Foreign Direct Investment in Developing Countries: Leveraging the Role of Multinationals

Frédérique Sachwald, Serge Perrin

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Introduction

In the 1960s and 1970s, numerous developing countries’ governments had evolved foreign investment codes to restrict inflows in an effort to reduce remittances of dividends or to protect local firms. Since the 1980s, multinational companies, which have emerged as major actors in the globalization context, have been experiencing a quite remarkable reversal of fortune. After decades of skepticism or even hostility (Caves 1996, Vernon 1998, Graham 2000), a belief has developed that multinationals can be an important element in a country’s development strategy. As a consequence governments around the world, in both advanced and developing countries have been wooing multinationals (Oman 2000, Sachwald 1999). This evolution may be related to the broader context of liberalization in which most developing and transition countries have moved to market oriented strategies. The changing attitude of governments to multinationals may nevertheless be considered as the most striking policy change in developing countries (UNCTAD 1999). Most recently, a new hostile movement has been developing with harsh criticism from non-governmental organizations, which focus on the issues of labor and environmental standards. Governments from the developing countries nevertheless generally maintain a favorable attitude towards multinationals.

Why did the governments of developing and emerging countries reach a more favorable assessment of the role of multinationals? The major evolution is the deepening economic integration brought by globalization. Globalization accentuates the importance of the international economy for developing countries. And in this context, foreign direct investment (FDI) has become one of the most dynamic flows of resources to developing countries. Indeed, multiple benefits are associated with FDI inflows, which do not only transfer financial resources, but a broader package including technology, entrepreneurship and precious information on foreign markets. As a consequence FDI may offer critical resources to developing countries and act as catalysts of development and industrial upgrading. Furthermore, in financial crises, inflows of direct investment prove much more stable than other forms of investment (Lipsey 2001). The related emergence of the knowledge-based economy may yet reinforce the need for developing countries to be well integrated in global production and innovation networks.

The new theoretical perspectives on the process of development, where learning and the upgrading of indigenous human capital play a central role also play a role in the reversal of fortunes of multinationals. In recent analyses, the creation and diffusion of productive
knowledge have become central to growth and development. The increasing importance of knowledge is not limited to high tech activities but pervades all sectors, including traditional activities and services. In such a perspective, much more attention has been devoted to understanding the process of technology transfer and learning from foreign sources. Multinationals and various types of alliances play a fundamental role in these processes, which has motivated a revision of a number of restrictive policies vis-à-vis technology transfers.

It is thus of crucial importance to policy makers to understand whether and under which conditions FDI effectively contributes to technology transfer and development. The ability to leverage efficiency benefits from multinationals would constitute a stimulant to further reduce the restrictions these firms face in host countries. Many factors and policies can impact the extent of the benefits and costs of inward investment. In particular, spillover efficiency benefits have been extensively discussed, but this literature "conveys a sense of conflicting or inconclusive theoretical, as well as empirical evidence" (Blomstöm et al. 2000).

This survey critically reviews the empirical literature on the impact of foreign direct investment in developing countries with a view to derive policy lessons. Compared with previous surveys, it is able to assess the recent policy evolutions and to more fully discuss the consequences of globalization for the role multinationals can play in the development process. It draws on different strands of literature, including in particular contributions from the FDI and development perspectives, but also the international business perspective. This exercise proves quite enlightening as it enables to simultaneously consider the objectives of the multinational companies and those of host countries. Finally, this survey focuses on FDI in manufacturing and the issue of technological upgrading. This contrasts with some previous surveys, which reflected the larger role of FDI in resource based sectors played from the 1960s to the 1980s.

1. The Impact of FDI on Growth and Trade Performance

Multiple benefits are associated with FDI inflows, which are potential channels to transfer a package of capital, technology and entrepreneurship. We first focus on the interface of FDI with growth, productivity and trade performance. The idea that growth can be FDI-led has been examined in a number of relatively recent empirical studies referring explicitly to the endogenous growth literature. We then examine whether FDI leads to higher efficiency rather than simply higher capital accumulation by reviewing the main empirical studies on the impact of FDI on host country productivity. As to trade performance, does the presence of foreign MNEs increase the probability of exporting for a local firm? Evidence
from the East Asian experience suggests it may be the case and may be conducive to more rapid economic growth.

1.1. **FDI, Growth and Productivity**

1.1.1. **FDI and growth**

In the context of the emergence of endogenous growth theories, which stress the importance of human capital accumulation and technical progress in the development process, FDI is now perceived as a powerful agent of technology transfer to developing economies. Human capital and technical progress are now alleged to be determined by endogenous rather than exogenous economic forces, as technical progress was in the Solow neo-classical growth model. New growth theory provides a solid theoretical framework to analyze how the introduction of new inputs and technologies affects the production function and the diffusion of knowledge in a given economy. R&D, human capital accumulation and externalities are posed to be key growth promoting ingredients, which can be accruing to developing countries through FDI. Indeed, technical progress in these countries generally accounts for a limited proportion of their growth because of a relatively low endowment in human capital. A number of recent empirical studies on the effect of FDI on growth refer extensively to endogenous growth models (see notably Balasubramanyam et al. 1996, Bende-Nabende and Ford 1998, Borenszttein et al. 1998, De Mello 1999), and hypothesize that the knowledge created in industrialized countries, with their comparative advantage in human capital, can be partly transferred to developing countries through FDI.

The impact of FDI on economic growth is expected to be twofold: “First, through capital accumulation in the recipient economy, FDI is expected to be growth-enhancing by encouraging the incorporation of new inputs and foreign technologies in the production function of the recipient economy. Second, through knowledge transfers, FDI is expected to augment the existing stock of knowledge in the recipient economy through labor training and skill acquisition, on the one hand, and through the introduction of alternative management practices and organizational arrangements, on the other.” (De Mello 1999, 134). Moreover, the very presence of technologically more advanced MNEs is likely to spur competition in the host country and compel local firms to invest in learning, which in turn could be an incentive for foreign firms to bring in superior quality technology.¹

¹ The focus here is on FDI. For a recent study on the effects of the various types of capital inflows on the growth of developing countries, see Soto (2000). He estimates a dynamic panel for 44 developing countries during the 1986-97 period, and finds that FDI and portfolio equity flows exhibit a robust...
Although there seems to be a consensus in theory on the positive role of FDI for economic growth, the empirical evidence is yet more limited and less clear. Diverging results may be due to methodology issues and sampling differences, but the main problem lies in the simultaneity problem, i.e. a positive correlation between FDI and growth may simply reflect the fact that FDI is attracted to countries that are growing faster because it yields higher returns there. To address the endogeneity bias, the difficulty lies in finding explanatory variables, which are correlated with FDI inflows but not with economic growth. Despite these empirical problems, recent studies have shown that, in order to be effective, the incidence of FDI is likely to depend on a favourable economic environment, notably the stock of human capital available in the host country.

*The role of human capital*

The recent work of Borensztein, Gregorio and Lee (1998) provides a comprehensive empirical analysis on the role of FDI in the process of technology diffusion and economic growth in 69 developing countries. Their model underscores the roles of both the introduction of more advanced technology through MNEs’ activities and the requirement of learning capabilities in the host country as determinants of growth, and examines the complementarity between FDI and human capital in generating productivity growth.\(^2\) Their main results demonstrate that FDI flows from industrial countries have an overall positive impact on developing countries’ economic growth, and that the magnitude of this effect depends on the stock of human capital in the host country\(^3\). For example, countries with the highest levels of FDI and human capital grew, on average, by 4.3 per cent a year during 1970-89. In contrast, countries with the lowest levels of human capital grew only by 0.64 per cent on average. This confirms the earlier empirical results by Blomström, Lipsey and Zejan (1992), who reported a significant impact of FDI inflows on growth in LDCs only for the upper half of the distribution of developing countries, suggesting that there is a threshold effect of income below which foreign investment has no significant effect.

Borensztein et al. (1998) also show that FDI exerts a positive but limited effect on domestic investment, presumably because FDI stimulates investment in activities that are

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2 Their test is based on panel data for the two decades 1970-79 and 1980-89 and was estimated using the seemingly unrelated regressions technique.

3 The effect of FDI was positive but not significant without the interaction between FDI and human capital.
complementary to the projects undertaken by foreign firms (crowding-in effect).\textsuperscript{4} However their results are not very robust, as the authors themselves acknowledge, suggesting that most of the effect of FDI on growth derives from efficiency gains by stimulating technological progress rather than by increasing total capital accumulation in the host country. Interestingly, the interaction between domestic investment and human capital turns out to be not significant. This can be interpreted as indicative of differences in the technology involved in direct investment. FDI is more likely to flow to sectors where a process of technological innovation develops, which explains the importance of the interaction with human capital. In contrast, domestic investment may largely fall on less innovative activities, and thus the interaction effect may be too small to be statistically measured.

These findings on the combined roles of FDI and human capital in development are consistent with Romer (1993)’s showing that imports of machinery also interact with human capital to have a positive effect on economic growth.\textsuperscript{5} Imports of machinery and equipment also constitute an important channel of diffusion and technology transfer. Mayer (2001) finds that machinery imports by developing countries have been higher over the past few years than during the 1970s and 1980s, and confirms that machinery imports combined with human capital stocks have a positive and strongly significant impact on cross-country growth. His analysis suggests that the main role of human capital in economic growth is to facilitate the adoption of technology from abroad rather than to act as an independent factor of production. Trade may be as important, or more important, than FDI – through which management skills are transmitted – as a technology transfer channel.\textsuperscript{6} Actually, the respective role of trade and FDI as technology transfer channels may well vary according to the technology, its degree of maturity and the level of development of the recipient country.\textsuperscript{7}

In line with these results, Lipsey (2000a) also finds that the ratio of FDI inflow to GDP is the most consistently positive influence on developing countries’ subsequent growth in per capita real income when combined with the level of education, over the period 1970-95. The only difference compared to Borensztein et al. (1998)’s main results is that FDI inflows alone have a positive effect – albeit weaker - on economic growth. Also, the degree to which a

\textsuperscript{4} As to the efficiency of FDI compared to domestic investment, De Gregorio (1992) shows in a panel data of 12 Latin American countries that FDI is about three times more efficient than domestic investment.

\textsuperscript{5} Coe, Helpman and Hoffmaister (1997) also provide evidence that domestic productivity levels in developing countries are positively affected by machinery and equipment imports from developed countries.

\textsuperscript{6} Borensztein et al. (1998) suggest this may be the case. Among developed countries, Xu (2000) finds that MNEs are almost as important as international trade as a conduit for technology spillovers. This issue clearly needs further research.

\textsuperscript{7} See the discussion of technology transfer in the section below and table 1 in particular.
country is behind the United States in terms of per capita income plays a significant role: the lower the initial GDP per capita, the faster the subsequent growth. Among other variables, the degree of openness of the host economy, measured by the ratio of trade to output, was found to be the strongest influence on FDI inflows.

The importance of human capital is also emphasized in an original study by Xu (2000), who makes a distinction between the technology diffusion effect from other productivity-enhancing effects of MNEs. The author uses data on majority-owned affiliates of US manufacturing in 40 countries between 1966 and 1994, and finds strong evidence of technology diffusion in developed countries but not in LDCs. He points to threshold effects in human capital, more specifically, he finds that a country needs to reach a human capital threshold of about 1.9 years of secondary school attainment to benefit from technology transfer from U.S. affiliates. This is well above the 0.52 years estimated by Borensztein et al. (1998) for a country to benefit from the presence of MNEs. Thus it appears that a much higher human capital threshold is required for LDCs to benefit from the technology transfer of MNEs. According to Xu (2000), most LDCs meet the second threshold but not the first, which explains the weak evidence of technology diffusion in these countries.

The few empirical studies mentioned so far are cross-country in nature and cover a large span of developing countries in examining the contribution of FDI to economic growth. More recently, a number of studies looked more specifically at the Chinese experience which indeed deserves a special treatment considering the size of its economy and the remarkable growth and boom in FDI inflows it enjoyed over the last two decades. Zhang (1999) investigates the long-run relationship and the direction of causation between FDI and growth, using co-integration and error-correction modeling with the Chinese data for the period of 1977-98. His findings support a two-way causal relationship between FDI and economic growth, suggesting a virtuous circle: China’s rapid growth made it attractive to foreign investors and FDI has in turn been the engine of Chinese economic growth. Graham and Wada (2001) find that FDI drives higher per capita income growth in China via an acceleration of TFP growth in the provinces in which FDI is concentrated, mostly in the coastal region during the 1991-97 period. In examining the determinants of industrial growth in coastal China, Mody and Wang (1997) show that FDI, among other influences, is a consistent spur to growth, especially when it interacts with the local education level. They suggest that China’s eastern coastal provinces were able to exploit their educational record better than other regions “because the complementary effects of foreign knowledge

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8 The other influences are mainly regional (infrastructure, open-door policies and special economic zones).
enhanced the educational level of the workforce", which is consistent with the empirical studies on the role of FDI referring explicitly to the new growth theory and stressing the importance of the human capital factor.

1.1.2. FDI and productivity spillovers

Spillovers are external - or indirect - effects that can accrue to domestic firms when they are not wholly appropriated by the foreign investor. The existence of productivity spillovers from FDI has been the subject of a number of empirical studies, resulting sometimes in contradictory findings. More specific empirical work tends to emphasize the importance of competition in order for positive spillovers to take place. Also, FDI may have an influence on human capital formation through the training of labor and management.

**Empirical evidence on productivity spillovers**

In an early study, Blomström and Persson (1983) tested for the impact of foreign presence on productivity or efficiency of Mexican domestically owned manufacturing sectors. In line with the pioneering work of Caves (1974), they find a positive relation between labor productivity – used as a proxy for technical efficiency - in the domestically-owned plants in an industry and the share of foreign plants in the same industry. They conclude that foreign investment does raise the productivity in domestically owned plants through spillover efficiency. In a more recent study, Blomström and Wolff (1994) further explore the Mexican case and investigate whether spillovers were large enough to help Mexican firms converge toward US productivity levels during the period 1965-1982. Their answer is affirmative, that is foreign firms have a significant positive effect on the rates of growth of local productivity, and the rate of convergence is related with the extent of foreign ownership in the industries.

An important limitation of these industry level studies is related to the self-selection problem. Since foreign investors tend to cluster around high technology and marketing activities, these studies may reflect industrial characteristics rather than spillover effects, and thus may have overstated the positive impact of FDI on productivity in the host country. It seems therefore necessary to use plant level data to control for the self-selection problem.

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9 The earliest attempts to quantitatively measure the impact of foreign entry on productivity of local firms were studies for developed economies, namely Australia (Caves 1974) and Canada (Globerman 1979). Both studies find some support for the spillover benefit hypothesis at the intra-industry level.

10 Mexico has been the subject of a number of empirical studies in FDI spillovers because of the large share of manufacturing output produced by foreign firms (35-40%) and its rapidly growing industrial sector.
Haddad and Harrison (1993) in the case of Morocco, using panel data for the period 1985-89 notably did this. They find that foreign firms exhibit higher levels of total factor productivity (TFP) but their rate of productivity growth is lower than that for domestic firms. This could mean that domestic firms, which are at lower initial levels of productivity, might be able to increase efficiency at a faster rate (catch-up hypothesis). However, these tests show that 'although domestic firms exhibit higher levels of productivity in sectors with a larger foreign presence, they do not exhibit higher productivity growth in those sectors'. When sectors where divided into high and low tech, the effect of FDI at the sectoral level was found to be more positive in low-tech sectors. This may be an indication of the lack of learning capacity on the part of local firms in the high-tech sectors, where they may be further behind multinationals and unable to absorb foreign technology. 12

Another comprehensive study at the micro level is Aitken and Harrison (1999)’s test on the impact of FDI in Venezuela. Working on panel data on over 4000 firms between 1976-89, they find a positive relationship between foreign equity participation and plant performance, suggesting that individual plants do benefit from foreign investment. However this plant effect was only robust for small plants (less than 50 employees). Interestingly, productivity in domestic plants declined when foreign investment increased. Such negative spillovers are interpreted as the result of a ‘market stealing effect’: foreign competition may have forced domestic firms to lower output and thereby forgo economies of scale. On balance, the effect of FDI on the entire industry was found weakly positive.

Evidence on spillovers from FDI in the case of transition economies is mixed. Djankov and Hoekman (2000) conduct panel regression estimates of firm-level data of foreign-owned firms in the Czech Republic for 1992-1996. Their results suggest that total factor productivity growth rates is higher in firms with foreign partnerships, and that there is a clear hierarchy: firms that have been acquired by foreign investors have the highest TFP growth, followed by firms with joint ventures. Firms without foreign partnerships have the lowest TFP growth as a group. Consistent with the results of Aitken and Harrison (1999) and Haddad and Harrison (1993) are the negative spillover effects of foreign participation in an industry, either through joint ventures and FDI, found on firms without such links. This suggests that although foreign ownership and/or cooperation have a beneficial impact on the performance of the domestic partner, this has not spilled over to the rest of the industry. It could be that more time is needed for a transition economy like the Czech Republic, where the institutional environment

11 As Blomström and Persson (1983) themselves acknowledged.
12 The notion of absorptive capacity, which is used widely in the literature is discussed below in section 3.2.
is weak in terms of corporate governance and labor flexibility, to absorb more efficient
techniques than the four-year period observed. Contrary to this result, Sgard (2001) finds, in
the Hungarian case, that FDI has a large and positive impact on the levels and growth rates
of TFP during the 1992-99 period. Foreign-owned firms in Hungary have a higher productivity
than the average and induce intra-industry spillovers. However this effect is significant only
when associated with export orientation, while inward-looking FDI seem to produce negative
side-effects, possibly due to excessive competition. This is similar to the “market-stealing”
effect suggested by Aitken and Harrison (1999) in Venezuela. Another important difference
with Djankov and Hoekman’s analysis regards the regional impact of FDI. In Hungary,
spillovers associated with foreign investment are geographically determined and mostly
benefit firms located in the most developed region, close to EU borders. Lastly, considering
the very high levels of accumulated FDI in Hungary, Sgard’s results imply that a significant
amount of FDI is necessary to induce spillovers in the local economy, suggesting that a
threshold effect is at work.

In a comprehensive study, Damijan, Majcen, Knell and Rojec (2001), not only explore the
importance of FDI and intra-industry spillovers from FDI for firms’ TFP growth, they also
manage to analyse the roles of firm’s own R&D accumulation and of international R&D
spillovers through trade for eight transition countries during 1994-1998. After controlling for
selection bias, they found a significant direct effect of FDI in five countries (Czech republic,
Estonia, Poland, Romania and Slovenia), i.e. foreign ownership contributes to the average
growth rate of firms by 0.5 to 0.7 percentage points\textsuperscript{13}; however there are no evidence of
spillovers to other firms in the same industry, even when controlling for the absorptive
capacity of domestic firms. Instead, it appears that trade (both imports and exports) may
serve as an alternative source of international R&D spillovers to domestic firms in four
countries (Czech republic, Poland, Romania, Slovenia). Damijan and alii. (2001) also raise
the issue of crowding-out effects that may take place in countries such as Poland and
Romania, and the question is whether competition effects could outweigh the positive
spillovers generated through trade. In the case of Taiwan, Chuang and Lin (1999) extend the
early analyses by including the impact of FDI on foreign-owned firms.\textsuperscript{14} For domestically
owned firms, they find that a one percent increase of the foreign investment ratio in an
industry produces a 1.40 per cent to 1.88 per cent increase in domestic firms’ productivity.
The impact on foreign-owned firms appears less conclusive, with a considerably smaller
magnitude of effects. As the authors suggest, the reason may be that domestically-owned

\textsuperscript{13} These results should be interpreted cautiously in the cases of Hungary and Slovakia given the
small samples of firms available.
\textsuperscript{14} Their sample consists of 8,846 manufacturing establishments in 1991.
firms, whose technology levels are both more scattered and relatively backward, are more sensitive to capturing technology spillovers, whereas foreign-owned firms may directly adopt their technologies from their parent companies in the home country. Their study also underlines the importance of the R&D spillovers, i.e. the creation of knowledge by one firm will spill over to other firms in the industry: a one percentage point increase in R&D intensity of the industry will result in 19.1 per cent to 41.7 per cent increase in firms’ productivity.

Factors influencing spillovers

Blomström and Persson (1983, 229) identified three types of spillover channels: competition, training of labor and management and technology transfer. They assume that the most important channel is via competition, as MNEs are likely to enter markets with high entry barriers and induce stronger competitive pressures, thus forcing local firms to adopt more efficient methods. Investment in human capital, through the training of workers who later take employment in local firms, is another prospective source of gain to the host country. Last, MNEs may accelerate the transfer of technology: “For both process and product technology such a transfer is a central activity of MNEs, and this may stimulate domestic firms to hasten their access to a specific technology, either because they would not have been aware of the technology’s existence, or because they would not have felt it profitable to try to obtain the technology in this manner.” The broader issue of technology transfer via FDI is the focus of section 2 below. This section examines studies which specifically analyzed the incidence of competition on the magnitude of productivity spillovers from FDI, and the role of foreign investment in local human capital formation.

The incidence of competition

One possible explanation for the contradictory findings in these studies is that the statistical analyses may have not clearly distinguished between demonstration effects and effects of competition. Kokko (1996) argues that the early studies, most of which have assumed that the spillovers are proportional to foreign presence, have failed to capture the impact of competition between local firms and foreign affiliates. As shown by Wang and Blomström (1992) in a theoretical model, spillovers from competition are not necessarily proportional to the presence of foreign firms, although demonstration effects are. The authors suggest that the former effect may dominate the latter, so that large foreign presence may result in small technology transfer, which was probably the case in many Latin American countries. Working on Mexican manufacturing data in 1970, Kokko (1996) investigates whether there are significant spillovers from competition that are not proportional to foreign presence, and if the labor productivity of foreign and local firms are simultaneously
determined because of competition. The regression results support both hypotheses, but only when suspected ‘enclaves’ industries, “where foreign firms operate in isolation from local competition”, are excluded from the sample.\textsuperscript{15} The finding that local productivity has a strong and positive impact on foreign productivity – stronger that the impact of foreign productivity on local productivity – suggests that the behavior of foreign affiliates is partly determined by the behavior of local firms in some sort of a strategic game among equals\textsuperscript{16}.

For example, an improvement in local technology as a result of spillovers reduces the technology gap, cuts into the affiliate’s earnings, and forces it to import or develop new technology – which in turn may again spill over – in order to restore its profitability. The question is whether this simultaneous effect of competition is a realistic one in the context of the Mexican manufacturing industries of 1970, or is it possible that a positive correlation between domestic and foreign productivity may be the consequence of a neglected factor that is not necessarily competition?

Using detailed micro data from the Indonesian manufacturing sector for two years, 1980 and 1991, Sjöholm (1999a) extends Kokko’s analysis on spillovers from competition by examining both the impact of domestic and international competition, on an establishment level. Furthermore, his model accounts for the identification problem related to examining levels of productivity, and therefore also manages to analyze the effect on growth rates of productivity. He uses the Herfindahl index to measure the degree of concentration in different sectors and the effective rate of protection to measure the degree of openness to foreign competition, and finds that competition does have a positive impact on the degree of spillovers from FDI. Moreover, it seems to be domestic competition rather than competition from imports that affects spillovers from FDI. The author suggests that his results may be somewhat biased for two reasons. First, if the effective rate of protection is a determinant of FDI in Indonesia, and if high tariffs are motivated to protect weak domestic establishments, these will logically experience difficulties in assimilating foreign technologies. Second, the effective rate of protection is an imperfect measure of the level of protection as non-tariff barriers also accounted partly for import restrictions in Indonesia. Regarding the distinction between levels and growth rates of productivity, both measures are significant which gives some robustness to Sjöholm’s results by taking care of the identification problem.

\textsuperscript{15} 40 industries are excluded out of a total of 156 industries.
\textsuperscript{16} These two-way exchanges are more likely in the case of US direct investment in Europe. Indeed, Cantwell (1989) shows that the effects of US FDI on local technological capability in Europe (1955-75) were most beneficial in the more competitive industries, and that there were continuing two-way exchanges between foreign and local firms.
FDI and the formation of human capital

In light of the studies on the role of FDI in economic growth, taking its roots in endogenous growth theories, there is a clear need for research on the prospective impact of FDI on human capital accumulation. Although there is now strong evidence that levels of human capital are a significant determinant of FDI inflows (Noorbakhsh et al. 2001), the reverse is not well established.

Aitken, Harrison, and Lipsey (1996) investigate whether MNEs can play an important role in the formation of human capital by measuring the impact of FDI on domestic wages in Mexico, Venezuela and the United States. The idea is that if foreign investors bring knowledge to the host country, they should put upward pressures on wages as the marginal productivity of workers in those plants rise. Results for Venezuela indicate a positive impact of FDI on aggregate wages for foreign and domestic enterprises combined: a 10 per cent increase in the share of foreign investment in overall employment in a region and industry raises wages by 2.2 per cent to 2.9 per cent, and the impact is consistent for both skilled and unskilled workers. However, the higher overall wage appears to be due to higher wages only in foreign-owned firms. In fact, the wage effects are even negative in domestically owned firms. This can be explained by the declining productivity of domestic firms associated with increased foreign competition, as shown in Aitken and Harrison (1999), and the fact that MNEs are likely to attract the best workers away from domestic enterprises. In the case of Mexico, the results are similar to those for Venezuela, and point to no spillovers from foreign investment to wages in domestic enterprises. These findings are to be contrasted with those for the US, where a larger share of foreign firms in employment was associated with a higher average wage in domestic establishments, suggesting reduced productivity differentials between foreign- and domestically-owned firms in the United States.

In analyzing the behavior of foreign-owned firms in Indonesian labor markets, Lipsey and Sjöholm (2001) show that foreign-owned plants pay a higher price for labor, i.e. more than locally-owned plants of a given quality (and controlling for plant characteristics such as size, industry and location). Wages in foreign-owned plants are about 12 per cent higher than in private domestic plants for blue-collar workers and by more than 20 per cent for white-collar workers. Foreign investors might be doing so because they invest more in training than locally owned firms, and wish to prevent labor turnover. A second result is that higher foreign presence leads to higher wages in locally owned plants and raises the general wage level in a province and industry, suggesting the existence of positive wages spillovers. Several factors emphasized by the authors may explain such an increase in wages. First, the entry of foreign firms may simply raise the demand for labor, or increase competition in labor.
markets, thus forcing domestic firms to increase wages (‘pecuniary’ spillover, Aitken et al. 1996). Second, the existence of productivity spillovers from FDI in Indonesian manufacturing may lead to increased wages in domestic plants, indicating a positive effect on human capital accumulation (Blomström and Sjöholm 1999, Sjöholm 1999a and 1999b).

A more critical view of the effects of FDI on human capital is developed by Ritchie (2001). He agrees that MNEs have played an important role in the economic growth of Southeast Asia but questions their prospective impact on the formation of ‘technical intellectual capital’ – i.e. the knowledge and skills possessed by managers, engineers, scientists and technicians – in the local economy. There is little doubt MNEs may indirectly affect labor supply by influencing the curriculum of the host countries’ educational institutions.17 As to direct effects, despite evidence that MNEs offer more training than local firms, skills and knowledge created within MNEs do not necessarily spill over to local firms. Skills that do eventually spill over are confined to low-level manufacturing process skills (Thailand), and technological development is limited to a narrow range of processes and production technology (e.g. packaging and testing in Malaysia). The same problem exists in most Southeast Asian countries, even in Singapore: “…after decades of producing silicon chips and hard disk drives, the most technically advanced country of the region, Singapore, which has a level of intellectual capital every bit as high as Korea and Taiwan, has yet to develop a single, 100% Singaporean-owned hard disk drive or chip manufacturing company. The problem is that these narrow technologies are not sufficient foundations upon which to build local entrepreneurial firms” (Ritchie 2001, 22). His argument is that FDI can supply the explicit knowledge, but tacit knowledge must be developed endogenously before foreign technology can be successfully transferred to the local economy. Accordingly, the Korean and Taiwanese experiences, opening selectively to FDI only after developing a highly educated work force, are more likely to have a positive effect on human capital development compared to the Southeast Asian economies, where there has been a surge in FDI before the formation of a significant pool of intellectual capital.

In brief, “…it is possible that host economies with relatively high levels of human capital may be able to attract large amounts of technology intensive foreign MNCs [MNEs] that contribute significantly to the further development of labor skills. At the same time, economies with weaker initial conditions are likely to experience smaller inflows of FDI, and those foreign firms that enter are likely to use simpler technologies that contribute only

17 For example the government of Costa Rica agreed to expand training in electronics and English in several technical high schools to lure Intel and its $300 million semi The broad issue of technology transfer via FDI is the focus of section 2 below.
marginally to local learning and skill development" (Blomström and Kokko 2001, 16). Clearly, further research is needed to provide a more comprehensive picture of the links between FDI and human capital formation. The role of public policies to enhance the absorption and learning capability of host countries in particular should be assessed (see section 3.2.).

1.2. FDI and Export Performance

The success of East Asian economies in achieving rapid export-led growth amply demonstrates the importance of engaging in international trade for developing countries. Export promotion in particular has played a key role in fuelling impressive growth rates in the Asian NICs during the development stage, and more recently, China is another example of export success among emerging countries. Exports are indeed an important component of a country’s development strategy as they may help to realize economies of scale in production and are essential to generate the foreign exchange needed to finance the imports of inputs and capital goods. Over the period 1980-1995, Asian developing economies accounted for 78% of total manufactured exports in the developing world. Developing countries no longer rely exclusively on exports of low-value added products; in fact their share in high-technology exports (30%) is higher than for medium-technology products and may soon overtake their share of low-technology products. Again, Asian countries’ share of total developing high-technology exports is overwhelming (89%). According to data presented in Lipsey (2000b), the share of R&D-intensive industries in East Asian manufactured exports (except Indonesia) was even higher than in France and Germany in 1995. In the cases of Singapore and Malaysia, the figures were far above those in the exports of the United States and Japan.

What explains the dynamics of the comparative advantages of East Asian economies, and notably the remarkable changes in the R&D intensities of major export industries in less than two decades? The decision to open their economies to FDI, to various extents and at conductor assembly and testing plant in Costa Rica in 1996 (Hanson 2001, 21).

The eight East Asian countries (Hong Kong, Singapore, Korea, Taiwan, Malaysia, Thailand, Philippines, Indonesia) grew more than twice as fast, in terms of their GDP, as the world as a whole, and their exports of manufactured goods grew to sixteen times the 1977 level by 1995, bringing their share of world manufactured exports from 6 to 16 per cent (Lipsey 2000b, p155).


Latin America accounted for 17 per cent of total manufactured exports and 11 per cent of high-technology exports.
different periods, seem to have played a crucial role in this evolution. It is believed that the linkages with foreign multinationals may provide knowledge about product quality and foreign market conditions, giving an opportunity to developing country firms to enter world markets, initially for labor-intensive final products. Over time, as they accumulate capital and know-how, developing country firms should be able to move into higher value-added products and upgrade their export activities. Lipsey (2000b) suggests that U.S. affiliates may have played an important role in these transformations. U.S. parent companies investing in developing Asia were not only in relatively high R&D industries but, within those industries, were R&D intensive relative to other firms: parents in the electrical and non-electrical machinery industries with direct investments in Asia in 1977 were 40 to 50 per cent more R&D intensive than those with investments in Europe.

**Measuring the Impact of FDI on Export Performance**

Few comprehensive empirical analyses have been conducted to support the idea that FDI may contribute in a significant manner to host country export performance, but some, mostly scattered and qualitative, evidence indicates it may be the case. First, a simple indicator such as the share of foreign affiliates in host country exports provides a useful indication of the relative importance of MNEs in some emerging countries. For example, countries with a large FDI presence and strong locational advantages such as input cost advantages have high shares, ranging from 40 per cent to 70 per cent (Hungary, Singapore, Malaysia, and China). At the other end of the spectrum, MNEs in Taiwan and India account for a very low share of exports, respectively below 20 per cent and 10 per cent\(^2\). Second, a number of studies, mainly firm-level surveys, indicate that in any given sector foreign affiliates tend to have a higher export propensity as compared with domestic firms, which explains why they generally account for a larger share of host country exports than they do of output. It is now well established that foreign affiliates tend to be concentrated in trade-intensive sectors, and that MNEs’ trading propensity tends to be greater than that of domestic firms (Dunning 1993). However, as shown by Aitken et al. (1997) in the case of FDI in Mexico, this feature is influenced by the MNE’s country of origin. They found that plants under Japanese or North American ownership are more likely to export than are domestic plants, while plants under European ownership are not.

\(^2\) The share of high-R&D-intensity industries in exports from Singapore and Malaysia were, respectively, 62 and 47 per cent, whereas the corresponding numbers in the US and Japan were 33 and 35 per cent in 1995 (Lipsey 2000b, Table 5.4, p156).

\(^2\) See UNCTAD (1999), p. 245.
Rhee and Belot (1990) present a number of detailed cases where foreign investors have acted as export catalysts, fueling a domestic export industry where there were no domestic exports at all. This was especially true for the least developed countries. For example the development of garment exporters in Bangladesh show how the entry of one Korean garment manufacturer lead to the establishment of hundreds of local exporting firms, and garment exports became the single largest source of foreign exchange earnings.\textsuperscript{23} The predominance of U.S. multinationals in some Asian countries electronics exports in the late 1970s also suggest that FDI initiated the electronics industry in these countries. The shares of US affiliates’ exports ranged from 97 per cent in the Philippines to 75 per cent in Malaysia and Thailand in 1982, and over half in Singapore and close to 30 per cent in Hong Kong and Taiwan in 1977.\textsuperscript{24} Lipsey (2000b) argues that US affiliates were more export oriented than Japanese affiliates in Asia, especially in the late 1970s. Kumar (1997) interpreted this by the fact that “US MNEs tend to relocate production of intermediate products for home consumption, whereas Japanese MNEs seem to shift production of more finished goods in relatively simpler technology industries. The offshore production by US MNEs would seem from this more of ‘globalized production’ which links subsidiaries in home and host countries vertically”. Also, this pattern may be linked to the MNEs’ degree of maturity: Japanese newcomers were not attracted to Asian developing countries as locations for export-oriented investment before the end of the 1980s.

A more skeptical analysis on the role of FDI in Asian trade performance can be found in OECD (1999). The authors argue that export success of ASEAN four countries based partly on FDI has been limited to a small number of (mostly intermediate) products, and that these foreign sectors have been ‘virtual foreign enclaves’ within host countries, often characterized by low value-added and limited technology transfer. The study points out to the high import dependence ratio for MNE-related exports as symptomatic of the poor linkages between foreign affiliates and the domestic economy. For example in automatic data processing equipment, imports represent 80 per cent and 95 per cent of the value of exports of finished goods in Thailand and Malaysia respectively. Accordingly, the failure to upgrade local industries in light of increased competition from China and Vietnam was one of the growing structural problems leading up to the Asian financial crisis. However, according to the report’s figures, the successful export sectors in Singapore and Indonesia are relatively less import dependent in comparison to Thailand and Malaysia (Table 3, p. 38). This can be

\textsuperscript{23} The other countries and industries studied are: Indonesia/plywood, Colombia/flowers, Zambia/uniforms, Honduras/condiments, India/diamonds, the Ivory Coast/semi-processed cocoa, Jamaica/garments, Guatemala/shoes, Hungary/software and Brazil/aircraft.
explained in the case of Singapore by a longer exposure to FDI, which suggests the possibility of reduced import dependence over time. Also the study does not elaborate on the Indonesian case: do lower import dependence ratio for MNE-related exports in Indonesia imply greater linkages between foreign and local enterprises, and thus increased scope for technology transfers? To the best of our knowledge, there is no such evidence in the Indonesian case.

Few statistical analyses attempt to investigate the influence of FDI on host country exports. A simple test of the relationship between FDI and manufactured exports in a cross-section of 33 developing countries in 1995 indicates a significant positive relationship between FDI inflows and export performance as well as between FDI inflows and the technological sophistication of exports. A one per cent rise in per capita FDI leads to a 0.78 per cent rise in high technology exports and a 0.31 per cent rise in low technology exports but is insignificant in medium technology exports (UNCTAD 1999, pp. 246-47). Among other variables, per capita manufacturing value added has a strong influence for medium- and low-technology exports, indicating that the level of industrial development is also important in explaining export competitiveness. Taking the share of high-technology exports in total exports as the dependent variable, both FDI and R&D turn out to have a very strong influence. These results provide some evidence of a positive relationship between FDI and export performance in developing countries, notably in high-technology products, although the causality is yet to be further investigated.

In a more comprehensive study, Aitken, Hanson and Harrison (1997) analyze the indirect effects of MNEs' activities on export performance, i.e. whether firms that penetrate foreign markets reduce entry costs for other potential exporters. Using panel data on 2,104 Mexican manufacturing plants over 1986-1990 and deriving a probit specification, the authors first find that the probability a domestic plant exporting is positively correlated with both local export concentration and MNE export activity. However, they did not correct initially for unobserved site-specific characteristics, which could mean that exporters tend to locate in regions where natural endowments make exporting more feasible. After excluding the industries for which site-specific factors are likely to be more important in the export decision, the local export

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24 The weight of US affiliates is now around 3 per cent in Hong Kong, 6 per cent in Singapore and 7 per cent in Taiwanese electronics exports (Lipsey 2000b, p. 160).
25 For a review of early studies on the role of FDI in export expansion of developing countries, see Kumar (1996). The findings quoted in his survey are generally mixed. Several of the mentioned studies are on India, where foreign firms account for a limited share of India’s exports (5-7 per cent).
26 With coefficients of 0.33 and 0.42 respectively.
27 The industries excluded in the empirical analysis are those that are natural resources intensive and those that have high transport costs (and hence tend to produce for the local market).
concentration variable becomes statistically insignificant while the MNE export activity variable is significant, suggesting that export spillovers are restricted to multinational activity.

This confirms the findings of Rhee and Belot (1990) on the role of foreign firms as 'catalysts' for domestic exporters. Policy implications can be derived from these results by host governments, notably as to the creation of export processing zones (EPZs). On the other hand, Athukorala, Jayasuriya and Oczkowski (1995) find no significant relationship between MNE affiliation and the degree of export orientation of exporting firms in Sri Lanka in 1981. However, there is some evidence that MNE affiliation is an important determinant of whether a firm is an exporter or not, but only when the firm is an affiliate of a Third World Multinational. Affiliation to developed countries MNEs do not seem to affect in a significant manner local firms' export decision. This lends support to the hypothesis that developing countries MNEs may indeed be able to make a 'better' contribution to export growth of other lesser-developed countries. However, as shown by the US experience in Asia, the activities of developed countries MNEs can also give a significant boost to developing countries' exports.

*The trade policy regime and the degree of openness*

The host country trade policy regime is aside the human capital factor, an important influence likely to affect the interrelationship between FDI and growth. Bhagwati (1978) first hypothesized that the magnitude and efficacy of FDI in stimulating economic growth will depend on whether a country is following a policy of export promotion or import substitution. He argued that, given all other factors, export promoting countries were more likely, first, to attract a greater volume of FDI and second, to benefit from greater effects on growth because of their distortion-free environment. Balasubramanyam and Salisu (1991) provide some empirical evidence on the superior amount of FDI attracted in export promoting countries as opposed to import substituting countries. Balasubramanyam, Salisu and Sapsford (1996) test Bhagwati’s hypothesis related to growth on a cross-section of 46 countries over the period 1970 to 1985. According to their results, FDI is a driving force of growth in export promoting countries, while it exerts no significant influence upon growth in import substituting countries. Moreover, in countries with export promoting trade regimes, FDI appears to have a stronger effect on growth than domestic investment. Along the positive impact of FDI, increased exports also have a strong effect on economic growth in

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28 On the specific role of EPZs in promoting exports, see the section on policy implications for FDI.
29 Whereas an import substituting strategy, relying on the extensive use of tariffs and quotas, induces distortions in factor and product markets.
export promoting regimes, which is consistent with the export-led growth path followed by East Asian economies.

Marino (2000) also investigates the importance of host countries’ trade policy regimes on the impact of FDI for 42 countries. More specifically he examines whether trade policy determines both the volume of inward FDI and the relationship between foreign capital and host country economic growth, and finds that ‘open’ economies attract a larger amount of foreign capital than ‘closed’ economies. Simple proxies are used in order to determine whether a country is ‘open’ (the sum of exports and imports as a share of GDP) or ‘closed’ (the average tariff on imports of intermediate and capital goods). In the former, the relationship between FDI and growth is positive while it is negative in the latter. The author then tests whether the influence of inward FDI on growth is a function of the development level attained by the recipient country, and finds, contrary to the results of Borensztein et al. (1998), no significant relationship.

1.3. Summary

One central finding of the empirical literature on FDI and growth, inspired by endogenous growth models, is that the impact of foreign investment on economic growth is dependent on the level of human capital available in the host country; This suggests that there is a threshold effect of human capital, or income, under which FDI makes no significant contribution. Estimates of the importance of this threshold effect may vary according to host country and industry characteristics, and to sampling differences and methodologies. Nevertheless, a ‘sufficient’ local learning capability appears to be a prerequisite to assimilate the more advanced technologies introduced by MNEs in the host economy. When technology gaps vis-à-vis foreign firms are large and combined with a sizeable foreign presence, “affiliates may operate in ‘enclaves’, i.e. isolated segments of the market where technologies, products, and plant sizes are very different from those used by local firms” (Kokko 1994, p. 291). This contradicts the standard hypothesis that spillovers increase with the size of the technology gap.

The lack of adequate learning capabilities tends to be greater in high-tech sectors, which would explain that foreign investment may not impact local productivity, as shown by the case of Morocco. These results notably confirm the importance of investing in human capital in order to maximize the benefits of foreign presence – along other factors to improve

30 Three variables are considered as development indicators: the per-capita income level, the value of life expectancy at birth, and the secondary school enrollment rate.
spillovers and learning (macroeconomic environment, political stability, sound financial system, physical infrastructure...). Although governments, like in East Asia, should be at the forefront of the education effort to improve labor quality, FDI may also have an effect on the formation of human capital, and thus on subsequent growth in developing countries. Further research in this direction is much needed.

Another interesting finding is the importance of the duration of MNEs’ activities. The absence of any significant effect of foreign direct investment on productivity growth in the Czech Republic and Morocco could be due to the short time periods analyzed. Also, the experience of Japanese firms in Asia show that the initial impact of affiliates’ operations may be limited. Indeed, Japanese MNEs were newcomers in the late 1970s relative to their U.S. counterparts, and were more interested in selling to the developing host countries and thus to transfer the manufacturing of final goods in simple technology industries, whereas U.S. affiliates relocated production of intermediate goods for home consumption, contributing positively to host countries’ exports. Over time, Japanese firms matured and behaved more like U.S. MNEs, implementing a global production network linking vertically subsidiaries in home and host countries, and thus transferring more technologies. Japanese MNEs are now more willing to exchange with local companies and adopt a cooperative approach with their Asian production networks.

2. Multinationals and Knowledge Transfers

Historical evidence suggests that, at least since the industrial revolution, latecomer countries developed by effectively exploiting the international pool of existing technologies available from foreign leaders. Effective technology transfers require building up adequate absorption capabilities. Successful latecomers have thus combined heavy imports of technology with strong expansion of indigenous efforts to foster learning and upgrading. This historical experience contrasts with the view that foreign technology might prevent less developed countries from nurturing their own science and technology base. In a number of Latin American countries or in India for example, the utilization of foreign technology, whether imported equipment, transfers from multinationals or licenses “was interpreted as inimical to sustained national development” (Pack 2000, p.73). Such a perspective was consonant with import substitution development strategies. It emphasized the cost of technology imports and neglected the opportunity cost of local generation of technologies.

This section contrasts the objectives of multinational firms and those of host governments in the process of technology transfer. It then examines the role of the learning capabilities of recipients for the success of transfers. For this discussion, “technology transfer” and
“knowledge transfer” are used as synonyms. This is because the term “technology” is broadly used to mean knowledge, which may be embodied in products, processes or business practices. Know how and managerial skills may thus be subject to “technology transfers”.

2.1 Competing Objectives in Knowledge Transfers

The efficiency of knowledge transfers through FDI depends both on the supply of technology by multinationals and on the effective appropriation of that technology by local firms. MNEs bring with them proprietary technology or know how that constitutes their firm-specific advantage and allows them to compete successfully with local firms, which enjoy superior knowledge of local markets, consumer preference and business practices. This proprietary knowledge tends to be imperfectly transferable and the positive influence of MNEs on the local development process hinges on the breath and depth of the positive externalities or spillovers, which in turn depend on characteristics of the host economy. Different strands of literature, have actually focused either on the determinants of the supply of technology transfer by multinationals, or on the objectives of governments from host countries. This survey considers both the supply and demand determinants of technology transfer.31

2.1.1 Firms’ objectives

Since the 1960s, the theory of the multinational firm has largely been built on the premise that the very reason why firms become multinational in the first place is their possessing some ownership advantage over local competitors in foreign markets (Hymer 1960). Researchers have studied the circumstances under which firms with such superior assets will become multinational, that is to say, when they will decide to invest abroad in order to exploit these assets. A firm may earn rents on its assets through arm’s length transactions such as licensing or turnkey contracts, or by investing abroad in wholly owned subsidiaries or joint ventures. In taking its decision the firm considers different sets of factors such as the potential of the foreign market, foreign production costs and transaction costs.32 The overall objective is to maximize rents on assets while knowledge transfers may actually undermine rents through diffusion to competitors. Typically, knowledge transfers will thus be restricted to situations where they are necessary as part of a profitable venture, such as getting access to a closed foreign market or producing in a low cost country.

31 A similar supply and demand framework has been used by Blomström et al. (XX) to analyze the determinants of FDI spillovers.
32 Ownership-Location-Internalization framework provides considers the interactions between these different types of considerations for each investment; see for example Dunning (1993).
The risks of uncontrolled dissemination

The literature on international business has extensively discussed the risks involved in international technology transfers and the transfer modes firms have chosen in order to limit them. The transaction costs perspective suggests that firms will tend to internalize risky transactions such as knowledge transfers (Teece 1981, Hennart 1991). It further suggests that firms will seek full ownership of their foreign ventures in sectors where marketing costs are high in order to assure the quality of their products abroad and prevent debasing of their trademarks. FDI does appear to be a major channel for technology transactions since the vast majority of international royalty payments are made from subsidiaries to their parent firm (80% in 1995 for example, UNCTAD 1997).

A number of empirical studies have sought the confirmation of the role FDI plays in transmitting technology in the inter-industry distribution of foreign investment. Early studies based on data from US multinationals have typically showed that they are concentrated in industries that exhibit high R&D and high marketing expenses relative to sales. European and Japanese multinationals are concentrated in sectors where they enjoy competitive advantage, like chemicals or automobile respectively, which are not necessarily the most high tech sectors but for which knowledge-based proprietary assets are important. Within manufacturing, the sectoral pattern of involvement by MNEs is broadly comparable in developed and developing countries, with a bias in favor of sectors with above average R&D intensity or product differentiation. A number of studies have further showed that multinationals tend to choose full ownership rather than shared ownership in high tech sectors or in sectors where marketing expenses are high. Finally, technological and marketing leaders within an industry are more likely to enter foreign markets with fully owned subsidiaries than other firms (Smarzynska 1999). Conversely, competitors, which are less R&D or marketing intensive, are more likely to enter through joint ventures.

One reason why firms tend to internalize technology transfers is because intellectual property rights (IPRs) may not be sufficiently protected in foreign countries. In such countries, licensing contracts may be easily breached by licensees, which then enter in direct competition with the licensor. A weak IPR regime may thus deter licensing and encourage

33 For data and qualifications, see Dunning (1988, 1993). The degree of disaggregation, by country, product and production stages all play a role. Smarzynska (1999) has found that FDI into transition economies in the 1990s have been concentrated in rather low tech sectors.
34 Gomez-Casseres (1989) used data on US multinationals, and Smarzynska (1999) data on investment projects in Eastern European countries and former Soviet Republics between 1989 and 1994. Results are not always statistically very significant though. Hennart (1991) and Hennart and
FDI. This perspective is particularly relevant in sectors where proprietary knowledge is expensive to develop and easy to copy such as pharmaceuticals, certain chemicals or software. In his analysis of 49 Indian industries for 1980-81, Kumar (1987) found FDI to be concentrated in advertising and human skill intensive sectors, while licensing was concentrated in industries where know how is embodied in equipment, or those with less complex machinery. A very weak IPR regime could conceivably go as far as deterring FDI though. Besides, the choice between exports, licensing and FDI also depends on other factors such as the size of the market and local production costs. Thus the overall relationship between the degree of IPR protection and FDI is ambiguous (Maskus 2000).

Surveys of multinationals suggest that when the IPR regime is judged particularly weak, firms tend to be equally suspicious of the different channels for technology transfer, including licensing to unrelated firms, joint ventures with local partners, and even transfer of newest technology to wholly owned subsidiaries. This was the case in India in particular, at least until the beginning of the 1990s (Mansfield 1994). But this may have been influenced by other restrictive Indian policies, on FDI in general and on the maximum amount of royalties, which could be paid to a licensor. Generally, firms are more concerned by the strength of IPR regimes in IPR sensitive sectors such as chemicals, machinery and electrical equipment (Mansfield 1994, 1995). Moreover, firms are more concerned with IPRs when they consider siting knowledge intensive types of operations such as complete product manufacture or R&D, rather than sales or basic assembly. In her firm level empirical study, Smarzynska (1999) has confirmed both tendencies. During the 1990s, FDI into transition economies has been deterred by weak IPR regimes, especially so in the most IPR sensitive sectors and in manufacturing (as opposed to distribution). A recent survey of European multinationals with operations in China (Bennett et al., 2001) has also confirmed that weak property rights constitute a major obstacle to setting up R&D activities in a foreign country. The costs of knowledge transfers are not only risky, but also complex and costly to organize successfully. Teece (1977) has defined technology transfer costs as the “costs of transmitting and absorbing all the relevant unembodied knowledge” (p. 245). He firstly found that these transfer costs could reach very substantial amounts; in his sample, they averaged 19% of total project costs, with considerable variation between projects. His empirical study shows that transfer costs are positively related to the degree of novelty of the technology and

35 A number of results on the incentives for FDI and its consequences for the recipient country may be quite different when the regulatory regime changes. This issue is further discussed below.

36 Drug, cosmetics and health care products; chemicals; machinery and equipment; electrical equipment.
negatively with how well the innovation is understood by the parties involved. Transfer costs also tend to decline with each application of a given innovation. Finally, the study found that transfer costs in chemicals and petroleum refining were lower than in machinery, which suggests that inter-sectoral generalization on this issue are hazardous. More generally, this early study indicates that the characteristics of innovations as well as the organizational capabilities of both the transferor and transferee should impact on the feasibility and cost of technology transfers.

Other studies confirm that the relative importance of arms’ length licensing as a channel of technology transfer varies widely across industries. In sectors where technology has a relatively high tacit component, owners tend to adopt the internal mode of transfer. In 1989, for example, the proportion of technology transferred internally by US multinationals has varied from 46% for transportation equipment to 78% for chemicals and 97% for non-electrical machinery (Kumar 1998). In Indian manufacturing, FDI predominate in advertising and human skill intensive industries, while licensing was important where knowledge can be embodied in capital goods and those with relatively simpler technologies (Kumar 1987). Going beyond sectoral characteristics to individual transactions, Kogut and Zander (1993) have showed that multinationals tend to internalize technology transfer when the knowledge involved is particularly complex and difficult to teach. Conversely, simpler knowledge may be transferred through joint ventures.

The above results suggest that multinationals use their extensive border spanning organizations to efficiently transfer knowledge between countries. In their empirical study based on patent citations, Almeida and Grant (2000) suggest that internal technology transfer is more efficient than inter-firm alliances, which are themselves more efficient than licenses. The relative efficiency of the internal solution is due to the very complexity of knowledge transfers. Effective knowledge transfer requires continuous and intensive contact between functional technically specialized groups within the firm. Without these organizational and individual contacts, there are no ‘anchors’ within companies to receive, develop, as well as utilize new skills and the inherent critical link between the twin processes of assimilation and cultivation of technological capabilities can be jeopardized. (Cusumano and Elenkov 1994). The R&D management literature is in part devoted to study the best designs to identify and organize these contacts within firms and more broadly within global R&D networks including joint ventures and alliances (Weil 2000, Doz et al. 2001). Provided they allow enough resources to the process, multinational can manage to transfer complex knowledge, including tacit and team dependent knowledge. When Japanese automakers first invested in the US and Europe in the 1980s, they faced a formidable challenge as they had
to adapt their production techniques abroad. The latter involved teamwork on the shop floor and specific relationships with a hierarchical set of suppliers. Japanese automakers have managed to successfully adapt their organization abroad and have offered useful models to the local carmakers, especially those with which they had entered joint ventures, such as GM in the United States.\footnote{GM used its Californian joint venture, NUMMI, with Toyota as a training ground for a number of its production managers (Womack 1988).}

Both risk and cost considerations suggest that firms should be more willing to transfer older technologies. As a technology or industry matures, firms tend to shift from product innovations to process improvements (Abernathy 1978, Utterback 1994). As a result, their ownership assets become more diversified, possibly also including learning, scale and reputation effects.\footnote{The competitive position of the firm is strengthened by assets which are strongly complementary to the initial innovation, as explained by Teece (1986).} This can result in a lower risk for the transfer of the technology underlying the initial innovation. Besides, products become more standardized, equipment is refined and tends to embody more of the technology. Along the product cycle, technology thus tends to become more codified, embodied and transferable. At the same time, the size of the market grows and prices tend to decrease through learning and scale economies. Diffusion and stronger competition constitute economic pressures in the same direction. As a result, firms are looking both for foreign markets and foreign locations for production, where labor costs in particular would be lower. Vernon (1966) has described this dynamics, which was typical for the American multinationals in the 1960s. The product cycle dynamics is not the main rationale for FDI today, but it still captures some of the fundamental forces at work in international technology diffusion.\footnote{Technology diffusion itself has become more complex and tends to accelerate, which will be discussed below.} In particular, the fact that older technologies are both more likely to be transferred and less costly to absorb by the host country. The product cycle also suggests that we should observe a cycle in transfer and diffusion from the innovator country to technologically close countries and, later, to developing countries with lower technological capabilities.

In summary, firms appear to be very much influenced by the risks and costs of international technology transfers. As a result, they may well avoid investment when conditions are judged unfavorable. They also tend to prefer transferring complex or new technology to their fully owned subsidiaries rather than to joint ventures. Incentives, costs and efficiency consideration would thus explain that multinational expend more resources for transfer, both tangible and intangible, to their local partner when they have a higher...
participation in its capital. The different studies also point to the importance of the experience and competencies of the recipient firm.

More generally, firms make multifaceted decisions about how they can serve foreign markets. The outcome depends on a host of complex factors involving technology, local markets and regulations.

2.1.2 Governments’ objectives

From the point of view of the recipient developing country, technology transfer involves two sets of issues. The first one relates to the mode of transfer and its costs. The second one relates to the diffusion of technology within the recipient country through various types of spillovers. These issues are distinct but closely related because the extent of diffusion depends on successful transfer in the first place, which is the focus of this section.

Technology transfer has long been recognized as an important ingredient for development. It is thus not surprising to observe that the attitude of governments vis-à-vis technology transfer has been evolving with development policies in general. In the 1960s and 1970s, technology transfer policies were thus strongly influenced by the mainstream import substitution positions.

One fundamental idea behind import substitution policy was that, given the existence of already industrialized economies, developing countries had to protect their economies from imports from the highly productive northern countries. Protection was supposed to be a major policy instrument to enable countries from the South to concentrate on putting in place new activities that would produce an array of manufactured goods currently imported. In this context, technology transfer policies have two main objectives: first, to reduce the costs of transfer, and, second, to maximize the learning effects. These objectives have had important consequences on the occurrence and effects of technology transfers to developing countries. We focus below on the consequences on the choice of the modes of transfer.

In the 1960s and 1970s, governments have been suspicious of multinationals and have promoted arms’ length types of transactions, which were more easily controlled. Their preferences were for market mediated transactions and thus, in descending order, from licenses to transfer to local joint ventures and to wholly owned subsidiaries of foreign firms.

40 At the time when Indian regulations forced firms to choose between licensing and joint ventures to transfer technology, Davies (1977) has observed that British companies spent more resources for transfer to their joint ventures than to independent local firms.
41 For a detailed survey, see in particular (Radosevic 1999).
This order of preferences is the reverse of the order of MNEs in a number of cases as discussed above. Hence the need for governments and firms to enter into bargaining over technology transfer.

The bargaining power model of the interaction between the developing host country and the MNE, which was developed by researchers in international political economy, assumed both inherent conflict between foreign investors and hosts and a foundation of convergent interests. The bargaining model was studied to show which conditions influenced the distribution of possible joint gains between the MNE and the host country. Results tended to show that outcomes were a function of the bargaining power of the host State. The latter depended on the size of the market of the host country in particular, or on its resources in natural resource based sectors.

Gomes-Casseres (1990) has devised a test to assess the relevance of the bargaining model on investment projects by US multinationals in the 1970s. His method attempts to estimate how the ownership and entry effects of restrictive policies vary with the characteristics of the MNE, its subsidiary, the sector and the host country. A first logit analysis shows that the choice of a wholly owned subsidiary, as opposed to a joint venture, depends on the variables discussed in the international business literature reviewed above. A number of characteristics of the firm and the industry influence positively the choice of a wholly owned subsidiary: sectoral intensity in marketing spending, international experience of the MNE and its familiarity with the host country, intensity of intra-firm sales. Other characteristics rather favor the choice of joint ventures: the fact that the venture belongs to a resource based sector and its small size, as well as the small size of its parent. A number of characteristics of the host country also unsurprisingly influence the probability to observe a joint venture: the size of the industrial GNP and national growth, as well as regulatory restrictions against FDI. The two variables with the strongest influence are the indicator of familiarity with the host country and the indicator of restrictive regulations.

A second test includes interaction terms between the existence of restrictive regulations and the other variables. All the independent variables remain significant, except for GDP growth and the restrictive-country dummy. This suggests that policies with respect to ownership have no across-the-board effect and that their effect depends on the characteristics of the industry and the host country. The interaction terms are meant to measure the specific influence of variables in restrictive countries. The interactive term with GDP growth of host becomes the strongest positive influence on the probability to observe a

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42 Kobrin (1987) discusses a number of results.
joint venture, which corresponds to the bargaining power interpretation.\textsuperscript{43} Two other variables are much less favorable to the bargaining power model. Firstly, the interactive term with the resource-based industries significantly influences the choice of fully owned subsidiaries. This is remarkable, because in resource based industries; multinationals often choose joint ventures, partly to yield to governments’ demands. Gomez-Casseres (1990) interprets this as meaning that restrictive governments seeking to develop their country’s natural resources might yield to multinationals’ demands. Restrictions would then paradoxically increase the bargaining power of firms; it may be that they ask for more security if the regulatory environment is globally insecure. Similarly, the interaction term including the indicator of familiarity significantly influences the choice of a joint venture solution, while familiarity tends to favor full ownership when there are no constraints. This might be explained by the fact that MNEs might anticipate better working relationships with their local partners when they know the country better. In such a case, restrictions would then force the joint venture solution for firms, which are familiar with the host country.

This study (Gomez-Casseres 1990), as a number of studies discussed above on the role of the characteristics of firms, industries and host countries on firms’ preferences, suggests that the latter have the strongest influence on the choice of the mode of technology transfer. The study further suggests that restrictive policies only increase the bargaining power of governments under specific circumstances only. The results also suggest that firms facing restrictive governments forego investing altogether. This is the case of firms with relatively little international experience or of multinationals with extensive intra-firm transactions. Firms in resource-based industries also tend to forego investment in restrictive countries. These results are consistent with those discussed above showing that high tech firms might be deterred to invest in countries with weak IPR regimes (Smarzynska 1999). The bargaining model emphasized the role of policies to force firms to choose less hierarchical modes of entry, but the result of restrictive policies has probably been no investment at all in a number of cases. Smaller enterprises for example are typically less able to dictate the terms of transfer and accept joint ventures less reluctantly, but they may also forego the transaction altogether. More generally, as a consequence of restrictions on FDI in the 1970s and early 1980s in many developing countries, licensing emerged as an alternative channel of international technology transfer.\textsuperscript{44} With the evolution of national regulations towards more openness, this trend has been reversed since the mid-1980s and FDI has regained some of

\textsuperscript{43} There might be collinearity here between GDP growth and the interactive variable.

\textsuperscript{44} This trend was particularly striking in Korea, where royalty payments boomed during the 1980s as the result of the R&D effort by firms (Kim 1997).
its lost importance as a mode of technology transfer. Technology-licensing requirements and their consequences will be explored further in the policy section below (3.1.2).

The above observations and results suggest that there exist substitution effects between the different channels of technology transfer. The different channels however tend to convey different vintages of technology. MNEs thus tend to transfer more advanced technologies to their subsidiaries located in developing economies than to joint ventures or unrelated licensees (Mowery and Oxley 1995). As in the case of the height of capital control, there thus seems to be an arbitrage between the degree of local control and the height or quality of the knowledge flow into a country. Until the 1980s, policies focused on the price of technology transfer and on the degree of control by local firms. There is agreement that these policies improved the terms of transfer, but much less regarding their effectiveness. The most controversial aspect of these policies was in their attempt to foster technological development by primarily relying on regulations in international transfer. In India for example, restrictions imposed on royalty payments and contractual clauses allowed local firms to reduce the short run costs of technology transfers but also significantly decreased the willingness of foreign firms to undertake any real efforts to effectively transfer knowledge (Kumar 1996, Radosevic 1999). More generally until the 1980s, the mainstream analysis paid scant attention to technological effort by the receiving enterprises which play an essential role in the adoption phase and which is crucial for diffusion too.

2.2 Transnational Learning by Latecomer Firms

Since the 1980s, two major sets of issues have been more precisely studied with respect to technology transfer.

Firstly, from the recipients’ perspective, the context of emerging countries has more clearly underscored the central role of local firms in absorbing foreign technology. The experience of a number of countries also suggests that diverse modes of organization may be relevant, including wholly owned foreign investment, joint ventures or various types of contracting within global network. As a consequence, the analysis of technological catching-up has focused on the combination of countrywide capabilities (education, skills) and firm-specific capabilities (know-how).

Secondly, multinationals have had to adapt to global competition and the emerging knowledge based economy. Tougher competition, including by entry of latecomers from developing countries has increased the pressure to innovate and optimize global networks of production. As a consequence, multinationals have closely managed their transnational
activities with suppliers. They have also developed closer links with institutions, which are related to technology and skills development in different countries. The opening of new markets creates new opportunities and challenges for MNEs and gives them a broader choice of modes with which to access markets and increase competitiveness. It also makes them more selective in their choices of potential investment sites; the sites that will receive most FDI are increasingly those that allow MNEs to set up facilities able to withstand global competition. MNEs are increasingly shifting their portfolios of mobile assets across the globe to find the best match with the immobile assets of different locations. The ability to provide the necessary immobile assets thus becomes a critical part of FDI strategy for countries, including developing countries.

2.2.1 From transfer to absorption and innovation

While obtaining access to technology is a necessary step toward a successful transfer, this access in itself or the passive possession of technology does not guarantee that a country or company will effectively use the acquired. This issue of assimilation has been overlooked for a long time, because technology was implicitly viewed as a commodity, as an input, the specific nature of which was ignored. This perspective may be broadly related to the literature on growth, which focused on the importance of capital accumulation for development. The role of endogenous technical change and of assimilation of foreign technologies was only gradually understood from the 1980s on.\textsuperscript{45} By implicitly understanding technology as a commodity, policy undervalued its complexity, especially the fact that it is embedded in a structure of firms and that the firm, as the main locus of innovative activity, must also be an object of research. It was only in the 1980s and 1990s, with the technology capability stream of research, that technological accumulation at the firm level became an object of systematic research.

\textit{Firms' technological capabilities}

Cusumano and Elenkov (1994) contrast international technology transfer literature with management researchers. The latter "tend to view the cultivation of technological capabilities not as a phenomenon at the nation-state level, but as a process occurring along multiple dimensions aimed at improving the ability of firms to operate specific functions and compete in specific markets" (p. 198). Actually, since the mid-1980s, there have been much more interaction between the different types of literature studying innovation processes and the

\textsuperscript{45} For a discussion contrasting the "accumulation" version of growth theory and the "assimilation" version, see Nelson and Pack (1999).
Technology capability stream of research may be considered as one fruitful result of these interactions, with its focus on the building of technological capabilities by recipient firms. This perspective strongly argues that the ability to make effective use of imported technology is generally not embodied in a book blueprints. As a consequence international technology transfer, like domestic inter-firm transfers, are time- and knowledge-intensive processes, during which the recipient must complement imported technology with internal efforts of absorption. This costly process also implies that the exploitation of external technology is made easier if the recipient possesses an adequate ‘absorptive capacity’ (Cohen and Levinthal 1989).

Technological capability may be defined as the "ability of firms to undertake a range of productive tasks, extending from pre-investment analysis to product and process engineering, manufacturing, and the introduction of new technologies as they appear. Such capabilities provide a basis or anchor for effective technology transfers as well as in-house innovation." (Cusumano and Elenkov 1994, p. 208). Cusumano and Elenkov (1994) further suggest that technological capabilities must be rooted in the knowledge, organization, and people that comprise the firm. Bell and Pavitt (1997) consider that technological capabilities consist of all the resources needed to generate and manage technical change, which include skills, knowledge and experience, but also "institutional structures and linkages". This perspective thus underscores two important issues for technology transfer. Firstly, firms are the fundamental actors in the learning process between technology transfer and acquisition. Secondly, this learning process has to be carefully organized within the firm, which in turn underscores the organizational dimension of technology transfer and learning. The latter was considered above from the point of view of the transferor, while the technological capability literature emphasizes its role from the point of view of the recipient firm.

From the point of view of the recipient firm, access is indeed important, but the assimilation phase is just as important. Studies of technological upgrading and catching-up by latecomer firms emphasize this point. They actually discuss diverse modes of transfer and always emphasize the amount of effort firms have expended to absorb and master new technological inputs, before being able to modify and improve them. The process may be the clearest with one of the basic and widely used mode of technology transfer, i.e., reverse engineering. In this case, the transferor is actually passive, and may even be reluctant, and the entire effort is on the side of the recipient, which actively pursues understanding and learning. Figure 1 illustrates the interactions between technology transfer and the

46 For numerous references to the technology capability literature, from both the technology transfer and research management perspective, see (Cusumano and Elenkov 1994, Radošević 1999).
progressive building up of indigenous technological capabilities. As the literature on latecomers suggests, the figure shows the process starting with simple assembly and process technology, before gradually moving on to product technology and innovation. The evolution, which is described by this figure, is quite general. It has been applied to domestic firms from emerging countries, but may be extended to subsidiaries of MNEs. In a number of emerging countries, the latter have indeed followed such upgrading, from simple assembly to more complex functions, and from manufacturing to design, or even some R&D operations (Hobday 1995, 2000, Amsden et al. 2001).

Figure 1. Learning along the technology life cycle


Japanese and Korean firms have been extensively resorting to reverse engineering from the 1950s through the 1970s. Reverse engineering may still be practiced, but it has become relatively less important. Firstly, some argue that new technologies, such as biotechnologies and information technologies may be more difficult to reverse engineer, as they tend to be more like “black boxes” (Mytelka 2001). This may be related to their systemic character, the important role of users in innovation and the high knowledge intensity of new technologies. Secondly, as firms upgrade their technological capabilities, they come closer to the technological frontier where the underlying body of knowledge is more complex and a constant state of flux. As a consequence, they have to diversify their channels of access to foreign technology, in particular to include licensing and closer contacts with technological progress in the making.

**Learning efforts**

The literature reviewed in the previous section suggests that modes of technology transfer are not equivalent because the transferor does not accept to transfer competitive assets under risky conditions in particular. The discussion above also suggested that the intensity of effort and involvement by the transferor is reflected in the mode of transfer. Technology transfer channels are not equivalent from the point of view of the recipient either. In particular, there is a close relationship between the type of knowledge, which is transferred, and the required technological capability. Absorption efforts by the recipient may always be required. In the case of reverse engineering of relatively simple machinery, effort may be quite intense if the technological capability of the latecomer is low. But, as the recipient firm assimilates knowledge and its technological capability increases, it has to exert increasing amounts of effort and allocate greater amounts of better quality resources to the process (Rosenberg and Frischtak 1985).

Table 1 summarizes the characteristics of the different knowledge transfer mechanisms, taking into account both the transferor's and the recipient's perspectives. The point of this exercise is to establish a parallel between the mode of transfer, the degree of involvement of the transferor and the degree of effort of the recipient. It underscores that the transfer of more sophisticated or more recent knowledge, which requires active participation from the transferor, is associated with partial or total internalization and also requires substantial efforts and resources from the recipient.
<table>
<thead>
<tr>
<th>Transfer mechanism</th>
<th>Mode of transfer, from the perspective of the transferor</th>
<th>Role of the transferor from the source country</th>
<th>Type of absorption and creative effort by the recipient in the host country</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Market</td>
<td>Hybrid/Network</td>
<td>Hierarchy</td>
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<tr>
<td>Imports of equipment</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>Retro-engineering</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Turnkey plants</td>
<td>X</td>
<td></td>
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<tr>
<td>Personnel movement (training abroad, reverse brain drain)(^2)</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>Licensing</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Subcontracting, OEM(^3)</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Technological alliances</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Joint ventures(^4)</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Inward investment: Majority owned subsidiaries(^4)</td>
<td>X</td>
<td></td>
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<tr>
<td>Outward investment: Technology sourcing(^6)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

1. Only private transactions are considered. Public aid can take the form of technical assistance, which in turn can operate technology transfer under several forms, including licenses. The table focuses on manufacturing, in particular because FDI is subject to specific conditions in resource-based sectors.
2. This category is quite diverse as a firm may decide to send an employee for apprenticeship or training abroad, or hire a graduate who has studied abroad. The level of expertise of the person will thus vary a lot. The transferor here is taken to be the foreign institution, either a firm or a university.
3. Original Equipment Manufacture. This specific mode of subcontracting and its role as a technology transfer channel is discussed below.
4. The hypothesis here is that the transferor from a developed country invests into a developing country.
5. In this case, there is not necessarily a local R&D laboratory, as subsidiaries often rely on laboratories located in the home country, but this may evolve over time (see text).
6. Technology sourcing through outward direct investment from a latecomer firm into an advanced country is discussed below. The acquired company in an advanced country or the wholly owned laboratory is supposed to actively contribute to technology transfer.

Sources: Review of the literature.
Technology transfer is not a matter of simple "diffusion"; in particular of technology which would be embodied in capital equipment (Bell and Pavitt 1993). As a consequence, in order to absorb technologies and assimilate the related know-how, latecomer firms have typically relied on hard work from technicians and engineers. As firms have been accumulating technological capabilities, engineering input has increased and engineers have become the "gatekeepers of technology transfer" (Amsden 1989). When firms want to deepen their imitation and creative capabilities, they tend to resort to a mix of technology transfer channels and to strengthen further their technological capability. At this stage, the technology to be assimilated is too complex to be handled as part of routine engineering activities and an in-house R&D becomes indispensable. When firms are particularly ambitious, they may speed up the formation of their own R&D laboratory by hiring foreign-trained R&D personnel.

Korean latecomer have followed the typical path described by figure 1 in their efforts to move from "imitation to innovation" (Kim 1997). They have progressively transformed the skills and activities they had developed for reverse engineering into R&D activities. In the electronic and automobile industries, they have also periodically organized task forces in order to expedite learning and new product development, which was partly based on foreign licensing. Finally, they have invested in own R&D laboratories from the mid-1980s on and have substantially increased their R&D capabilities over the next decade (Ernst 1994). This cumulative process has been painstaking and required strong commitment from the management.

These considerations suggest that imports of foreign technology from abroad are complement and interact with domestic R&D investment. The issue of complementarity versus substitutability between technology transfers and indigenous technological efforts has been much discussed in the literature. The substitution hypothesis makes an implicit parallel between goods and technology, with firms being able choose to either conduct research themselves or procure technology from outside. If technology could be bought and simply plugged into the production process, imports could indeed discourage R&D efforts. As a consequence, the greater the dependence of a firm on imports of technology, the lower its own technological effort. This issue has been most extensively analyzed in the case of India, where the policy of substitution of imported for local technology was probably the most developed. The substitution hypothesis has been supported by some early empirical work based on data from the 1970s or early 1980s. Empirical tests have been plagued by technical problems, such as the relationship between country, industry and firm

48 For references and discussions, see (Kumar 1996, Radosevic 1999, Aggarwal 2000).
characteristics which may have an influence on the complementarity between imported technology and in-house R&D. More recent empirical work concludes generally that imports of technology and domestic technological efforts are complementary (Braga and Willmore 1991, Aggarwal 1997). Some of the recent studies also suggest that restrictive regulations might have had a strong influence on the interactions between technology imports and local efforts - this issue is examined in more details below.

Foreign subsidiaries are in a quite different position from that of local firms, but they nevertheless follow the same type of path whenever they want to upgrade quality or integrate a larger part of the value-added chain. Subsidiaries from leading global firms in East Asia in electronics have typically started as assembly operations and some have moved up to more complex operations. This has entailed more engineering and technical work. In some cases, work has included design, development, and in a small number of cases, applied research operations. Amsden et al. (2001) give a number of examples of foreign subsidiaries from the electronic and biotech sectors in Singapore, which have progressively moved into development and to a lesser extend applied research, mainly related to processes and manufacturing. These evolutions depend in part on the availability of adequate personnel, and in particular, Ph.Ds. R&D operations in foreign subsidiaries imply more generally that these productive units have achieved a specific status within the global organization of the MNE and has accumulated substantial technological capabilities.

2.2.2 Latecomers in global production networks

As underscored by Hobday (1995), the latecomer firm from a developing country confronts two types of disadvantages in export markets; it is isolated from both the main sources of innovation and from the most sophisticated and demanding consumers. Firms from developing countries needed access to both these sources of knowledge to upgrade their competitive assets and be able to compete on export markets. Firms from emerging countries, and more particularly from East Asia, are considered as remarkable success stories in terms of technology transfer and assimilation. In a number of cases, firms have arguably graduated from "imitators to innovators" (Kim 1997), at least for some products. Access to market information and marketing competencies constitutes essential complementary assets (Teece 1986), which may be just as difficult and costly to build. This is more particularly the case for new activities for a latecomer firm from a developing country,

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49 On the role of the Singaporian government in attracting R&D facilities, see below.
50 For discussions from the international business literature, see (Cantwell and Mudambi 2001).
51 As opposed to both "leaders" and "followers" from advanced countries.
as opposed to a more traditional activity related to the country’s comparative advantage – in resource based or labor intensive sectors.

As innovation accelerates and as customization and services are included into manufactured products, interactions with clients and suppliers have become more and more important to serve the high margin end of the market, or even to penetrate the markets of leading developed countries. The growing importance of users makes it increasingly difficult to have long periods of learning within developing countries, where interactions are typically with unsophisticated users. Interactions with not sophisticated enough buyers thus constitutes a barrier to innovation and productivity enhancement, and in turn to continued exports to developed markets. It has thus become ever more important to get integrated into global networks of production.

Technological evolution also contributes to the increasing role of network relationships. Digitalization and the massive use of computing power enable to codify knowledge to a larger extent, which makes transfer easier, but at the same time, products tend to incorporate new tacit dimensions. Moreover R&D close to the technological frontier is still largely tacit and knowledge is in a constant state of flux. In this context, technology transfer is very difficult to conduct on an arms’ length basis (licenses) and requires different forms of network relationships (subcontracting, alliances).

From subcontracting…

The role of multinationals in overseas marketing has long been recognized as important for developing countries (Helleiner 1989). FDI can help firms from developing countries to speed up their entry on foreign markets, but various types of joint ventures and participation to global production networks through subcontracting and cooperative agreements have constituted other channels of access to the necessary strategic assets. FDI and transfer from multinationals have usually played a positive role in both accessing export markets and transferring competitive assets to East-Asian latecomers, but their contribution has been very diverse. FDI has been a channel for technology transfer early on in Japan or Korea, but has then been limited and strictly monitored by governments. In other countries, such as Malaysia, export growth has been to a much greater extend led by American and Japanese multinationals (Lall 1996, Lipsey 2000b). Taiwan provides yet another profile, with more inward FDI than Korea and detailed targeting and surveillance in the 1970s and 1980s, especially in high tech industries in order to foster technology transfers (Lall 1996). FDI in
Taiwan played an early catalytic role in the transfer of technology and management practices in semiconductors, computers and consumer electronics, while the role of OEM has progressively increased in the 1980s (Ernst 2000a).

A cross-country perspective shows that subcontracting has been another major way for East-Asian firms to access foreign markets and has represented a substitute to multinationals in a number of cases. Hobday (1995) has argued that OEM subcontracting agreements have played a fundamental role in the transfer of manufacturing and technological skills to latecomer firms from East-Asian countries. He has explored the role of the "OEM system" as one of the major institutional mechanisms for technological transfer in the electronic sector. OEM has taken a variety of forms since the 1950s when it started to be used by U.S. computer makers in East Asia. The basic idea though is that the OEM systems promote specific and evolving interactions between the partners. From the 1960s through the 1980s, buyers have helped their subcontractors with the selection of machinery, the training of engineers and managers and have advised them on various management issues. Successful collaborations have led to long term relationships between the partners through which local learning has been encouraged. The relationship has evolved, in particular to take into account the increased technological capabilities of local partners.

Since the 1980s, a number of firms from the emerging countries have been able to participate to more sophisticated tasks, such as design in particular. The local firm carries out part of the design as well as the production and the buyer may cooperate with the local supplier on design. OEM thus overlaps with this "own design and manufacture" (ODM) system (Hobday 2000). In the mid-90s, a large proportion of the computers sold under OEM arrangements by American and Japanese companies were designed by Taiwanese partners, which indicates significant design capabilities. More broadly, Taiwanese firms have been able to extend their competencies to cover a wider range of operations along the value-added chain. As a result for example, Compaq has made a “turnkey production arrangement” by which it outsources all stages of the value chain except marketing (but including after-sales) to Mitac International for Taiwan, China, the UK, Australia and the U.S. (Ernst 2000a).

In his comparison of the experience of Korea, Taiwan and Malaysia, Hobday (2000) suggests that both OEM and FDI may be effective modes of technology transfer. OEM has represented a major technology training school for Korean firms and has been a major channel for transfer, along with licensing. Within the OEM system, Korean firms have been

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52 The emergence of this trend in the 1970s and early 1980s has been first described as « new forms of investment » (Oman 1984).
able to learn the rate of learning depending on in-house efforts, investments in engineering and on-the-job training. OEM has also provided Korean firms with economies of scale. Korean firms have nevertheless tried to shed their dependence on OEM in order to increase their profitability. As suggested above, such independence requires both further investments in technological capability and brand names to gain direct access to foreign markets. The experience of Taiwanese firms with OEM has been similar, and the largest ones, such as ACER, have been trying to establish their own-brand (Hoesel 1999).

Malaysia, along with Singapore and Thailand, is one example of MNE-led export growth. Multinationals from industrial countries have started to invest in Malaysia in the 1960s in order to manufacture consumer electronics. They were attracted by low cost labor and fiscal incentives. Subsidiaries developed and became large exporters of electronics (Lipsey 2000a). Since the 1990s, they have been diversifying into disk drives, computers and color TV in particular. Most electronic MNEs conduct substantial innovative activity related to process improvements, but there is very little R&D into new material or new product designs. During a survey, managers of the major MNEs in Malaysia declared that parent companies were motivated to transfer technology, but that success depended on local plant capabilities (Hobday 2000).

Throughout East Asia, both multinationals' subsidiaries and the OEM/ODM system have proved effective channels of technology transfer. In the countries where FDI is quite large, there are actually substantial interactions between the two modes of international involvement, with subsidiaries entering into OEM agreements with local firms as suppliers. The subsidiaries of firms such as Motorola Hewlett Packard, Compaq or Sony have evolved from simple assembly operations in diverse electronic products to more complex operations and more sophisticated products (Ernst 1994, Hobday 2000, Amsden et al. 2001). In a number of cases, subsidiaries in one country have assumed responsibility for design or part of the R&D operations.

... to independent entry on foreign markets?

FDI and the OEM system have proved effective technology transfer channels and have contributed to catching-up in East Asia. The examples of Korea and Malaysia nevertheless suggest that local absorption and upgrading efforts are fundamental. The cases of Korea and Taiwan also suggest that upgrading from the OEM system and becoming independent new entrants on the lucrative leading markets constitute yet another step. This step is extremely costly, as it requires further investment in both technological and marketing capabilities.
Korean chaebols have ventured the furthest in this direction. They have heavily invested in in-house R&D capabilities in semiconductors and the automobile industry in particular. At the same time they have sought complementary R&D and marketing assets by investing in the United States in particular. Korean groups have either created a greenfield laboratory like Samsung did in the 1980s to expedite its catching up process in semiconductors, or acquired high tech firms. Actually, these acquisitions have proved very risky and a number have failed, such as AST or Zenith. These failures are due to a host of factors. In some cases, the acquired companies were in weak financial and competitive positions. Korean management has also had difficulties at adapting to American, and particularly high tech, management style, which resulted in the departure of major members of the team in some cases. These management problems also made it more difficult to integrate the acquired company into the group and to take full advantage of this new channel for technology and marketing upgrading. Given these various difficulties, Korean firms have resorted to minority shareholding, venture capital operations and cooperative agreements when they aimed mostly at accessing technology, rather than broader strategic assets (Miotti and Sachwald 2001). Korean firms have entered a number of technological partnerships with major Japanese and US companies in information and telecommunication technologies (Kim 1997, Mytelka 1998). This participation into the R&D end of global networks is only possible when firms can contribute to the network, which means that their technological capability has reached a relatively high level. Korean firms have been eager to enter such arrangements in a number of cases as they might ease their access to frontier knowledge, which Japanese and American competitors have tended to refuse as they have become more serious potential competitors (Lee and Lim 2001).

Outward direct investment as a channel of access to strategic assets has also been recently used by Taiwanese (Hoesel 1999) and Indian firms (Chaudhuri 2000). The best known Taiwanese electronic firms, such as ACER in computers, have been trying to set up distribution channels in the United States in order to promote their brand name and have been buying up local firms. This effort has proved quite risky and has met with major difficulties (Hoesel 1999, Hobday 2000). Indian firms have been recently acquiring American firms in order to access technology, but, more importantly, marketing assets. It seems that the heavy presence of Indian engineers and managers in high tech American firms and the heavy exchanges between the U.S. and Indian high tech communities has smoothed the management problems and that integration of the acquired companies is relatively smooth (Chaudhuri 2001). As firms from developing countries upgrade their technological capabilities

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53 These types of investment in Europe and Japan are much rarer. For a case study of the acquisition
and develop specific competencies, they will probably be better integrated into the global web of technological alliances, which is still largely relating firms from the leading countries (Hagedoorn et al. 2000). Here again, the interactions between internal investments and efforts on the one hand, and access to external technological assets on the other hand closely interact.

2.3 Summary

This review of different strands of literature on technology transfer suggests two main related sets of conclusions, which in turn have policy implications.

Firstly, multinationals and transferors of technology in general have some scope in their choice of modes of transfer. Moreover, they can also choose not to transfer knowledge if they consider that it may jeopardize the future rents on their strategic assets. Results from the literature on multinationals, on technology transfer and on R&D management converge on this point. Multinationals tend to shun the most risky and costly transfers. As a consequence, they will typically prefer to internalize the transfer of the newest and most complex knowledge. In countries where the IPR regime is particularly weak, they will not license, but might not even venture into FDI. Conversely, when they perceive an interest for their local or global operations, multinationals do transfer technology and knowledge about management practices both to their subsidiaries in developing countries and to their OEM contractors. In other words, the supply of FDI and technology transfer is partly determined endogeneously by foreign investors. As remarked by Blomström et al. (2000), the literature tends to assume that this supply is determined exogeneously so it is important to recognise that MNEs actually assess how much technology they put at risk of appropriation.

Secondly, effective transfer to local subsidiaries or latecomer firms depends on the absorption capabilities of the latter. From this perspective, cross-country studies as well as firm and country monographs point to two major conclusions. As latecomers progressively build up their technological capabilities, they tend to access a broader range of knowledge transfer channels. This diversified array of transfer channels in turn enhances their access to both technological and marketing assets, which constitute the building blocks of barriers to entry into the most sophisticated and high margin foreign markets. This conclusion leads to a reconsideration of the issue of the mix of transfer channels, which has been debated at length in the literature. The experience of Asian countries in particular and the evolution of Rollei from Germany by LG from Korea, see Lee (2001).
latecomer firms indeed suggest that an adequate absorption capacity may prove more important than the mix of technology transfer.

The importance of absorption and learning capability on the one hand and the positive relationship between this capability and access to a diversified range of knowledge transfer channels on the other hand suggest that policies should foster access to diverse channels. Since continuous access to foreign markets through subcontracting, alliances and FDI has become crucial to the transfer and absorption of strategic knowledge, the nurturing of the multiplicity of channels may be more important than the hierarchy of those channels. This result has been discussed above at the firm level. The major issue of "spillovers" has not yet been discussed because a good understanding of the basic transfer and absorption mechanisms was necessary before turning to diffusion into the local economy. Next section discusses spillovers as they are, logically, strongly related with the broader structure of the recipient economy and to national policies.

3. The Role of Public Policies in Leveraging the Effects of MNEs

Policies aimed at leveraging the effects of multinationals on the host economy may be divided into two groups. Those which directly impact FDI, either by attracting larger flows of investment, or by imposing specific conditions to multinationals when they invest in the country. The second type of policies is indirect and aims at maximizing positive spillovers from inward investment. Both types of policies should be examined in the broader context of the national industrial strategy and the creation of the specific “ownership” advantages of local firms (Lall 1995).

3.1 Refocusing FDI Policies

One of the most persistent issues of the policy debate with respect to the policies that host-countries may follow in order to influence the activities of foreign investors has been whether to require MNEs to take on local partners in joint ventures. With respect to technology transfer a complementary issue has been whether to require foreign firms to license technology to local firms, rather than enter via direct investment. These issues are now less hotly debated as numerous developing countries and economies in transition have liberalized their regulations with respect to FDI and technology transfer. Moreover, a number of empirical studies suggest that liberalization has had positive results on the development of inward investment and technology transfers.
This section examines the role of both specific requirements on foreign firms investing in developing countries and incentives, which have been on the rise over the last two decades.

3.1.1 Policies to limit control by MNEs on transferred assets

Joint venture requirements

Policies requiring joint ventures have been built on the hypothesis that more capital control from local firms would mean stronger linkages with the recipient economy and hence more benefits from FDI.

MNEs choose to team with local partners when they feel that they need support from insiders. This need may stem from a lack of information about the local economy and business practices. Access to local financing or to indigenous managers may also favor the choice of a joint venture as opposed to a wholly owned subsidiary. More generally, lack of knowledge about the country of investment, including about cultural and political, constitutes an incentive to team with a local partner. Smarzynska (1999) finds for example that, at the beginning of the 1990s, MNEs tended to enter economies in transition with joint ventures whenever they felt unfamiliar with the country of investment. We have seen above however, that firms have strong preferences for unambiguous control when foreign operations involve sensitive strategic assets such as frontier technologies or brand names. The issue then is whether developing countries can force firms to relinquish control in these circumstances.

The studies on technology transfer surveyed above suggest that firms will transfer older technologies to joint ventures than to wholly owned subsidiaries. They also suggest that they might shun investment in countries where they anticipate that their technological assets will be endangered. Stringent local regulations about capital control or weak IPR regimes constitute indicators of such risks for companies. Besides, historical record suggests that joint ventures experience high failure rates, which are partially due to opportunism from indigenous partners\(^{54}\) and conflicting views on quality standards, transfer prices or the degree of coordination between the joint venture and the parent (Kogut 1988, Gomes-Casseres 1989, Caves 1996, Smarzynska 1999).

It thus seems that the scope for forcing multinationals into joint ventures is quite limited. If the multinational does accept to enter with an unwanted partner, it will tend to cut back on the resources it commits to the joint venture. As a consequence, the joint venture will

\(^{54}\) Moran (1999) mentions previous studies. More recent experiences in China also suggest that joint ventures can be risky ventures.
generate less technology transfer, have lower quality production and weaker export performances (Ramachandran 1993, Moran 1999). Moreover, when faced with joint venture constraints, MNEs may also simply renounce to invest.

Empirical studies thus suggest that the behavior of multinationals is strongly influenced by the regulatory context in host countries. As a consequence, their choices with respect to modes of entry and to investment should change substantially when a country changes its regulations. Studies on the case of India show that the liberalization of its industrial policy and the relaxation of restrictions with respect to foreign operations have not only attracted much more FDI, but also changed the sectoral composition and technological characteristics of the foreign firms.

A case study of the computer industry found that when India moved away from its policy of mandatory shared ownership and allowed multinationals more leeway, the technological lag with advanced countries decreased.\textsuperscript{55} Aggarwal (1997) shows more generally, that the set of deregulation measures which were decided by the Indian government in the early 1980s have had noticeable consequences on FDI. Liberalization has been quite broad, but measures have been particularly important with respect to foreign trade and investment. The range of industries eligible for FDI has been substantially broadened, administrative procedures have been simplified and duty-free zones have lowered entry barriers for FDI. As a consequence, FDI flows increased rapidly at the end of the 1980s. In his empirical study, Aggarwal (1997) shows that the role of the different determinants of FDI also changed with the regulatory context. In particular, the positive influence of ownership advantages of multinationals, such as marketing and technological assets, increased.\textsuperscript{56} The positive influence of the Indian location advantages also increased. The more liberal regime enabled the Indian competitive advantages to be more clearly directed towards the export sectors. Indeed, until the Indian development strategy changed direction in the early 1980s, government policies deliberately encouraged FDI in import-substituting sectors to achieve the objective of self-reliance. In the more recent period, multinationals have been able to invest relatively more in export intensive sectors.

\textsuperscript{55} The study by Grieco (published in 1984 by University of California Press) is quoted by Moran (1999).
\textsuperscript{56} The share of multinationals' sales is higher in high tech industries and the negative influence of low-mid tech industries increases after deregulation. Results are not as clear as one would expect on the technological asset variables though, which may be due to multicollinearity.
Technology-Licensing Requirements

As we already saw above, countries have used technology-licensing requirements as part of the broader industrial policies aimed at promoting the development of infant-industries. They have been used as part of both import-substitution and export-led growth strategies. In Japan or Korea for example, technology-licensing requirements have been part of a larger set of measures, including restrictions on FDI and imports, export promotion and subsidies aimed at the promotion of national champions. In India, technology-licensing requirements were part of a very restrictive FDI regime until the 1980s.

The discussion of the bargaining hypothesis above (section 2.1.2) concluded that firms would typically not license their most recent technologies, except to wholly owned subsidiaries. Which means that in those cases, they may shun both licensing and entering joint ventures with local partners. The discussion also underscored the role of the IPR regime as an incentive to license, as opposed to internalized modes of technology transfers. This suggests that technology-licensing requirements might slow down the process of technology transfer, or reduce the quality of imported technologies. Moreover, both the empirical evidence and theoretical discussions on learning reviewed above, suggest that imported knowledge is complementary to in-house technological efforts. As a consequence, a reduction in technological imports will have both a direct and an indirect depressing effect on the technological capability of recipient country.

Aggarwal (2000) has specifically tested the incidence of the liberalization of FDI measures that the Indian government decided in the 1980s on technological imports. The intensity of technological imports was measured as the ratio of technology payments made abroad to industry sales. The intensity of technological imports was explained by a set of variables related to industry characteristics, including in particular regulatory and technological characteristics. The specification further distinguishes the pre- and post-deregulation periods, 1985 being the cut-off year. Results clearly show that the intensity of technological imports has increased across the board after 1985. The measurement of the influence of deregulation on different industries depending on their specific characteristics suggests that governmental policies also have strong effects on the sectoral allocation of imported technologies.

In the restricted regime, the Indian government encouraged technology imports in the 'core and priority industries', which were explicitly listed (Aggarwal 2000). Some of these industries were capital intensive and some were high tech sectors. Overall, the empirical study shows that under the liberalized regime, core sectors still have a high intensity of
technology imports relatively to other sectors, but less so than in the regulated regime. In the deregulated regime, capital intensity, advertising intensity and R&D intensity positively influence technology imports intensity. Besides, technology import intensity is more consistently positively influenced by past domestic R&D effort than in the regulated regime. Aggarwal (2000) explains that in the regulated regime, only the core sectors enjoyed a relatively liberal access to foreign technologies in order to enhance their own R&D efforts. In other sectors, imports of foreign technologies were only allowed in areas where domestic technologies were not available. As a result, no statistically significant relationship between past domestic R&D and technology imports intensity could be observed out of the core sectors under the regulated regime. The studies of the change in FDI regulations in India thus show that such regulations had a strong restrictive influence, on the amount of both foreign investment flows (Aggarwal 1997) and on technology imports (Aggarwal 2000). They further show that these restrictions also distorted the allocation of these foreign flows between sectors. In the deregulated regime in particular, technology imports increased significantly in marketing intensive sectors - which were typically not ‘core’ sectors.

These assessments of the consequences of changes in FDI regimes thus broadly confirm the discussion of technology transfers in section 2. In the import-substitution development strategy, technology imports were viewed as the import of blueprints, which could serve as substitutes for absent indigenous technologies. In the current more liberal regimes, technology imports are viewed as complements to local R&D efforts. Moreover, interactions tend to go both ways, with indigenous efforts as a prerequisite for technology imports, and transfers triggering further absorption efforts.

Korea constitutes a further illustration of this reconsideration of the role of inward foreign investment as a source of effective knowledge transfers. American firms have played a crucial role in the creation of the chip assembly industry in the 1960s and 1970s, both by transferring knowledge and by opening export channels (Ernst 1994). They also played an important role in consumer electronics. But, after this first period, chaebols began to dominate the electronic industry and relied on OEM relations to increase their exports. As discussed above, Korean firms progressively increased their efforts to upgrade their technological capabilities, combining licensing with own R&D. As they have come closer to the technological frontier they have felt the need to speed up learning and to get in more direct contact with research by the world leaders, while the latter were more and more reluctant to enter licensing agreements with the Korean competitors. Korean firms have engaged in international technological alliances and outward direct investment in R&D.
laboratories or acquisitions of high tech firms with this objective.\footnote{See table 1 and the discussion.} This strategy turns out to be quite risky for relatively inexperienced multinationals (Sachwald 2001). Besides, it focuses on the chaebols, with the result that the technology transfers may not spill over so well to suppliers and smaller firms, as the Korean industrial structure is highly concentrated. The liberalization of FDI policies after the 1997 crisis was partly motivated by financial consideration, but the policy change was also advocated on the grounds of knowledge transfers and efficiency promotion (Kim 1997, Yun 1999).

A final consideration on technology-licensing requirements in relation with import substitution relates to the acceleration of technological progress. In such a context, it seems particularly inefficient to both protect an industry from imports in order to allow domestic firms to progressively build-up their technological capability and to hinder the process of technology transfer by imposing restrictions on it. Such a policy implies that development will take a very long time. Moreover, indigenous technologies will tend to be obsolete, which will make exports impossible and render protection necessary forever. Radosevic (1999) argues that "the main problem in the substitution idea is not its feasibility but its cost and the dynamic potential of technological development behind the protective barriers" p. 119).

In summary, these different results suggest that national policies should not try to favor licenses over FDI or joint ventures, or to precisely control technology transfer agreements. Policies should rather foster interactions between domestic and foreign enterprises abroad or at home in the hope that the production integration will generate efficient knowledge transfers.

3.1.2 Policies to attract and shape the activities of MNEs

Given the desire of many developing countries to achieve rapid growth through the promotion of exports and follow in the footsteps of some of these Asian success stories, attracting FDI into export activities may be considered as a complementary strategy to improving the capabilities of domestic enterprises. From a policy perspective, the empirical studies that have found positive spillovers proportional to foreign presence imply that host country governments aiming at maximizing these benefits should perhaps offer some incentives to increase the inflow of FDI. Another related question is whether host country governments should intervene to shape the activities of MNEs in order to maximize domestic welfare.
Export-performance and domestic-content requirements

According to Moran (1999), export-performance requirements appear to have played a key role not only in shaping the activities of MNEs but also in attracting substantial industrial operations as a starter/catalyst in some developing countries. In the automotive sector, despite growing competitive pressure from Japanese manufacturers, US and European carmakers were reluctant to expand sourcing patterns in cheaper cost-production locations in Latin America. International sourcing strategies were opposed on from different grounds: cultural prejudice about local ‘work ethics’, opposition from labor unions and administrative authorities at home, as well as opposition from within the parent companies. In Mexico, the government, concerned about a growing trade deficit in the automotive sector, adopted a trade-balancing Trade-Related Investment Measure (TRIM) in 1977, requiring that imports be matched with exports. US MNEs tentatively pressured the Mexican government to drop its export-performance requirements but eventually failed to win the political bargaining game. The decision by General Motors to launch its largest-ever overseas investment in 1979 was a turning point, which led other US and European rivals to follow suit in a typical oligopolistic reaction framework. This in turn stimulated complementary investments by foreign parts firms, creating extensive backward linkages within Mexico, who became one of the largest developing-country exporter in the automotive sector in the world (exports of $14 billion and employment of 364,000 by the mid-1990s). Mexican automotive exports to the U.S. rose 4.6 times during 1990-97, from $4.5 billion to $20.8 billion. This industry accounts for over 21 per cent of the value of Mexico’s total exports to North America (Mortimore 1998).

In the Asian electronics industry, export-performance requirements were not as heavy as in the automotive sector, similar to what Moran (1999) calls the “Irish model”: combining locational incentives, preferential labor regulations, tax rebates for exports, with subsidized land in free-trade zones. Follow-the-leader behavior also occurred among US electronics firms in Asia from the late 1960s, with General Electric’s first move in 1968 matched the following year by RCA and Zenith. US subsidiaries, as in the automotive sector, were integrated into the parent’s global and regional sourcing networks to serve developed country markets. As a result, they have been transferring more advanced technological and

58 Ford, Chrysler, and Volkswagen followed GM within months. Nissan joined the bandwagon in less than a year (Moran 1999, p. 54).
59 Moran (1999) explains the success of the Mexican experience in the automotive sector (and also of Brazil) by the relative flexibility for foreign investors in terms of how to meet the affiliates’ export requirements. He asks whether the fact that there were more constraints in Malaysia can explain the difficulties of the national car project (Proton). Also, international rivalry did not play a role in Malaysia due to the exclusive joint venture relationship with one Japanese manufacturer (Mitsubishi).
managerial responsibilities to local suppliers: “...US firms upgraded their Asian investments in line with the pace of development of the lead market being served, the US market. In essence, they upgraded in line with US rather than local product cycles” (Borrus 1997, 6). In contrast, Japanese firms kept their higher value-added operations at home, and upgraded the technological capacities of their Asian plants at the slower pace necessary to serve lagging local markets. However, Ernst (1997) shows that, since the early 1990s, Japanese firms have been forced to change the key features of their Asian production networks, and are now more willing to interact with local companies and increase their Asian value-added.60 Despite these overall positive experiences in the automotive and electronics industries in Latin America and Asia, UNCTAD (2001, 170) considers one should not generalize these results and believe that export-performance requirements invariably produce favourable outcomes as regards linkages to domestic suppliers in host countries.

Aside from export-performance requirements, many host country governments in developing countries have imposed domestic-content requirements on MNEs' affiliates in order to enhance industrial upgrading and develop backward linkages. The empirical evidence on the effectiveness of such ‘developmental tool’ is mixed. Some studies suggest that domestic or local content requirements contributed to the development of supplier industries in Korea, Taiwan, Brazil, Mexico and Thailand before the 1990s.61 Others have questioned the efficiency of such measures. For example, a survey of 16 countries with automobile assembly operations found that domestic-content levels as low as 18-20 per cent induced price differentials up to 2 times as high as the cost of imports.62 This raises the question on how one can disentangle the effects of domestic-content and export-performance requirements, which were often used simultaneously by host countries. Despite domestic-content requirement set at 60 per cent in the 1960s and 1970s in the Mexican automotive sector, Moran (1999) suggests Mexico managed to establish a relatively firm automotive export base thanks mainly to its export-performance requirements policy. However, one cannot conclude that, if it were not for domestic-content requirements, the development strategy followed by Mexico in the automotive sectors could have been more rapid. Observations from China suggest that local content requirements did promote the development of domestic suppliers, but at the cost of low efficiency, high costs of production and hence a loss of competitiveness of these local firms – as well as foreign car

60 This move was notably motivated in 1991 by ‘the effect of the Yen appreciation, the bursting of the bubble economy and the Japanese recession.
61 See Box V.3., p. 169, UNCTAD (2001).
62 Study quoted in Moran (1999, p. 43); for more details on the empirical record of domestic-content requirements, see Chapter 4.
In conclusion, the case for local content requirements is similar to that of infant industry protection as it relies on the need to promote infant supply firms during their learning stage: “Where used carefully, with offsetting measures to ensure that suppliers face competitive pressures and have access to the technology and skills they need to improve their capabilities, [local content requirements] can foster efficient suppliers. Where used in a protected setting, with few pressures to invest in building competitive capabilities, they can result in inefficient suppliers that saddle the economy with high costs, outdated technologies or redundant skills” (UNCTAD 2001, 169). Actually, host country requirements are now being progressively phased out as a result of international commitments: the 1995 WTO TRIMs Agreement, and a number of regional or bilateral agreements that explicitly prohibit or discourage them and may extend their scope at the multilateral level.

**Locational incentives**

Whereas export requirements by developing countries do seem to have an influence on foreign investors’ investment decision, the impact of locational incentives on FDI inflows is more controversial. Should developing countries participate in the global race among local and national governments to attract FDI, considering their more limited financial resources in comparison to developed countries’ standard? Most empirical studies tend to show that the effect of tax policy on FDI is rather limited, at least compared to other factors such as political stability, the costs and quality of labor and infrastructure, and in any case can not compensate for a poor investment climate. Gastanaga, Nugent and Pashamova (1998) also stress the importance of host country reforms and the economic environment on FDI inflows. According to Morisset and Pirnia (2001), many countries from South America and Sub-Saharan Africa have offered investment incentives for MNEs to locate in underdeveloped regions with little success in generating sustainable FDI flows. While tax policy generally does not rank among the most important locational variables, it may nevertheless affect the decisions of some investors. For example, the impact of tax rates on investment decisions appears higher on export-oriented firms than on domestic market-seeking firms, and small investors are generally more responsive to tax incentives than large ones. On the other hand, large MNEs are also more likely to receive special tax treatments (Oman 2000).

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64 For details on the 1995 WTO TRIMs Agreement and other international agreements on host country operational measures, see UNCTAD (2001), pp. 169-170.

65 For a recent survey on the impact of tax policy on FDI, see Morisset and Pirnia (2001).

66 These results are mentionned in Morisset and Pirnia (2001, 10-11).
Evidence from the ASEAN4 (Indonesia, Malaysia, Philippines, Thailand) experience on investment promotion indicate that export-oriented firms and MNEs likely to transfer technology are given numerous incentives, such as automatic approvals, land ownership, full control of the affiliate, tax holidays and duty free imports of components (OECD 1999, 31). As argued in the report, these measures are more selective removal of distortions in economies traditionally less opened to foreign investors than incentives in the sense of the term in OECD countries. Typically, the ASEAN4 countries are less likely to offer grants to potential investors due to financial resources constraints. This is also the case of Korea, who started to liberalize its FDI regime by the mid-1980s, and to seek actively foreign investors only after the financial crisis of 1997 in order to strengthening stability in foreign reserves and to assist with corporate restructuring (Yun 2001). For example, Korean local governments are now given increased power to attract foreign investors through local tax exemption, land leases, or development and management of foreign investment zones, but it is too early to assess whether such policies have been effective.

The experience with export-processing zones (EPZs) does provide some insights on the prospective benefits of tax heavens. Many developing countries (Costa Rica, China, Mauritius, Bangladesh, Singapore, Malaysia, and Sri Lanka) have enjoyed remarkable growth in manufactured exports from EPZs, which offer various incentives such as tax holidays and access to duty free imports. EPZs account for 50 per cent of Haiti’s garment exports and 77 per cent of Mauritius’s total exports (UNCTAD 1999, 237). Despite the relative successes of Malaysia and Singapore, the systematic use of incentives to attract FDI to EPZs often casts doubts about the overall positive contribution to the local economy. There may well be a short-term increase in exports based on low-skilled labor with little spillover to domestic firms and technology development, which may create a dual economy between the EPZ firms and those operating under the ‘normal’ regime. In any event, when deepened linkages do seem to occur, the process takes time as the case of Bangladesh demonstrates. In a comprehensive statistical analysis, Johansson and Nilsson (1997) show that EPZs have increased total exports of several developing countries (Hong Kong, Malaysia, Mauritius, Singapore and Sri Lanka). One common feature is their outward-oriented trade policy, combined with a favorable location and access to relatively high-skilled labor. In the case of Malaysia, the export-generating effect is larger than the exports from the country’s EPZs, indicating the presence of a catalyst effect. However the effect does not increase over time and turns out to be fairly constant.

67 In Bangladesh, the garment industry is only moving now beyond the simple assembly of shirts although clothing exports began in the 1970s (UNCTAD 1999, 237).
In light of these experiences, what lessons have we learned regarding FDI promotion? Following Hanson (2001), one sensible approach is to presume that subsidies to FDI are not warranted, unless there is strong evidence of substantial positive spillovers associated with multinational activities, and where MNEs are unlikely to choose the host country or region considered without any specific incentive. The problem is that even if FDI promotion policies are not justified, host-country governments feel compelled to offer special subsidies given the context of the global ‘tournament for FDI’. Also, promoting FDI may serve the interests of host-country politicians if they can benefit specific constituencies. In an ideal scheme, Hanson suggests increased cooperation among governments to prevent MNEs from extracting all gains associated with their presence in host economies.

3.2 Fostering Spillovers and National Absorptive Capabilities

One major lesson from the literature is that knowledge transfers should be viewed as processes, including learning efforts in the recipient country, rather than one-off import of technology. The above discussion of the process of construction of technological capability suggests that latecomer firms learn through continuous market and technology access which puts a firm on the path of knowledge accumulation and enables its catching-up. This perspective raises two interrelated policy issues. Firstly that of access to foreign technology, which was dealt with above. The conclusion here was that liberal FDI policies and reasonably strong and predictable IPR regimes constitute incentives for multinationals to increase the transfer of up-to-date technology. The second set of issues relates to the learning and spillover processes in the recipient countries. This section now turns to the relevant national policies that may enable a country to use foreign knowledge in order to move domestic firms from technologically simpler to more complex sourcing positions based on dynamic learning.

3.2.1 Competition and market structure

FDI flows and multinationals exist to compensate for transaction costs and market imperfections. In turn, they generate or increase barriers to entry and rents. Looking at either home or host countries, there is pervasive evidence of a correlation between market imperfections or concentration and FDI.\(^{68}\) Both multinationals and host governments are trying to capture the benefits and rents from these activities, which is one major explanation for the tradition of mistrust between them. Host governments have typically set up policies to

\(^{68}\) Part 2 discussed the role of multinationals as an internalization of costly transactions. For reviews and references on empirical studies, see (Dunning 1993, Pitelis and Sugden 2000).
ensure control of rent generating assets, and in particular technology, by local firms. These policies have also typically been embedded in broader industrial and trade policies. Besides, developing countries are more generally typified by a lack of efficient markets and institutions (Khanna and Palepu 1999, Lall 2000). As a result, one major problem has been that the firms that were allowed to receive technology transfers, be they domestic or foreign owned, have tended to face too weak competition and incentives to upgrade.

Lall (1996) explains the role of this general context for India. Indian technology-import policies have had many features in common with those of Korea, also using specific policies to restrict FDI and promote licensing in targeted sectors. In India however

« ... this was done in an environment of stifling inward orientation, detailed bureaucratic licensing of industry, limitations on the growth of large firms, strong preferences for public enterprises [and] restrictions on imports of licensed technology [...] The licensing system led to widespread rent-seeking, the setting up of suboptimal sized plants, and over-diversification of business houses [...].

Until the late 1980s FDI inflows into India were minuscule; unfortunately, other access to technology was also limited. The trade strategy meant that the role of foreign buyers was very limited; and the lack of OEM purchases meant that the engineering sector remained deprived of modern designs and know-how. Capital-goods production was itself highly protected until the late 1980s, and importers had to establish that there were no domestic suppliers available, largely regardless of price and technological features [...]. All these interventions in technology purchases meant that the extent and depth of technology inflows to Indian industry suffered. In combination with the trade-incentive regime, this led to large areas of uncompetitiveness and technological sloth in industry. This is not to say that no technological development took place [...] Yet the extent of learning and dynamism was clearly far less than in Korea.» (p. 76)

The author further stresses the role of export targets in pushing Korean private groups into acquiring foreign technologies and investing in world-class equipment. The contrast between the experience of India and that of Korea underscore the role of public policies and structure of incentive on entrepreneurship. In turn, the use of imported knowledge whether as a part of FDI package or under contractual arrangements for the augmentation of local capability to respond to the challenges of competitive industrialization seems to depend on the quality of local entrepreneurship (Lall 1996, Kumar 1998). Local entrepreneurship in turn interacts with the extent of competition in the markets in which the FDI is embedded.

Competitive and variegated local suppliers constitute one important asset to enhance spillovers from FDI. Vertical linkages are one major channel of technology transfer (UNCTAD 2001). As a consequence, numerous and competitive local suppliers of intermediate goods and components stimulate technology transfers and learning. On the contrary, high concentration or weak suppliers will reduce positive spillovers from foreign affiliates. The dearth of small private enterprises in Vietnam for example hinders technology transfers from multinationals. In such a context, reforms of the financial sector and of the large public
enterprises will both stimulate the creation of new small private firms and enhance spillovers from foreign affiliates (Paulmier and Sachwald 2002).

3.2.2 Policies to enhance the absorption and learning capability

Since technology transfers and spillovers depend on the local absorption capabilities, policies which aim at increasing the latter will enhance the positive impact of FDI. Relevant policies should target both education and training as well as the local R&D capabilities. This complex set of policies can at best be rapidly mentioned here in relation with FDI and technology transfer.

Numerous studies have underscored the fundamental role of government policies to foster investment in generic immobile assets, including first basic education and training more broadly (Lall 2000, Mani 2000). Infrastructure, including in information and telecommunication, is also very important. As suggested in the box below, even least developed countries can benefit from such generic policies to attract FDI and leverage FDI to meet nationalist developmental objectives.

### FDI in Least Developed Countries

According to UNCTAD (2001b), FDI flows to the 49 LDCs as a group increased from an annual average of $0.6 billion in 1986-1990 to an annual average of $3.6 billion during the latter half of the 1990s. Overall, however, the share of LDCs in total FDI inflows to developing countries declined slightly from 2.2 per cent in 1986-1990 to 2.0 per cent in 1996-1999, as FDI to other developing countries grew faster. Nevertheless, with Official Development Assistance (ODA) to LDCs declining, FDI is now playing a more prominent role and is changing the structure of external financial flows in many LDCs. In the 1990s 29 countries experienced simultaneously increases in FDI and decreases in bilateral ODA; in six LDCs, FDI inflows even exceeded bilateral ODA flows.

Contrary to the general perception by foreign investors that, if there are any investment opportunities at all, they are mainly limited to natural resource related industries, a number of countries offer promising opportunities in various sectors, e.g. Bangladesh (textiles and garments manufacturing, computer software programming and data entry management), Uganda (telecommunication services, beverages and food processing, privatization of the national airline, financial institutions, public utilities…). Odenthal (2001) considers the Ugandan experience - where economic and political stabilisation, improvements in the provision of infrastructure services - has done much to improve investors’ confidence, as a promising example of how adherence to reforms can make a difference in terms of FDI, which may serve as a good example for other African countries. The introduction of a linkage programme is considered, providing special incentives for MNEs to establish or deepen up- or down-stream linkages with Ugandan firms, as well as the establishment of “Multi-Facility Economic Zones”, areas that would receive priority attention in upgrading infrastructure facilities. Despite these positive developments, many obstacles to attract further FDI remain: inefficient logistics in the transport sector, shortages of a skilled workforce, corruption and “red tape”. Morisset (2000) also shows that a few Sub-Saharan African countries have generated the interest of international investors thanks to pro-active policies and reform-oriented governments, suggesting that they can become competitive internationally and attract FDI on a sustainable basis, that is not based on natural resources or aimed at the local market, but rather at regional and global markets.
The experiences of Mali and Mozambique reveal that, beyond macroeconomic and political stability, those countries focused on a few strategic actions that do not differ significantly from the policies implemented in Singapore and Ireland, such as opening the economy through a trade liberalization reform, launching an attractive privatization programme, modernizing mining and investment codes, adopting international agreements related to FDI, developing a few priority projects that have a multiplier effect on other investment projects, and mounting an image building effort with the participation of high political figures.

Sources: Morisset (2000), Odenthal (2001), UNCTAD (2001b)

Investment in education and training has proved fundamental in the catching-up process of East-Asian countries and should be considered an important lesson even for least developed countries. Presently, some poor countries, such as Vietnam, do take advantage of their education system to attract FDI, the challenge being to trigger a virtuous circle between the improvement of the education system and higher quality foreign investment (Paulmier and Sachwald 2002). As a country catches up and ventures into more creative and innovative paths, the education system has to become increasingly sophisticated and R&D – both public and private - has to be fostered. Increasing local absorptive capability is actually important for technology transfer in general and not only via FDI. In the case of Korea for example, OEM has been a major channel of technology transfer, but proved so successful because local firms have been keen learners and because the Government carefully supported firms’ efforts in learning and R&D investments (Hobday 1995, Cyhn 2002).

Learning within the firm is indeed the major engine of technological upgrading and competence building. Moreover, learning has to go beyond mere learning by doing (Bell and Pavitt 1993). In this perspective, it is important to underscore the interdependence between technical and organizational or institutional innovations, which is a major feature of sustained technical change. As a consequence, relevant public policies actually go beyond support to education and research, to include institutional reforms. Much attention is currently devoted to the issue of intellectual property rights from this perspective. This survey has underscored the role of the IP local framework to attract FDI in a number of sectors, including high tech. IPRs are also important for local firms once they begin to innovate themselves and rely more on innovation to compete.

More generally, policies aiming at fostering local absorptive capacity increasingly appear connected to innovation policies. In the 1960s and 1970s, domestic technology policy was most often separate from technology import considerations, or was weak and undeveloped. As discussed above, countries following “technonationalist” strategies in countries such as India or Korea have created “hot house” development environments through trade barriers and subsidies to shield local firms from foreign competition (Ritchie 2001). Recent studies suggest on the contrary to organize close interactions between technology transfer and
national innovation policies (Lee and Lim 2001). Singapore has thus developed specific policies to attract R&D operations and, at the same time, upgrade local formation (Amsden et al. 2001). In this perspective, technology transfer channels are complementary and the key objective of technology transfer policy is to increase connectivity between a national system of innovation and a foreign science and technology base across a wide range of contact points (Radošević 1999, 10).

Conclusions

This survey suggests that static and dynamic effects of FDI for developing countries are potentially substantial. The effective contribution of FDI to domestic growth and technological upgrading however depends crucially on the economic and institutional context in the host country. In particular, knowledge transfers and productivity spillovers depend on the accumulated stock of human capital in the host country. More generally, the survey has extensively discussed the crucial role of local absorptive capabilities, which in turn depend on the local institutional context. Results from various studies thus indicate that FDI can play a very effective complementary and catalytic role in the process of development, provided countries adapt their own capabilities to harness the potential of global markets and production networks. On the contrary, subsidies may lure some foreign firms, but are not sufficient to promote either their extensive cooperation or to ensure spillovers. More generally, since the 1980s, the reversal of attitude vis-à-vis FDI may have led host country governments to expect too much from multinationals and could have exacerbated “investment wars” through which potential hosts try to woe IDE away from other countries.  

Host countries should rather devise lucid policies that aim at maximizing the benefits and minimizing the costs from incorporating FDI into their development strategies. The literature surveyed here suggests that government should encourage inward FDI and offers some insights on the effective policy levers to encourage FDI and capture related spillovers.

Policy Implications for Host Countries

Empirical studies suggest that foreign units that are tightly integrated into the global networks of the parent company tend to generate more technology transfers and spillovers in host countries. This in turn suggests that host countries should allow parent companies to choose the characteristics of their affiliates, including in particular full ownership and the extent of technology transfers. Such an attitude constitutes a “paradigm reversal” for

69 This trend is not new as Bergsten (1974) identified it in the 1970s, but it has spread among both developed and developing countries (Oman 2000, Moran 2001).
authorities in developing countries, where traditional policies aimed on the contrary at controlling foreign units to ensure that their behavior would benefit the host country (Moran 2001). The previous paradigm was consonant with a whole set of policies aimed at promoting import substitution in a technonationalist perspective. In the context of globalization, broader policies have evolved away from import substitution strategies and it may seem logical that FDI policies also change.

The prospective benefits from changes in rules impacting FDI directly should be enhanced by changes in the general business environment aimed at strengthening the rule of law and market institutions. Empirical studies show in particular that corruption and weak intellectual property regimes tend to reduce the amount of FDI into a country and to attract lower quality projects. More generally, the literature strongly suggests that there are multiple interactions between different types of market institutions and policies which influence investment, so that reforms should probably target different areas.

Studies show that attracting FDI is not enough to ensure the potential benefits of such investments for host economies since positive spillovers crucially depend on the local context. As a consequence, host countries should also carefully strengthen their absorptive capacity. Relevant policy areas include education, training and the innovation system. Adequate policies to upgrade the local absorptive capacity are required to maximize the spillovers and positive effects of FDI in all productive activities and not only in high tech sectors. The above three broad sets of policies may seem to set an overwhelming agenda for host countries. Actually, these policies should be integrated into the national development strategy rather than considered as specifically aimed at foreign investment. Such a perspective would help integrating foreign companies’ operations into the local business environment, which would become more transparent and predictable for all types of companies.

Developing and emerging countries should thus be able to substantially increase the development returns to FDI. A number of poor countries on the contrary are cut from FDI sources, although recent trends show that some LDCs are beginning to attract foreign investors and rewarding projects. Such examples (as in the box above) suggest that poor countries may not be necessarily trapped at the very beginning of the investment development path. A major difficulty is that these countries are faced with an overall development problem and that they would need to work at the whole set of relevant policies without much assets and attractive features to start from. Foreign aid and international consultancy should probably be called for in such cases, with FDI as only a secondary, but complementary, source of investment and technology transfer.
Interactions with Global and Regional Governance

The evolution of local policies should be eased by concurrent changes in the global governance context of international exchanges. In particular, both developed and developing countries should consider the empirical results discussed here as a further incentive to implement the TRIMs Agreement of the Uruguay Round. The latter includes the phasing out of domestic content regulations, while a number of countries have been implementing new requirements in this area. The European Union, NAFTA and Mercosur have been including high local content rules of origin as part of their preferential trade agreements. These rules should probably be harmonized and lightened in order to promote high quality FDI (Moran 2001). Subsidies, in particular from developed countries, also tend to slow down the international reallocation of activities, through trade and FDI (Moran 1999, Graham 2000, Mytelka 2000).

Legitimate and credible competition policy and intellectual property institutions are important both to attract FDI and to leverage that FDI to meet national developmental objectives. Local competition is instrumental in curbing multinationals' market power and in enhancing spillovers throughout the economy. Multinational institutions and negociations should probably more explicitly take into consideration the needs of developing countries in these areas. Regional institutions might provide complementary fora to deal with the relevant issues, but regional integration areas can not generate the same benefits as FDI from all over the world.70 Regional integration plays a complementary role to global integration, rather than substitutes for it, as demonstrated by the experience of the European Union with FDI, including since the 1980s (Sachwald 1994).

A major issue in the present context of globalisation is that of the interactions between the process of liberalisation into which developing countries are engaged and their ability to conduct policies to catch up and promote development. “Korean strategies” can not be reproduced as a country can not export and keep its local market protected from imports and competition from multinationals. Besides, countries can benefit from the presence of foreign companies, provided the local context attracts FDI and nurtures the channels for spillovers from multinationals. In the case of China for example, protection of the state owned enterprises from competition entails various kinds of restrictions on foreign owned firms, including on their ability to choose where to locate. These restrictions contribute to their clustering in coastal provinces and cuts the rest of the countries from the benefits of FDI, which in turn reinforces inequalities within China. The Chinese government seems thus

70 For a discussion of this issue, see Narula (2002).
caught in a quandary: it preserves the current industrial structure in the interior provinces to avoid the social instability that may result from more competition, but this policy proves increasingly destabilizing itself. Graham and Wada (2001) argue that the way to break the quandary is to “phase-in procompetitive deregulation” (p. 25), progressively but explicitly.

Reflecting on the quite different case of African countries, Lall (2000) suggests that they can take advantage of the adjustment periods allowed by WTO agreements to design gradual liberalization policies. He also emphasises the importance of pre-announcing the phasing-out of protection. He further suggests that the management of the liberalisation process should be combined with “supply side policies of the type being increasingly used in industrial countries as part of competitiveness strategy” (p. 33). These suggestions build upon the results of empirical research on the interactions between foreign investment, trade and the local economy. More research should be devoted though to the strategies and tools to successfully design these policy packages.

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