure that results from the influence of direct investment, it can be argued that the entry by a foreign subsidiary is likely to produce more active rivalrous behaviour and improvement in market performance than would a domestic entry at the same initial scale"¹⁵. Another point to note is that this increase in competition may be more effective in inducing technological change and productivity improvements than profit incentives, since "threats of deterioration or actual deterioration from some previous state are more powerful attention-focusing devices than are vague possibilities for improvements".¹⁶

C. EMPIRICAL EVIDENCE ON SPILLOVERS

18. The earliest discussions of spillovers in the literature on FDI date back to the 1960s. The first author to systematically include spillovers (or external effects) among the possible consequences of FDI was MacDougall (1960), who analysed the general welfare effects of foreign investment. Other

¹⁴ Mansfield and Romeo (1980) present indirect evidence also for this argument. They claim that the export of technologies from parents to United States affiliates abroad speeded up the emergence of competing products or processes in the host countries by an average of 2.5 years in about a third of their cases. In addition, they report that more than half of the managers of a sample of British firms believed that they had introduced some products and processes earlier as a consequence of transfers of technology to United States affiliates operating in the United Kingdom. More evidence will be presented later, in the survey of empirical studies of spillovers.

¹⁵ Caves (1971), p.15.

¹⁶ Rosenberg (1976), p.124.

early contributions were provided by Corden (1967), who looked at the effects of FDI on optimum tariff policy, and Caves (1971), who examined the industrial pattern and welfare effects of FDI.

19. The common aim of these studies was to identify the various costs and benefits of FDI, and spillovers were discussed together with several other indirect effects that influence the welfare assessment, such as those arising from the impact of FDI on government revenue, tax policies, terms of trade and the balance of payments. The fact that spillovers were taken into account was generally motivated by empirical evidence from case studies rather than by comprehensive theoretical arguments - the detailed theoretical models analysing spillovers did not appear until the late 1970s.¹⁷ Yet, the early analyses made clear that multinationals may improve allocative efficiency by entering into industries with high entry barriers and reducing monopolistic distortions, and induce higher technical efficiency if the increased competitive pressure or some demonstration effect spurs local firms to more efficient use of existing resources. They also proposed that the presence of MNEs may lead to increases in the rate of technology transfer and diffusion. More specifically, case studies showed that foreign MNEs may:

- (a) contribute to efficiency by breaking supply bottlenecks (but that the effect may become less important as the technology of the host country advances);
- (b) introduce new know-how by demonstrating new technologies and training workers who later take employment in local firms;
- (c) either break down monopolies and stimulate competition and efficiency or create a more monopolistic industry structure, depending on the strength and responses of the local firms;
- (d) transfer techniques for inventory and quality control and standardization to their local suppliers and distribution channels; and
- (e) force local firms to increase their managerial efforts, or to adopt some of the marketing techniques used by MNEs, either on the local market or internationally.

20. Although this diverse list gives some clues about the broad range of various spillover effects, it says little about how common or how important they are in general. This raises the question of how the significance and scope of spillovers can be measured.

21. It is not difficult to picture an ideal study of productivity spillovers in host countries. To examine how the development of technology and productivity in individual local firms is related to the presence of foreign MNEs in the local market, the study would require detailed micro data, both quantitative and qualitative. The study would have to cover several years, to take into account the fact that spillovers are not instantaneous. It should also include a large number of firms and industries, so that inter-industry spillovers could be observed, and so that it would be possible to draw statistically significant conclusions. However, no comprehensive analyses of this character have ever been made - one reason, of course, is the extreme data requirements. Additional empirical evidence on spillovers must therefore be drawn from two other sources.

22. Firstly, in addition to the few case studies focusing directly on spillovers, there is a large number of detailed case studies discussing other aspects of FDI in different countries and industries, and these studies often contain valuable "circumstantial evidence" of spillovers. For instance, many

¹⁷ For theoretical studies, see e.g. Findlay (1978), Koizumi and Kopecky (1977), Das (1987), and Wang and Blomström (1992). Some other early empirical studies are Balasubramanyam (1973), Brash (1966), Deane (1970), Dunning (1958), Forsyth (1972), Gabriel (1967), Rosenbluth (1970) and Safarian (1966).

analyses of the linkages between multinationals and their local suppliers and subcontractors have documented learning and technology transfers that may make up a basis for productivity spillovers or market access spillovers.¹⁸ These studies seldom reveal whether the MNEs are able to extract all the benefits that the new technologies or information generate among their supplier firms, so there is no clear proof of spillovers, but it is reasonable to assume that spillovers are positively related to the extent of linkages. Similarly, much has been written on the relation between MNE entry and presence and market structure in host countries, and this is closely related to the possible effects of FDI on competition in the local markets.¹⁹ There are also studies of demonstration effects, technology diffusion, and labour training in foreign MNEs that are relevant for the purposes of this study.²⁰ Secondly, there are numerous statistical studies examining the relation between foreign presence in a host country industry and productivity (or productivity growth) in the locally owned share of the industry or in individual locally owned firms. These studies typically estimate production functions for locally owned firms, and include the foreign share of the industry as one of the explanatory variables. They then test whether foreign presence has a significant positive impact on local productivity (or productivity growth) once other firm and industry characteristics have been accounted for. Although the data used in these analyses are often limited to few variables, aggregated to industry level rather than plant level, and in several cases of a cross-section rather than time-series or panel character, they do provide some important evidence on the presence and pattern of spillover effects.

23. The following paragraphs first provide an overview of case studies on spillover effects that are related to backward and forward linkages between MNEs and domestic firms, MNE training of local employees, demonstration effects, and effects of FDI on industry structure and competition in the host country. This is followed by a review of the results of the available statistical studies of spillovers.²¹

Linkages between MNEs and Local Firms

24. Some of the spillovers from FDI operate via the linkages between the MNE's foreign affiliate and its local suppliers and customers. The spillovers occur when local firms benefit from the MNE affiliate's superior knowledge of product or process technologies or markets, without incurring a cost that exhausts the whole gain from the improvement. The existence of linkages does not prove that there are spillovers, but the two are probably closely related. Even if the MNE affiliate charges for the support it provides to local suppliers and distributors, it is not always able to extract the full value of the resulting productivity increases. Backward linkages arise from the MNE affiliate's relationships with suppliers, while forward linkages stem from contacts with customers.

Backward Linkages

25. Some of the "complementary activities" that may create spillovers through backward linkages are identified in Lall (1980). In summary, Lall notes that MNEs may contribute to raise the productivity and efficiency in other firms as they:

- (a) help prospective suppliers (domestic as well as foreign) to set up production facilities;
- (b) provide technical assistance or information to raise the quality of suppliers' products or to facilitate innovations;

¹⁸ See e.g. Lall (1980).

¹⁹ See e.g. Lall (1979) and Blomström (1986b).

²⁰ Lake (1979), Langdon (1981), and Mansfield and Romeo (1980).

²¹ Blomström and Kokko (1998) and De Mello (1997) provide comprehensive surveys of the relation between FDI and technology diffusion in the host country.

- (c) provide or assist in purchasing of raw materials and intermediaries;
- (d) provide training and help in management and organization; and
- (e) assist suppliers to diversify by finding additional customers.

In his empirical study, Lall examines two Indian truck manufacturers (one MNE and one joint venture) and finds significant backward linkages of all five types mentioned above. In particular, he notes that the truck manufacturers had been active in the establishment of supplier firms: of the 36 sampled supplier firms, 16 had been launched by the principals.²² Behrman and Wallender (1976), who examine the operations of General Motors, ITT, and Pfizer in several host countries, find similar linkages. They emphasize the ongoing character of the contacts and information flows between MNEs and their local suppliers. Evidence on the development of linkages is also provided by e.g. Watanabe (1983a, 1983b) and UNCTC (1981).²³

26. Apart from demonstrating various types of linkages that create a potential for spillovers, these studies also suggest that the local content in MNE production is one of the determinants of the strength of linkages. Reuber et al. (1973), in a comprehensive survey of MNE affiliates in developing countries, note that over a third of the total value of goods and services purchased 1970 by all affiliates included in their survey were provided by local firms. However, there were systematic differences in local purchases depending on the affiliates' market orientation, the parent's nationality, and the host country. Local-market oriented affiliates purchased more from local firms than did export-oriented affiliates (perhaps because import licenses are easier to obtain for exporters); European MNEs relied more on local firms than US or Japanese firms (perhaps because they are generally older and have already built up local supplier networks); and affiliates in Latin America and India purchased more local inputs than affiliates in the Far East (probably because of differences in local content requirements). In addition to these factors, it seems that the technical capability of potential local suppliers must be important to take into account.²⁴

27. Moreover, there is a tendency for the share of local inputs to increase over time, also for export-oriented affiliates. McAleese and McDonald (1978), who study Irish manufacturing during the period 1952-1974, show that local purchases of inputs increase as the MNE affiliates mature. Several factors contribute to the gradual development of linkages: further production processing stages are added over time, the autonomous growth of the manufacturing sector brings up new suppliers, and some MNE take deliberate action to attract and develop local suppliers.²⁵ Hence, it is possible that

²² The domestic content in Lall's two cases was extremely high - probably over 90 per cent - and both firms had extensive supplier networks, with 500 and 339 independent suppliers, respectively. It should be noted that these characteristics already distinguish the Indian experience from others, since an extreme import substitution policy made India a virtually closed economy until the mid-1980s. Hill (1982), who examines the Philippine appliance and motor cycle industries, argues that inter-firm linkages are often significantly weaker than in the Indian case. More liberal import policies reduce local content, the smaller size of most markets makes much production economically unviable, and the assembler character of many principal firms makes them incapable of offering technical assistance to suppliers. Similarly, Lindsey (1989) argues that the positive impact of MNEs on the Philippine economy has been very limited.

²³ Lall (1978) reviews numerous other studies of linkages between MNEs and local firms, and Halbach (1989) summarizes a detailed study of subcontracting and linkages in several South-East Asian industries.

²⁴ Some more recent evidence from a study of foreign owned and domestic manufacturers in Georgia and South Carolina by Barkley and McNamara (1994) confirms the importance of linkages. They find that the foreign firms' propensity to purchase inputs locally was significantly larger than that of branch plants of firms headquartered in other US states, and did not differ significantly from that of locally-owned firms. They also conclude that "local linkage differences are primarily a function of host economy characteristics and plant characteristics other than country of ownership."

²⁵ This last point is noted in numerous other studies. Dunning (1958), one of the earliest contributions, maintains that foreign firms are generally engaged in the training of local suppliers. In addition to the

spillovers also become more common over time, as more and more local firms establish various types of contacts with the foreign MNEs.

28. In addition to the linkages and spillovers that are the result of cooperation between affiliates and local firms, it is also possible that there are effects that occur as suppliers are forced to meet the higher standards of quality, reliability, and speed of delivery of the MNEs. For instance, Brash (1966), in a study of the impact made by General Motors on its Australian local suppliers, emphasizes the importance of the MNE's stricter quality control, which also had an impact on the suppliers' other operations. Katz (1969, p. 154) reports that foreign MNEs operating in Argentina "forced their domestic suppliers to adopt productive processes and techniques used by the suppliers of their main firms in their country of origin". Similarly, Watanabe (1983a) notes complaints from small local producers in the Philippines about the large foreign firms' tough requirements on both product characteristics and prices: in developing countries, in particular, this alone may have an effect on what technologies are used, and perhaps also on the general competitive climate. However, there is very little additional evidence on such "forced linkage effects".

29. Most of the available empirical evidence on linkage effects from FDI refers to the manufacturing sector. One of the few exceptions is Barrow and Hall (1995), who focus on the finance sector in an analysis of the impact of AMEX on the local Brighton economy. The study finds significant linkages with local suppliers – a total of 4,179 suppliers were identified for 1990 – with a strong bias towards services, such as marketing, telecoms, finance, travel and entertainment. As in many of the studies focusing on manufacturing, there were signs that these linkages provided various benefits to the local firms. For instance, in their discussion of the contacts between AMEX and local banks, Barrow and Hall conclude that they have "a model example of how skills, expertise, technology, improved business practices and attitudes can be diffused via a range of types of linkages".²⁶ They also note that the large AMEX operation led to improvements in the local communications infrastructure, and enhanced the reputation of Brighton as a center for the financial services sector.

30. Some less optimistic conclusions on the effects of linkages are suggested by Aitken and Harrison (1991), who examine Venezuelan manufacturing between 1976 and 1989, and conclude that the effect of foreign investment on the productivity of upstream local firms is generally negative. They assert that foreign firms divert demand for domestic inputs to imported inputs, which means that the local supplier firms are not able to benefit from potential economies of scale. Their results differ from most other findings in this respect.²⁷ One reason is that their study includes also local firms that have not been fortunate enough to establish linkages with foreign affiliates, and because they do not take into account the increase in local content that seems to take place over time. Yet, their

comprehensive evidence on local content, Reuber et al. (1973) argue that MNEs actively support the establishment of independent local suppliers. Lim and Pang (1982) also underscore this in their study of the Singapore electronics industry: they point specifically at the role of MNEs in suggesting entrepreneurial possibilities and assisting in the establishment of supplier firms, and their "willingness to bear the initial costs of encouraging and patronizing local suppliers, who in the long run would be cost-competitive" (p. 591). What distinguishes their study is, firstly, that it is concerned with export-oriented TNCs whereas most others look at import-competing industries, and secondly, that they show how the development of linkages in Singapore was relatively rapid during the late 1970s while most other studies seem to suggest a much slower process.

²⁶ Barrow and Hall (1995) p.650.

²⁷ However, Fujimore (1986), in an analysis of the Filipino auto industry, also argues that the technology diffusion from assemblers to parts manufacturers has been limited because of the relatively small scale of orders. This arguably contributes to a "penchant on the part of parts manufacturers toward side lines and diversification of operations" (p. 365), and reduces the motives to invest in learning from the foreign assemblers. Judging from this evidence, it is possible that the potential for technology spillovers might be positively related to market size.

conclusions highlight the need for more research where the connection between spillovers and linkages is examined explicitly.

Forward Linkages

31. There is much less evidence of forward than of backward linkages. Only a minority of the firms studied by Reuber et al. (1973) claimed to have contributed significantly to the development of local distributors and sales organizations. However, McAleese and McDonald (1978) report that forward linkages in the Irish economy grew in much the same way as backward linkages. In particular, they assert that many MNEs commenced operations with heavy export-orientation, but that the importance of the home market has increased over time.

32. Blomström (1991a) discusses forward linkages in closer detail, and emphasizes the growing technical complexity in many industries. On the one hand, this could mean that only MNEs can afford the necessary R&D to develop and manufacture modern products; on the other hand, industrial application of e.g. computer-based automation and information technologies might require expertise from the manufacturers. This, he argues, would contribute to increasing the role of MNE-customer contacts, especially in the smaller countries. One of the few empirical works touching upon the issue is the study by Aitken and Harrison (1991) noted above. They conclude that spillovers from forward linkages seem to be important in most industries - in fact, they argue that the downstream effects of foreign investment are generally more beneficial than the upstream effects.

33. Summarizing, there is much evidence of the existence and potential of backward linkages, and a suspicion about the growing importance of forward linkages as well. Some of the host country characteristics that may influence the extent of linkages - and thereby the extent of spillovers - are market size, local content regulations, and the size and technological capability of local firms. Moreover, linkages are likely to increase over time, as the skill level of local entrepreneurs grows, new suppliers are identified, and local content increases. This constitutes circumstantial evidence for spillovers, but it must also be mentioned that there are hardly any studies where the connection between linkages and spillovers is explicit.

Training of Local Employees in MNE Affiliates

34. The transfer of technology from MNE parents to affiliates is not only embodied in machinery, equipment, patent rights, and expatriate managers and technicians, but is also realized through the training of the affiliates' local employees. This training affects most levels of employees, from simple manufacturing operatives through supervisors to technically advanced professionals and top-level managers. Types of training range from on-the-job training to seminars and more formal schooling to overseas education, perhaps at the parent company, depending on the skills needed. Although higher positions are often initially reserved for expatriates, the local share typically increases over time. The various skills gained while working for an affiliate may spill over as the employees move to other firms, or set up their own businesses.

35. The evidence on spillovers from the MNE affiliates' training of local employees is far from complete, and comes mainly from developing country studies. Considering that the public education systems in developing countries are relatively weaker, it is also possible that spillovers from training are relatively more important there. However, there is scattered evidence of effects in the industrialized countries, and then perhaps mainly regarding management skills. It is possible, for instance, that the inter-firm mobility of managers has contributed to spread specific management practices from Japan to the United States and Europe, and, in earlier times, from the US to Europe.²⁸

²⁸ Caves (1996).

Moreover, casual observation suggests that the mobility of employees from MNEs in the computer and software industries contributes to spillovers, both within the industry and elsewhere.

36. Studies in developing countries have recorded spillovers of both technical and management skills. For instance, Gershenberg (1987) examines MNEs and the training and spread of managerial skills in Kenya. From detailed career data for 72 top and middle level managers in 41 manufacturing firms, he concludes that MNEs offer more training of various sorts to their managers than private local firms do, although not more than joint ventures or public firms. Managers also move from MNEs to other firms and contribute to the diffusion of know-how. Of the managers in private local and public firms who had training from elsewhere, the majority had received it while working for MNEs - joint ventures, on the other hand, seemed to recruit mainly from public firms. Yet, mobility seemed to be lower for managers employed by MNEs than for managers in local firms. This is not surprising remembering the common finding that MNEs pay more for their labor than what local firms do, even taking skill levels into account: in fact, it is not unreasonable to hypothesize that the fear of a "brain-drain" to local firms is one of the reasons behind the higher wages in MNEs.²⁹ Katz (1987) points out that managers of locally owned firms in Latin America often started their careers and were trained in MNE affiliates.³⁰

37. Chen (1983), in a study of technology transfer to Hong Kong, chooses to emphasize training of operatives. In three out of four sampled industries, the MNEs' incidence of undertaking training and their training expenditures were significantly (several times) higher than those of local firms. Consequently, he concludes that "the major contribution of foreign firms in Hong Kong manufacturing is not so much the production of new techniques and products, but the training of workers at various levels" (p. 61).

38. Another factor in the dissemination of technology and human capital skills is related to the R&D efforts undertaken by the MNE affiliates. MNEs do undertake R&D in host countries, although it is strongly concentrated in their home countries. The affiliates' research efforts could be important, and should be compared with the R&D efforts of local firms, rather than with the parents' total R&D. Thus, Fairchild and Sosin (1986) conclude that foreign firms in Latin America exhibit more internal local R&D activity than is generally presumed, and that their total expenditures on research are very similar to those of domestic firms. In addition, they have access to the aggregate know-how base of the parent and related affiliates, and sometimes also to the parent's R&D facilities. The affiliates' R&D may therefore be more efficient than that of local firms. Not much is known, however, about what type of R&D is done in affiliates - traditionally, much has been adaptation of products and processes - and even less is known about the mobility of R&D personnel or the effects on the host country's technological capability.³¹

²⁹ In a later study of the diffusion of managerial know-how in Jamaica, Gershenberg (1990) does not find any significant differences in training between MNE affiliates and local publicly owned firms. He therefore concludes that "the transfer of managerial know-how does not appear to afford a significant explanation of why the leadership cadres of less economically developed countries should compete actively to attract foreign direct investment (p. 212)."

³⁰ Wasow and Hill (1986) provide similar evidence for the dissemination of management skills in the Philippine insurance industry. Likewise, Yoshihara (1988) underlines the importance of training in foreign companies (and overseas education) for Chinese-owned firms in South-East Asia. Behrman and Wallender (1976) recognize spillovers of both managerial and technical skills. In particular, they note that several of the MNE affiliates' subcontractors had been established by former employees. Hill (1982) also identifies similar cases in the Philippine appliance and motor cycle industries, but argues that they were insignificant. Nevertheless, 12 out of 20 assembler firms had some subcontractors that were established by former employees.

³¹ For some recent studies touching on these issues, see Cantwell (1995), Patel and Pavitt (1994), and Zander (1994).

39. Judging from the aggregate evidence on spillovers from the training of MNE personnel, there seems to be a definite accumulation of human capital skills in the MNEs' employee stock. Some of these skills can be appropriated by local firms when employees move to new jobs, but how much is an open question. The fact that most studies deal with the spread of management skills might suggest that they are less firm-specific than technical skills, and can more easily be used in other contexts. It is also possible that managerial skills and know-how can only be transferred through close personal contacts.³² The empirical evidence on how systematic these differences are, however, is too limited for more definite conclusions.

Demonstration Effects

40. There are a few case studies which discuss pure demonstration effects of FDI on local firms in the host countries of MNEs. Riedel (1975) claims that horizontal demonstration effects from the operations of MNEs were an important force behind the development of the manufacturing export sector in Hong Kong, China in the 1960s. Swan (1973) suggests that multinationals are important not only for the diffusion of the specific technologies they use, but more generally because they strengthen international communications channels, which makes demonstration across international borders possible. Tilton (1971), in a study of the semiconductor industry, points to the importance of new MNEs in introducing US innovations to the European countries. Lake (1979), also examining the semiconductor industry, argues that affiliates of US MNEs have been more active than local firms in the diffusion of new technology in Great Britain. Mansfield and Romeo (1980) show that the technologies transferred to affiliates are younger than those sold to outsiders, and that there are cases where the affiliates' technology imports have induced local competitors to imitate their behavior.

41. These case studies suggest that demonstration may be an important channel for spillovers. However, there are two problems that make it difficult to judge how important simple demonstration effects are in an aggregate perspective. One problem is that pure demonstration effects often take place unconsciously: it is seldom documented how and where a firm first learns about a new technology or product that is subsequently adopted. Another reason is that demonstration effects are often intimately related to competition. Some authors have actually hypothesized that the most important influences of MNEs on local firms operate through the interaction of demonstration and competition.³³ Summarizing a comparison of MNE and local technologies, Jenkins (1990, p. 213) notes that "over time, where foreign and local firms are in competition with each other, producing similar products, on the same scale and for the same market, there is a tendency for local firms to adopt similar production techniques to those of the MNEs. Indeed this is part of a general survival strategy, whereby in order to compete successfully with the MNEs local capital attempts to imitate the behavior of the MNEs."

42. There are some case studies at the firm and industry level which describe the combined effects of demonstration and competition from MNEs on the technology choices of local firms. For instance, Langdon (1981), in a study of FDI in the Kenyan soap industry, reports that the entry of foreign MNEs also introduced mechanized production, and local firms found themselves unable to sell handmade soap in the urban markets. Instead, they were forced to introduce mechanized techniques to stay in business. Similarly, foreign entry into the Kenyan footwear industry led to increased competition and changes in the production techniques of local firms.³⁴ In the Brazilian textile industry, the establishment of an affiliate by a foreign firm brought in synthetic fibers. The subsequent stagnation of demand for cotton textiles led to the disappearance of some local firms, and

³² Komoda (1986) p. 412.

³³ Blomström (1986a).

³⁴ Jenkins (1990).

forced others to seek joint ventures with foreign firms in order to get access to competitive technology.³⁵

43. Many of the case studies on demonstration effects have also contributed valuable information on how local firms respond to increased competition in the short run, before imitation takes place. The immediate local reaction may be to merely enforce stricter or more cost-conscious management and motivate employees to work harder, in order to reduce slack or improve X-efficiency. It is possible that this seemingly simple response may make a more substantial contribution to productivity than improvements in resource allocation.³⁶ Bergsman (1974), on the basis of a study of industry in six developing countries, argues that X-efficiency is several times as important as allocative efficiency in increasing incomes in these countries. Also Pack (1974), in a study of LDC manufacturing industries, and Page (1980), referring to evidence for three manufacturing industries in Ghana, suggest that factors related to X-efficiency - mainly management and capacity utilization - are more important than changes in resource allocation (via changes in relative factor prices) to improve performance.³⁷

44. The potential productivity improvements from these types of reactions are probably larger in developing countries than elsewhere, simply because the initial inefficiencies are often larger. On the other hand, local firms in developing countries may be too weak to mount a competitive response to foreign entry, whereas the locals in industrialized host countries can often be expected to reply competitively. Various defensive corporate agreements, such as amalgamations among local firms or cooperative ventures with other foreign firms, may improve the local firms' competitiveness, even in developing countries³⁸ (but there are no direct cross-country comparisons available, and there are not enough case studies for more comprehensive conclusions. Exactly what the reaction is - and how important the spillover benefits are - is likely to depend on the initial conditions in the market, and how much of an impact MNE entry makes on concentration and competition. This motivates a closer look at the relation between FDI and competition in host country markets.

Competition and Industry Structure

45. It was argued earlier that MNEs may improve industrial efficiency and resource allocation in their host countries by entering into industries where high entry barriers reduce the degree of domestic competition.³⁹ One of the few studies explicitly examining the impact of competition from foreign MNEs on the productivity of local firms - a study on the American automotive components industry by Chung *et. al.* (1996) - also concludes that the observed positive relation between inward investment and host country productivity is primarily due to increased competitive pressures. However, it was also noted above that there is sometimes a concern that strong foreign MNEs might outcompete all local firms and establish monopolies that are even worse than the local monopolies they replace.

46. One central problem in this connection is the question whether MNE entry and presence explain industry structure or whether industry structure determines if MNEs will enter or not. This is an important question because it was argued earlier that one of the reasons to expect significant effects of foreign presence is the improvement in efficiency and resource allocation that may follow from MNE entry into monopolistic host country industries. Another problem is that there is some confusion regarding effects that are endemic to MNEs and those that are only speeded up by the presence of MNEs. Few authors have been able to make a proper distinction between these two

³⁵ Evans (1979).

³⁶ Leibenstein (1966) and (1980).

³⁷ See also White (1976).

³⁸ Blomström (1986b), Lall (1979), Evans (1977).

³⁹ The UNCTAD *World Investment Report 1997* contains a comprehensive discussion of FDI and host country market structure.

effects, but it may not be a crucial issue in the present context. What matters is the impact of MNEs and not whether the impact is due to foreign ownership or some other of the MNE's characteristics. A third source of confusion concerns the mode of entry –greenfield or acquisition- of the MNE. A greenfield entry is likely to raise the level of competition in the host economy, while an acquisition may reduce competition.⁴⁰ Yet another, and perhaps more important, complication is that, as discussed below, there is no simple relationship between competition and efficiency, on the one hand, and concentration, on the other hand.

47. Moving to the empirical findings, it is clear that the overwhelming majority of studies are able to establish a positive correlation between foreign entry and presence and seller concentration in host country industries.⁴¹ However, the causal links are more difficult to establish. One finding is that the correlation disappears once other determinants of concentration are taken into account, and that MNEs do not cause concentration but are drawn to concentrated industries.⁴² Knickerbocker (1976) shows that entries by MNEs into the US market in the 1960s led to lower concentration, and that the same pattern was evident also for Canada, Italy, France, and West Germany. Commenting on these and other studies, Caves (1996, p. 89) concludes that the "correlations do not themselves prove that any direct causal relationships exist between foreign investment and concentration". It should, however, be noted that most of the studies look at effects of MNE entry, and it is possible that the concentration-reducing impact does not hold for already established affiliates, who may instead be interested in building barriers to entry.

48. Regarding the studies of developing countries, most authors have not been able to - or have not even tried to - determine whether the high degrees of concentration in the industries where foreign affiliates are present have been caused by MNEs or whether MNEs have just been attracted to these industries by good profit opportunities. Two (seemingly contradictory) exceptions are Evans (1977), who claims that MNEs tended to reduce concentration in the oligopolistic Brazilian pharmaceutical industry, and Newfarmer (1979), who argues for the opposite effect - caused by interlocking directorates, collusion, cross-subsidization, and other "oligopolistic tactics" - in the Brazilian electrical equipment industry.

49. Lall (1978) hypothesizes that it is plausible that MNEs speed up the natural concentration process in developing countries, or that the weakness of local competitors allows MNEs to achieve a higher degree of market dominance than in developed countries. Lall (1979) proceeds to argue that the level of concentration probably falls in the short run following MNE entry, as the affiliate adds to the number of firms in the industry, but that this may be reversed in the long run. The MNEs may buy out local firms or force them out of business, their success may force local firms to mergers and amalgamations, or they may be more skilled as lobbyists than others, thus adding to entry barriers and protection. Looking at the effects of MNEs on concentration in 46 Malaysian industries, he asserts that the presence of foreign firms on balance increased concentration. This was brought about both by the MNEs' impact on general industry characteristics - such as higher initial capital requirements, capital intensity, and advertising intensity - and by some apparently independent effect of foreign presence, perhaps related to "predatory" conduct, changes in technology and marketing practices, or gains of policy concessions from the government. Similar results were reported for Mexico in Blomström (1986b). Thus, the evidence seems to suggest that FDI is likely to lead to higher concentration in most host countries, and there is a larger risk that MNEs crowd out local firms in developing countries than in developed countries, because of their greater technological advantages.

⁴⁰ Greenfields are still the dominant entry mode in most developing countries since it is often difficult to find suitable candidates for acquisition.

⁴¹ See e.g. Dunning (1993) and Caves (1996) for surveys.

⁴² Fishwick (1981) Globerman (1979b).

50. The assumption implicit in much of the discussion above is that competition improves efficiency and welfare, but this is not necessarily always the case. Firstly, economies of scale are important determinants of industrial productivity. To the extent that foreign entry increases concentration in relatively small national industries, resource allocation and efficiency may well improve from the increase in average firm size. Whether this effect is stronger than that from the presumably reduced competition depends on market characteristics and trade policy. For instance, a fall in the number of competitors from thirty to twenty must not necessarily harm the competitive environment, but a reduction from three to two certainly will. Similarly, increased concentration is likely to have more harmful effects in protected industries than in import-competing or export-oriented industries.⁴³

51. In fact, free trade and imports may well be good substitutes for large numbers of domestic competitors: Scandinavian, and particularly Swedish, industrial policies have for a long time built on this assertion.⁴⁴ although the competition between the few remaining large firms has also been important.⁴⁵ The conclusion by Chen (1983, p. 90) from his study of manufacturing in Hong Kong, China where all industries are either export-oriented or import-competing, is consistent with these arguments: "There are indications that the presence of foreign investment in an industry may have the effect of eliminating wasteful competition ... [without introducing] damaging monopolistic elements into the industry".

52. Secondly, focusing more closely on technology, there is the classic "Schumpeterian Dilemma" of weighing the static allocative efficiency of competitive markets against the supposed dynamic efficiency of monopolistic and oligopolistic firms. The rate of technical progress can perhaps be higher in concentrated markets, since firms there have internally generated profits to use for R&D, and are generally larger and more able to enjoy economies of scale in R&D. It is also possible that market structure has some impact on what the R&D efforts aim to achieve.

53. In fact, empirical studies seem to show that market structure affects both the rate and type of technical progress. Looking at the overall rate of technical change, Kamien and Schwartz (1982) summarize a survey of research in industrialized countries by concluding that neither perfect competition nor perfect monopoly, but rather mildly oligopolistic markets, are most conducive to technical progress. Moreover, Katz (1984) and Teitel (1984) in studies of Latin America, and Lall (1980) for India, show that technical change in industries with limited competition largely aims to overcome supply bottlenecks, e.g. by substituting imported raw materials and components, while change in more competitive industries is characterized by cost-reducing and quality-improving innovations. In these cases, however, limited competition is intimately tied to import-substitution rather than concentration, although there is a certain overlap.

54. Summarizing the evidence on the relation between MNE entry and presence and industry structure, it seems that MNEs enter mainly into industries where barriers to entry and concentration are relatively high, and initially add to the number of firms in the market. In the long run, MNEs may contribute to some increase in concentration, but efficiency may still benefit, particularly if protection does not guarantee an easy life also for the MNE affiliate. Most of the evidence, however, is related to MNE entry rather than to MNE presence - the dynamic aspects of MNEs and competition in host

⁴³ The Peruvian automotive industry in the late 1960s and early 1970s (like many other industries in countries with extreme import-substitution policies) provides a striking example of the fact that low concentration does not necessarily equal high efficiency. At that time, "13 firms, each with some foreign ownership, were assembling 18 brands and over 25 models of automotive vehicles, mostly passenger cars. Facing a limited local market, none of these firms was able to use more than 30 per cent of its installed capacity" (UNCTC, 1981, p. 19). The Vietnamese automobile industry in the late 1990s provides an almost identical example of highly wasteful foreign direct investment.

⁴⁴ Hjalmarsson (1991).

⁴⁵ Porter (1990) Sölvell, Zander, and Porter (1991).

country markets are not well researched. Moreover, much of the evidence refers to effects in developed countries, and it is not possible to disregard the risk that MNE entry into developing countries replaces local production and forces local firms out of business, rather than forcing them to become more efficient.

Statistical testing of spillovers

55. Although the case studies referred to above provide much detailed information about the various channels for spillovers, they say little about how common such spillovers are. The statistical studies of spillovers, by contrast, may reveal the overall impact of foreign presence on the productivity of local firms, although they are generally not able to say much about how the effects come about. It appears clear that both perspectives are necessary for a comprehensive picture of the impact of FDI on the technology and productivity of locally owned firms.

56. Before turning to the statistical analyses of spillovers, it should be noted that most studies have focused on intra-industry effects.⁴⁶ An early exception is Katz (1969), who notes that the inflow of foreign capital into the Argentine manufacturing sector in the 1950s had a significant impact on the technologies used by local firms. He asserts that the technical progress did not only take place in the MNEs' own industries, but also in other sectors, because the foreign affiliates forced domestic firms to modernize "by imposing on them minimum standards of quality, delivery dates, prices, etc. in their supplies of parts and raw materials".⁴⁷ Aitken and Harrison (1991) include some discussion about inter-industry effect in Venezuelan manufacturing, and argue that forward linkages generally brought positive spillover effects, but that backward linkages appeared to be less beneficial because of the foreign firms' high import propensities (although there were differences between industrial sectors). Sjöholm (1998) also identifies a geographical dimension of positive inter-industry spillovers in Indonesian manufacturing. His results suggest that the presence of foreign MNEs may raise the productivity of locally owned firms in other industries, presumably through various linkages, but only if they are located in close proximity to affiliates of foreign multinationals. The subsequent discussion will rarely touch upon this kind of inter-industry link, but rather focus on intra-industry effects. To the extent that FDI affects other industries than that where the foreign investor operates, it is obvious that there is a risk that effects – negative as well as positive – are underestimated.

57. The earliest statistical analyses of intra-industry spillovers include studies for Australia by Caves (1974), for Canada by Globerman (1979) and for Mexico by Blomström and Persson (1983).⁴⁸ These authors examine the existence of spillovers by testing whether foreign presence - expressed in terms of the foreign share of each industry's employment or value added - has any impact on labour productivity in local firms in a production function framework. Foreign presence is simply included among other firm and industry characteristics as an explanatory variable in a multiple regression. All

⁴⁶ It should also be noted in this context that both intra-industry and inter-industry R&D spillovers have been identified and estimated, mainly for developed countries, but generally without explicit reference to MNEs and FDI. See e.g. Bernstein (1988, 1989) and Nadiri (1991a). The fact that this kind of spillover seems to take place offers some indirect support to the hypothesis that there are technology spillovers between MNE affiliates and local firms. The conclusion that technological innovations (proxied by R&D measures) in some domestic firms have positive effects on the productivity of other domestic firms is analogous to the situation where technological innovations (proxied by the size of the technology gap or the amount of technology imports) in foreign affiliates have positive effects on the productivity of local firms.

⁴⁷ Katz (1969), p.154.

⁴⁸ See also Blomström (1989). Moreover, Chen (1983) presents a detailed discussion and some statistical evidence of spillovers in the major manufacturing industries in Hong Kong, China, although he does not examine the whole manufacturing sector. More specifically, he shows that foreign firms have been more active than local firms in importing new technologies to Hong Kong, China, and that the rates of technology diffusion have been higher in the industries where foreign firms hold larger market shares.

three studies conclude that spillovers are significant at this aggregate level, although they cannot say anything about how spillovers take place.

58. Some more recent studies also present results that are consistent with these early analyses. Blomström and Wolff (1994) ask whether the spillovers in the Mexican manufacturing sector were large enough to help Mexican firms converge toward United States productivity levels during the period 1965-1982. Their answer is affirmative: foreign presence seems to have a significant positive impact on the rates of growth of local productivity. Nadiri (1991b), in a study of the impact of United States direct investment in plant and equipment on the manufacturing sectors in France, Germany, Japan, and the United Kingdom between 1968 and 1988, comes to similar conclusions. Increases in the capital stock owned by US multinationals seem to stimulate new domestic investment in plant and equipment, and it appears that there is also a positive impact of FDI on the growth of total factor productivity in the host countries' manufacturing sectors.

59. There are also some studies suggesting that the effects of foreign presence are not always beneficial for local firms. For instance, Haddad and Harrison (1991 and 1993), in a test of the spillover hypothesis for Moroccan manufacturing during the period 1985-1989, conclude that spillovers do not take place in all industrial sectors. Like Blomström (1986a), they find that foreign presence lowers the average dispersion of a sector's productivity, but they also observe that the effect is more significant in sectors with simpler technology. This is interpreted to mean that foreign presence forces local firms to become more productive in sectors where best practice technology lies within their capability, but that there are no significant transfers of modern technology. Furthermore, they find no significant effects of foreign presence on the rate of productivity growth of local firms, and interpret this as additional support to the conclusion that technology spillovers do not occur.

60. Aitken and Harrison (1991) use plant-level data for Venezuelan manufacturing between 1976 and 1989 to test the impact of foreign presence on total factor productivity growth. They conclude that domestic firms exhibited higher productivity in sectors with a larger foreign share, but argue that it may be wrong to conclude that spillovers have taken place if MNE affiliates systematically locate in the more productive sectors. In addition, they are also able to perform some more detailed tests of regional differences in spillovers. Examining the geographical dispersion of foreign investment, they suggest that the positive impact of FDI accrued mainly to the domestic firms located close to the MNE affiliates. However, effects seem to vary between industries.

61. Cantwell (1989), who investigates the responses of local firms to the increase in competition caused by the entry of United States multinationals into European markets between 1955 and 1975, also argues that positive technology spillovers did not occur in all industries. His analysis differs notably from the other studies discussed in this section - he does not focus on productivity, but rather on changes in the market shares of foreign and local firms - but his conclusions are interesting. He asserts that "the technological capacity of indigenous firms ... was the major factor in determining the success of the European corporate response" (p. 86) to the United States challenge, and that the size of the national market was an additional determinant. More specifically, Cantwell suggests that the entry of United States affiliates provided a highly beneficial competitive spur in the industries where local firms had some traditional technological strength, whereas local firms in other industries - especially in countries where markets were too small to allow both kinds of firms to operate at efficient scale - were forced out of business or pushed to market segments that were ignored by the foreign MNEs.

62. A possible reason for the apparently contradictory findings from the country studies is that various host industry and host country characteristics may influence the incidence of spillovers. For instance, it is possible that the foreign affiliates' levels of technology or technology imports have some impact on the amount of spillovers to local firms. The technology imports of MNE affiliates, in turn, have been shown to vary systematically with host country characteristics. These imports seem to

be larger in countries and industries where the educational level of the local labour force is higher, where local competition is tougher, and where the host country imposes fewer formal requirements on the affiliates' operations.⁴⁹

63. Yet, it is not entirely obvious from a theoretical perspective what the relation between the affiliate's technology level and the spillovers to local firms should be. In fact, two opposing arguments have been proposed in the literature on foreign investment and technology transfer. On the one hand, it has sometimes been argued in discussions of the "appropriateness" of MNE technology that MNE affiliates may be too advanced to leave any mark on local host country firms. The reason is that "technical advances [and technologies] applicable to the factor-proportions of capital-rich developed countries are hardly of any use in improving techniques of low capital-intensity in less developed countries".⁵⁰ This suggests the hypothesis that spillovers are negatively related to the complexity of MNE technology or the size of the technology gap between affiliates and local firms. On the other hand, it is obvious that a certain technology gap is necessary for those spillovers that occur as local firms copy MNE technology or benefit from the MNE' training of local employees, and it has been hypothesized that spillovers grow with the size of the technology gap.⁵¹

64. Some recent studies have addressed the apparent contradictions between the earlier statistical spillover studies, with the hypothesis that the host country's level of technical development may matter as a starting point. In line with Cantwell (1989), Kokko (1994) argues that spillovers should perhaps not be expected in all kinds of industries. In particular, foreign MNEs may sometimes operate in "enclaves", where neither products nor technologies have much in common with those of local firms. In such circumstances, there may be little scope for learning, and spillovers may not materialize. Conversely, when foreign affiliates and local firms are in more direct competition with each other, spillovers are more likely.

65. Examining data for Mexican manufacturing, Kokko (1994) finds no signs of spillovers in industries where the foreign affiliates have much higher productivity and larger market shares than local firms. Most of these industries are those where superior marketing abilities and proprietary brand names and labels are likely to make up the competitive assets of foreign firms. Examples of the goods produced are perfumes and cosmetics, alcoholic beverages, cigars and cigarettes, chewing gum, instant coffee, prepared food products, clocks and watches, and film. The oligopolistic nature of these industries may mean that the products of foreign and local firms are not directly comparable, that foreign and local firms aim at different segments of the market, and that there may not be much scope for spillovers of production technology. Other industries where there are no signs of spillovers are such where the market leadership of the foreign affiliates is likely to be based on economies of scale. Examples here are office and computing machines, synthetic fibers, light bulbs and fluorescent tubes, some chemical industries, and primary metal industries. The affiliates operating in these industries may have "crowded out" the local firms so that there is nobody to absorb the potential spillovers. It is also possible that the small local entrepreneurs in these industries may not be able to benefit much from learning about machines or management practices that are optimal for a plant that is ten, 50, or 100 times larger than their own firm. In industries without these enclave characteristics, on the other hand, there appears to be a positive relation between foreign presence and local productivity, even when there is a large productivity or technology gap. Kokko *et al.* (1996) present similar findings for the Uruguayan manufacturing sector, although their study suggests that weak technological capability at the firm level may also be an obstacle for spillovers.

⁴⁹ Blomström *et al.* (1994), Kokko and Blomström (1995).

⁵⁰ Lapan and Bardhan (1973), p.585.

⁵¹ Findlay (1978), Wang and Blomström (1992).

66. Kokko (1996), focusing on effects of competition in Mexican manufacturing, proposes another possible explanation for the divergent findings from the earlier statistical tests. The earlier studies have tested the hypothesis that productivity spillovers are strictly proportional to foreign presence, but Kokko (1996) argues that this is not always the case. Spillovers from competition, in particular, are not determined by foreign presence alone, but rather by the simultaneous interactions between foreign and local firms. Hence, it is possible that the spillovers are larger in cases where a few foreign MNEs stir up a previously protected market than in a situation where foreign affiliates hold large market shares, but refrain from competing hard with local firms. In fact, in some cases, large foreign presence may even be a sign of a weak local industry, where local firms have not been able to absorb any productivity spillovers at all and have therefore been forced to yield market shares to the foreign MNEs. Analysing the operations of foreign and domestic firms in Mexican manufacturing in a simultaneous framework, Kokko (1996) finds support for these hypotheses. The labour productivity of foreign and local firms appears to be simultaneously determined, and competition from foreign affiliates seems to have an independent effect on the productivity of local firms, even after accounting for the demonstration and contagion spillovers that are directly proportional to foreign presence. Sjöholm (1997) also concludes that competition enhances the positive productivity spillovers from FDI.

67. While most of the studies mentioned above have focused on differences between industries in a given host country, Blomström *et al.* (1994) have examined the role of the host country's overall development level as a determinant of spillovers.⁵² The results of their comprehensive cross-country study of 101 economies suggest that spillovers are concentrated in middle-income developing countries, while there was no evidence of such effects for the poorest developing countries. Just as the analyses of individual host countries, these findings highlight the importance of local competence and competition for spillovers. Few local firms in the poorest countries are in direct competition with foreign MNEs, and few of these countries possess the technical skills needed to absorb modern MNE technologies.

68. The summary conclusion from these studies is that host country and host industry characteristics are likely to determine the impact of FDI, and that systematic differences between countries and industries should therefore be expected. In line with these findings, several other studies have recently examined other industry characteristics that may have an impact on spillovers. One example is Kokko *et al.* (1998), who focus on the policy environment and analyse spillovers from foreign firms in relatively import-substituting and export-oriented industries in Uruguay. Somewhat surprisingly, they find stronger productivity spillovers in the more import-substituting industries. The reason is arguably that import-substituting foreign investors bring with them skills and technologies that are in short supply in the host country and may eventually spread to local firms, whereas export-oriented foreign investors may well employ production technologies that are not significantly different from those of local exporters. Local firms in export-oriented sectors, however, seem to benefit from some transfer of marketing or exporting technologies from the foreign investors. The presence of foreign export-oriented multinationals raises the likelihood that local firms export to countries outside the regional market.

69. Blomström and Sjöholm (1998) also find more significant spillovers in import substituting local firms, but their explanation emphasizes effects of FDI on competition. They argue that export-

⁵² It should be noted that Blomström *et al.* (1994) did not distinguish explicitly between the direct and indirect effects of FDI. Instead, they examined the impact of FDI (measured as the average ratio of FDI to GDP) and other potential growth determinants on growth in real income per capita in 23 developed and 78 developing countries during the period 1960-85. The estimated coefficient of FDI was consistently positive, but significant only for higher income developing countries. It is likely that various kinds of spillovers accounted for a significant share of this positive effect, since the inflow of physical capital was included in a separate fixed investment variable.

oriented local firms already face heavy pressure from the world market, which means that the entry and presence of foreign multinationals does not have much of an additional impact on the competitive environment. In more protected sectors, however, it is likely that FDI will raise the level of competition and force local firms to become more productive and efficient in order to survive. It should also be noted that both Kokko *et al.* (1998) and Blomström and Sjöholm (1998) raise a warning against policies to attract import-substituting FDI in order to reap potential spillover benefits. The negative effects of the economy-wide distortions resulting from import-substituting policies are likely to outweigh any positive spillover benefits in the protected sectors.⁵³

70. The main conclusion from the recent FDI studies mentioned above is that local conditions in host countries are an important determinant of the magnitude and scope of spillovers. A high level of local technical skills and a competitive environment seem to be particularly important, since they have a positive impact on the foreign affiliate's imports of technology as well as on the absorptive capacity of the host country. In addition to explaining some of the differences between countries and industries when it comes to productivity benefits from FDI, they also highlight a possible role for economic policy in host countries.

71. To date, many developing countries have relied on a combination of various fiscal incentives and performance and technology transfer requirements to attract foreign MNEs and to control their operations. However, measures to actively promote direct investment from abroad may not be sufficient to generate spillovers if the majority of local firms employ technologies that are very different from those used by foreign firms. It should also be noted that technology transfer requirements are often inefficient, for two reasons. Firstly, the requirements typically raise the cost of technology transfer, which may lead the potential foreign investors to abandon their investment plans, or to reduce their imports of technology to the bare minimum. Secondly, many multinationals are able to circumvent distortive regulations, albeit at a cost.⁵⁴ Neither of these responses is desirable from the point of view of the host country, although it may be commercially rational from the perspective of the multinational firm. Many developing countries have also encouraged joint ventures as a way to maximize the diffusion of foreign technology to local users. Blomström and Sjöholm (1998) show that this policy has not succeeded in raising the inflows of technology to the Indonesian manufacturing sector. The reason is presumably that the foreign joint venture partners have chosen to import less technology than what wholly foreign owned affiliates would do because some control must be relinquished to the local partner.

72. The conclusions of the spillover studies reviewed above suggest that policies to support local technological capability and to stimulate competition between foreign affiliates and local firms should complement the usual policies that aim to encourage inflows of FDI. Efforts to promote inward FDI could also focus on industries where local technological capability is already relatively strong, or where product differentiation and scale economies are not so significant that foreign firms can easily take over the whole market. It is also obvious that secure intellectual property rights are an important precondition of inflows of valuable technologies to host countries. For instance, Mansfield (1994) has shown that the character of a country's system of intellectual property protection has a substantial effect on FDI flows as well as on the quality and quantity of technology transferred by US firms to their foreign affiliates. Host country competition policy also has an important role to play in promoting efficiency. At the same time, it must be stressed that more research is needed to examine

⁵³ These findings are consistent with the finding in several studies that greater openness to international competition encourages firms to bring in best-practice technology (see e.g. WT/WGTI/W/38, paragraph 24). In a protected market, a MNE may bring in technology that represents a larger improvement over the technology of domestic firms than that brought into an export-oriented sector, even if it is less "state of the art" than that which would have to be employed in sectors subject to international competition.

⁵⁴ Blomström, Kokko and Zejan (1995).

second-best policy alternatives for those industries where local firms cannot be expected to compete effectively with foreign affiliates in the short run.

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