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Foreign Direct Investment, Technology and Skills in Developing Countries

Preface to the Collection

A combination of foreign direct investment (FDI) and skills promotion by government has been shown to facilitate growth and poverty reduction. It is hence important to implement policies that help improve the foreign investment climate while boosting the contribution of multinational enterprises (MNEs) to domestic development through spill-over effects.

This collection of articles is a contribution to understanding the interactions between FDI and domestic human capital formation. It shows that an active governmental policy with substantial investment in education, training and technology is a major factor in attracting high value-added FDI into a developing country. This tends to enhance spill-over effects from MNEs reinforcing the country's attractiveness for further FDI and stimulating long-term development with positive externalities. Until recently, there was little evidence and few analyses of these issues; and what scarce evidence did exist was inconclusive. One of the pioneer efforts to resolve the question was the OECD Development Centre's meeting on FDI and human capital formation in December 2001, which provided the starting point for this research.

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February 2008

Introduction and Policy Issues*

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Abstract

This article presents a brief discussion of the main issues in this collection: the importance of foreign direct investment (FDI) spillovers in developing countries, policies to attract FDI and enhance FDI spillovers. It summarises how, in the context of the impressive expansion of FDI since the beginning of the 1990s, raising the level and quality of human capital is seen to be indispensable for attracting FDI as well as to enable host countries to gain maximum benefits from their activities. However, FDI spillovers appear to differ from country to country depending on the type of multinational enterprises involved and on the contexts of the host economy. It is shown that a good investment climate is not enough to enhance FDI spillovers. Recent evidence demonstrates a clear positive relationship between the firm's economic performance and its investment in human resource development, and a complementary relation of education with training and technology. Therefore policies targeting variables such as the promotion of education and training (the inducement of higher competitiveness and absorptive capacity in domestic firms) and the targeting of FDI with high value added have all proved successful.

* This article is one of six resulting from an expert workshop convened by the Development Centre on Financing Development. Spanish translations of these articles have been published together by the Colegio de México in a book entitled *Inversión extranjera directa, tecnología y recursos humanos en los países en desarrollo*. See Preface to the collection at the end of this article.

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Introduction

This article is based on research at the OECD Development Centre that had started from a technical meeting at the Centre in 2001, in which a number of experts had examined the links between FDI and human capital development in developing countries. It provides a synthesis of the discussion during this meeting as well as an account of further studies done in this area. It is composed of selected contributions from economists at the OECD, the United Nations, the World Bank, Tokyo University(Japan), El Colegio de Mexico and the University of Warwick. The aim is to analyse the links between human capital formation and FDI with special attention to the nature and extent of FDI spillovers. The definition of FDI provided by UNCTAD is adopted: "An investment involving a long-term relationship and reflecting a lasting interest and control by a resident entity in one economy (foreign direct investor or parent enterprise) in an enterprise resident in an economy other than that of the foreign direct investor (FDI enterprise or affiliate enterprise or foreign affiliate)" (UNCTAD, 2004, p. 345)[2].

This article presents a brief introduction to the main issues. The main features of FDI global trends are presented in the next section. The third section explains the type of investment climate that would help to attract FDI to developing countries. The fourth section focuses on empirical findings in FDI spillovers involving technology and Human Resource Development (HRD) in developing countries, with particular emphasis on the relationship between FDI spillovers, economic performance, domestic technological change and HRD. The fifth and last section discusses policies relevant to the enhancement of FDI spillovers.

Major Trends

Two recent overviews of the major world trends in FDI, by sector and by region and particularly in the developing countries, are provided in the articles by Miyamoto and by Mercado. The main features of these overviews are briefly presented below.

One of the most salient features of the two overviews is the impressive expansion of FDI since the beginning of the 1990s. Another feature is the sharp increase in investment flows to developing countries in the last two decades. Developing countries' inward stock of FDI amounted to about one-third of their GDP in 2002, compared to just 10 per cent in 1980. One-third of global trade is

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intra-firm trade between the affiliates of MNEs or transnational corporations[3]. A survey of transnational corporations in 14 OECD countries finds that their numbers increased from some 7 000 in the late 1960s to 24 000 in 1990 and 64 000 at the beginning of the new millennium, according to UNCTAD's estimates (Fredriksson, 2003, p. 8). These firms control around 870 000 foreign affiliates, account for about two-thirds of world trade and an even greater share of industrial research and development (R&D) and directly employ more than 53 million workers in their foreign affiliates around the world (UNCTAD, 2003). In 2002, moreover, total sales by foreign affiliates amounted to almost $18 000 billion — more than twice the value of world exports of goods and non-factor services (UNCTAD, 2002; Fredriksson, 2003, p. 8).

Another feature of the FDI global trend is a convergence of the inward FDI trend in Latin American and the Caribbean with respect to developing Asian countries, with a recent catching-up trend in Latin American countries.

FDI has the potential to generate employment, raise productivity, transfer skills and technology, enhance exports and contribute to the long-term economic development of developing countries. More than ever, countries at all levels of development seek to use FDI for development. One means by which FDI can stimulate economic growth is through spillovers of technology, knowledge and skills to domestic enterprises. Three empirical questions concerning these spillovers arise: how important are they in practice? What are the principal mechanisms by which they occur? What public policies and private actions by domestic and foreign enterprises can induce greater positive spillovers? This collection of articles explores these questions in depth with evidence from developing economies.

Domestic Climate to Attract FDI

Recent research findings provide strong evidence to indicate that outward FDI seeks large markets as well as relatively cheap and skilled labour in developing countries (for the case of US outward investment, see Carr *et al*., 2004). A high level of human capital is without doubt one of the key ingredients for attracting FDI, as well being a requirement if host countries are to gain the maximum benefit from their activities. Miyamoto argues the benefit for host developing countries of attracting any type of FDI for which there is a need for a labour force with at least basic schooling. The type of human capital necessary to attract FDI obviously depends on the type of FDI host countries seek. To attract high value added MNEs it is necessary to further develop the skill level of the labour force, and to reduce the distance between learning institutions and the industry.

Batra and Stone confirm that key attributes of the investment climate critically affect firm performance (as measured by the growth of sales, employment and investment). Corruption, financing, tax administration, regulations and policy uncertainty all matter in explaining firms' outcomes. Batra and Stone reveal the negative relationship between burdensome labour regulations and employment growth, suggesting that excessive labour regulations may deter investment (and employment growth). The authors conclude that a good investment climate stimulates growth and argue that an essential priority for governments that want to encourage growth is to address fundamental issues such as good governance, properly functioning financial systems and stable policies.

Part of the domestic climate necessary to attract FDI is the degree of economic liberalisation of the host countries, but this should be complemented with substantial governmental support for education. O'Connor and Lunati argue that insofar as reduced educational investment implies reduced per capita income levels and perhaps slower income growth in the future, liberalisation measures may need to be accompanied by special government efforts to bolster private educational incentives. However, on the negative side the countries in which such efforts are required are likely to be among the poorest whose governments lack the necessary domestic resource base. In such cases foreign assistance with education acquires great importance.

FDI Spillovers involving Technology and HRD

There is growing evidence that suggests that FDI is generating technology spillovers For instance, in the case of Mexico, Blomström and Wolff (1994) find statistically significant spillovers, claiming that FDI had a positive impact on the rate of growth of Mexican productivity between 1965 and 1982. In Asia, Chuang and Lin (1999) and Sjoholm (1999) also reveal significant knowledge spillovers from MNEs in Taiwan and Indonesia respectively. Since inward FDI in developing countries can make a substantial contribution to the host economy, these spillovers tend to be a centre of attention for policy makers. However, FDI spillovers seem to differ across countries, depending on the type of MNE subsidiaries involved and on microeconomic and macroeconomic variables of the host economy. Aitken and Harrison (1999), for example, found that FDI inflows negatively affected the productivity of domestic plants in Venezuela. Mercado argues that Latin American countries have lagged behind developing Asian countries as regards enhancing MNE spillovers. The understanding of these differences is one of the subjects of this work[4].

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As research findings show in various articles of this collection, a good climate for investment is not enough to achieve wider FDI spillovers, (see Miyamoto; Todo and Aoki; Batra and Stone; and Mercado). There are strong relationships between variables that imply policies with the objective of enhancing such spillovers. A brief explanation of the empirical relationships between economic performance and investment in HRD and between education, training and technology follows.

HRD and Economic Performance

Although there are positive effects of HRD on firm productivity and employee wages, they depend on the conditions of a developing economy and the interaction with other variables such as the rate of technological change. This is discussed in Batra and Stone, who show a generally positive relationship between HRD and firms' economic performance. Todo and Aoki find that FDI spillovers are greater when the absorptive capacity of host country firms is increased through human resource development or R&D activities, or when the host country receives FDI which entails local training or R&D activities. Mercado compares the experiences of developing countries in Asia and Latin America and finds similarities between them regarding the positive correlation between HRD and the economic performance of firms, as well as between HRD and wages.

Firms struggle to compete in global markets. As Batra and Stone argue, one key response to competition is the effort to improve technological capabilities and skills. The importance of strengthening firm capabilities in the context of an increasingly knowledge-based global economy is well recognised in the literature (see, for example, World Bank, 2001). Up to now, however, there has been a relative paucity of systematic international data about how firms upgrade their capabilities and whether this results in improved performance (see Katz, 1987; Chuang and Lin, 1999; Görg and Strobl, 2001; Alfaro and Rodríguez-Clare, 2003; Blomström and Kokko, 2003). Clearly, firms' performance critically depends on the policy and institutional conditions in the domestic economy, which together constitute the investment climate. Batra and Stone explore whether firms' actions to upgrade capability affect their actual performance as measured by increased sales, investment and employment.

The World Bank's World Business Environment Survey (WBES) finds that firms' investments in technology and skills are critically associated with company performance (see Batra and Stone). Investment in technological capacity is strongly related to sales growth, while international technological

acquisition relates clearly to employment and investment growth. Training is also important, and it is clear that investment in private training services is significantly associated with all dimensions of firm growth. Firms that do not invest in training appear disproportionately inclined to fail.

Training and Technology

MNEs contribute to technology transfer through numerous channels of technology spillover, including vertical/horizontal linkages, labour turnover and spinoffs (see Miyamoto). Technological change — made either by adopting innovations or by undertaking R&D activities — tends to enhance the positive effects of HRD. In other words, linking training with technology investment and transfer is complementary for private sector competitiveness and human capital growth. This argument is confirmed by Mercado (2006), Todo and Miyamoto (2002 and 2006) and Tan (2001).

Policies to Enhance FDI Spillovers

Research findings in this work indicate a considerable need for explicit domestic policies to enhance FDI spillovers. A good investment climate is not sufficient to reach wider FDI spillovers. Other complementary measures are necessary, such as targeting a specific type of FDI[5], carrying out demand-driven training policies, introducing incentives for MNEs to invest in training and participating in local education and R&D (for instance through training, levy-reimbursement schemes and fiscal instruments), to synchronise key components of HRD policies and co-ordinate a policy of FDI attraction with education and technological policies.

As Miyamoto suggests, it is necessary to target specific types of firms in order to facilitate HRD. According to Todo and Aoki, host governments should select MNEs that contribute to domestic industries and perform local HRD (in-firm training or education) and R&D activities. Governments also need to incorporate localisation criteria in their industrial policies, taking into account that the distance between an MNE subsidiary and domestic suppliers and clients can be a factor in reducing spillover effects, as the studies they examine suggest. Todo and Aoki also argue that there appear to be inter-industry FDI spillovers through backward linkages, so that intra-industry spillovers seem less likely. Considering this likely inter-industry channel of FDI spillovers

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through backward linkages, the authors recommend that host governments should target final goods industries (instead of intermediate goods industries) and promote technology transfers from foreign firms in final goods industries to domestic firms in intermediate goods industries. They also suggest limiting production through FDI and promoting production through licensing in the least-developing countries, because FDI is lower than licence spillovers and thus dependence on FDI in the early stages of development can hinder technological progress in the host country. On the other hand, Miyamoto suggests that HRD policies can target constrained enterprises such as small and medium-sized domestic enterprises that under-invest in training owing to market failures. These are likely to benefit most from increased education and training. The author maintains that FDI promotion policies can also target high-value added MNEs likely to bring in new skills and knowledge to the economy and allow technology transfers.

Concerning the domestic climate for FDI in developing countries, it is important to enhance domestic absorptive capacity since this increases FDI spillovers, as Todo and Aoki point out. Therefore, host governments should improve educational levels and promote R&D and HRD activities by domestic firms.

It is also necessary to implement demand-driven training policies, as Miyamoto argues. Government policies have been playing a basic role in stimulating training finance to minimise financial constraints and market failures, and encouraging MNEs to invest in the HRD of their host economy. Most of the successful training policies have been demand-driven, involving industries, MNEs, and foreign academic institutions that have close ties with advanced developments in technology, business administration and management.

Another policy requirement is the introduction of strong incentives for MNEs to participate in local education and R&D. Miyamoto suggests that strong incentives should be provided for MNEs and Investment Promotion Agencies (IPAs) to participate in formal education and vocational training, even for workers employed by domestic firms. The author argues that this allows human resource development to be flexible and demand-driven. MNEs can contribute to the HRD of their host developing country by providing training and supporting formal education.

Synchronising the key components of HRD policies is also recommended. Miyamoto maintains that the key components of HRD policies, i.e. formal schooling and vocational education and training policies (post-formal schooling), must be coherent and co-ordinated so as to minimise underinvestment in human

capital at each level. Synchronised HRD policies make it possible to equip students with knowledge and skills that will later be complementary to training opportunities provided in the labour market. In Indonesia, manufacturing firms tend to hire educated workers in preference to providing training (Miyamoto and Todo, 2003). As a policy implication, it appears necessary to strengthen the link between education and training policies and to minimise market/policy failures in training by enhancing access to the credit market and allowing apprenticeship wages below the minimum wage level.

Additionally, as mentioned above, a policy of FDI attraction should be co-ordinated with educational and technological policies. O'Connor and Lunati argue that it is highly important that developing countries co-ordinate investment in human capital with trade and investment liberalisation measures. They argue that human capital investment alone, without economic opening, may well face steeply diminishing returns, since a closed economy will not enjoy the continuous stream of learning opportunities associated with constant exposure to foreign technologies and markets. Economic opening without human capital investment may yield allocative efficiency improvements but is unlikely to enable a country to shift its comparative advantage towards higher quality goods demanding higher skills in their production. In short, O'Connor and Lunati conclude that "the productivity benefits of economic opening in the absence of human capital investment and vice versa are apt to be short-lived; those associated with co-ordinated economic opening and human capital upgrading are apt to prove far more enduring".

In brief, as Miyamoto argues, governments that emphasise flexible demand-driven HRD strategies, target MNEs in high value added areas and co-ordinate education and training policies are more likely to lead the country into a virtuous circle of inward FDI, HRD and technology transfer, in which host countries receive a continuous inflow of FDI over time by increasingly attracting higher value-added MNEs while at the same time upgrading the skill contents of pre-existing MNEs and domestic enterprises.

Various policy experiences and examples of FDI spillovers in developing countries are presented in this collection of articles with the purpose of contributing to the understanding of policies that would induce wide positive spillovers and encouraging further policy-oriented research.

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Notes

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2. The UNCTAD report specifies that this general definition of FDI is based on the detailed definitions of OECD (1996) and the IMF (1993).
3. In this book the terms "transnational corporations" and "MNEs" are used interchangeably to mean "enterprises comprising parent enterprises and their foreign affiliates" (UNCTAD 2004, p. 345).
4. See Saggi (2002) for excellent surveys on this issue.
5. See, for example, the recommendations made by OECD (2006*a* and 2006*b*) to international business for conduct in such areas as HRD, economic growth and sustainable development. From 2001 to 2006, these guidelines have consolidated their position as one of the world's principal corporate responsibility instruments.

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Economic Opening and the Demand for Skills in Developing Countries: A Review of Theory and Evidence*

David O'Connor and Maria Rosa Lunati[1]

Abstract

A policy reform such as trade liberalisation can accelerate structural change in an economy, causing an exogenous shift in relative factor demands. For some developing countries, the result may be an increase in skills demand associated with the adoption of newly available foreign technology and lower-cost imported capital goods. This demand shift may be permanent or only temporary, but in either case the skills supply should eventually increase in response to higher returns. One concern, however, is that with an initially highly skewed distribution of education the skilled labour supply adjustment may be prolonged; likewise any transitional increase in skill-based wage inequality.

Of greater policy concern are those countries where trade and investment opening is not associated initially with an increased demand for skills. If newly accessible foreign technology and capital are skill complements, they will tend not to flow readily towards countries where skills are scarce. It is even possible that, for some low-income countries, private returns to skill would decline post liberalisation. What — from one perspective — might be viewed as a welcome reduction in earnings inequality could — from another perspective — be seen as an unwelcome reduction in the incentive to invest in education. Insofar as reduced educational investments today imply reduced per capita income levels and perhaps slower income growth in the future, liberalisation measures may need to be accompanied by special government efforts to bolster private educational incentives. On the negative side, the countries where such efforts are required are likely to be among the poorest countries, where governments lack the necessary domestic resource base (hence, the importance of foreign assistance to education). On the positive side, reduced income inequality suggests that poor households in those countries should be better able to afford education for their children. With an expanding educated labour force, such countries should in time be able to capture a greater share of the dynamic benefits of economic opening.

* This article is one of six resulting from an expert workshop convened by the Development Centre on Financing Development. Spanish translations of these articles have been published together by the Colegio de México in a book entitled *Inversión extranjera directa, tecnología y recursos humanos en los países en desarrollo*. See Preface to the collection at the end of this article.

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Introduction

A policy reform such as trade liberalisation can accelerate structural change in an economy, causing an exogenous shift in relative factor demands. For some developing countries, the result may be an increase in skills demand associated with the adoption of newly available foreign technology and lower cost imported capital goods. This demand shift may be permanent or only temporary, but in either case the skills supply should eventually increase in response to higher returns. One concern, however, is that with an initially highly skewed distribution of education the skilled labour supply adjustment may be prolonged; likewise any transitional increase in skill-based wage inequality.

This article reviews evidence in support of the claim that greater economic openness[2] may have caused such a demand shift in developing countries through induced capital deepening and/or technological change. Because of the importance of self-employment in many developing countries, it also considers how economic openness may affect the returns to education in entrepreneurship.

Our focus in this article is on globalisation's impacts on skills demand and relative wages in developing countries. These potential impacts need to be put in context of the ongoing structural change that occurs in the process of economic development, whether a developing economy happens to be open or closed. Economic opening can (indeed, probably will) affect both the rate and direction of such change. It may also affect the rates of technical progress, of capital accumulation, and of per capita GDP growth. It is through the combination of these that its effect on the relative demand for, and rewards to, skilled labour will make itself felt.

In a stylised view of the initial labour market conditions in a low-income developing economy, a large reserve of low productivity, largely unskilled workers coexists with a much smaller number of skilled workers. Initially, growth is largely the result of labour force expansion and capital accumulation, but with little capital deepening and labour productivity (hence, wage) growth. Where markets, institutions and policy offer the prospect of higher returns, investment rates rise and with them productivity and GDP growth rates. As profit opportunities vary considerably across sectors, resources are reallocated, with manufacturing and later services accounting for a large share of incremental GDP. While employment shares lag behind output shares, over time a growing share of the workforce finds employment in industry and services. Capital deepening and technical improvement occur across sectors, including in

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agriculture, permitting a shrinking agricultural labour force to feed a growing industrial one. With this transformation, and assuming some capital-skill and technology-skill complementarity, the demand for skills could be expected to rise. Mincer (1995) notes the general tendency for skills demand to rise with development as a result of both capital accumulation and technological change. Schultz (1963) emphasises the role of education in enhancing labour force flexibility to respond to structural change[3]. With rising per capita incomes, education levels are also likely to rise, so the net effect on relative wages will depend on the relative strengths of skill demand and supply shifts. For long periods, the two may be roughly balanced and relative wages fairly stable. In sum, development is a process that involves, *inter alia*, a secular rise in human capital investments, with no *a priori* reason to suppose anything more than a temporary imbalance between skills demand and supply. It is against this background that the effects of economic opening are to be considered.

Even if the broad outlines of the development process are similar across countries, rates of economic growth are not. Two recent strands of growth theory have focused, respectively, on economic openness and on human capital as explanations for differential growth performance. In only a handful of cases have the two strands intersected. A brief review of the major findings of each follows, with an emphasis on their points of intersection. This article concludes with some policy reflections.

New Growth Theory and Conditional Convergence

Studies of conditional convergence seek to explain why countries at similar initial levels of per capita income grow at very different rates, rather than converging at roughly the same rate towards the productivity and income levels of the most developed countries. There appears to be no general tendency for catch-up of poor countries with richer ones; indeed, income gaps between the poorest and richest countries have widened over time. Yet, some countries have managed to close the income (and productivity) gap. What are the common conditions for successful catch-up?

Several studies (for example, Azariadis and Drazen, 1990; Barro, 1991; Benhabib and Spiegel, 1994) find evidence that a country's initial endowment of human capital is a significant variable explaining its subsequent GDP growth[4]. In Barro (1991), the stock of human capital affects growth principally through physical capital investment, with the two types of capital being complementary.

It also positively influences per capita income through its negative association with fertility rates. Benhabib and Spiegel (1994) find little evidence that their human capital measure influences output growth as a factor input in a standard neoclassical production function, but they do find a significant positive association between the stock of human capital and productivity growth. They hypothesise that this reflects the role of human capital in both the domestic generation of technology (contrary to the findings in Romer, 1993) and the successful imitation of technologies developed abroad (consistent with Romer). Also, following Lucas (1990), they suggest that the stock of human capital serves to attract investment in physical capital, notably through foreign direct investment.

While investment in physical capital (and particularly capital equipment) is an important growth determinant (DeLong and Summers, 1991), the cross-country variation in the investment rate is partly a function of absorptive capacity, which in turn depends on human capital availability (but also on the larger institutional framework; see Romer, 1993). Benhabib and Spiegel (1994) find, in cross-country regressions, a significant positive relationship between the stock of a country's human capital and the rate of physical capital investment. In other words, the rate of return on investment in physical capital would appear to be a positive function of the supply of human capital; where the latter is scarce, the former is low and so too is the incentive to invest. If so, it follows that raising levels of educational attainment should, all else equal, increase the returns to physical capital investment and thereby boost investment rates. The reverse should also hold, *viz.,* that raising investment in physical capital, by boosting demand for human capital, would raise its return. Looked at differently, human capital investment can (at least partially) offset the tendency towards diminishing returns in physical capital investment.

As noted above, capital-skill complementarity is to a significant degree a reflection of the skills required to master technologies embodied in newly acquired capital equipment. Nelson (1994) develops the implications of this for technology leaders and laggards, suggesting that for the latter (i.e. for the bulk of developing countries) investing in both physical and human capital is crucial to adopting more productive technologies.

Not all technology, however, is embodied in capital goods (or in blueprints, software programmes, technical documents or other "tradables"). Another element consists of tacit knowledge embodied in individuals, teams and organisations. In this case, Nelson (1994) suggests that mastery of a technology is like a skill that needs to be learned, normally at the level of an organisation or team. Effective learning-by-doing depends on the education and skills

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possessed by the workforce, with interactive skills of particular importance in fostering teamwork[5]. The cross-border transfer of such tacit know-how is generally facilitated through closer than arm's-length transactions between separate organisations. Indeed, this is one important rationale for foreign direct investment.

Besides human capital (narrowly defined), Abramovitz (1986) cites technological, organisational and social capabilities (with the last two sometimes grouped together under the heading, "social capital") as important preconditions for sustained productivity catch-up. Nelson (1994) suggests that what accounts for rapid growth is the combination of education (and skills otherwise acquired) with technologies employed in organisations well designed to exploit them. Both Nelson and Abramovitz emphasise the extent to which technological capabilities are socially and institutionally determined. The mere accumulation of human capital is not itself sufficient to ensure the successful innovation or acquisition of new technologies. Organisations, institutions and their interaction constitute the environment within which technology adoption occurs. The insufficiency of human capital alone to foster strong technological capabilities is evident in the formerly centrally planned economies, where high levels of education of the labour force were not associated with technological dynamism. (This raises the question of how the policy environment and, in particular, the degree of openness of an economy may shape its organisations and institutions.)

Economic opening may expose developing countries to new ideas and technologies. Their costs of adoption, however, are a function of the suitability of a number of domestic conditions (cf. Parente and Prescott, 1994), of which the size and quality of the stock of human capital is only one (albeit an important one). Others may include a conducive legal and regulatory framework, relatively low hidden transactions costs of doing business (which implies among other things a low level of corruption), and labour market institutions that do not significantly raise the costs of introducing new technologies. Rosenberg and Birdzell (1986, chap. 4) describe the emergence in Western societies from the 15th century onward of a number of institutions conducive to commerce[6], among which were: a legal system designed to give predictable, rather than discretionary, decisions; the introduction of bills of exchange, which provided the credit needed for commercial transactions; the rise of an insurance market; double-entry bookkeeping, which facilitated the separation of the individual family's property and transactions from those of the enterprise; and the change of government revenue systems from discretionary appropriation to systematic taxation. While some of these institutions are now nearly global in their reach (e.g. double-entry bookkeeping), others are still relatively weak in many

developing countries. While an environment conducive to commerce is not synonymous with one conducive to technological dynamism, neither are the two unrelated (again, the example of the formerly centrally planned economies comes to mind).

A number of studies have sought to test the hypothesis that more open economies tend to grow faster or that they exhibit faster total factor productivity growth (cf. Dollar, 1992; Harrison, 1995; Sachs and Warner, 1995; and Edwards, 1997). The results of Sachs and Warner are particularly interesting because they incorporate a measure of economic openness into a Barro-type growth regression where human capital is also an explanatory variable. While openness has a significant effect on growth performance, its inclusion weakens the significance of the human capital measure. They interpret their results as showing unconditional convergence among open economies, and no significant tendency towards convergence among closed ones[7]. In short, human capital (at least on their measure of initial year primary and secondary school enrolment rates) does not appear to matter to growth.

Another noteworthy result of Sachs and Warner in the present context is that trade openness does not affect the supply of human capital — i.e. open economies do not appear to accumulate human capital at a faster rate than closed ones[8] — while openness does seem to stimulate investment in physical capital. Thus, if human capital and physical capital are complements, the higher investment-to-GDP ratio in open economies would tend to augment their demand for skilled labour without a corresponding augmentation of supply. This could be one source of any tendency for relative wages of skilled workers to rise with economic opening.

Apart from the demand effects of openness on skills, moving from a closed to an open economy could also alter the relationship between skills supply and returns. As noted by Berthélemy *et al.* (1997), in a closed economy an expansion of the supply of educated labour would tend to depress educational returns. In an open one, however, relative supply changes (at least in the simple one-cone HO trade model) have no effect on relative factor rewards. Thus, an exogenous expansion of the supply of educated workers in an open economy would not exert the same downward pressure on their rewards as in a closed one. Meanwhile, trade opening may positively affect skills demand through a number of channels discussed below. Berthélemy *et al.* find some evidence of positive demand effects for workers with secondary education: in cross-country regressions, their private returns to schooling are positively and significantly related to trade openness.

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In summary, there is evidence suggesting that a more educated labour force can raise the returns to investment in physical capital, i.e. that skills and capital are complementary. Similarly, the stock of human capital appears to be positively correlated with technological dynamism, as reflected for example in TFP growth rates. There is also fairly strong evidence that more open economies grow faster, *ceteris paribus*, and greater openness in turn seems to be positively correlated with higher rates of investment in physical capital and of technical change (as measured by TFP growth). Given capital-skill and technology-skill complementarity, this suggests that more open economies should experience a more rapid growth in demand for skilled workers than closed ones.

Extensions of the Standard Trade Model

As noted above, the prediction (and apparent evidence) of rising skill differentials with economic opening in (some) developing countries does not square well with the simple (one-cone, 2x2x2) HOS trade model. Wood (1997) suggests ways in which this framework might be extended to explain this apparent anomaly. Though not the first to do so, he notes that the inclusion of non-traded goods and many factors may lead to results that reverse the standard predictions on movements in relative wages.

Relaxing first the two-good assumption, Wood presents the case of a country with an abundant supply of unskilled labour, and a comparative advantage in labour-intensive goods, where a labour-intensive non-traded good is produced which is a close substitute for an imported good. If opening to trade lowers the price of the imported good, substitution in consumption from the non-traded good to the imported one would result. A possible outcome is a fall in the relative wage of unskilled workers, if the effect of substitution in consumption more than offsets the increase in demand for unskilled labour needed in the production of the exported good. The final equilibrium would depend on the elasticity of substitution in consumption between traded and non-traded goods.

The second case of "perverse" effects of trade on relative wages involves relaxation of the two-factor assumption. Let us suppose a country with three factors, skilled and unskilled labour and infrastructure. The factor infrastructure is abundant and complementary in production to skilled labour, but the country has a low ratio of skilled to unskilled workers. If this country, with a comparative advantage in infrastructure-intensive goods, is exposed to more trade, the export

demand for these goods will boost the demand for skilled workers. Once again, the wages of skilled workers will increase relative to those of the unskilled. [Of course, this case is not materially different from one where the third factor is (internationally immobile) capital.]

Wood (1998) notes another possible explanation for widening wage disparities in developed countries, but this one has somewhat ambiguous implications for relative wages in developing countries. The mechanism is a fall in "co-operation costs", by which he means the costs of combining highly skilled workers from OECD countries with workers (and other factors) in developing countries. With declining transport and communications costs, it has become cheaper for skilled OECD workers to make short visits to production sites in developing countries and to communicate, in the meantime, with those sites via computer, telephone and fax. That this should raise the relative demand for skilled workers from OECD countries is evident, but how it affects developing countries depends on further specification of the production technologies there. Wood argues that such transfer of skilled labour enables developing countries to move into production of higher quality goods, which could plausibly involve an increased relative demand for skilled labour. On the other hand, it is possible that skilled OECD "migrant" workers would act to raise the productivity of low skilled workers in developing countries, perhaps even raising their relative returns. Thus far, there has been no empirical work to establish what the effects are of declining co-operation costs on labour markets in developing countries.

Feenstra and Hanson (1995*a*) propose a model with free trade in which a move to international capital mobility results in increased relative wages of skilled workers in both the North and the South. Their approach is to assume a single final good produced from a continuum of intermediate goods whose production requires varying proportions of skilled to unskilled labour. Prior to capital mobility, the minimum cost locus of the South lies below that of the North for very labour-intensive intermediate goods and, beyond some skilled-unskilled labour ratio, the North becomes the lower cost producer. With capital mobility, and assuming the returns to capital are higher in the poorer Southern region, capital flows from the North to the South, lowering the cost locus of the latter and raising that of the former. The intersection of the two cost loci thus shifts rightward towards goods requiring a higher skilled-unskilled labour ratio. The average skill intensity of Southern production rises[9], as does that of Northern production (the latter because the least skill-intensive goods it formerly produced now shift to the South), and the relative wages of skilled workers therefore rise in both regions[10].

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A final possibility (relaxing the two-region assumption) is that middle-income developing countries are relatively labour abundant *vis-à-vis* their OECD trading partners and relatively skill abundant *vis-à-vis* their low-income developing country trading partners. Trade liberalisation involving greater openness towards both groups of countries would therefore have ambiguous effects on the relative demand for skilled labour. If one thinks of sectors as arrayed along a skills continuum, then the net effect of trade opening on skills demand will depend on relative size of the intersectoral resource reallocations induced by each of the expanding bilateral trade flows. If the effect of trade with lower income countries is especially strong, then the relative demand for unskilled workers in the middle income country would tend to fall. There is one piece of empirical evidence (for Mexico) which suggests such an effect of trade liberalisation. Building on work by Revenga (1994) and Bernard (1995), Cragg and Epelbaum (1996) seek to explain the rising skill premia observed in Mexican industry during the period of rapid liberalisation (i.e. roughly from the mid-1980s). They note that trade liberalisation has two possible effects: to reduce the cost of capital goods and, if capital and skills are complements, to increase skills demand; to reduce costs of imported consumer goods, many of which have been produced in Mexico with labour-intensive methods, forcing domestic companies either to adapt by moving to more skill-intensive methods or to cease operation. They find that, while high-skill employment grew rapidly (1987-93) in both the non-traded services and the traded manufacturing sector, low-skilled employment grew much less rapidly in the latter, which is consistent with a relatively strong trade-induced adjustment of the skill mix in manufacturing.

Technology Diffusion Models[11]

Beyond the accustomed resource allocation effects, trade expansion may have an effect on technology levels of trading partners. Grossman and Helpman (1991) propose a model in which technological change is endogenous, responding, among other things, to trade pressures. Openness is hypothesised to affect the technology level in a number of ways: imported inputs often embody new technology; access to export markets increases the potential returns to innovation compared with domestic market alone (which should be of particular importance to small economies); trade may affect a country's degree of specialisation in research-intensive production (perhaps lowering it in unskilled-labour-abundant countries). Thus, trade's effects on technology

levels are not unambiguously positive for all countries. Even in high-income countries it is possible (*à la* Schumpeter) that increased import pressures would discourage innovation by reducing expected profits of competing domestic enterprises.

Pissarides (1997) presents a model of trade and technology in developing countries ("the South") that seeks to provide a theoretical rationale for the empirical evidence on rising returns to skill following trade opening. The model shows two possible cases: one in which, following liberalisation, skill differentials widen but only temporarily in the transition from one steady state to another; a second in which the widening of skill differentials is long-lived. Following Romer (1990), a key feature of the Pissarides model is the distinction between the process of imitation (in Romer, invention) and the process of production, each with its own technology. The former involves learning either to use or to make imported capital equipment, and it is assumed that the technology of learning (i.e. technology transfer) is skill-intensive. By comparison, the technology of production is labour-intensive. Moreover, the returns to investment in technology transfer in the South are directly related to the size of the technology gap with the North. In effect, trade opens up new possibilities for profitable imitation by exposing the technology follower to a wider range of capital goods from the North (in terms of the model, it widens the gap between all varieties of capital goods known to the South and that subset of varieties that it has already successfully imitated). To narrow that gap again, skilled labour must be reallocated from production to imitation (e.g. R&D, reverse engineering). This shift towards skill-intensive activities raises the relative earnings of skilled labour, but only temporarily. Eventually, the returns to imitation will decline, and so will the proportion of skilled workers employed in this activity[12]. The picture changes, however, if the technology imitated happens to be skill-biased, in which case there will be a permanent increase in the relative wages of skilled workers[13]. This seems a plausible assumption inasmuch as evidence presented above suggests that much recent technical change in the North has been skill-biased, and in the model — as in reality — the imitation of Northern technologies is a principal means of technical progress in the South.

Young (1991) and Stokey (1991) analyse trade opening in the context of models of learning-by-doing, in which learning is bounded in any particular product (process) but can spill over to related products (processes). If the knowledge spillovers are sufficiently large, then countries can sustain productivity growth in the long run by continuously moving into the production of new products of higher quality (climbing the "quality ladder"). With the introduction of trade, some countries specialise in sectors where learning

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possibilities have been largely exhausted, while others specialise in those with high learning potential (and high spillovers). Over time the latter group's technological lead widens and their economies grow faster than the former group's. These models assume, however, that knowledge spillovers are purely domestic in nature, neglecting the possibility of international spillovers such as have been found in some of the empirical studies discussed below. The extent of the latter spillovers may, however, depend importantly on the human capital stock in the recipient country — a relationship not explicitly tested in that literature.

The Stokey model is the more relevant of the two to the current discussion in that human capital accumulation is a central feature. The technology of human capital accumulation is such that private investment in schooling has an external effect, causing the social stock of knowledge to grow and thereby increasing the effectiveness of time spent in schooling by later cohorts. This is the source of long-term growth in the model. Labour is differentiated by quality (which is in turn a function of education) and different labour qualities are imperfectly substitutable for one another: i.e. only higher quality labour is able to produce higher quality goods. As aggregate human capital grows, output growth occurs as production of lower-quality goods is replaced by production of higher-quality ones. The situation faced by the small "skills-poor" economy is that, by lowering the domestic price of skill-intensive goods, trade liberalisation reduces the returns to the skilled labour used in producing those goods. By reducing investment in human capital, this results in lower steady-state GDP growth. The principal difference with the standard HOS model is in this dynamic effect resulting from human capital investment's social spillovers. By assuming labour (of varying skill) to be the only productive input, the model cannot capture the possible effect of trade opening on domestic costs of imported capital goods and the technologies they embody (and in this way perhaps indirectly on skills demand).

Empirical work by Levine and Renelt (1992) suggests a positive link between trade openness and the rate of capital investment that is robust to alternative model specifications. Trade would thus appear to affect growth at a minimum through access to lower-cost investment goods. Insofar as skills and capital are complementary, then a rising investment rate would tend to raise the relative demand for skilled labour. Besides any reallocation of domestic expenditure towards investment attendant on economic opening, one would also expect to witness (as indeed we do) a shift in investment expenditure towards imported capital goods. To the extent that these are relatively more skill-intensive than domestic ones, the effect would be further to augment the relative demand for skills.

Besides trade, foreign direct investment (FDI) can act as a conduit for international technology diffusion. Findlay (1978) presents a model in which FDI plays just such a role. He notes that, by being the first to adopt an innovation, subsidiaries of multinational corporations can have a "demonstration effect" on other firms, persuading them that the new technology can be profitably employed in the local environment. As Findlay puts it: "While the migration of individuals, such as Dutch shipwrights to Sweden or Italian architects to Russia, was the chief form of technological diffusion by "contagion" in earlier times, their role is now mostly taken over by large organizations such as the multinational corporations" (p. 4). Findlay makes only passing reference to the role of host country skills in facilitating such diffusion, but he does cite the earlier work of Nelson and Phelps (1966) where the adoption rate is an increasing function of the level of human capital.

Wang and Blomstrom (1992) model the degree of "contagion" or "spillover" of technology from multinationals to domestic firms as a function of the transfer costs within the former (from parent to subsidiary) and the learning (absorption) costs of the latter. Neither cost function incorporates the level of skill of the workforce as an explicit argument, but the domestic firm's learning investment function contains an efficiency parameter whose value would presumably be strongly and positively influenced by the level of workforce skills. In related work, Wang (1990) does link human capital accumulation to the efficiency of technology adoption in domestic firms.

Lucas (1990) considers alternative explanations for why, contrary to predictions from neoclassical theory, capital does not flow inexorably from rich to poor countries. In one hypothetical example, where each worker's productivity depends positively — and fairly strongly[14] — on the human capital of other workers, the returns on capital investment in countries with little human capital turn out to be hardly greater than those in rich countries, offering little attraction to foreign investors. In other words, as observed above, investment in human capital is a critical support to the marginal productivity of physical capital.

Empirical Evidence of Trade-Technology Skill Links

Empirical evidence on trade-technology skill links takes a number of forms. Most studies tend to focus on imports (whether as source of technology spillovers or as market discipline). A few look at the technological stimulus provided by competition in export markets, or the economies of scale made possible to small countries through expanding exports. The main focus here is

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on the former group. One strand in the literature seeks to identify and measure R&D spillovers via trade. Coe and Helpman (1995) find that foreign R&D has a significant positive effect on domestic productivity growth, especially for smaller economies. The US R&D stock has the largest effect on other OECD countries' productivity growth, because of both the large size of that stock and the large share of their imports coming from the United States. Coe *et al.*, (1997) find evidence, for a large sample of developing countries, that openness to equipment and machinery imports from technologically advanced countries significantly contributes to an economy's total factor productivity. On average, a 1 per cent increase in the R&D capital stock in the industrial countries raises output in the developing countries by 0.06 per cent.

The widening US trade deficit in the 1980s also stimulated research interest in the import side. Scherer and Huh (1992) find that, in response to high-tech import competition, companies in more concentrated industries, with large domestic markets and more diversified sales, tend to respond more strongly with increased R&D expenditures. MacDonald (1994) comes to a similar conclusion, *viz.*, that import competition results, with a lag, in significant increases in labour productivity only in highly concentrated industries[15]. Using total factor productivity (TFP) as his measure of technical change, Lawrence (1998) finds evidence that, in the case of US manufacturing, rising imports have had a small positive impact on TFP growth in labour-intensive sectors, but little effect on TFP growth in skill-intensive sectors[16]. While part of this may be the result of technological improvements, part may also be from the closure of the least efficient plants in an industry. (Interestingly, Lawrence also finds a negative association between exports and productivity growth.)

While we are not aware of comparable studies for developing countries, the above results suggest that trade's effects on their technology effort could also be differentiated by industry and enterprise. It seems unlikely that, for most developing countries, trade liberalisation would significantly raise formal R&D expenditures, since R&D remains a relatively unimportant activity there. More plausibly, it could result in lower costs of imitation of foreign technologies. Whether the effects are likely to be felt uniformly across tradables sectors, or be differentiated between import-competing and exporting sectors is not clear, though it is plausible (consistent with the Lawrence results) that they would be stronger in the former (which, in the developing country case, are likely to be the more capital- and skill-intensive ones). As in the United States, within any given sector those firms already accustomed to relatively advanced technology (i.e. with low adoption costs), as well as those with larger profits to invest in new technologies, are likely to respond most positively to the challenges and

opportunities provided by lower cost imports. Arguably, those firms are also likely to employ a ratio of skilled to unskilled workers higher than the sectoral average, in which case their expansion would raise the relative demand for skills. The employment share of skilled workers in the successful firms may also rise. Whether economy-wide skills demand rises or falls depends on the balance between intra-industry and intra-firm skills upgrading, on the one hand, and intersectoral reallocation toward relatively unskilled-labour-intensive export sectors, on the other.

Empirical Evidence of Foreign Investment Technology Skill Links

In the case of FDI, the link to technology transfer is potentially stronger than with trade. Foreign investors may bring to their overseas subsidiaries or joint ventures a variety of managerial, organisational and technical innovations that would not otherwise have diffused (or diffused as rapidly) to the host country. Those innovations may, in turn, spill over to domestic suppliers and/or customers, or even to domestic competitors through the movement of skilled personnel. Training of personnel in the new methods is often part of the FDI package, though training by capital goods suppliers of their overseas customers is also possible.

Still, much of the evidence on foreign direct investment's impact on skills demand is anecdotal. Only a few studies have utilised a sufficiently rich data set to make statistical hypothesis testing possible.

Borensztein *et al.* (1995) use a theoretical framework derived from Nelson and Phelps to test empirically for the impact of FDI on host country growth. Their results suggest that FDI contributes to growth in larger measure than domestic investment in a cross-section of 69 developing countries. They also confirm a strong complementarity between FDI and human capital, with the growth boost from FDI depending on a minimum stock of human capital[17]. Moreover, there appears to be a significant crowding-in effect of FDI on domestic investment, in which a $1 increase in FDI results in an increase in total investment in the country of more than $1. Thus, besides its positive effect on technology levels, FDI contributes to growth by raising overall investment rates.

Feenstra and Hanson (1995*b*) examine the relationship between foreign manufacturing investment and non-production wage share across Mexican states. They use OLS and IV regressions to test the hypothesis that this wage share (assumed to represent skilled workers) is systematically higher in states with a higher proportion of foreign investment (measured by *maquiladoras*) in

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total manufacturing investment. They find a positive and significant relationship between the two, and a decomposition of the wage share changes into quantity and price effects suggests that the predominant effect of FDI has been on relative wages rather than on the employment shares of skilled workers[18]. The significance of using "maquiladoras" as a measure of FDI is that such investments are directly linked to trade between Mexico and the United States. They are often established by US firms for the purpose of outsourcing labour-intensive processes (e.g. component assembly). Often, the resultant trade flows are intra-industry, even under a fairly disaggregated industry classification. Feenstra and Hanson further calculate that over 90 per cent of the change in non-production wage shares during the 1980s occurred as a result of intra-industry skill upgrading, with less than 10 per cent resulting from inter-industry shifts in employment. Two results follow: *i)* unlike in the simple HOS trade model, a change in relative wages has occurred as a result of increasing intra-industry trade rather than growing specialisation across industries; and *ii)* the direction of the relative wage change in the labour-abundant country (in this case Mexico) is opposite to that predicted by HOS theory. In effect, growing intra-industry trade (combined with FDI) has been associated with a rise in the relative wage of skilled workers in both the skill-abundant and the labour-abundant country.

Foreign direct investment flows from OECD countries to developing countries have been increasing very rapidly since the mid-1980s. Assuming such flows are a conduit for the transfer of technologies from the home countries of OECD multinationals, then their impact on relative demand for skilled labour (and relative wages) in the small (i.e. price-taking) host country will, following Haskel and Slaughter (1998), depend importantly on their sector-bias[19]. In effect, if the sectors where FDI is concentrated are skill-intensive ones, and if the net result of the technology introduction is an increase in these sectors' relative profitability, one would expect FDI to pull other resources into these sectors and, in so doing, raise relative demand for, and wages of, skilled workers[20]. On the other hand, FDI concentrated in unskilled-labour-intensive sectors that raised their relative profitability would have the reverse effect on relative demand and wages. In this regard, it would be interesting to know whether the "crowding-in" effect found by Borensztein *et al.* (1995) is localised to sectors of high FDI concentration or is more diffuse. A possible area for future research would be, as a first step, to determine the direction and degree of sector-bias of FDI inflows into specific developing countries and, as a second, to test whether sector-biased FDI has the expected effect on relative wages.

Education, Entrepreneurship and Openness

Questions rather neglected in the OECD-oriented literature on earnings distributions but arguably of paramount importance in developing countries is what effect education has on the returns to entrepreneurship and how, in turn, those returns may be conditioned by a country's economic openness. The reason for its importance stems from the composition of the labour forces of many developing countries, where self-employment accounts for a very sizeable share of total employment (partly a function of the large numbers of owner-cultivators in agriculture, partly a function of the large urban informal sector) (see Figure 2.1). (Arguably, many developing countries are also hotbeds of the sorts of disequilibria on which — Schultz (1975) suggests — entrepreneurs thrive.) In a developing country context, the studies coming closest to answering the first part of the above question are those estimating farmers' returns from schooling (see Lockheed *et al.*, 1980; also, Taylor and Yunez-Naude, 1999, Chapter 1, for an extensive review). Taylor and Yunez-Naude (1999) analyse household data for rural Mexico, employing a model in which they control for selection of rural household members into different activities (production of various crops, off-farm employment and migration). They then look at returns from education in each of those activities, and estimate education's effect on total household income. Their results suggest a strong positive effect of education on rural household income beyond the lower-secondary level (i.e. over nine years of schooling). Moreover, an important source of those returns is the "entrepreneurial" decision of how best to allocate work effort and other family resources across different income-generating activities. Lockheed *et al.* (1980) conclude from their survey that, while estimated returns from schooling vary widely, they tend to be higher in more dynamic economic environments (Schultz's disequilibria).

Comparable studies of returns from schooling in entrepreneurial activities outside a predominantly agricultural setting (e.g. in commerce or industry) are rarer, partly because of more limited data availability[21]. There are, however, *a priori* grounds for supposing that the returns are positive. Education provides the entrepreneur with an intangible asset that can be invested in a risky venture but that is not appropriable by creditors or other claimants in the event of bankruptcy. For this reason, he or she may be more inclined toward commercial risk-taking than the entrepreneur having only tangible (and alienable) assets to invest. (The other side of this is that educated entrepreneurs may face higher opportunity costs than less educated ones.) The educated entrepreneur may also be better prepared to execute the various managerial tasks involved in running a profitable business (though clearly how important that ability is will vary with the size and complexity of the business).

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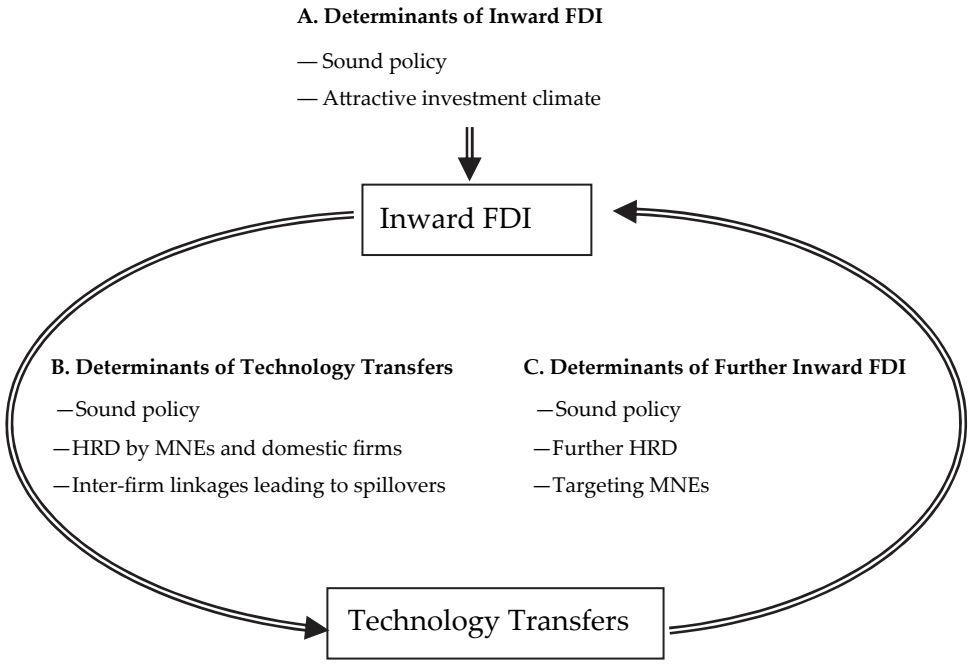
Figure 2.1. **The Virtuous Circle of Inward FDI and Technology Transfer/Spillovers**



Lall and Wignaraja (1997) offer some evidence for Ghana that education of the entrepreneur is a useful predictor of the "technical competence" of manufacturing firms. Also for Ghana, Vijverberg (1995) finds a small positive impact of an entrepreneur's education on family enterprise income, but a more significant effect from education of other family members[22]. Burki and Terrell (1998) find, for Pakistan, that technical efficiency of small manufacturing enterprises is significantly improved when the owner has at least a primary education, corroborating evidence reported in Little *et al.* (1987) for a number of developing countries. Nafziger and Terrell (1996) have examined the determinants of survival of Indian firms over a 22-year period, from 1971 to 1993. They find that higher educational attainment of the founding entrepreneur is associated with a smaller probability of firm survival, concluding that: *i)* the opportunity costs of entrepreneurship may have been greater for those with more education; and *ii)* the returns to rent seeking were reduced with India's liberalisation (the well-educated also being the better connected and hence more effective in rent extraction). Bates (1990) finds contrasting evidence for the United

States, where small business longevity is positively and significantly related to entrepreneurs' human and financial capital inputs. These two types of capital input are correlated in that the size of start-up loans extended by commercial banks to entrepreneurs is directly related to the latter's education[23]. The difference between the India and US results may be due to sample characteristics, but it may also point to the importance of the institutional and policy environment in shaping the incentives facing entrepreneurs[24].

If indeed the protected policy environment dominant before the early 1990s in India had diverted entrepreneurial energies in unproductive directions (on this point, see Baumol, 1990), this suggests that economic opening could in the long run boost the returns to entrepreneurship by redirecting it towards more productive undertakings. If the educated entrepreneur had benefited disproportionately from the *status quo ante,* does this imply that the benefits of education to entrepreneurship are less marked in a more liberal economic environment? Perhaps, inasmuch as success no longer depends on one's links to the "old boys network". There are plausible arguments on the other side, however. For a small country, greater outward orientation, by expanding the size of the potential market, would — all else equal — multiply the expected returns to any initial investment in entrepreneurial human capital. Also, the requirements of exporting (or competing with imports) may well put the educated entrepreneurs at a stronger competitive advantage than in the pre-liberalisation market environment. In short, the educated entrepreneur may be better placed to take advantage of new information — e.g. about new products, more efficient production methods, improved quality control, and more effective marketing techniques. Nelson and Pack (1998) argue that the growing supply of well-trained technical people in the newly industrialising Asian economies has facilitated successful entrepreneurship. For the moment, though, these are merely hypotheses.

Policy Implications

We have sought to shed light on the question of whether, in a developing country context, skills investments and economic opening are complementary, in the sense that the rewards to one are a positive function of the extent of the other. The theoretical arguments for such a positive relationship seem compelling and they are for the most part consistent with what empirical evidence is available. This suggests not that there are no gains from liberalisation without human capital investment but only that the gains (particularly in the long run) are likely to be greater *with* than *without* such investment. By the same token, the

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returns to investment in skills development will be limited to the extent that governments fail to create an environment — among other things, through trade and investment liberalisation — in which those skills can yield the highest possible returns.

Recent empirical work suggests a strong positive link between economic opening and enhanced growth in total factor productivity. A number of theoretical studies suggest that an important aspect of this acceleration of technical change is the increased diversity (and quality) of products (including capital goods) to which a country is exposed through trade (and also foreign direct investment). It may still be true that, for a developing country with an abundance of unskilled labour, the immediate effect of trade liberalisation is to shift resources into relatively low-skill sectors and activities. What determines the long-term benefits of such liberalisation are: *i)* the strength of the incentives to move up the "quality ladder" to progressively higher-skilled activities and sectors; and *ii)* how successful enterprises and entrepreneurs are in responding to them[25]. Insofar as this depends on the availability of higher quality human capital, then it may well be to a country's advantage if liberalisation were to raise returns to skill and thereby encourage higher rates of investment in skill acquisition. It is in those low-income countries where the private returns to human capital do not rise (or even fall) following liberalisation that there may be a particular need for government policy to sustain incentives for human capital formation. How sizeable a problem this is requires further empirical investigation, though Wood and Ridao-Cano (1999) suggest it may be non-trivial. Since the problem is apt to be most acute in the poorest countries, mobilising additional government revenue for education may be especially difficult without additional external sources of finance (e.g. through official development assistance). In any event, it is clear that backtracking on liberalisation as a way of countering any decline in private returns to education would be counterproductive, since it threatens the very technological and entrepreneurial dynamism that tends to reward investment in education and skill acquisition.

When looked at from a different perspective, any decline in returns to education in poor countries following economic opening would, all else equal, represent an improvement in income distribution, with wages of uneducated workers rising relative to those of the more educated. If, as in many poor countries, investment in education beyond primary level is household-income-constrained, then rising wage incomes for unskilled workers should improve their own and, more importantly, their children's educational opportunities. Moreover, depending on how far private returns may be depressed and how far incomes rise, the greater affordability of education could partially offset the effect on demand of reduced returns.

Where economic opening is accompanied by widening skill-related wage differentials in well-functioning labour markets, this provides a useful price signal to individuals and enterprises to invest more in education and training. Thus, if there is any problem requiring policy makers' attention, it is more a political than an economic one. How much of a problem growing wage inequality proves to be depends on several factors: *i)* what the initial wage (and income) distribution was; *ii)* how quickly the distribution is changing (and whether the change involves an absolute decline in income at the lower end of the distribution); *iii)* how persistent any increase in inequality is expected to be; and *iv)* how tolerant individuals are of (worsening) income inequality. Wage inequality becomes an economic problem only if, because of some combination of *i)* to *iv)*, governments feel compelled to engage in redistributive policies on a scale that threatens to undermine investment incentives, work incentives and growth[26].

Fortunately, in many developing countries, any unequalising effect from greater economic openness (due to skill-biased technology transfer and capital deepening) will tend to be muted by two other factors already noted, *viz.*, the HOS effects of trade liberalisation and — more importantly — an expansion of the supply of educated workers. Also, while in OECD countries the wages of unskilled workers have not only declined relative to skilled wages but in some cases absolutely[27], by contrast, in those developing countries enjoying rapid per capita income growth, real wages of unskilled workers are likely to rise, even if at a slower pace than those of skilled workers.

Whether the supply of educated workers expands fast enough to hold inequalities in check cannot be known *a priori*. In any case, as the new growth literature emphasises, the expansion of skilled labour supply is not simply a distributional issue but a determinant of long-term GDP growth prospects. Even in traditional growth theory, it is an important determinant of the *level* of per capita income in the long run. Since educational attainment levels in many developing countries remain low compared with OECD countries (and educated female labour force participation rates are also often substantially lower — notably in Latin America), the medium- to long-run elasticity of skilled labour supply should be relatively high in these countries.

Still, the supply response to rising wage differentials may vary significantly across countries, depending on how binding is each of a set of constraints — including institutional and physical constraints on the expansion of secondary and/or tertiary enrolments (not enough classrooms, not enough schools), budget constraints that may slow the rate at which institutional/physical constraints can be relieved, human resource constraints (not enough adequately trained high

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school teachers and university instructors), and foreign exchange constraints that make it difficult to expand the supply of human capital (including university faculty) through overseas education. With respect to the last, the importance of outward orientation — more specifically, strong export performance — to generating the foreign exchange needed to send sizeable numbers of students abroad for higher education should not be underestimated.

Even in the absence of the aforementioned constraints, raising significantly the educational attainment of the workforce takes time. A doubling of secondary (or tertiary) enrolment rates would only have a gradual effect on labour supply, as students work their way through the educational system and enter the labour market. How quickly the supply of new high school or college graduates increases depends critically on the demographic structure of the population. If new labour force entrants (say in the 18-24 age cohort) represent 10 per cent of the total labour force, the effect of doubling the number with a high school diploma will clearly be very different than if they represent only 1 per cent of the total labour force. In this respect, demographics are working in favour of most developing countries, with their relatively young populations and expanding labour forces.

Until new cohorts of educated workers enter the workforce, investing in additional training for the current workforce may provide an imperfect substitute — the more imperfect, the lower its average educational attainment. Beyond learning basic work discipline and rudimentary manual skills, much workplace training is more likely to complement than to substitute for formal education. Also, if developing countries do succeed in creating the conditions of technological dynamism that fosters a restructuring towards progressively more skill-intensive activities, then workers will have a growing need for continual (or "lifelong") learning, to update their skills and keep abreast of new technologies. Some of this may be firm-specific and provided through the workplace, but much will involve enhancement of generic skills through formal education and training.

In conclusion, both the theoretical and the empirical literatures suggest the importance, for a developing country, of co-ordinating investments in human capital with trade and investment liberalisation measures. Human capital investment alone, without economic opening, may well face steeply diminishing returns, since a closed economy will not enjoy the continuous stream of learning opportunities associated with constant exposure to foreign technologies and markets. Economic opening alone, without human capital investment, may yield allocative efficiency improvements, but is unlikely to enable a country to shift its comparative advantage towards higher quality goods demanding

higher skills in their production. In short, the productivity benefits of economic opening in the absence of human capital investment, and *vice versa*, are apt to be short-lived; those associated with co-ordinated economic opening and human capital upgrading are apt to prove far more enduring.

Table 2.1 **Regression Results**
Dependent variable: MIPS/'000 persons

	Constant	Per Capita GDP	Adjusted R2	No. observations
OLS for 1980	-12.0 [a]	1.25 [a]	0.80	45
OLS for 1989	-7.6 [a]	1.22 [a]	0.87	48
OLS for 1995	-1.6 [b]	1.06 [a]	0.89	48
Panel data Estimation				135
1. Pooling		1.18 [a]	0.97	
Dummy 1980	-11.46 [a]			
Dummy 1989	-7.16 [a]			
Dummy 1995	-2.64 [b]			
2. Between (OLS on means)	-21.5 [a]	1.19 [a]	0.86	
3. Within (fixed effects)		0.52 [b]	0.99	
Dummy 1980	-8.99 [a]			
Dummy 1989	-4.58 [a]			

Notes: MIPS: millions of instructions per second. Both the dependent and the independent variable are in natural logs.

a and b indicate a significance at the 1 per cent and 5 per cent levels, respectively.

The sample includes all OECD countries (except for Iceland, Luxembourg and Germany) and 22 non-OECD countries (Argentina; Brazil; Bulgaria; Chile; China; Colombia; Hong Kong, China; India; Indonesia; Israel; Malaysia; Peru; Philippines; Romania; Russian Federation; Saudi Arabia; Singapore; Slovak Republic; South Africa; Thailand; Ukraine; Venezuela).

Source: Our estimations based on data from the 8th Annual Computer Industry Almanac (1996) and the World Bank Development Indicators data.

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Notes

1. This article is a partial version of a previous publication, "Economic Opening and the Demand for Skills in Developing Countries: A Review of Theory and Evidence", *Technical Paper,* Development Centre, Paris, OECD, April 1999. Without implicating them, the authors would like to thank Colm Foy, Kiichiro Fukasaku, Helmut Reisen, David Turnham and Adrian Wood for helpful comments on an earlier draft, as well as Alfonso Mercado for his suggestions for this particular version. This collection of articles has been developed through a close co-operation with various individuals and institutions, including Javier Santiso and Louka Katseli of the OECD Development Centre, Francisco Gomez and Jaime Sempere of El Colegio de México, Aoyama Gakuin University (Japan) and the United Nations. The OECD Development Centre gratefully acknowledges the financial support of the New Energy and Industrial Technology Development Organisation (NEDO) of Japan, the Korean government, CONACYT of the Mexican government, the Swiss government, the International Finance Corporation (IFC), and the World Bank Institute (WBI) without which this work would not have been possible.

2. Various measures of openness have been used in the literature, normally referring to trade openness. Trade-to-GDP ratios (adjusted for country size) are among the most common. Policy-based measures (like effective tariffs) are less so, principally because of their more limited geographical and temporal coverage. Some studies (e.g. Harrison, 1995; Edwards, 1997) experiment with several measures of openness to test the robustness of results.

3. In his words, "Economic growth, under modern conditions, brings about vast changes in job opportunities. Schooling in this connection is valuable because it is a source of flexibility in making these occupational and spatial adjustments" (Schultz, 1963, p. 41). See also Schultz (1975) for further development of these ideas.

4. Despite the positive relationship between initial capital stock and subsequent growth performance, much of the empirical literature finds a weak (or even negative) correlation between human capital *accumulation* and productivity growth (see Pritchett, 1996, for evidence on a cross-section of 91 countries). Lopez *et al.* (1998) find that, once the distribution of education is controlled for, this "education puzzle" is partly solved. In short, for any mean educational attainment of the workforce, the more equitable the distribution of education is the more it contributes to growth. Griliches (1997) suggests an alternative explanation, *viz.,* that a very significant share of educated labour in many developing countries enters the government sector (including education) and various service industries, where productivity growth is not adequately measured — even assuming that they make a significant contribution to such growth.

5. A possible explanation for the recent increase in demand for interactive skills noted by Wolff (1996) could be the organisational innovations introduced by many US firms in the last two decades, including the greater reliance on production teams.

6. The Rosenberg/Birzell list is not necessarily definitive, nor were all institutional innovations equally important to the rise of commerce. Moreover, in the late 20th century, other institutions may be important to entrepreneurship and innovation that were much less developed (or perhaps unknown) in earlier centuries (e.g. venture capital markets).

7. Ben-David (1993) comes to a similar sort of conclusion based on a comparison of convergence rates among EU countries pre- and post-trade liberalisation as well as a comparison of EU members with non-EU members and with EFTA countries. Essentially, he concludes that per capita incomes tend to converge among countries as they become more closely linked through trade, while in the absence of free trade there is little basis for expecting income convergence. One possible explanation is that technology diffuses rather freely across borders of trading partners.

8. This result may, as Wood and Ridao-Cano (1999) suggest, merely disguise a divergence of factor endowments between skill-rich and skill-poor countries following trade opening. They find evidence, following trade liberalisation, of a significant divergence in secondary and tertiary enrolment rates between the two (presumably reflecting divergent returns to education). While Wood and Ridao-Cano dismiss differential income elasticities of demand for education as a competing explanation, another possibility not explicitly considered is that other policy variables — e.g. fiscal austerity measures associated with structural adjustment programmes — may have contributed to a decline in the availability and/or quality of educational services in poor countries during periods of liberalisation. This may explain, e.g. the stagnation of primary enrolment rates in sub-Saharan Africa during the 1980s.

9. The range of goods of differing skill intensities produced in the South also widens, while that in the North narrows.

10. See Cline (1997, pp. 120-122) for a clear graphical exposition of the argument.

11. For a valuable summary of the literature on trade and technology, see Grossman and Helpman (1995).

12. Note that this is independent of any supply response; in the Pissarides model, the relative supply of skilled workers is held constant, but clearly over time it may expand in response to higher expected returns, which would reinforce the demand-side effect tending to narrow skill differentials once more.

13. Here, as in the previous case, supply should respond endogenously to the prospect of higher returns to skill, thereby dampening the growth in differentials and eventually causing them to narrow once more.

14. In Lucas' calculation, the elasticity of labour productivity with respect to an increase in the average human capital of the workforce was 0.36.

15. A better measure of technical change would have been total factor productivity, since labour productivity growth may arise from a shift towards more capital-intensive

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activities following liberalisation or from an across-the-board increase in investment ratios (see Lawrence 1998).

16. The Lawrence findings provide some empirical support to the conjecture of Wood (1994) that trade competition with the South induces relatively rapid productivity growth in the labour-intensive industries of OECD countries, though Lawrence emphasises that the causation runs in both directions — from trade to technical change and *vice versa.*

17. In particular, in their results, the threshold corresponds to a 1980 average of 0.45 years of secondary schooling for male population above 25 years of age. See their note 10 for details of the calculation.

18. This would seem to suggest a rather inelastic short-run supply of skilled labour.

19. Haskel and Slaughter (1998) find evidence supporting a significant role for sector-biased technical change in explaining changes in skill-based wage differentials in 10 OECD countries.

20. This result holds unequivocally only if domestic output prices are regulated by world prices, though even if domestic prices are allowed to vary as a result of sector-biased technical change, the result may still hold if, e.g. demand is sufficiently elastic in the relevant sector.

21. Based on a 1993 survey of some 1 440 businesses in China, it was found that the education level of owners was relatively high compared with that of the working population as a whole (as reported in the 1990 census); see The Project Group, (1995).

22. This serves to reinforce the case made by Taylor and Yunez-Naude for broadening the measure of education used in econometric analyses beyond that of the household head to include other household members.

23. In Ecuador, Baydas *et al.* (1994) find that the education of a business owner is positively related both to demand for and supply of credit from microenterprise credit programmes.

24. Baumol (1990) argues from historical evidence that the number of entrepreneurs in a society is probably not so important to economic performance as the "rules of the game" that define the set of rewards to entrepreneurship and thereby influence how entrepreneurs allocate their efforts and talents among competing activities — e.g. rent-seeking *versus* wealth-creating activities.

25. This may, but need not, involve moving into wholly new industries; a moment's reflection on the quality range within the textile/clothing sector alone makes evident the scope for technical improvements within "traditional" industries.

26. Alesina (1995) contains a summary of the substantial recent literature on how a highly skewed income distribution can adversely affect growth through ill-conceived redistributive policies.

27. Mishel and Bernstein (1994) report a real hourly wage decline for high school dropouts in the USA of 22.5 per cent between 1973 and 1993.

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Human Capital Formation and Foreign Direct Investment in Developing Countries *

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Abstract

This article synthesises a selected literature on human capital formation and foreign direct investment (FDI) in developing countries. The aim is to take a bird's eye view of the complex linkages between the activities of multinational enterprises (MNEs) and policies of host developing countries. In doing so, general trends, best practices and policy experiences are extracted to evaluate the current state of knowledge. The literature indicates that a high level of human capital is no doubt one of the key ingredients for attracting FDI, as well as for host countries to gain maximum benefits from their activities. Most developing countries, however, underinvest in human capital, and the investment that is actually taking place is unevenly distributed across countries and regions that have adopted different human resource development (HRD) policies. To improve human capital formation and thus to attract more FDI would therefore require a more coherent approach that takes host country constraints such as limited budgetary resources into account. One such approach is to provide strong incentives for MNEs and Investment Promotion Agencies (IPAs) to participate in formal education and vocational training even for workers employed by domestic firms. This allows HRD to be flexible and demand-driven. Another policy option is to facilitate human resource development (HRD) for small and medium-sized domestic enterprises which usually do not invest sufficiently in training of employees although these enterprises stand to gain most from education and training. In addition, FDI promotion policies can target high value-added MNEs that are more likely to bring new skills and knowledge to the economy that can be tapped by domestic enterprises. Lastly, it is important that key components of HRD policies, i.e. formal schooling and vocational education and training policies (post-formal schooling), are well co-ordinated so as to equip students with knowledge and skills that will later be complementary to training opportunities provided in the labour market.

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Introduction

Human resource development (HRD) and foreign direct investment (FDI) are among the key drivers of growth in developed and developing countries[2]. While HRD and FDI individually affect growth, they also reinforce each other through complementary effects. In general, enhanced HRD increases incoming FDI by making the investment climate attractive for foreign investors. This is done through a direct effect of upgraded skill level of the workforce, as well as via indirect effects such as improved socio-political stability and health (World Bank, 2003; UNESCO and OECD, 2003). On the other hand, FDI contributes to HRD since multinational enterprises (MNEs)[3] themselves can be active providers of education and training, bringing new skills, information and technology to host developing countries. Ultimately, this complementary effect leads to a virtuous circle of HRD and FDI where host countries experience continuous inflow of FDI over time by increasingly attracting higher value-added MNEs, while at the same time upgrading the skill contents of pre-existing MNEs and domestic enterprises.

Figure 3.1 illustrates how this virtuous circle takes place. The first part of the cycle (A: Determinants of Inward FDI) shows that sound government policies are important determinants of FDI[4]. Host investment climate such as market access and availability/quality of factors of production are other key factors affecting inward FDI. Sound policies should also contribute to a better investment climate. After a host developing country succeeds in attracting FDI, the next step of the cycle is to mobilise MNEs so that the new technologies that they brought into the country are transmitted to other firms and industries. This is usually achieved through MNEs' links with domestic firms as well as through their own HRD activities. Note that HRD is not limited to enterprise training but extends further to MNE collaboration with governments, investment promotion agencies (IPA), and domestic enterprises to design and co-ordinate HRD activities of the country or of the industry. The final step of the circle is for host countries to take advantage of the upgraded skill levels of the economy so that more inward FDI takes place. This is not simply to increase the flow of inward FDI, but to attract higher value-added MNEs, in which the key factor of production is the skilled workforce. To this end, host country governments need constantly to fine-tune policies so that the investment climate adapts in a way so that higher value-added MNEs that utilise new skills and information will be attracted.

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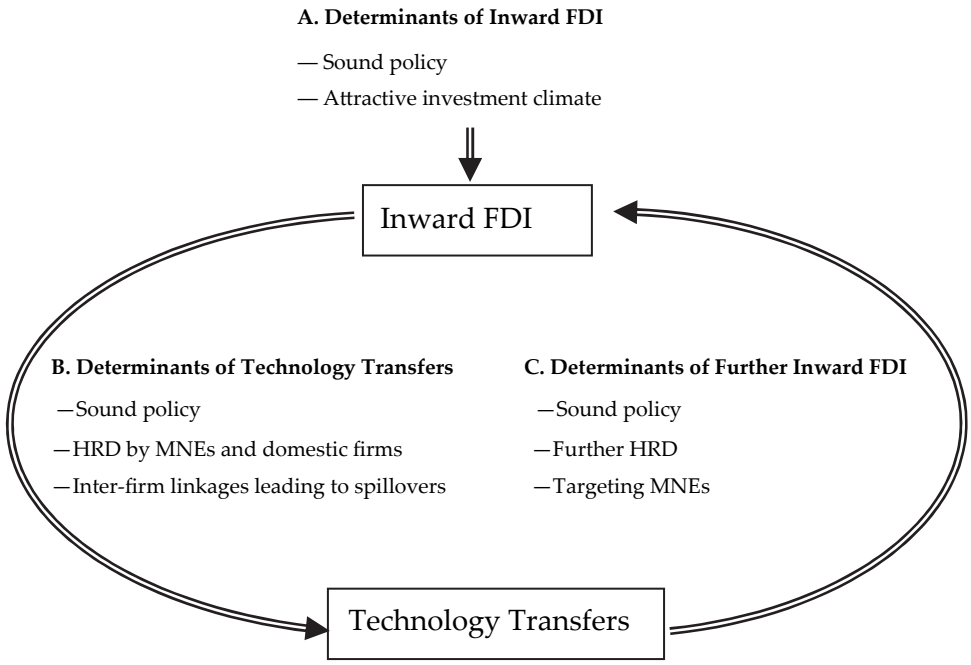
Figure 3.1. **The Virtuous Circle of Inward FDI and Technology Transfer/Spillovers**



During the past two decades, a number of developing countries witnessed a growing importance of FDI as the primary source of financial capital flows into their economy. FDI brings not only increased access to foreign exchange, trade and employment, but also new products, information and technology. It is no coincidence that this rapid growth of FDI was accompanied by an increase in the level of human capital. The latter was achieved by strong government commitments to expand formal education and vocational training along with improved enterprise efforts to improve training opportunities for workers. This section looks at recent trends in both FDI and HRD in order to highlight the magnitude of this issue as well as to explain some of the key issues raised in this paper.

Trends show that educational attainment among the adult population has steadily increased over the past three decades (Miyamoto, 2003, section II). However, cross-regional and intra-regional disparities remain a disturbing issue with the African region consistently lagging behind other developing regions. Future prospects of educational attainment among the adult population are

bright for countries in some areas of the developing world including Latin America and Caribbean (LAC) and Southeast Asia. However, the present state of school participation in the African region shows limited prospects for future growth in human capital. Evidence on enterprise training is fairly consistent with these trends in formal education with large cross-country disparities (Miyamoto, 2003, section II).

The objective of this paper is to delve into the vast literature of HRD and FDI in order to identify how this virtuous circle takes place and to seek ways to fine-tune polices to promote it. In doing so, empirical regularities, best practices and numerous policy experiences are extracted from the literature. Surprisingly, there has been a lack of comprehensive survey done on this issue as yet in spite of the growing concern and interest on this issue by policy makers, academics and other stakeholders. Since the major aim of this paper is to capture common regularities in how host developing countries mobilise human resources, it will not cover the whole literature exhaustively.

The paper is organised as follows. The rest of this section summarises questions to be posed throughout the paper. The next three sections provide the meat of the paper including: *i)* attracting inward FDI; *ii)* human capital formation by MNEs and technology transfers; and *iii)* the virtuous circle of human capital formation, incoming FDI, and technology transfers. The concluding section revisits the posed questions and provides directions for future research.

Questions posed

The following are key policy questions on HRD and FDI to be tackled throughout the paper. All the questions will be reviewed and assessed in the concluding article.

Question 1: What are the level and type of human capital necessary for host developing countries to attract FDI?

It is often argued that MNEs determine the choice of location based on the availability of high level of human capital. What exactly is the level of human capital (education and skills) that the MNEs are seeking? Do different types of MNEs seek different sets of skills, or are there minimal levels of human capital commonly acknowledged without which it is difficult to attract even the least skill-intensive MNEs?

Question 2: What are MNEs and domestic firms doing in terms of human capital formation? What are the correlates and determinants of training activities?

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After host countries successfully attract FDI, the next step is to have MNEs participate in improving the level of human capital of their workers as well as employees in other domestic firms. Case studies and firm surveys can be used to address: *i)* incidence, intensity, and the type of training activities performed by MNEs and domestic firms; *ii)* beneficiaries of training; *iii)* source of finance for training; and *iv)* the type of MNEs that are more likely to train.

Question 3: How does human capital formation of MNEs contribute to technology transfers?

One of the key motivations for the host countries to attract MNEs is to enjoy technology transfers. Is there any strong evidence of technology transfers in developing countries? What are the underlying conditions for such transfers to occur?

Question 4: What has been the role of government policies within the linkages between human capital formation and FDI? What are the good practices? What are the tentative policy conclusions?

After clarifying all the information surrounding the linkage between FDI and human capital formation, we address the most important question in this paper: which policies work and which do not? In doing so, past policy attempts will be assessed to identify tentative policy conclusions.

Question 5: Is there any evidence of a virtuous circle of human capital formation and increased inflow of MNEs? What is the role of policy to facilitate the virtuous circle?

Perhaps the ultimate scenario for the host country is to attain the virtuous circle where improvements in the level of human capital lead to more incoming MNEs, and improved training and technology spillovers from MNEs lead to a further increase in the human capital which leads to more incoming MNEs. Although it may be too early to assess the extent/mechanism for this circle to occur, we gather all possible evidence to identify the underlying conditions.

Human Resource Development and Attracting Inward FDI

One of the characteristics of rich industrial economies is the availability of a workforce with a high level of human capital. Whether human capital has been the key driver of economic prosperity or *vice-versa* is still a matter of debate. Nevertheless, long-time series trends in educational attainment and economic

growth during the last century indicate that HRD and economic prosperity went hand in hand[5]. Some developing countries followed similar trends in human capital and economic growth. What was distinctive about these developing countries is that they appeared to have realised large economic benefits in attracting MNEs into host economies, and have thus mobilised inward FDI to attain rapid economic growth.

How do host developing countries attract FDI? Figure 3.1 indicates the importance of an attractive investment climate and sound policy environment in order for host developing countries to attract FDI successfully. Investment climate includes availability/quality of factors of production, market size/access, logistic costs and numerous socio-political environments conducive to doing business with minimal risk. Past experiences of countries that have successfully attracted FDI indicate that many of these factors were indispensable. Among these, the level of human capital has been a crucial factor that MNEs, especially the high value-added MNEs, were seeking when determining the new location of operation. This has recently become even more crucial as the mode of MNE production is becoming relatively skill-biased with an increasing number of high-technology manufacturing and services MNEs seeking labour force equipped with knowledge in engineering, technology, organisational skills and business administration.

This section evaluates host developing-country efforts to develop human capital to attract inward FDI. The aim is to determine the following:

— Is human capital essential for attracting *any* type of FDI?

— What are the level and type of human capital necessary to attract FDI?

Both questions have become increasingly important but at the same time difficult to tackle since the type and the mode of FDI have changed dramatically during the past two decades and host countries are striving to upgrade/adapt their human capital as well as other key host country environments. The following evaluates empirical evidence on the role of HRD on inward FDI, and assesses policy experiences to mobilise HRD.

Empirical Evidence: Does Human Capital Matter?

Although the theoretical literature on FDI presumes human capital to be among the key ingredients of inward FDI (Dunning, 1988; Lucas, 1990; and Zhang and Markusen, 1999), there are only a few cross-country analyses done to identify the determinants of inward FDI in developing countries. Perhaps

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the reason for this lack of studies comes from the difficulty in constructing quality explanatory variables, especially for the indicator of human capital[6]. This becomes even harder when one tries to gather consistent cross-country variables. The literature on cross-country analyses can be divided into two groups. The first uses datasets that cover the period between the 1960s and 1980s, while the second is based on datasets between the 1980s and mid-1990s. All studies adopt cross-section and time-series analysis covering different sets of developing countries.

The first group includes Root and Ahmed (1979), Schneider and Frey (1985), Hanson (1996), and Narula (1996). Root and Ahmed show that among the 58 developing countries, none of their proxies for human capital — literacy, school enrolment, and the availability of technical and professional workers — are statistically significant determinants of inward FDI. Schneider and Frey, using data for 54 developing countries, find the share of an age group with secondary education to be a less significant determinant compared with other economic and political influences. Hanson, using a sample of 105 developing countries, shows that the adult literacy rate was not an important determinant of FDI compared with other socio-political variables. Finally, Narula demonstrates that the number with tertiary education in the population was not a statistically significant explanatory variable for FDI inflows among the 22 developing countries. Thus, all four cross-country studies show that human capital is not necessarily an important input for inward FDI. This conclusion is consistent with the fact that the period of the 1960s to 1970s was when FDI in the developing countries was concentrated on market and resource seeking and/or lower-end manufacturing types and that cheap labour and/or abundant natural resources were more important (Deyo, 1989; Ritchie, 2002; and Dunning, 2002). Thus, demand for more highly educated labour appears to be less crucial during this period.

The second group of cross-country analyses include Noorbakhsh *et al.* (2001), UNCTAD (2002), and Nunnenkamp and Spatz (2002). Using a dataset that covers the 1980s to mid-1990s, Noorbakhsh *et al.* find that both stock and flow measures of the human capital variable[7] show statistically significant and positive effects on FDI inflows, and that the effects became more significant over time. The major difference in the results compared with the first group of studies, apart from the econometric precision, should come from the fact that they used a more recent dataset that contains relatively more high value-added manufacturing firms. Indeed most MNEs operating in developing countries during the late 1980s and 1990s tend to be efficiency-seeking types and/or subcontractors (Dunning, 2002; Nunnenkamp and Spatz, 2002) and a

highly skilled labour force is expected to be crucial. UNCTAD also finds a high correlation between human capital proxies — tertiary gross enrolment ratio and science and engineering student ratio — and FDI inflows[8] among 140 developed and developing countries (UNCTAD, 2002). Nunnenkamp and Spatz use Barro and Lee's (2000) average years of education of total population aged 15 and above in the 28 developing countries and find that education becomes an increasingly important determinant from the mid-1980s to the late 1990s.

Thus, cross-country evidence indicates that human capital is an important determinant for inward FDI especially among efficiency-seeking MNEs, while not being an important determinant among market or resource-seeking MNEs. This is consistent with evidence that none of the Southeast Asian countries had institutions for industrial upgrading with skills development before the influx of FDI, at least in the low-end manufacturing sector (Deyo, 1989; Ritchie, 2002). This is also consistent with the experience in the African region, where much of the growth in FDI was in natural resources and market-seeking MNEs that were accompanied by stagnant growth in human capital.

Does this evidence indicate that countries seeking natural resources and/or market-seeking MNEs do not necessarily need to improve the level of human capital, while countries that seek higher value-added MNEs need to have a solid human capital base? To the extent that increased human capital contributes to civil liberties, political stability, health and reduced crime/corruption, all of which are considered to be key determinants of any type of FDI, human capital can still be a determinant for *any type* of FDI. One possible reason why human capital was not a significant determinant among studies using FDI data for the 1960s and 1970s is that other control variables may have captured the effect of improved socio-political stability due to improved human capital. Another reason may be that it may take longer time for improved human capital to have an impact on improved socio-political stability.

Although supported by limited evidence, education at the secondary school level appears to be the minimal level of education that is necessary for attracting relatively high value-added, efficiency-seeking FDI. The evidence, however, does not inform us which type of human capital, whether the level or types of education or firm-based training experience, is most effective in facilitating inward FDI. Most cross-section studies use secondary or tertiary level of schooling as a proxy of human capital. None of the studies compares different levels or types of human capital to identify which is the most effective.

While cross-country analyses provide a general idea of the importance of human capital on inward FDI, inconsistencies in the definitions of each explanatory variable are likely to plague their results. In this sense, country-

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specific studies are likely to reduce this bias. Unfortunately, there are equally less country-specific studies that delve into the role of human capital. Broadman and Sun (1997) and Coughlin and Segev (2000) provide evidence for China in the early 1990s, where they show that adult literacy is one of the key determinants for geographic determinants of FDI. Mody *et al.* (1998) identify the determinants of Japanese MNEs' expected investment in Asia. A variable representing labour quality[9] shows strong impact on expected investment for China, India, Indonesia, Malaysia, Philippines, Thailand and Vietnam. While a limited amount of evidence exists for other Asian countries, to the author's best knowledge none exists for the Latin American and African regions. Thus, the experience in limited country case studies is consistent with the importance of human capital on inward FDI, while giving no clear picture of the minimal level of human capital that is essential nor the level/type of human capital that is most effective.

Recently, a number of international organisations and bilateral donors have initiated surveys related to FDI and the host-country investment climate. They include the *World Business Environment Survey* by the World Bank in the year 2000, *Foreign Direct Investment Survey* by the Multilateral Investment Guarantee Agency[10] in 2001, and *JBIC FY2001 Survey* by the Japan Bank of International Cooperation (JBIC, 2002)[11]. The attractiveness of these surveys is the wide coverage of countries in developing countries, the relatively large sample size and the recent nature of survey years[12]. The last two surveys contain direct questions regarding the firm's motive for location selection. Although detailed analyses on location determinants have not yet been undertaken, preliminary analyses using these surveys show that the quality of human resources is an important criterion for MNEs' investment decisions. The *Foreign Direct Investment Survey* shows "ability to hire technical/managerial staff, and skilled labourers" to be among the critical factors of location choice[13]. *JBIC FY2001 Survey* shows that many Japanese MNEs considered "availability of superior plant workers and managerial personnel" to be an important factor for future investment choice of production bases[14].

To sum up, the literature on human capital and FDI indicates that human capital is an important determinant of FDI, especially among efficiency-seeking FDI that requires a skilled workforce as one of its key inputs. Although higher human capital does not appear to affect inflows of resource/market-seeking FDI directly, it can indirectly affect FDI by improving civil liberties, health and crime rates. Basic schooling (until lower-secondary school level) appears to be the minimal level of schooling required for FDIs after the mid-1980s. Given that the tendency of FDI in recent years is towards relatively skill-intensive production and services, and less towards primary and resource-based manufacturing, basic

schooling should be the absolute minimum level of education the developing countries must provide. For countries seeking to attract higher value-added MNEs, it is necessary to upgrade human capital way above the basic schooling level.

Policies to Develop Human Resources

Now that the importance of human capital in attracting FDI is understood, the next question is: what are the past HRD policy experiences of host developing countries that have strived to attract inward FDI? This section focuses on formal education policies to attract FDI. While vocational training policies also help improve human resources of host developing countries, they are likely to be more important after some influx of FDI into the economy.

a) Policy experiences to improve basic education

Basic education is the starting point of an HRD policy. Without wide access to quality basic education, host countries not only face difficulties in attracting low value-added MNEs, but also lose opportunities to move up the value chain by upgrading worker skills. Experiences in host developing countries that have invested in basic education appear to have led to a large influx of FDI. The following evaluates policies that have mobilised such efforts.

Perhaps the most celebrated policy initiative to expand basic schooling is *Education for All*, a collaborative action by international donors, governments and NGOs to improve education[15]. This initiative called upon all stakeholders to plan and initiate measures to improve numerous aspects of educational constraints faced by developing countries. They include lack of access to and quality of basic education and high adult literacy. Although many participating countries made large efforts to attain target goals set during the World Education Forum[16], many of these goals have not been achieved, with regions such as Central Asia and sub-Saharan Africa still facing low primary school enrolment rates and adult literacy rates. Gender gaps also remain quite large in these regions.

While the above initiative had a strong impact on increasing donors' official development assistance (ODA) for basic education, it also stimulated developing countries' own efforts to improve basic schooling. Mexico is a good case example where compulsory education was increased from primary to the end of basic schooling in 1993. This effort by the government as well as inputs from donors led to a substantial improvement in access and quality of basic schooling, with enrolments increasing seven-fold while total population tripled, and adult illiteracy decreased from 40 to 12 per cent. The government has also

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implemented a comprehensive reform of the education sector over the last five years with an emphasis on improving literacy and numeracy levels of the population. As a consequence, the average educational attainment among the population aged 15-64 has indeed increased from 5.9 years in 1980 to 7.95 years in 2000 (Cohen and Soto, 2001). Brazil is another country that has mobilised the *Education for All* initiative to reform the education system. The reform was undertaken in a direct manner via integrating the *Education for All* initiatives into the government's education policies. This has led to an improvement in access and quality as well as the management and financing. Net primary enrolment at the 1st-4th grade has increased from 86 per cent (1990) to 97 per cent (1999), while that of 5th-8th grade increased from 40 per cent (1990) to 62 per cent (1999).

A number of countries have made efforts to increase access and quality of basic education before the *Education for All* initiative. With the collaboration of the World Bank, Indonesia achieved an unprecedented increase in the number of primary schools of 61 000 between 1973 and 1978, which was later shown to have a large impact on school participation and wage gains (Duflo, 2001). The Indonesian government, with substantial financial assistance from donors including the World Bank, later implemented a scholarship scheme under the *Back to School Programme,* which allowed further improvement in access to basic education. Several countries have made attempts to increase the quality of basic education as well as access. They include Singapore, Indonesia, El Salvador, Haiti and Costa Rica. During the import-substitution phase back in the 1960s, Singapore initiated a scheme called *Standardised Education System* to streamline necessary types of skills in maths, science and English, to be covered in basic schooling. Indonesia, under the *Back to School Programme*, promoted improved efficiency in learning and service delivery by providing large lump-sum cash subsidies directly to schools and communities. This is a part of the community-participation scheme[17] which became a well-known model for developing countries to gain efficiency and quality in basic schooling. Other countries that followed the community-participation scheme include El Salvador, which emphasised the role of school-based management, and Haiti, which involved NGOs and a religious organisation. Recent developments in improving quality in delivering basic education are the use of technology in schools (World Bank, 1999). Costa Rica has been a frontrunner in the introduction of computers in classrooms to improve learning efficiency and to prepare students for the knowledge economy. The *Educational Computing Programme* and *Community Computing Programme* started in the late 1980s have already supplied over 10 per cent of all public primary schools in Costa Rica. It has been found that these initiatives had an enormous impact in spreading pre-internet digital culture in the communities (Monge and Cespedes, 2002).

In general, most of the above-mentioned policy experiences have indicated positive impact on quantity and quality expansion of basic schooling. However, care must be taken in applying these experiences to other countries each facing a unique set of constraints. For example, programmes to mobilise information and technology in schools are increasingly popular in developing countries. While computers may potentially be an efficient tool to facilitate learning and to equip students with technological skills, many developing countries simply do not have stable infrastructure or educational budgets to keep up with the recurrent cost of such investment. For these countries, other means to improve quality of schooling may well be more effective.

b) Policy experiences to improve post-basic education

There have also been numerous individual country and inter-governmental efforts to expand upper-secondary and tertiary education. Ireland and Korea are among the countries that have achieved increased access through policy change. To increase enrolments in upper-secondary and tertiary education, Ireland changed educational financing policies to reduce the tuition burden of students. The secondary education fee was abolished in 1967, followed by the introduction of free tertiary education. Korea, while already enjoying a relatively high tertiary school enrolment rate, faced problems in allocating students to subject areas that reflected industry's demands (UNCTAD, 1994). In particular, it was difficult to expand students in fields of technology. After identifying that lack of qualifications and recognition in these fields led to low enrolments of students in them, the government decided to redesign a technical qualification system that allowed graduates who studied these subjects to have the same status as other professionals.

Several countries have also tried numerous policy initiatives to improve the quality of tertiary education. They include Singapore, Ireland and Africa.

Singapore's Investment Promotion Agency (IPA). The Economic Development Board (EDB) has recently made an attempt to shape the Singaporean education system which is highly responsive to the demands of industry. This effort began in 1997 with the *World Class Universities Programme*, with an aim to set up ten world educational institutions in Singapore to deliver quality courses on demand-driven subjects. Singapore already has eight American and European schools that have strong links to industries. The amount of education and R&D delivered through these schools is expected to meet the skills needs of the industries.

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Ireland's IPA. The Irish Development Authority (IDA) also has a role in shaping educational policy in synchronisation with industry's demands. In 1997, for example, the *Experts Group on Future Skills Needs* was formed to identify skills needs of sectors and recommend action for HRD. Furthermore, the Irish IPA led a strategy called Education, Skills and Research, which includes research programmes in tertiary education to promote R&D and innovation capacity of the economy.

African Virtual University. In spite of the over-mounting problems to expand basic education, a number of countries in Africa, with the assistance of the World Bank, have initiated *African Virtual University* to overcome supply and quality constraints in tertiary schooling. This initiative, begun in 1997 with 17 African countries participating, has already produced 24 000 graduates in the fields of technology, engineering and business. The main idea of this initiative is to provide demand-driven tertiary education of high quality in areas where either infrastructures or the type/quality of courses are non-existent. However, to the extent that many of the graduates of these courses may go outside Africa, the true impact of the African Virtual University on upgrading skills in Africa is unclear, though experience in Singapore provides a good example for countries that aim to attract high value-added FDI.

c) Policy initiatives in the EU-zone: the minimum learning platform

Attempts have been made in a number of EU member countries to set a so called "minimum learning platform" which defines areas of knowledge and competence that are necessary in the forthcoming labour market. They take into account the new skill requirements such as those in communication, understanding ICT, ability to learn independently and further personal and social skills (McIntosh and Steedman, 1999). Furthermore, the "minimum learning platform" is expected to include not only skills that increase employability, but also skills that relate to all aspects of human conditions, such as personal and social skills (*ibid.*). The concept of the minimum learning platform contains an important message that the minimal skills necessary to meet the future labour market demand is increasingly moving towards higher technology areas as well as personal developments.

d) Policy conclusion

Past trends in inward FDI and policy experiences lead to two policy conclusions. First, HRD policies should, at the minimum, address access to and quality improvement of basic education. Without a sound basic education

policy, the education system will constantly feed underskilled workers into the labour market, which sends a bad signal for potential MNEs seeking location advantages. While basic education is important in itself to upgrade human capital, it also provides means for further increasing human capital by opening options for tertiary education, which has become increasingly demanded by high-value added MNEs. Even for countries that intend to attract primary and resource-based manufacturing FDI, basic education is important since it has a long-lasting effect on other key investment climates such as socio-political stability, health and civil liberty. However, effective ways to rapidly improve basic education is unclear from past host country experiences. It should depend on specific educational constraints faced by each country.

Second, HRD policies must be demand-driven. Past experiences indicate that participation by industries and foreign academic institutions that have close ties with high-technology industries can be effective. Moreover, experiences in Singapore and Ireland show that IPA-driven educational policies allow demands sensitive HRD policy reforms. To the extent that not all IPAs have authorities to make an impact on education policy making, IPAs should collaborate closely with the Ministry of Education.

Attracting Service Sector MNEs

Services sector FDI has been a growing area in the past 15 years (see Miyamoto, 2003, section II.2). Since the service sector FDI, in general, involves high value-added MNEs that possess knowledge and technology, host developing countries may want to mobilise their human resources so as to attract these types of MNEs. While not all services-related MNEs require high-skilled workers, some of the growing services-related MNEs do actually require a highly skilled workforce. They include MNEs operating in the areas of financial services, information technology, telecommunications, pharmaceuticals, medical services, as well as firms that locate regional headquarters in the host country.

The common feature among these services-related MNEs is that they require strong business support linkages and global connectivity. This calls for a highly skilled workforce that could handle business administration and management as well as computing and information and technology.

One good example of a rapidly growing services sector is regional headquarters. Singapore is a country that has successfully attracted a large number of corporate headquarters and is now a key hub in Asia. More than 60 per cent of the 6 000 foreign companies now based in Singapore have

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regional responsibilities and headquarters functions[18]. With a sufficient supply of computer-literate English-speaking workers with tertiary education, as well as other key factors such as sound logistics, financial infrastructure and tax incentives, more corporate headquarters are likely to be based in Singapore in the future.

Summary

To sum up, empirical evidence indicates that human capital is important for attracting FDI, and that host developing countries need, at least, a minimum of basic schooling for all the adult population to show that their country has a sound investment climate for potential MNEs. Countries that seek high value-added MNEs in high-technology manufacturing and services need to develop the tertiary education sector further. This calls for HRD policies that secure access to and quality of basic schooling. To formulate effective demand-driven HRD policies, it is necessary to have industries and IPAs participate in policy making as well as the delivery of educational services.

Human Capital Formation by MNEs and Technology Transfers

The previous section examined the role of host countries in attracting inward FDI and found that efforts to develop an attractive investment climate supported by sound policy reforms in HRD would help open doors to inward FDI. This section focuses on what host countries can do next to mobilise these MNEs to strengthen HRD further.

The obvious place to start is the role of enterprise training by the MNEs, since they are one of the limited channels of foreign technology coming into the host developing country[19]. MNEs cannot only afford to provide more training but should also provide innovative training in areas such as information and technology, organisational skills and management, to which otherwise host developing countries have limited access. However, it is not just the host country effort that is crucial for maximising the role of HRD by the FDI. It is also important to have domestic firms, which constitute the majority of firms and workers in developing countries, conduct HRD in order to maximise the amount of skills transferred to the host country. Thus, this section will consider training activities of both MNEs and domestic firms.

Human Capital Formation by MNEs and Domestic Firms: Determinants of Enterprise Training

It is a widely understood that firms in general underinvest in training in both developing and developed countries (Batra and Tan, 2002; OECD, 2003*a*; OECD, 2003*b*). Among the few surveys that cover enterprise training in the developing countries, the World Business Environment Survey (WBES) provides some information about cross-country comparison in the incidence of training. It shows that, on average, 60 per cent of firms in both East Asia and Latin America and the Caribbean (LAC) regions conduct some formal training (Batra and Tan, 2002; Batra, 2003). However, there are wide variations in the incidence of formal training, which ranges from 65 to 75 per cent in China, the Philippines and Singapore to 30 per cent in Malaysia. Another set of enterprise surveys that compared training incidences in Indonesia, Malaysia, Chinese Taipei, Colombia and Mexico in the early 1990s[20] also confirms large variances, with high-performing countries such as Colombia (50 per cent) and Malaysia (35 per cent) to low-performing countries such as Indonesia (19 per cent), Chinese Taipei (9 per cent) and Mexico (11 per cent).

What are the sources of training? WBES distinguishes between formal in-house training provided by the employer, and formal training provided by external public/private training institutions. It indicates that formal in-house training is the major source of training provided by firms in both East Asia and LAC regions, accounting for 40 per cent in East Asia and 50 per cent in the LAC. Among firms that use outside training sources, most firms in both regions appear to rely on private training institutions.

Underinvestment in training that is relatively unequally distributed is a disturbing evidence when host developing countries are trying to catch up with the skills level of the industrialised economies and enterprise training is one of the most important sources of skills acquisition. Indeed many studies have shown that enterprise training raises labour productivity substantially. Empirical studies show that productivity gains of training range from about 50 to 75 per cent in Indonesia, Nicaragua and Guatemala, to about 30-45 per cent in Mexico, Malaysia and Colombia (Tan and Batra, 1996; Batra, 2003). These productivity gains are even stronger for small and medium-sized firms (World Bank, 1997). Before describing policy measures to tackle these training problems, the literature on training determinants is assessed to identify the reason behind this underinvestment.

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a) Determinants of enterprise training: what are the training constraints?

Enterprise surveys have shown that large variances in training incidence exist across firms. A natural question then is why do certain firms invest more in training and others do not? There is a certain amount of cross-country and individual country evidence in the literature to identify why this is the case.

The only cross-country/cross-region survey in developing countries that sheds light on the training determinant is the WBES. This survey contains questions where firms are asked to rank on a scale of one (not important) to five (very important) the relevance of seven statements to their decision to provide little or no training (Batra, 2003):

1) training is not affordable because of limited resources;

2) training is costly because of high labour turnover;

3) firm lacks knowledge about training techniques and organisation;

4) firm used a mature technology, so learning-by-doing is sufficient;

5) informal training is adequate;

6) skilled workers are readily hired from other firms;

7) firm sceptical about the benefits of training.

Among the most important reasons for providing little or no training, East Asian firms responded: *4)* mature technology (45 per cent); *5)* adequacy of informal training (35 per cent); and *2)* labour turnover (33 per cent), to be the three most important determinants. Firms in the LAC region responded: 6) availability of hiring skilled workers from other firms (44 per cent); *4)* mature technology (35 per cent); *5)* adequacy of informal training (33 per cent), being the three key reasons. For firms already using mature technologies, there is limited scope for improving on existing techniques and workers can become more proficient by learning by doing or through informal training (Batra, 2003).

The WBES also indicates that 27 per cent of firms in East Asia and 13 per cent of firms in the LAC region face training constraints due to non-affordability coming from limited resources: *1).* This is likely to be the case because of the credit constraints faced by many enterprises in developing countries. While there are increasing numbers of training grants and subsidy schemes available in developing countries, not all the firms are eligible for training subsidies and credit availability may thus be important. Small and medium-sized enterprises

(SMEs) are more likely to face this type of training constraint since they are the ones which are less likely to have access to the credit market. Indeed, the WBES shows that, in East Asia, 29 per cent of small-sized firms and 19 per cent of medium-sized firms cannot afford training because of limited resources, whereas only 13 per cent of large-sized firms cannot afford it *(ibid.)*.

Lack of knowledge also appeared to be an important reason for providing little or no training. This was especially true in East Asia (24 per cent). Larger firms are more likely to have better access to information on training techniques and organisation. Indeed, in East Asia, only 18 per cent of large firms claimed to have constraints while more than 28 per cent of small firms lacked access to such information (*ibid.)*.

Firms having a perception of high-labour turnovers is another important reason why firms provided less or no training. Thirty-three per cent of firms in East Asia and 18 per cent of firms in the LAC region indicated their doubt that training investment is not worthwhile because of worker turnovers. This is more likely to be the case among small firms facing difficulties, whether financial or contractual, in providing incentives to keep trained workers. This is verified by the high percentage of small firms (32 per cent) showing concerns, while a smaller fraction of large firms (22 per cent) indicates this to be a problem.

To sum up, the WBES indicates that firms in East Asia and LAC face training constraints due to a number of market failures including information constraints, credit constraints and labour turnovers. These constraints were found to be less binding for larger firms. Larger firms have much wider opportunities to receive information regarding training techniques and organisation methods. Their training burden per worker is likely to be lower than smaller firms, since the opportunity cost of losing one employee in training activities and per worker cost of training is presumably lower.

Studies that focus on individual countries using firm surveys are consistent with these findings. For example, Zeufack (1999), Tan and Batra (1996), Tan and Lopez-Acevedo (2003), and Miyamoto and Todo (2003) show that the effect of firm size on training incidence is significant and large for Mexico, Indonesia, Thailand and Malaysia. Miyamoto and Todo (2003) use variables capturing legal status[21] in order to capture the extent of credit constraint among Indonesian firms. They find that having no legal status reduced the probability of training. Note that the findings that large firm size positively affects training is consistent with firms not training because of information and credit constraints and labour turnovers. This is because larger firms are less likely to be credit constrained, more likely to have access to information on training, and less likely to suffer

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from high labour turnovers. Smaller firms on the other hand usually find it hard to gain credits, participate in training workshops, face difficulties replacing workers engaging in training activities, and will not be able to provide attractive incentives for workers not to quit after training.

Another interesting finding from these studies is the positive role of a firm's technological sophistication on training determinants. Tan and Batra (1996), Zeufack (1999), and Tan and Lopez-Acevedo (2003), all show that R&D investment is an important determinant for training in Mexico, Malaysia, Thailand and Chinese Taipei. For Mexico this impact becomes even stronger over time (Tan and Lopez-Acevedo, 2003). This is consistent with firms using a sophisticated production process and R&D requiring intensive training for workers to adapt to such a mode of operation.

b) Do MNEs train more than domestic firms?

Most empirical findings confirm this by using variables representing foreign ownership. Tan and Batra (1996), Tan and Lopez-Acevedo (2003), and Miyamoto and Todo (2003) show that higher foreign equity share is indeed an important determinant of training in Mexico, Indonesia and Malaysia. Why do MNEs train more than domestic firms? The literature provides numerous explanations. MNEs are less likely to face credit constraints since they usually have wide access to foreign capital. It is also suggested that MNEs are more likely to gain information on techniques and organisation of training since their range of information is global. They can also reduce the probability of labour turnovers by providing attractive compensation packages to keep employees after the training provision[22]. A recent analysis in Almeida (2003) indicates that foreign-owned firms "cherry pick" domestic firms to be acquired, choosing those with a more highly educated workforce. If an educated workforce is more likely to be trained, or if "cherry picked" firms tend to be high-technology firms that require training, MNEs are more likely to train than domestic firms.

c) Does availability of educated workers increase enterprise training?

A number of studies have addressed the issue of whether educated employees are more likely to receive enterprise training. Since productivity gains of training activities among educated workers are expected to be higher, firms with a higher proportion of educated workforce are more likely to provide training. Much empirical evidence supports this. Tan and Batra (1996) show that

firms with high mean years of education are more likely to provide training in Colombia, Mexico and Malaysia. Tan and Lopez-Acevedo (2003) and Zeufack (1999) show that firms with a higher proportion of educated workers are more likely to provide training.

However, this does not necessarily imply that firms, faced with an abundant supply of educated workers, would train more. Indeed the WBES indicates that as many as 44 per cent of firms in LAC and 21 per cent of firms in East Asia provide less or no training due to the availability of skilled workers in the labour market. Miyamoto and Todo (2003) further confirm this by showing, after controlling for endogeneity of average workers education variable, that firms in Indonesia substitute training by hiring more educated workers.

This has an important policy implication since these findings indicate that simply expanding educational attainment may reduce firm's incentives to provide training.

Human Capital Formation by MNEs: Supporting Formal Education

While training is no doubt the major source of HRD activities undertaken by the MNEs, they can also contribute to the HRD of host developing countries by mobilising formal education. One of the MNEs that has invested substantially in formal education is Intel. They have invested in curriculum, educational equipment, infrastructure and technical support to almost all countries where they have production facilities, including Argentina, Brazil, Costa Rica, China, Malaysia, South Korea, India, Russia, Poland, Ireland and South Africa.

For example, in China, Intel has supported tertiary education through effective curriculum development and research. Working closely with the Chinese academia, Intel has participated in joint research projects, facilitated technology development and provided scholarships. In Costa Rica, Intel has assisted all levels of formal education in their *Robotics Programme* by providing training workshops for teachers, curriculum development, and equipment and materials. Its collaboration with the tertiary education sector includes technical assistance to the engineering curriculum and equipment supply to the University of Costa Rica and Costa Rica Technology.

Another example of MNE participation in education is Toyota Motors Corporation in Indonesia. Toyota decided to collaborate with ASTRA Foundation and created the Toyota-ASTRA Foundation with the aim of supporting HRD through education, training and R&D. Recent programmes include scholarships

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to students at all levels of formal education, but in particular for children from poor families; educational materials and equipment to schools and universities; and research grants to universities and research institutions.

What are the motivations for MNEs to support formal education? Is it out of charity or to gain good publicity, which may well make sense under the recently growing hostility towards the MNEs? Does recently growing awareness of corporate social responsibility help in supporting MNE investment in human capital? Moreover, are there economic benefits for MNEs to invest in education? One economic benefit that MNEs may gain is the opportunity to hire graduates from the educational institutions that MNEs are supporting. In other words, if it is more cost efficient to invest in formal schooling rather than providing in-house enterprise training, MNEs' investment in formal education can be justified. However, it is not clear if the graduates will end up working for the MNEs that had financed part of the education. To the extent that the type of skills that MNEs are funding is most likely related to the skills relevant for the MNEs themselves or for their suppliers and distributors, most of the students would likely be employed in firms with at least some backwards or forwards linkages to the MNEs. To verify these hypotheses, tracer studies of graduates of MNE-funded educational institutions are necessary.

One interesting example of services sector MNEs that have direct links to educational institutions are universities and business schools in the US and Europe. In fact, this is a special case of MNEs supporting HRD of host developing countries by themselves being the provider of education services. Examples of these include Harvard Business School in the US, INSEAD in France and the Stockholm School of Economics, all of which have school branches around the world including in developing countries. Singapore is one of the popular places where foreign educational institutions are located. Recent efforts by governments to attract and expand MNEs' educational services further include the *World Class Universities Programme,* which aims to attract at least 10 world class education institutions. Today eight top American and European schools with strong linkages to industry conduct advanced postgraduate education and R&D programmes in business, management, engineering and applied sciences. Although some of the participants of these educational programmes may be non-Singaporean who may not stay in the country after graduation, these educational services provided by MNEs are expected to contribute to HRD by fostering R&D and supplying high-skilled graduates to the fast-growing industry.

Technology Transfer through Training Spillovers

HRD activities conducted by the MNEs have proved to be important for host developing countries since domestic firms are more likely to face training constraints due to market failure. MNE training is also important since it is most likely to bring in the advanced skills and technologies to which domestic firms otherwise have no access. One important channel through which this technology may transfer from MNEs to domestic firms is the so-called training spillovers.

Training spillovers may occur through four routes: vertical linkages, horizontal linkages, labour turnovers, and labour spin-offs. Vertical linkages happen when MNEs train or provide technical support to domestic firms that supply them with intermediate goods (backward linkages), or to buyers of their own products (forward linkages). Horizontal linkages occur when domestic firms in the same industry gain skills through industry or region-wide skills development institutions that are supported by MNEs[23]. Labour turnover occurs when MNE-trained workers or managers transfer their knowledge to other firms when switching employers. Finally, labour spin-offs happen when an MNE employee starts up a new firm based on the know-how gained from previous experience.

a) Training spillovers through vertical linkages

One of the most common linkages between MNEs and domestic enterprises is made through backward and forward linkages. MNEs can affect domestic firms that supply goods by providing technical assistance as well as training in innovative production methods, management and organisation.

There is much evidence of such training spillovers. One case was in Mexico during the 1980s, when the Mexican auto industry rapidly grew through the location decision made by General Motors and other major foreign car and auto parts companies. Within a short five-year period, more than 300 domestic suppliers of car parts and accessories had sprung up to serve these MNEs. Spillovers appear to have taken place through interactions between MNEs and domestic suppliers such as shop-floor training, quality-control training, weekly meetings and technical assistance (UNCTAD, 2000; Lim, 2001).

Costa Rica provides another case of training spillovers through backward linkages. Intel started to operate the semiconductor assembly and testing plant in Costa Rica in 1997. While providing a substantial amount of training to its own employees, Intel also provided training to suppliers of specialised goods and services (Larrain *et al.*, 2001).

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b) Training spillovers through horizontal linkages

When MNEs support industry/regional skills development institutions through infrastructure investment, technical support and programme design, advanced technologies and skills of MNEs are expected to spill over to other firms in the same industries receiving training at these skills development institutions.

Malaysia provides a successful case of an MNE-government collaborative effort to mobilise domestic firm skills through horizontal linkages. This collaboration effort was made by two states, Penang and Selangor, to establish two state-run skill development centres: the Penang Skills Development Centre (PSDC) and the Selangor Human Resources Development Centre (SHRDC). Before the establishment, a series of meetings between MNEs and the state government was made to plan and design the content of the Centre, during the period when both of these states faced severe skilled labour shortages. Both of the skills development centres now provide, under the management of MNEs, training in technical manufacturing, managerial skills, and further education primarily to workers in domestic firms.

c) Training spillovers through labour turnovers and spin-offs

When employees of MNEs seek alternative firms to work in after receiving MNE-based training, it is likely that they will try to sell their skills and experiences attained while working at the MNEs. Domestic firms interested in new skills and technologies would most likely seek ex-employees of an MNE in the same industry. Labour turnovers occur when such demand and supply of skills clears in the labour market. Training spin-offs occur when such employees decide to use their acquired skills to start up a new company. Case examples of these are found in the Intel case for Costa Rica (Rodriguez-Clare, 2001) and in the machine-tools industry case for Malaysia (Lim, 2001).

Another interesting case is found in the enterprise training by Siemens India Limited, which manufactures a wide variety of electronic items such as switchgears/boards, control equipment, and communication/medical electronics equipment (Dagaur, 1997). The training programme provided by Siemens is a three-year apprenticeship programme for 140 young entry-level workers. After the apprentices have completed the in-house training which involves rotation of different divisions of the firm, half continue to work in Siemens, while the rest are employed in large- and small-scale industries or start up their own firm.

d) Training spillovers by improving the absorptive capacity of domestic firms

Is it only the efforts made by MNEs that stimulate training spillovers? The literature indicates that efforts made by host developing countries to improve their absorptive capacity also help transfers of skills. For example, Borenzstein *et al.* (1998) show that reducing the technology gap between MNEs and the domestic economy increases technology transfers. Blomstrom *et al.* (1994) also show that FDI contributes to growth only for a country that already has the necessary capabilities to absorb FDI-related technology transfers. These two pieces of evidence imply that domestic firms' efforts to develop skills through training helps skills to transfer from MNEs to domestic firms.

Todo and Miyamoto (2002) provide direct evidence supporting the importance of domestic firms' absorptive capacity on training transfer. Using enterprise survey in Indonesia, they show that their variables capturing absorptive capacity of domestic firms, including R&D and human resource development expenditures, were important determinants of technology spillovers.

HRD Policies to Promote Training and Spillovers

The above assessment of selected past empirical evidence suggests that firms, in spite of large productivity gains, underinvest in training because of market failures such as credit market constraints, lack of information and labour turnovers. The underinvestment is even more acute among small- and medium-sized domestic firms that tend to have higher productivity gains from training compared to MNEs or large domestic firms. It has also shown that MNEs have numerous channels to improve HRD in host developing countries by training their own workers and facilitating training spillovers. This calls for policy measures to tackle market failures in training and to stimulate training spillovers, especially among domestic small and medium-sized firms.

a) Policies to Finance and Promote Training

To determine the optimal policy to tackle underinvestment in training, it is necessary to identify the nature of the market failure. If lack of information is the main reason for firms not training, the right policy response should be to address information failure. If firms lack incentives for training owing to high labour turnovers, optimal policy should require firms to train or to contribute to the cost of training organised by a third party (Batra and Tan, 2002).

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Information failures: Results from the WBES indicate that firms in the East Asian and LAC regions, on average, underinvest in training because of either "lack of knowledge about training techniques and organisation" or "being sceptical about the benefits of training". This calls for policies that facilitate dissemination of information regarding the benefits of training, best practices in training, and availability/costs/procedures to participate in training. Several developing countries including Malaysia and Mexico took such an approach as part of their training policies.

In Malaysia, the *Double Deduction Incentive for Training* (DDIT) scheme was created in 1987 to tackle underinvestment in training. It later turned out to be less effective than originally envisaged and training take-up was low. According to the *Malaysia Industrial Training and Productivity Survey 1995*, the most frequently claimed reasons for firms to underinvest in training turned out to be that many were not aware of such training opportunities. The *Human Resource Development Fund* (HRDF) was later created in 1993 using a matching grant from the government. The council was formed by representatives from the private sector and from responsible government agencies to administer the scheme. One important feature of the HRDF was to disseminate information on training using workshops on training needs analysis, clinics to answer questions about different schemes, and employer associations to participate (World Bank, 1997). This new scheme, although not entirely thanks to the increased level of information dissemination, was shown to have increased the use of training funds.

Mexico initiated the Integral Quality and Modernisation Programme (CIMO) in 1988 to provide subsidised training to small and medium-sized enterprises. After the pilot programme that consisted of training subsidy, it expanded the scope to provide integrated training package and industrial extension services to 23 000 SMIs per annum and 150 000 employees (World Bank,1997). An information campaign to disseminate this new programme was an important component, which included workshops explaining basic information about the scheme and technical assistance services. The key aspect of this information campaign was that the CIMO promoters actively sought out the small and medium-sized firms to deliver assistance (World Bank, 1997). An evaluation study shows that the CIMO increased participation of training programmes.

Labour turnovers: WBES indicated that 33 per cent of firms in East Asia and 18 per cent of firms in the LAC region considered labour turnovers as important factors hindering training activities. A number of governments have tried to overcome this market failure by imposing payroll tax or profit

tax to force firms *de facto* to spend on training. In general, financing schemes in developing countries can be categorised as follows (Batra, 2003): *i) levy-grant scheme,* where payroll levies are later used by fund administrators to make grants to employers for approved training; *ii) levy-rebate schemes*, where payroll levies are later partially reimbursed for approved training; *iii) levy-exemption schemes,* where payroll levies are exempt for employers that spend a given percentage of their payroll on training; and *iv) tax-incentive schemes,* where firms can deduct training expenditures from their profit tax.

A number of countries including Singapore, Chinese Taipei, Argentina and Costa Rica have adopted the levy-grant scheme. While there has been a mixed outcome of this scheme, its success appears to depend on the management methods of funds[24]. Malaysia, Korea, South Africa, Chile and Zimbabwe have adopted levy-rebate schemes. An evaluation study for Malaysia shows that this scheme resulted in positive contribution to training, especially among medium-sized firms (Tan, 2001). Chile's levy-rebate scheme, *franquicia tributaria,* also indicated that small firms have benefited from the training scheme, with an increase in training participation among the disadvantaged groups such as women and unemployed. Levy exemption schemes are adopted in France, Turkey, Botswana and Morocco, and tax-incentive schemes have been implemented in Malaysia (previously) and the Netherlands. Evaluations for Malaysia indicate that this scheme was not effective in increasing training, especially among small domestically-oriented firms (World Bank, 1997). The majority of firms that benefited from this scheme were export-oriented firms, mostly MNEs that have trained even without tax incentives. This is in fact the reason why Malaysia decided to introduce the levy-grant scheme.

Financial constraints: WBES indicates that 27 per cent of firms in East Asia and the LAC region on average provide less or no training due to financial constraints. Providing training grants to firms facing financial constraints is not a viable option for the government due to fiscal constraints. Tax-incentive schemes can be one option for constrained firms since this will not increase the financial burden of training expenditure. Payroll-levies may also be considered as an option since payroll taxes can be shifted onto wages[25]. Alternatively, governments may also design policies so that MNEs pay training costs for constrained domestic firms[26].

What can be learned from all these different experiences of policies related to training finance? Unfortunately, due to the lack of evaluation studies to compare different options, it is difficult to conclude which policy works

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best and which does not. A tentative conclusion is that: *i)* payroll tax levies are preferred to training grants since funding levels are more stable; and *ii)* aggressive information campaign on training can be effective.

b) Intergovernmental Policies to Promote Training: The OECD Guidelines

The *OECD Guidelines for Multinational Enterprises*, adopted by 30 OECD member countries and seven non-member countries[27], recommend MNEs to support local capacity building and to facilitate innovative capacities in science and technology in host countries (OECD, 2000). More explicitly, it recommends to "encourage human capital formation, in particular by creating employment opportunities and facilitating training opportunities for employees" and to "perform science and technology development work in host countries to address local market needs, as well as employ host country personnel in a science and technology capacity and encourage their training, taking into account commercial needs" *(ibid.)*. Although the Guidelines are a code of conduct and thus non-binding for enterprises, governments have committed themselves to promoting their observance and effective implementation.

c) HRD Policies to Promote Training Spillovers

Given the past evidence and experiences related to training spillovers examined previously, the following three tentative policy conclusions can be made. First, governments should increase training incentives for not only MNEs but also domestic firms that are of small and medium size. Given that MNEs usually have strong incentives to train their workers in the first place, training incentives should be focused more on domestic firms. Second, policies should provide strong incentives to support MNE-state partnerships to mobilise demand-driven training schemes. Case examples of state-run skills development centres in Malaysia have shown that MNEs can contribute to training spillovers through horizontal linkages. Third, governments should provide incentives for MNEs to collaborate with educational institutions. Unfortunately, evidence does not exist on whether or not governments do provide tax incentives to MNEs investing in educational institutions. Finally, government policies requiring minimum local content may increase incentives for MNEs to train workers in domestic firms (OECD, 2002).

The Virtuous Circle of Human Capital Formation, Inward FDI and Technology Transfers

The previous two sections described how host developing countries attract MNEs. It is found that while basic education for all adults is the key starting point, a demand driven HRD at a higher level is necessary to attract higher value-added MNEs including those in the recently growing services sector. To further squeeze out the benefits of FDI, host countries need to fine-tune policies further to facilitate technology transfers. Even reaching this point is a difficult task for most host developing countries, especially for those countries that have historically relied on the primary sector and natural resource- based manufacturing in which a high level of human resources were deemed less important as an attraction.

This section discusses possible policy options so that the process of inflowing FDI and technology transfers continuously repeats in a virtuous circle, for countries that have at least gradually succeeded in attracting FDI and are moving towards optimising HRD policies to facilitate technology transfers. What else, apart from the policy implications mentioned in the second and third sections, is necessary to start and sustain such a virtuous circle?

Policies to Facilitate a Virtuous Circle

There are only limited experiences of host countries that have succeeded in continuously attracting FDI while effectively moving up the value chains through solid HRD and technology transfers. Among these, Singapore, Ireland and, to some extent, Costa Rica are the few countries that are considered to be in the process of a virtuous circle. All three countries started their industrial development with a large proportion of unskilled workers and minuscule level of FDI. All three countries have acknowledged the important role of foreign firms in the economy, consequently made rapid HRD, and have continuously increased the supply and quality of education. They all initially started attracting low value-added MNEs, and have gradually succeeded in attracting high value-added MNEs in the past one or two decades, which went hand in hand with an upgraded investment climate and a policy environment driven by a well-functioning IPA. The following describes the common policy fundamentals behind the success of these countries.

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i) Flexible Demand-Driven Policies

One of the most important fundamentals behind the FDI policies in the three countries is a demand-driven principle. The establishment of effective IPAs with strong authorities to co-ordinate human resource development was a key starting point. All IPAs in the three countries had good links with industries and MNEs which helped identify the skill needs of the economy. This was crucial in devising effective educational policies and establishing government-funded skills development institutions.

Another important feature of the successful demand-driven policies among the three countries is its flexibility. With the rapid innovation in technologies and increased importance of the services industry, the mode of MNE operation has been substantially transformed over the past ten years. This calls for host developing countries to devise HRD policies that are highly flexible, reflecting fast changes in the skill demands of the economy. In order for this to happen, industry involvement in HRD policy making, with industry-driven training schemes, becomes a key.

ii) Targeting Inwards FDI

In the short run, increasing the amount of inward FDI is feasible for most countries by simply providing attractive tax exemption policies or rewarding preferential status to particular MNEs that host countries seek. This, however, is not likely to be effective in the long run since it will lead to a large fiscal burden, and the very MNEs that countries seek most — those with high value added, bringing skills and technology — are usually not attracted solely by tax incentives policies. Indeed, the second section has shown that high value-added MNEs require other host-country conditions including a high level of human resources.

The experiences in these three countries indicate that it is crucial to target the type of MNEs that the host country is likely to benefit in the long run as well as in the short run. If host countries attract MNEs that will not lead to much upgrading of skills in the economy, the virtuous circle can never be attained, and its impact on the economy is expected to be one-shot. Thus, host developing countries must first identify the type of MNEs that they would not only like to attract in the short run (potentially increasing employment and tax revenues), but also the types that would most likely benefit the economy in the long run, through increased training opportunities and technology spillovers. The next step is to assess whether the country has the right investment climate for this type of MNE to be attracted. If not, rapid policy reforms to improve the investment climate become imminent.

iii) Co-ordinating Education and Training Policies

Past experiences in the three successful countries show that HRD policies to attract FDI and HRD policies to promote skills transfers were both critical in each of the steps of the virtuous circle. In particular, formal education policy was shown to be important for the former while training policy was shown to be critical for the latter. Is it then sufficient that host countries simply make efforts in improving education and training policies as described in the previous sections? The answer to this question is most likely to be no. One reason could be that education policies that simply increase the number of school graduates may crowd out enterprise training. Increased numbers of students finishing basic schooling level and above may give financially constrained firms incentives to increase hiring of these students instead of providing job-specific training that may be more beneficial for these workers and firms in the long run (Miyamoto and Todo, 2003). Another reason comes from evidence that the contents of enterprise training programmes are in many cases very similar to what is taught in formal education[28]. While low-educated workers in the labour market who had missed basic education may gain from such training programmes, other workers may not benefit at all. All these policy/market failures can be reduced if formal education policies and (post-formal) education and training policies are well co-ordinated. In fact, one of the important goals of adult-learning and/or life-long learning policies adopted in many of the OECD countries emphasises the importance of co-ordination of formal schooling and education and training during the post formal schooling stage (OECD, 2003*b*). They stress the importance of policy coherence and a co-ordinated approach to adult (life-long) learning by bringing all the relevant partners at different education and training levels together (OECD, 2003*b*).

Co-ordination is important since formal schooling, depending on its contents, can reinforce or hinder post-schooling training. If workers gain the right skill/knowledge mix in formal schooling that would later increase the benefits of continuous training, both workers and firms would have more incentives to provide training. Unfortunately, even in most of the European Union member countries, there is as yet no coherent strategy to co-ordinate the different phases of education and training either in terms of curricula and/or recognition/certification of formal and non-formal learning. Co-ordination is thus an issue not only for countries concerned with adjusting workforce skills to the ever evolving skills demand, it is particularly important for developing countries that seek further gains by attracting and mobilising FDI.

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Conclusion

The literature on human capital formation and FDI provides tentative answers to the five questions posed in the introduction of this paper. *First,* to attract *any type* of FDI, host developing countries need an adult population with at least basic schooling. The type of human capital necessary to attract FDI obviously depends on the type of FDI host countries seek. To attract high value-added MNEs, it is necessary to develop the tertiary education sector with close collaboration with the industry so as to formulate demand-driven programmes. *Second,* MNEs can contribute to the HRD of the host developing country by providing training and supporting formal education. Small and medium domestic firms tend to underinvest in training as compared to MNEs and large domestic firms, even though the former group usually enjoys higher productivity gains from training. The underinvestment appears to be due to market failures including lack of information, financial constraints and training spillovers. *Third,* MNEs contribute to technology transfers through numerous channels of training spillovers, including vertical/horizontal linkages, labour turnovers and spin-offs. Host-country efforts to improve the absorptive capacity have also been shown to facilitate technology transfers. *Fourth,* government policies have been important to facilitate training, to minimise financial constraints and market failures, and to promote MNEs to invest in HRD of the host economy. Most of the successful training policies have been demand-driven, involving industries, MNEs, IPAs, and foreign academic institutions that have close ties with the advanced developments in technology, business administration and management. *Fifth, and last,* there is limited evidence of a virtuous circle of inward FDI, HRD and technology transfers. Governments that emphasise *flexible* demand-driven HRD strategies, *target* MNEs in high value-added areas, and *co-ordinate* education and training policies are more likely to lead the country into a virtuous circle.

The arguments made in this paper are based on limited evidence extracted from the literature on human capital and FDI, and a number of selected case studies of firms operating in developing countries. Obviously, more evidence and detailed analyses are required to gain clear and in-depth understanding of the changing role of HRD, FDI and economic growth. In particular, there are a few areas that may help extend the understanding on this issue. One is to initiate globally comparable firm-level surveys that contain detailed information on HRD activities among firms. While the *World Business Environment Survey* provides some cross-country information on training in East Asia and Latin America, it is limited with respect to its small sample size (per-country),

restricted coverage (East Asia and LAC-region) and lack of information on inter-firm linkage. Another area that may facilitate this line of research is the analyses of matched employers-employees surveys that contain detailed information on employee training and inter-firm linkages. While such surveys have become increasingly available in developed countries, only a limited number exist in developing countries. The last area of research could be on the collaboration between different actors of FDI and HRD including MNEs, IPAs, governments and educational institutions, which would provide a better understanding of how synchronisation among different stakeholders can be best made so as to attain flexible and demand-driven HRD policies.

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Notes

1. This is a modified version of a previous document (Miyamoto, 2003). The author is grateful to Ulrich Hiemenz, Colm Foy and David O'Connor at the OECD Development Centre for comments and suggestions. This collection of articles has been developed through a close co-operation with various individuals and institutions, including Javier Santiso and Louka Katseli of the OECD Development Centre, Francisco Gomez and Jaime Sempere of El Colegio de México, Aoyama Gakuin University (Japan) and the United Nations. The OECD Development Centre gratefully acknowledges the financial support of the New Energy and Industrial Technology Development Organisation (NEDO) of Japan, the Korean government, CONACYT of the Mexican government, the Swiss government, the International Finance Corporation (IFC), and the World Bank Institute (WBI) without which this work would not have been possible.
2. Vast evidence exists on the role of human capital and growth, including Mankiw *et al.* (1992), Borensztein et al. (1998), Reisen and Soto (2001), Bassanini and Scarpetta (2002), and UNESCO and OECD (2003). Although there is still no clear consensus on this issue, the general perception appears to be that human capital positively affects growth.
3. In this paper, the term "MNE" is used for affiliates of MNEs operating in host developing countries.
4. They include macroeconomic, tax, trade, regulation, corruption, and also education and training policies as well as the rule of law. Stein and Daude (2002) show that macroeconomic stability, corruption, rule of law and effectiveness of the regulatory regime are significant determinants of location of foreign investments, while Kaufman *et al.* (2000) show that the rule of law is significantly related to the FDI inflows after controlling for other variables.
5. Godo and Hayami (2002) present a long time-series of educational attainment in the US and Japan during the 20th century. Cohen and Soto (2001) also present cross-country evidence in 38 countries between 1960 and 2000.
6. Nunnenkamp and Spatz (2002) also mention that: "The shortage of relevant empirical studies is probably largely because non-traditional determinants, including cost factors and complementary factors of production, are difficult to capture for a sufficiently large sample of developing countries and over a sufficiently long time span. This is in marked contrast to traditional determinants such as size and growth of local markets".

7. Their human capital variable is the average years of secondary and tertiary education per worker and secondary school enrolment.
8. More specifically, UNCTAD (2002) uses tertiary gross enrolment ratio as a percentage of relevant age group, science and engineering students as a percentage of total population, and the ratio of a country's share in global FDI flows to its share in global GDP.
9. Mody *et al.* (1998) do not use proxies for labour quality such as education. Instead they use each firm's perception of labour quality within a scale of 7.
10. Multilateral Investment Guarantee Agency (MIGA) is part of the World Bank group.
11. Japan Bank for International Cooperation is the lending arm of the Japanese ODA (official government assistance) agency.
12. World Business Environment Survey covers firms operating in 30 developing countries in Latin America and Asia; Foreign Direct Investment Survey covers 14 developing countries in Latin America, Asia, and Africa (location of headquarters); while the JBIC-FY2001 Survey covers Japanese firms with subsidiaries in China, Thailand, Indonesia, Malaysia and the Philippines.
13. More specifically, firms considered "ability to hire technical professionals" (39 per cent), "ability to hire management staff" (38 per cent), "ability to hire skilled labourers" (32 per cent) to be critical location factors.
14. 16.9 per cent and 25 per cent of firms considered "availability of superior managerial personnel" to be important.
15. This was initiated at the World Conference on Education for All held in Thailand in 1990 by UNESCO, UNICEF, UNDP, the World Bank and UNFPA, along with 155 governments and 150 NGOs. A follow-up to this conference was the World Education Forum, held in Dakar, Senegal, in 2000.
16. The first goals set in 1990 include: "universal access to, and completion of, primary education by the year 2000"; "reduction in adult illiteracy to one-half its 1990 level by the year 2000"; and "improvements in learning achievements" (World Bank, 1999). The new goals set in 2000 include: "access to and complete free and compulsory primary education by 2015"; "50 per cent improvement in adult literacy by 2015"; and "eliminating gender disparities in basic education by 2005" (UNESCO, 2002).
17. In addition to the community participation, decentralisation of educational administration from national authorities to state/prefecture authorities has proved to be effective in Indonesia.
18. One recently established corporate headquarters is ASM International, a leading supplier of semiconductor process equipment in front and back-end markets. The role of its Singapore headquarters is to handle manufacturing, R&D, management and technical support for regional operations, and holding worldwide charter for several key product offerings.
19. International trade is another important channel.

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20. With an exception in the survey of Chinese Taipei, which was done in 1986. Other surveys were done in 1992 for Colombia, Mexico and Indonesia, and Malaysia in 1994.

21. They include three dummy variables including limited corporation, limited partnership, and no legal status.

22. For example, Intel in Costa Rica has managed to keep the labour turnover low even after investing heavily in training (Rodriguez-Clare, 2001).

23. Note that the usage of *horizontal-linkages* here is different from what is understood in the literature. It is usually understood to occur when "local firms in the same industry or phase of the production process may adopt technologies through imitation, or are forced to improve their own technologies because of increased competition from MNE affiliates" (OECD, 2002).

24. The levy-grant scheme had a dramatically positive impact on training in Chinese Taipei and Singapore. Flexibility and demand-driven design are among the key factors of success (Batra, 2003).

25. In such a case, payroll levies can be considered as a policy instrument to reduce underinvestment by employees due to credit market constraints (OECD, 2003*a*).

26. It is probably not necessary to provide large incentives for MNEs to provide training for (or train) vertically linked firms, since MNEs will be the main beneficiary in such training.

27. This includes Argentina Brazil, Chile, Estonia, Israel, Lithuania and Slovenia (OECD, 2000).

28. This is even the case among most European countries where upgrading low-skilled workers is an important policy issue. Many of the European schools are producing young people inadequately equipped or prepared to take advantage of further education and training. Some school leavers have developed an aversion to learning and, at the same time, adult education tends to replicate the school system and therefore fails to attract low-skilled individuals (McIntosh and Steedman, 1999).

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FDI and Economic Growth in Less Developed Countries: A Theoretical and Empirical Survey*

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Abstract

During the 1960s and 1970s, foreign direct investment (FDI) and the activities of multinational enterprises (MNEs) in less developed countries (LDCs) were generally viewed unfavourably, often being considered exploitative and as leading to worsening labour market conditions and job losses. However, there was a gradual shift in perception during the 1980s and 1990s, with increasing recognition of positive features of FDI such as technological spillovers and the increase in demand for domestic industry. Hence many countries, including LDCs, have introduced measures such as favourable tax treatment for foreign firms in order to attract FDI[2]. Against this background, FDI flows to LDCs have grown rapidly, increasing from 0.9 per cent of LDCs' combined GDP in 1990 to a peak of 4.1 per cent in 1999, before declining slightly to 3.3 per cent in 2003 (World Bank, 2005). This article surveys the theoretical and empirical literature that describes the role of FDI in the economic growth of LDCs, and extracts its policy implications.

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Theoretical Literature on FDI and Growth

FDI may help to raise the income levels and/or growth rate of the host country, since it potentially embodies the following two types of externalities:

a) *Technological externalities* due to spillovers of advanced technologies and knowledge from foreign-owned firms (hereafter, foreign firms) to domestic firms through, for example, visits to foreign firms by domestic workers, labour turnovers from foreign to domestic firms, technical support for domestic firms by foreign firms, discussion between engineers of domestic and foreign firms and related spin-offs;

b) *Pecuniary externalities* due to increase in demand for the products of domestic firms caused by foreign firms' purchases of intermediate goods from domestic firms.

In the presence of these externalities, policies that stimulate FDI inflows may be growth-enhancing and thus can be justified. Below, we present several seminal studies on the effects of FDI under each of these externalities.

Technological Externalities of FDI: Knowledge Spillovers

In a theoretical analysis of FDI spillovers, Wang (1990) and Walz (1997) consider two-country dynamic models involving a developed country (DC) and an LDC and assume that FDI generates knowledge spillovers to domestic firms[3]. Their models suggest that an increase in the size of FDI leads to incremental knowledge spillovers and thus raises the rate of technical progress and per capita GDP in the LDC. However, this conclusion relies exclusively on the following two assumptions: *i)* knowledge spillovers from FDI occur automatically and without any cost; and *ii)* there are no means of acquiring overseas knowledge other than FDI. Once these assumptions are relaxed, however, promoting FDI does not necessarily ensure faster growth, as shown in detail below.

First, it is assumed that knowledge spillovers from FDI entail costs. Kim and Ma (1997) and Lall (2000), based on their case studies of East Asian countries, find that knowledge of foreign firms does not spontaneously spill over to domestic firms, since production workers in foreign firms can attain operational capability but may not necessarily learn the principles of foreign knowledge. Therefore, domestic firms may have to make certain efforts, e.g. enhance their training or R&D activities, to induce spillovers from foreign firms.

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Wang and Blomström (1992) have constructed a model assuming that knowledge spillovers entail such costs. In their dynamic oligopoly model foreign and domestic firms produce differentiated products. The model assumes that foreign firms improve the quality of their products by transferring technology from parent firms, whereas domestic firms improve the quality of their products through knowledge spillovers from foreign firms. The extent of spillovers increases in proportion to the level of domestic firms' learning activities and the difference in the level of knowledge between foreign and domestic firms.

In this model, foreign firms, under competitive pressure from domestic firms, will import technology from parent firms, and the absorbed technology will spill over to domestic firms. Hence host country policies that favour foreign over domestic firms may not be growth-enhancing, since such policies reduce the degree of competition between foreign and domestic firms. The reduced competition consequently decreases the incentive for parent firms to transfer advanced technology to their subsidiaries in the host country, and accordingly the volume of knowledge that spills over from foreign subsidiaries to domestic firms may also be reduced. In this case, to enhance the size of knowledge spillovers from foreign firms and thus improve the rate of technological progress of domestic firms, the government of the host country might instead increase domestic firms' capability to acquire foreign knowledge by, for example, providing incentives for individuals and firms to invest in education.

Second, it is assumed that domestic firms have means other than FDI by which to acquire foreign knowledge and consider whether policies that particularly favour FDI are growth-enhancing. A notable model among the literature following this line is developed by Glass and Saggi (1999). This model assumes that the technological level in the less developed host economy can be raised through both knowledge spillovers from FDI and the imitative activities of domestic firms. The model predicts that if domestic firms are sufficiently technologically advanced to imitate foreign products, a faster flow of FDI only substitutes for imitation activities and has no net effect on the rate of technical progress in the host country. However, this conclusion relies on the assumption that the volume of FDI is determined exogenously.

In another model, Glass and Saggi (1998) relax this assumption and assume that the volume of FDI is determined endogenously, reaching a more general conclusion. Using a quality ladder model of endogenous growth with a DC and an LDC, they assume that the quality of products in the LDC improves as a result of either technology transfers through FDI from parent firms in the DC to their affiliates in the LDC or as a result of the imitation of foreign products by

domestic firms. Furthermore, it is assumed that there are two types of consumer, which differ in their utility function. As a result, in each country one type of consumer consumes higher quality products while the other consumes the same products of a lower quality.

Under these assumptions, when domestic firms in the LDC produce a product of a certain quality foreign firms in the same country produce the same product of a quality one step better than that of the domestic firms by transferring technology from their parent firms. Then, if domestic firms already have a fairly high level of technology and can produce high-quality products, foreign firms import technology that is sufficiently high to produce products of even higher quality. On the other hand, if the current technology level of domestic firms is low, parent firms in the DC need not transfer high technology to their affiliates in the LDC. Consequently, the level of technology which foreign firms import from their parent firms to the LDC depends on the current technology level of domestic firms, which can be interpreted as their absorptive capacity.

The model suggests that policies which enhance the current technology level and the absorptive capacity of domestic firms, such as subsidies for imitation as well as education and training, lead foreign firms to import more advanced technologies, thereby accelerating technological progress in the LDC. In contrast, policies which simply aim to attract FDI may not necessarily promote technological progress in the LDC. More specifically, attracting FDI involving low technology discourages technological progress, while attracting FDI involving advanced technology promotes technological progress. Glass and Saggi (1998) therefore conclude that it is important for the growth of LDCs to encourage FDI selectively rather than generally.

Another model that assumes means of acquiring foreign knowledge other than through FDI is the two-period duopoly model developed by Saggi (1999). He assumes that a foreign firm in a DC has two choices: namely to invest directly in an LDC or to entrust a domestic firm in the LDC with production through a licence agreement. Saggi (1999) analyses how the foreign firm's choice affects technological progress in the LDC. Note that in this model, FDI and licensing are assumed to differ in three respects:

1) Since the foreign firm and the domestic firm produce a homogenous good, Cournot competition occurs in the case where the foreign firm chooses FDI, whereas in the licensing case the licensee in the LDC monopolises the market.

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2) While technology transfer entails costs in the case of licensing, it is cost free in the case of FDI.

3) The model considers two periods and assumes that the licensee completely learns the foreign firm's technology in the second period in the case that the foreign firm chooses licensing in the first period, whereas the technology only partially spills over in the case where the foreign firm chooses FDI in the first period.

Based on these assumptions, consider the foreign firm's choice in each period under the following two scenarios. In the first, the extent of technology spillovers through FDI is high, whereas the cost of technology transfer through licensing is low. This situation may arise, for example, when there is no large technological gap between the foreign and the domestic firm. The second scenario is the reverse of the first, i.e. the extent of technology spillovers through FDI is low, whereas the cost of technology transfer through licensing is high.

In the first scenario, the foreign firm chooses licensing in the first period because the future losses of choosing FDI due to technology spillovers exceed the cost of licensing. In addition, having chosen licensing in the first period, the foreign firm will do so again in the second period since this choice yields a larger profit than the alternative. This is because with licensing the foreign firm can share monopolistic profits with the licensee, while with FDI it would find itself in a situation of duopolistic competition with the domestic firm. Note that in the second period, the domestic firm possesses the same level of technology as the foreign firm, since by assumption the domestic firm has completely learnt the foreign firm's technology owing to licensing in the first period. In contrast, in the second scenario, the foreign firm chooses FDI in both periods, since the costs of technology transfer through licensing exceed losses from FDI spillovers.

A further assumption of the model is that after the foreign firm makes its choice between licensing and FDI in the second period, both firms invest in R&D. Consider the combination of choices by the foreign firm, which maximises the total volume of R&D investment by the two firms. If licensing is chosen in the first and FDI in the second period, first-period licensing allows the domestic firm to learn the foreign firm's technology completely and consequently duopoly competition occurs in the second period. The duopoly competition encourages the two firms to engage in R&D activities in the second period, and thus maximises the total volume of R&D investment.

In the case of first-period licensing and second-period FDI, consumer welfare is greater than in the case of licensing or FDI alone in both periods, since in the first case the level of technology obtained by the LDC is the highest, and in the second the market is not monopolised. However, since either licensing or FDI in both periods is the decentralised equilibrium, this optimal social outcome cannot be achieved through market forces. The LDC government therefore should try to induce the foreign firm to choose licensing in the first period and FDI in the second in order to maximise technological growth and consumer welfare in the country.

Another model that assumes other means of acquiring foreign knowledge than FDI is the growth model developed by Todo (2005) that considers a small LDC importing foreign advanced knowledge. The model assumes that there are two means of importing foreign knowledge: introducing FDI, and performing local R&D activities in the LDC. In practice, local R&D activities are often performed by foreign firms in the LDC or domestic firms are provided with technology licensing by firms in DCs. Furthermore, it is assumed that while local R&D activities contribute to an increase in local knowledge of the LDC, FDI has no effect on local knowledge levels. The model suggests that to raise income levels in the LDC, policies to encourage local R&D activities are more effective than policies to attract FDI, because of technological externalities embodied in local R&D but not in FDI.

Taken together, the studies by Glass and Saggi (1998), Saggi (1999) and Todo (2005) suggest that LDCs' policies that heavily rely on FDI as channels of technological progress do not always lead to optimal growth. Rather, it may be desirable for LDCs to implement policies that encourage FDI selectively. For example, encouraging FDI in high-tech industries, attracting FDI initially but later replacing it with licensing, or stimulating FDI in R&D may be more growth-enhancing than simply encouraging FDI in general.

Policies such as these have been put into practice in several countries and appear to be bearing fruit. Kim and Ma (1997), for instance, argue that during their periods of high-speed economic growth, Japan and Korea restricted FDI and promoted technology transfer through licence agreements. Along similar lines, the Chinese government obliges foreign firms that invest in certain industries, such as the automobile industry, to establish R&D facilities in China. Although quantitative examinations of the effects of such policies are rare, it seems likely that these policies have had some positive effect on growth, for the simple reason that these countries are either highly developed or are developing rapidly.

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Pecuniary Externalities of FDI: Backward Linkages

The pecuniary externalities embodied in FDI through MNEs' purchases of intermediate products from domestic firms, which Hirschman (1958) call backward linkages, may also improve the income level of the host country owing to increases in demand for domestically produced goods. However, whether government policies should extend backward linkages from MNEs to domestic firms to benefit the domestic economy depends on several conditions, as in the case of spillovers from FDI.

For example, Markusen and Venables (1999) develop a model of an LDC in which there are domestic intermediate-good firms under the monopolistic competition of Dixit and Stiglitz (1977) and domestic and multinational final-good firms. They show that when the quantity of domestic intermediate goods per unit of the final good purchased by MNEs in the final-good sector is greater than that purchased by domestic firms, expanding the number of MNEs benefits domestic intermediate-good firms through backward linkages. In other words, the benefit of MNEs is ambiguous when they purchase the same or a greater quantity of domestic intermediate goods than domestic final-good firms do.

Rodriguez-Clare (1996) considers conditions under which MNEs have larger backward linkages than domestic firms, using a two-country model with a DC and an LDC. His model also assumes intermediate-good firms under the monopolistic competition of the Dixit-Stiglitz type and final-good firms under perfect competition. In addition, it is assumed that MNEs in the final-good sector of the LDC can use intermediate goods produced in both the LDC and the DC, and that some high-tech intermediate goods are produced only in the DC. Given these assumptions, Rodriguez-Clare (1996) shows that when the transportation costs of intermediate goods are low or the technology gap between the DC and the LDC is large, MNEs in the LDC are less likely to purchase intermediate goods from LDC firms. If purchases of domestic intermediate goods by MNEs are sufficiently small, income per capital in the LDC is lower in the decentralised equilibrium in which MNEs are allowed than in the autarky equilibrium without MNEs. In other words, when MNEs are "enclaved" from the local economy, the LDC's income level in the equilibrium with MNEs may not be higher than that in the autarky equilibrium.

Lin and Saggi (2005) consider these backward linkages in an oligopolistic model that incorporates vertical technology transfer from final-good to intermediate-good firms. In their model, MNEs in the final-good sector cannot

import intermediate goods, unlike in Rodriguez-Clare's model, but have two choices when purchasing intermediate goods locally: they can purchase them in the domestic competitive market or from a particular domestic firm in exchange for an exclusive contract. In the latter case, the domestic firm under an exclusive contract cannot sell its goods to other final-good firms other than the MNE with which it holds the contract, while it can receive technical assistance from the MNE. Lorentzen and Mollgaard (2000) document that in practice MNEs often have such exclusive contracts with domestic firms.

Exclusive contracts between MNEs and domestic firms affect the host economy through several channels. Most notably, technological assistance provided by MNEs lowers the costs of producing intermediate goods and hence has a positive impact on the production of intermediate goods. At the same time, however, competition among intermediate-good firms is reduced, and the reduced competition also reduces the intermediate production. Lin and Saggi (2005) call this the de-linking effect of MNEs. Under reasonable conditions, MNEs choose to have exclusive contracts with a domestic firm rather than purchase intermediate goods in the competitive market. However, when the negative *de-linking effect* of MNEs exceeds the positive effect of technology transfer, the entry of MNEs shrinks the production of intermediate goods and lowers the income level of the host country. This is the case, for example, where the extent of technology transfer from MNEs to domestic firms through an exclusive contract is small, or where the intermediate-good sector has many domestic firms so that it is relatively competitive.

Summarising Policy Implications from the Theoretical Literature

We have seen in the theoretical literature that since FDI has technological and pecuniary externalities to domestic firms, policies that open the economy to FDI to a greater extent may lead to an improvement in its level and growth of income. However, the literature also suggests that the positive impact of FDI policies relies on several conditions, particularly the technology level of domestic firms in the host LDC and the type of FDI introduced to the LDC. Education and training policies are critical in meeting these conditions, since both the level of technology among domestic firms and their success in attracting FDI that brings in advanced technology depend on the availability of a skilled workforce.

The literature also suggests that knowledge spillovers can be further enhanced by means of host country policies that provide strong incentives for individuals to invest in education. Such a policy is desirable, as it helps to

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narrow down the distance between foreign and domestic firms in terms of knowledge and hence to trigger competition between foreign and domestic firms. Education and training policies also help to increase the absorptive capacity of domestic firms.

An Empirical Survey of FDI and Growth

Empirical analyses of the relationship between FDI and economic growth can be divided into those using macro data such as country-level or industry-level data, and those using micro data such as firm or plant-level data. This section provides an overview of studies using both macro and micro data.

Empirical Studies using Macro Data

Many studies of the relationship between FDI and income growth (or income levels) that employ country-level data regress the GDP growth rate or GDP level on the ratio of FDI inflows to GDP. These studies generally suggest that FDI inflows into LDCs do not necessarily contribute to economic growth. Rather, this happens only when certain conditions are met, such as there being good policies in place or abundant human resources.

Balasubramanyam *et al.* (1996), for example, conduct a cross-section analysis with country-level data using the following specification:

$$\Delta \ln y_i = \alpha + \beta FDI_i + x'_i \delta + \varepsilon_i \qquad (1)$$

where subscript *i* indicates the country and Δlny represents the per capita GDP growth rate from 1970 to 1985. FDI is the ratio of FDI inflows to GDP averaged over 1970-1985; x is a vector of other variables and ε is the error term. Using data from 46 LDCs, Balasubramanyam *et al.* show that FDI has a positive and significant effect on the per capita GDP growth rate. However, once these countries are classified into those that have adopted export promotion policies, such as Singapore, Malaysia and Chile, and those that have adopted import substitution policies, such as Bangladesh, the Philippines and Mexico, the coefficient of FDI was positive for the former but insignificant for the latter.

Borensztein *et al.* (1998) provide another empirical study using cross-country data. Equation (1) was estimated by seemingly unrelated regression (SUR) using data for 69 LDCs divided into two periods, 1970-79 and 1980-89. In addition to the FDI-to-GDP ratio, they included a cross-term of the FDI-to-GDP ratio and a human capital indicator as a regressor in order to examine how human capital influences the effect of FDI on GDP growth rate. As their human capital indicator, the authors used the average number of years of secondary education of male workers over the age of 25. In the estimation, the FDI-to-GDP ratio was found to have a negative and insignificant coefficient, whereas the cross-term of the FDI-to-GDP ratio and the human capital indicator had a positive and significant coefficient, suggesting that FDI has no effect on GDP growth rate in countries with poor human capital resources but promotes economic growth in countries rich in human capital resources. According to their estimation, the boundary of poor and rich human resources is 0.52, that is, FDI accelerates growth in a country with more than an average of 0.52 years of schooling. In 1980, the average number of years of schooling exceeded 0.52 in 46 of the sample's 69 countries.

Alfaro *et al.* (2004) and Durham (2004) also use cross-country data by including cross-terms of FDI and an indicator of the maturity of financial markets[4] or the absence of corruption[5]. The results indicate that GDP growth is positively correlated with both cross-terms but not with the FDI indicator itself. In other words, the effect of FDI on GDP growth depends on the maturity of financial markets because domestic firms need financial support to purchase new machinery or hire new workers, which help them to absorb knowledge spillovers from MNEs. The quality of economic institutions, measured by their degree of corruption, is important because efficient economic institutions allow MNEs to concentrate their resources on productive activities.

De Mello (1999) provides a different approach using cross-country data based on a more elaborate equation:

$$\Delta \ln y_{it} = \alpha_i + \beta FDI_{it} + \delta \ln y_{i,t-1} + \varepsilon_{it}$$

where y stands for per capita GDP or total factor productivity (TFP). De Mello employs instrumental variable techniques in which lagged values of the regressors and the ratio of a country's per capita GDP to that of the United States are used as instruments. The latter is used as an instrument because it is assumed that the difference in GDP levels is a measure of the difference in the marginal productivity of capital or the technology level, both of which affect

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the volume of FDI inflows. In addition to conducting estimations based on the entire sample, de Mello (1999) also divides his sample into OECD and non-OECD countries and then estimates the equation for each sub-sample. The results show that FDI has a positive and significant effect on per capita GDP both in the sample as a whole and in the sub-sample of OECD countries, although no significant effect is found for non-OECD countries.

Li and Liu (2005) examine the stationarity of variables such as GDP per capita and the extent of FDI inflows based on the method developed by Im *et al.* (2003). Using a cross-country panel data set for the period from 1970 to 1999, they estimate equation (1) and show that FDI has a positive and robust effect on GDP growth, although in the sub-sample consisting of LDCs only this effect diminishes as the difference in income levels with the United States increases[6].

One criticism levelled against analyses using macro statistics, however, is that statistics on FDI inflows are generally inaccurate, particularly in the case of LDCs. To overcome this problem, Xu (2000) estimates the effect of FDI on host countries' TFP growth by using data on FDI from the United States, as these seem more reliable than other FDI data. This is a reasonable approach given that the United States operates at the frontier of world technology and the knowledge spillovers from there consequently contribute to technological progress in many countries (Eaton and Kortum, 1999). The results obtained by Xu are in line with those of previous studies: FDI has an insignificant effect on economic growth in LDCs and, as suggested by Borensztein *et al.* (1998), requires sufficient human resources to promote economic growth.

Another possible shortcoming of the above-mentioned studies is that they ignore the problem of endogeneity. Carkovic and Levine (2005) address this problem by employing the differenced generalised method of moments (GMM) procedure developed by Arellano and Bond (1991) and conclude that FDI has no significant effect on growth. In addition, they show that contrary to the result obtained by Borensztein *et al.* (1998), the cross-term of the FDI ratio and the human capital stock is also insignificant. Since none of the studies except that by Carkovic and Levine (2005) sufficiently control for the correlation between the error term and the FDI indicator, it is possible that the positive effect of FDI on economic growth found in the other studies is the result of bias caused by endogeneity.

However, Carkovic and Levine's study has been criticised by Blonigen and Wang (2004), who argue that pooling samples from DCs and LDCs and estimating the effect of FDI on economic growth are problematic[7]. This is

because, as suggested in the theoretical survey above, the effect of FDI on growth is likely to depend on conditions in the host country. In addition, since the majority of FDI in LDCs is of a vertical nature, while most of that in DCs is of a horizontal nature, the effect of FDI in DCs and LDCs is likely to differ. Using data from both DCs and LDCs, Blonigen and Wang (2004) estimate the same equation as Borensztein *et al.* (1998) and show that neither the FDI-to-GDP ratio nor the cross-term of the FDI ratio and the human capital indictor are significantly correlated with per capita GDP growth. Therefore it is unclear whether the result shown by Carkovic and Levine (2005) differs from those of the other studies because they pool observations from DCs and LDCs or because they correct for endogeneity.

While the above studies estimate the direct effect of FDI on economic growth, van Pottelsberghe de la Potterie and Lichtenberg (2001) investigate whether FDI is a channel for knowledge spillovers from the home to the host country. They set the following equation:

$$\ln TFP_i = \alpha^0 + \alpha^d \ln S_i^d + \alpha^{ff} \ln S_i^{ff} + \alpha^{ft} \ln S_i^{ft}$$

where S_i^d represents the domestic R&D stock, i.e. the sum of R&D expenditure adjusted for depreciation. S_i^{ff} and S_i^{ft} are the sums of the R&D stock except that of country *i*, weighted by the ratio of FDI inflows to total investment in country *i* and by the ratio of FDI outflows to total investment in country *i*, respectively. Focusing on DCs, van Pottelsberghe de la Potterie and Lichtenberg suggest that it is not inward FDI in country *i* that is a channel for foreign knowledge spillovers but outward FDI by country *i*, which leads to knowledge spillovers from the host country back to the home country.

In summary, the macro data-based studies discussed above suggest that FDI does not necessarily promote economic growth. FDI appears to enhance economic growth only in countries with a high absorptive capacity that is based on, for instance, supportive trade policies, a high level of human capital, mature financial markets and/or efficient economic institutions. In particular, almost all the studies indicate that FDI rarely enhances economic growth in LDCs with a poor capacity for absorbing technology.

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Empirical Analysis Using Micro Data

In recent years, firm-level data have become available in many countries, and the number of empirical analyses of the effect of FDI on economic growth based on such micro data has increased rapidly. Firm-level data allow more specific analyses that make it possible to examine through what channels FDI affects economic growth in the host country. The central issue in this respect is whether FDI contributes to the production of domestic firms through knowledge or demand spillovers. This section surveys the empirical literature examining the relationship between FDI and growth in domestic firms' production through the analysis of micro data. Although the focus of the present study is on the effects of FDI on growth in LDCs, our survey also discusses studies on DCs, because much of the methodology developed for the analysis of micro data has been applied to DCs and the number of studies on LDCs remains small.

a) Mixed evidence on FDI spillovers

Most previous studies examining knowledge spillovers from FDI estimate the effect of foreign firms' penetration of a particular industry on the production, productivity level or productivity growth of that industry. A typical equation estimated is:

$$\Delta \ln y_{it} (\text{or } \ln y_{it}) = \alpha + \beta FDI_{it} + x'_{it}\,\delta + \varepsilon_{it} \qquad (2)$$

where subscripts i and t refer to firm i at time t, Δlny and lny represent the growth rate and the level of domestic firms' output respectively, and x is a vector of other variables. *FDIi* is the degree of FDI penetration in the industry firm i belongs to, and is typically measured as foreign firms' share of output or employment in that industry. In some cases, the TFP level or the TFP growth rate of domestic firms is used as the dependent variable. It is important to note that the choice of dependent variable implies different assumptions about what the spillover effect results in.

Studies estimating equation (2) using firm-level data have yielded conflicting results. A number of studies, including those of Kokko (1994) for Mexico, Chuang and Lin (1999) for Chinese Taipei, and Blomström and Sjöholm (1999), Sjöholm (1999) and Takii (2005) for Indonesia, suggest that there are indeed positive and significant spillovers from FDI. On the other hand, Haddad and Harrison (1993), using data from Morocco, and Kinoshita (2001), using data from the Czech Republic, do not find evidence that FDI enhances the productivity of domestic firms.

Aitken and Harrison (1999), using data from Venezuela, even find that FDI appears to have a negative effect on the productivity of domestic firms. They argue that this result may be due to the fact that foreign firms intensify competition and decrease the share of domestic firms in certain industries. In addition, it is possible that foreign firms increase the demand for workers, especially highly skilled ones, and therefore raise domestic firms' costs by driving up wages. Theoretical studies such as those by Ethier and Markusen (1996) and Saggi (1999) suggest that negative effects in the host country such as these can be larger in the case of FDI than in the case of importing or production under licence.

There are a number of possible reasons for these conflicting results. The first is the diversity of estimation methods and treatment of the data. Görg and Strobl (2001) address this problem by conducting a meta analysis based on the results of 21 studies using firm-level or industry-level data. Using the t-value for the coefficient of FDI penetration obtained in these studies as the dependent variable, they perform an OLS regression with the following independent variables:

1) the square root of the degrees of freedom in the estimation;

2) dummy variables indicating whether the data used consist of *i)* firm-level or industry-level data, and *ii)* cross-section or panel data;

3) dummy variables indicating whether the target of analysis is a DC or an LDC;

4) the length of the period covered by the data;

5) dummy variables indicating whether the dependent variable is *i)* the growth rate of output per worker or something else and *ii)* the growth rate of output or something else;

6) dummy variables indicating whether the variable representing the degree of FDI penetration is *i)* the share of employment in an industry or something else, such as the share of assets or sales, and *ii)* the share of output in an industry or something else.

In the estimation results, the coefficient of the dummy variable for cross-sectional data is positive and significant; i.e. the t-value of the coefficient of the FDI penetration variable tends to be smaller if the data used are panel data. This evidence implies that in analyses based on cross-sectional data, positive and significant coefficients of the FDI penetration variable do not reflect the true effect of FDI but spring from a failure to capture unobserved fixed effects, i.e. time-invariant effects.

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In addition, the dummy variables indicating whether FDI penetration was measured by something other than share of employment or output are negative and significant, suggesting that the choice of proxy for FDI penetration can change the regression results. Apart from these dummies, none of the independent variables in Görg and Strobl's (2001) meta-regression were significant, meaning that it made no difference to the estimation results of the effect of FDI penetration whether the data were for a DC or an LDC.

A second possible reason why empirical studies using micro data have yielded conflicting results is that estimations of spillover effects from FDI are biased because estimation equations omit variables which influence spillover effects from FDI. As mentioned before, Aitken and Harrison (1999) point out that FDI may have a negative effect; that is, FDI may erode the market position of domestic firms by intensifying competition between firms in the same industry. Therefore, even though FDI indeed has knowledge spillover effects, its positive effect may not be captured by a simple equation such as equation (2), which does not control for its negative effect, that of market erosion.

To separate the effect of market erosion from the spillover effects from FDI, Haskel *et al.* (2002) and Keller and Yeaple (2003) add variables which represent the degree of competition in the market, such as the market share of each firm, captured by the ratio of a firm's output to the total output of the industry, or the size of the firm-level or industry-level markup, captured by the ratio of sales to total costs. Haskel *et al.* and Keller and Yeaple (2003), using firm-level data for the United Kingdom and the United States respectively, confirm that after taking the effect of market erosion into account, spillovers from FDI still are positive[8].

Görg and Hijzen (2004) also suggest that the effect of FDI on competition in the host country may be small if foreign firms export their products. Therefore they distinguish between the presence of foreign firm in the domestic market, captured by the share of foreign firms in domestic supply (domestic production minus exports), and the presence of foreign firms in the export market, captured by the share of foreign firms in total exports. Görg and Hijzen then estimate the effect of the presence of foreign firms in each market on domestic firms' production. The results of their estimation using data for the United Kingdom indicate that the presence of foreign firms in the domestic market does not lead to higher production by domestic firms, whereas the presence of foreign firms in the export market does lead to higher production by domestic firms.

Another related study is that of Bloom *et al.* (2004), which distinguishes between the effects of knowledge or technology spillovers and the effects of the intensification of market competition, although this study is in the context not of FDI spillovers but of spillovers from other domestic firms' R&D activities. Bloom *et al.* argue that the magnitude of technology spillovers from one firm's R&D to another firm depends on the closeness of the *technologies* involved and that the negative effect of intensified competition depends on the degree of similarity between the *products* produced by the two firms. Hence when the two firms produce similar products, such as a computer printer, but use distinct technologies, such as technologies required to produce an ink-jet or a laser printer, no technological spillovers may be generated and the only effect is the negative impact of increased market competition. Conversely, when two firms produce distinct goods but use similar technologies, there are no negative effects from market competition while only technological spillovers may be generated.

Based on these considerations, Bloom *et al.* (2004) define the product market closeness measure, $SIC_{i,j}$ $(i \neq j)$, and the technological closeness measure, $TECH_{i,j}$ $(i \neq j)$, which range between zero and one, depending on the degree of product market overlap and technology market overlap respectively:

$$SIC_{i,j} = \frac{S_i S_j^{'}}{\left(S_i S_i^{'}\right)^{1/2} \left(S_j S_j^{'}\right)^{1/2}}$$

$$TECH_{i,j} = \frac{T_i T_j^{'}}{\left(T_i T_i^{'}\right)^{1/2} \left(T_j T_j^{'}\right)^{1/2}}$$

where subscripts i and t refer to firm i at time t. S_i and T_i are defined as $S_i = (S_{i,1}, S_{i,2}, ..., S_{i,k}, ...)$ and $T_i = (T_{i,1}, T_{i,2}, ..., T_{i,k}, ...)$, respectively. $S_{i,k}$ is the share of firm i in the total output of product k, and $T_{i,k}$ is the share of firm i in the total number of patents in the field of technology h. They then construct the pool of other firms' R&D in product market space, *SPILLSICit*, and in technology space $SPILLTECH_{it}$:

$$SPILLSIC_{it} = \sum_{j \neq i} SIC_{ij} R_{jt}$$

$$SPILLTECH_{it} = \sum_{j \neq i} TECH_{ij} R_{jt}$$

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Based on this framework, Bloom *et al.* regress the market value of firm *i*, total firm value divided by the full book value of assets[9], on $SPILLSIC_{it,}$ and $SPILLTECH_{it.}$ The result indicates that *SPILLSIC*, the pool of other firms' R&D *SPILLTECH* in the product market space, has no impact on the market value of firm *i*, while, the pool of other firms' R&D in the technology space, has a positive impact on the market value of firm *i*, suggesting that if the effect of market competition is removed, there are indeed technology spillovers from other firms. Although this study does not focus on spillovers from FDI but rather on spillovers between domestic firms, it provides a methodology that could also be used to examine spillovers from FDI.

b) Spillover effects and the absorptive capacity of host country firms

The most important reason that empirical studies using micro data have yielded conflicting results appears to be that the extent of spillover effects from FDI depends on the characteristics of domestic firms as well the nature of the FDI involved, rather than the difference in estimation methods. Both the theoretical analysis presented above in the section on Technological Externalities of FDI and empirical studies using macro-data support this possibility. In order to examine the spillover effects from FDI taking these issues into account, a number of studies have focused on the technology gap between host country firms and foreign firms.

Kokko (1994), for example, uses a cross-term for the share of foreign firms and the technology gap between foreign and domestic firms, measured by the average labour productivity in a selected industry, as an independent variable. He then suggests that the extent of knowledge spillovers from FDI is low in industries where the technology gap between foreign and domestic firms is large. Takii (2005) arrives at the same conclusion by distinguishing between industries in which the difference in the level of technology between foreign and domestic firms is large and those in which it is small.

Another, similar study by Girma (2005) follows Hansen (2000) in conducting an endogenous threshold regression analysis which shows that the extent of spillovers depends on the extent of the technology gap between foreign and domestic firms. He uses the following estimation equation:

$$\Delta \ln TFP_{it} = \rho \ln TFP_{i,t-1} + \beta_1 \cdot FDI_{i,t-1} \times I(ABC_{i,t-1} \le \alpha) + \beta_2 \cdot FDI_{i,t-1} \times I(ABC_{i,t-1} > \alpha) + x'_{i,t-1}\delta + \varepsilon_{it}, \quad (3)$$

where *ABC* represents the absorptive capacity of technology and is defined as follows:

$$ABC_{i,t} = \frac{TFP_{i,t-1}}{TFP^{*}_{i,t-1}}$$

where $TFP^{*}_{i,t-1}$ is the maximum level of TFP in the industry which firm *i* belongs to. $I(ABC_{i,t-1} \leq \alpha)$ and $I(ABC_{i,t-1} > \alpha)$ represent the indicator functions. The sample-splitting value of α is identified by a grid search over the 401 absorptive capacity quantiles {0 per cent, 0.25 per cent, 0.5 per cent, …, 99.5 per cent, 99.75 per cent, 100 per cent}[10]. Although only one threshold is indicated in equation (3), Girma (2005) sets two or three thresholds and checks whether the coefficients of FDI, $\beta_1 \beta_2$are equivalent to each other in each range, using the Lagrange multiplier test. He then chooses the largest number of thresholds for which the coefficients of FDI in each range are significantly different from each other. Using British data, he shows that there are one or two such thresholds and that the effect of FDI on TFP growth is positive and significant only when the absorptive capacity of domestic firms is sufficiently large; i.e. the technology gap between foreign and domestic firms is sufficiently small.

Not all studies find that knowledge spills over from foreign to domestic firms only when the technology gap between foreign and domestic firms is small. Using Indonesian data, Blalock and Gertler (2004) follow Kokko (1994) in using a cross-term for the technology gap between foreign and domestic firms and the share of foreign firms as an independent variable. They show that the magnitude of knowledge spillovers is high when the technology gap between foreign and domestic firms is large[11].

Theoretically, the relationship between the technology gap and the extent of spillover effects from FDI can be either negative or positive. Findlay (1978), for example, argues that there can be advantages in lagging behind in terms of technology, because the larger the gap, the more LDCs can potentially profit from FDI. On the other hand, if the technology gap between host country firms and foreign firms is too large, it is possible that no spillovers occur because the absorptive capacity of host country firms might be insufficient for them to be able to absorb advanced technologies. Note that a large technology gap between host country firms and foreign firms does not always mean that host country firms have a low absorptive capacity. Even though the gap may be large, host country firms' efforts can still promote spillovers from FDI.

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R&D activities performed by host country firms are one example of such efforts. Kinoshita (2001) adds a cross-term for the share of foreign firms and the ratio of domestic firms' expenditure on R&D to output to equation (2) and shows that the coefficient of the cross-term is positive and significant, suggesting that the R&D activities of domestic firms enhance spillovers from FDI. Similarly, Blalock and Gertler (2004), using a dummy variable for firms performing R&D, show that the knowledge spillovers from FDI to R&D-performing firms in LDCs are three times as large as those to firms that do not perform R&D. In addition, they show that a high level of human capital in a firm, measured by the percentage of university graduates among the firm's employees, encourages spillovers from FDI. These studies thus suggest that the efforts of domestic firms play a role in raising their absorptive capacity and greatly influence the spillover effects from FDI.

c) Spillover effects and types of foreign firms

Another factor potentially affecting knowledge spillovers from FDI is the type of foreign firms involved. A study by Todo and Miyamoto (2006) distinguishes different types of firms providing knowledge. Using Indonesian plant-level data, they classify foreign firms into those that perform R&D in the host country and those that do not, and then correlate the share of each type of foreign firm with the TFP growth rate of domestic firms. The result suggests that R&D-performing foreign firms enhance the TFP growth of domestic firms, whereas non-R&D-performing foreign firms do not have such an effect. A possible explanation for this finding is that foreign firms' knowledge does not diffuse to production workers but does diffuse to local scientists or engineers who perform R&D. The transfer of scientists or engineers and information exchange between scientists or engineers then help the knowledge to diffuse to domestic firms. Todo, Zhang and Zhou (2006), using firm-level data from a science park in Beijing, China, reach the same conclusion as Todo and Miyamoto (2006).

Along similar lines, Todo and Miyamoto (2002) show that foreign firms in Indonesia that conduct knowledge-enhancing activities, including human resource development and R&D, contribute to knowledge spillovers to domestic firms, while this is not the case for foreign firms without knowledge-enhancing activities[12]. In addition, the effect of the interaction term between domestic R&D and industry-wide foreign capital is found to be positive, while the direct effect of domestic R&D is insignificant, implying that domestic R&D is effective only when MNEs are present in the same industry so that domestic firms can absorb knowledge from MNEs through R&D. Thus Todo and Miyamoto (2002) conclude

that the knowledge-enhancing activities of both domestic firms and MNEs promote knowledge diffusion from MNEs, while the advanced knowledge of MNEs does not spill over without such efforts.

d) Spillover effects and geographical distance

Geographical distance may reduce spillover effects from FDI. Studies which examine this topic include those of Girma and Wakelin (2001) and Girma (2005). They use two indicators representing the scale of FDI in a certain industry. The first is defined as the share, in a particular industry, of foreign firms situated in the same area *r* as domestic firm *i (FDI1r)*. The second is defined as the share, in a particular industry, of foreign firms situated in another area to *r, (FDI2r)*, which is calculated as follows:

$$FDI2_{r,t-1} = \sum_{k \neq r} \frac{FDI1_{k,t-1}}{d_{kr}^2}, \qquad (4)$$

where *k* is an area other than area *r* and d^2_{kr} is the distance between area *k* and area *r*. Using British firm-level data, Girma and Wakelin (2001) and Girma (2005) find that the correlation between *FDI2* and TFP growth is insignificant, suggesting that FDI conducted far away from firm *i* has no spillover effects.

However, Halpern and Muraközy (2005), using Hungarian data arrive at different results. As in the studies just mentioned, they use two indicators representing the scale of FDI in a particular industry: the share of foreign firms in each industry in the country, and the share of foreign firms situated within 25 km (or 50 km or 100 km) of a certain domestic firm in that industry. They show that the correlation between the latter indicator and firm-level value added is insignificant, suggesting that spillover effects from FDI do not diminish with distance.

These conflicting results mean that the relationship between distance and spillover effects remains unclear. One possible reason is that no generally agreed estimation methodology has been established. For example, Girma and Wakelin (2001) and Girma (2005) assume that spillover effects diminish in inverse proportion to the square of the distance, as shown in equation (4). This assumption, however, may not be appropriate. One way to reduce such arbitrariness would be to estimate the following equation, based on Keller (2002), who analyses the relationship between distance and international spillover effects from R&D activities using country-level data:

$$\Delta \ln TFP_{irt} = \rho \ln TFP_{ir,t-1} + x'_{i,t-1}\theta + \beta \sum_k FDI_{k,t-1} \exp(-\delta d_{kr}) + \varepsilon_{it}, \qquad (5)$$

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where the subscripts i and t refer to firm i and time t. $\Delta 1nTFP_{ir}$ represents the TFP growth rate of firm i located in area r. FDI_k is an indicator of the volume of FDI in area k, and d_{kr} is an indicator of the distance between area k and area r. δ is the elasticity of spillover effects from FDI with respect to distance. Hence, a positive δ in equation (5) would suggest that distance reduces the effect of FDI on TFP growth. Since most studies on the relationship between distance and spillover effects focus on DCs, we are awaiting studies using the data from LDCs.

e) Spillover effects generated by backward linkages

Most of the studies mentioned so far focus on spillovers within the same industry, i.e. intra-industry spillovers. However, it is also conceivable that FDI generates inter-industry spillovers through backward linkages from final goods industries to intermediate goods industries. As mentioned in the section above on Technological Externalities of FDI, such inter-industry spillovers could be generated both through pecuniary externalities due to an increase in demand, and through technological externalities, for example as a result of the technical guidance provided by firms producing final goods to firms producing intermediate goods.

A pioneering study in this direction was conducted by Javorcik (2004), who investigated whether there were any spillovers through backward linkages. Using Lithuanian firm-level data, she shows that spillovers through backward linkages exist but does not find any evidence of intra-industry spillovers. She uses an indicator representing the extent of the foreign presence in industry j at time t, $Horizontal_{jt}$, which is defined as follows:

$$Horizontal_{jt} = \frac{\sum_{firmi \in j} FS_{it} \cdot Y_{it}}{\sum_{firmi \in j} Y_{it}}$$

where FS_{it} is the share of total equity of firm i owned by foreign investors at time t, and Y_{it} is the output of firm i at time t. Javorcik constructs the following indicator of the foreign presence in industry k which receives its supplies from industry j:

$$Backward_{jt} = \sum_{k \neq j} \alpha_{jk} Horizontal_{kt}$$

where α_{jk} is the proportion of industry j's output supplied to industry k. As firm-level data are not available, Javorcik uses industry-level data from input-output tables to calculate αjk. Her estimation results suggest that the correlation between $Horizontal_{jt}$ and the TFP level is insignificant, but the correlation

between $Backward_{jt}$ and the TFP level is positive and significant. Employing a similar methodology, Blalock and Gertler (2004) use Indonesian data and also find evidence of spillovers through backward linkages but none of intra-industry spillovers.

Rodriguez-Clare and Alfaro (2004) employ a different approach to examining the effect of backward linkages. Using firm-level data from Mexico, Brazil, Venezuela and Chile, they show that, except in Mexico, MNEs buy more intermediate goods per worker than domestic firms. In other words, MNEs have greater backward linkages than domestic firms. This finding is in line with Markusen and Venables (1999), who show theoretically that if MNEs have greater backward linkages than domestic firms, FDI increases the utility of a host country.

f) Summarising micro evidence

The studies based on firm-level data provide several conclusions. First, FDI does not necessarily generate knowledge spillover effects on domestic firms. This is particularly the case with FDI in LDCs. Hence some effort is required to increase spillovers from FDI in LDCs. For instance, spillovers from FDI are greater when the absorptive capacity of host country firms is increased through human resource development or R&D activities, or when the host country receives FDI entailing local training or local R&D activities in the host country. Second, the studies suggest that distance can be a factor in reducing spillover effects. Third, while there appear to be inter-industry spillovers from FDI through backward linkages, intra-industry spillovers are less likely.

Conclusion

The theoretical and empirical literature on the effects of FDI on the economies of less developed countries suggests that FDI does not always generate technology spillovers or increase domestic demand and thereby boost economic growth. Consequently, LDC governments might carefully weigh the costs and benefits of measures to attract FDI. For example, establishing export processing zones, investing in infrastructure and offering tax breaks to foreign firms involve substantial costs. Yet where foreign firms form an enclave[13], import parts and components from abroad and export a large share of their output, it is quite possible that they contribute little to stimulating domestic demand

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or technology transfers to domestic firms. The industrial parks on Batam and Bintan Islands in Indonesia illustrate this point. They are situated 1 000 km from Jakarta but only 20 km from Singapore; as a result, they form enclaves in Indonesia and have closer ties with Singapore than Indonesia.

There are, however, also various studies that suggest that under certain circumstances FDI can contribute to domestic industries and can boost economic growth. In this regard, several points should be noted. First, it is important to select foreign firms which contribute to domestic industries. For example, foreign firms which perform local human capital development and R&D activities, such as providing in-firm training or education, generate larger technology spillover effects. Similarly, foreign firms that rely on parts from domestic firms are likely to generate larger demand spillover effects. Second, enhancing domestic absorptive capacity increases the benefits from FDI. For instance, efforts by host-country governments to improve educational levels or by domestic firms to perform R&D or develop human resources are likely to raise the country's absorptive capacity and thus increase the benefits of FDI. Third, the studies suggest that technological progress in the host country might be boosted if FDI targets final goods industries instead of intermediate goods industries and that technology transfer can be promoted from foreign firms in final goods industries to domestic firms in intermediate goods industries. In addition, during the early stages of development it may be better to limit production through FDI and promote production through licensing. This is because FDI generates fewer knowledge spillovers than licensing, and thus dependence on FDI in the early stages of development can hinder technological progress in the host country.

The policies adopted by the Japanese government during the postwar era and by the Chinese government since the 1980s resemble these recommendations. For example, from the end of World War II to 1964, Japan limited inward FDI and instead promoted production through licensing. In addition, the Ministry of International Trade and Industry (MITI; now Ministry of Economy, Trade and Industry) was directly involved in licence contract negotiations between Japanese and foreign firms, trying to ensure that licence agreements entailed substantial technology transfers (Goto and Wakasugi, 1988; Kim and Ma, 1997). Until 2002, the Chinese government, on the other hand, required foreign firms in the automobile industry to purchase at least 80 per cent of parts and components from domestic firms (Francois and Spinanger, 2004). Policies such as these appear to be among the factors that have led to Japan's and China's rapid technological growth.

Notes

1. These articles have been developed through a close co-operation with various individuals and institutions, including Colm Foy, Javier Santiso and Louka Katseli of the OECD Development Centre, Francisco Gomez and Jaime Sempere of El Colegio de Mexico, Aoyama Gakuin University (Japan) and the United Nations. The OECD Development Centre gratefully acknowledges the financial support of the New Energy and Industrial Technology Development Organisation (NEDO) of Japan, the Korean government, CONACYT of the Mexican government, the Swiss government, the International Finance Corporation (IFC), and the World Bank Institute (WBI) without which this work would not have been possible.
2. According to UNCTAD (2001), among 1 185 laws concerned with FDI and enacted from 1991 to 2000 around the world, 95 per cent were laws providing for favourable treatment for FDI.
3. The first dynamic model to analyse technology transfers from FDI was developed by Findlay (1978).
4. The studies use a variety of measures for the maturity of financial markets such as the ratio of the sum of cash, credit and bonds owned by financial institutions to GDP (Alfaro *et al.*, 2004) or total stock market capitalisation relative to GDP (Durham, 2004).
5. Durham (2004) uses the indicator of corruption constructed by Knack and Keefer (1995). It should be noted that the higher the indicator, the lower the degree of corruption.
6. Since the Durbin-Wu-Hausman test suggests the possibility of endogeneity between the per capita GDP growth rate and the FDI ratio for data from 1985 to 1999, Li and Liu (2005) estimate simultaneous equations consisting of equation (1) and an equation for the determinants of FDI.
7. Alfaro *et al.* (2004) and Durham (2004) also pool observations from DCs and LDCs.
8. While we focus on studies which analyse the effect of FDI on firms' output or productivity, there are others which analyse the effect of FDI on domestic firms in other ways. For example, Görg and Strobl (2003) examine the effect of the presence

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of foreign firms on the survival rate of domestic firms, while Görg and Strobl (2002) and Barrios *et al.* (2005) look at entry rates, and find that the effects are positive. The effects may arise as a result of knowledge or demand spillovers from foreign to domestic firms.

9. Firm value is the sum of the values of common stock, preferred stock, long-term debt and short-term debt net of assets. Book value of capital includes net plant, property and equipment, inventories, investments in unconsolidated subsidiaries and intangibles (other than R&D).

10. Hansen (2000) sets α to minimise, $\Sigma_i \Sigma_t \varepsilon_{it}$ the sum of squared errors.

11. Castellani and Zanfei (2003) arrive at the same conclusions in their analysis based on data from Italy, France and Spain.

12. Another study on the factors potentially affecting knowledge spillovers from FDI was conducted by Girma (2005), who classified FDI into technology-sourcing FDI and technology-exploiting FDI. The former is defined as investment from a country with a low ratio of R&D expenditure to output, while the latter is defined as investment from a country with a high level of R&D expenditure. Technology-sourcing FDI is made to acquire technology from the host country, while technology-exploiting FDI is made to produce goods in the host country using the source country's technology. Girma estimates the spillover effects of the different types of FDI, the results suggest that the spillover effects of technology-sourcing FDI are insignificant or much smaller than those of technology-exploiting FDI. Note, however, that this study concentrates on FDI in a developed country (the United Kingdom) and, generally speaking, there is little technology-sourcing FDI in LDCs.

13. This is likely to be the case when export processing zones are established a long way from existing areas of industrial concentration.

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Investment Climate, Capabilities and Firm Performance: Evidence from the World Business Environment Survey*

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Abstract

The *World Business Environment Survey* (WBES) provided a unique look at the impact of the investment climate on enterprise performance, employing a standard core questionnaire to more than 10 000 firms in 80 countries between late 1998 and mid-2000. This paper examines results of a special module of the survey administered in 28 of the WBES countries that focused on issues of competition, trade and firm capabilities in terms of technology and worker education and training. It confirms that key attributes of the investment climate such as corruption, financing, tax administration, regulations and policy uncertainty all matter in explaining firm performance as measured by sales growth, employment growth and investment growth. Further, excessive labour regulation is negatively associated with both employment and investment growth. The new data on firm capabilities suggest that firm investments in technology and skills are also critically associated with firm performance. Investment in technological capacity strongly relates to sales growth, while international technological acquisition relates clearly to employment and investment growth. Training matters as well, and it is quite clear that investments in private training services are significantly associated with all dimensions of firm growth. What is equally clear is that public training bears no significant relationship with firm performance. Firms that make no investments in training appear disproportionately influenced by three types of market failure. This link has direct implications for governments as they shape technology policy and training policy.

* This article is one of six resulting from an expert workshop convened by the Development Centre on Financing Development. Spanish translations of these articles have been published together by the Colegio de México in a book entitled *Inversión extranjera directa, tecnología y recursos humanos en los países en desarrollo*. See Preface to the collection at the end of this article.

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Introduction

Around the world, firms struggle to compete in increasingly global markets. One key response to competition is the effort to improve capabilities and skills, including through technological upgrading and employee training. The importance of strengthening firm capabilities in the context of an increasingly knowledge-based global economy is well recognised in the literature (see, for example, World Bank Institute, 2001; Dahlman, 2001). Up to now, there has been relatively little systematic international data about how firms upgrade their capabilities and whether this effort results in improved performance. Clearly, firm performance is critically dependent on the policy and institutional conditions in the domestic economy, which together constitute the investment climate[2]. This paper explores whether, controlling for critical differences in firm characteristics and investment climate conditions, firm-level actions to upgrade capability have an impact on their actual performance as measured by increased sales, investment and employment.

WBES Survey and Findings

The basis of this analysis is the World Business Environment Survey (WBES), which provided a unique look at the impact of the investment climate on enterprise performance. The survey employed a standard core questionnaire applied to more than 10 000 firms in 80 countries (generally interviewing at least 100 firms per country), implemented by the World Bank Group and other collaborators primarily in 1999 and the first half of 2000. The intention of the survey was to provide an affordable, uniform and replicable approach to measuring and benchmarking national business environments, their binding constraints, the quality and integrity of supportive and regulatory public services, and the relative improvement or decline of conditions over time.

The WBES identified firm priorities by region and characteristics[3]. Taking the global average of 80 countries and one territory, four constraints led others: taxes and regulations, financing, policy uncertainty/instability, and inflation. In four developing regions, South Asia, Africa, developing East Asia and MENA, corruption figures as one of the top three leading constraints; and inflation figures among the top three constraints in developing countries as a group. Generally, on average, smaller firms were systematically more constrained than larger firms.

The WBES analysis found a strong empirical connection between firm-level outcomes and firm constraints. Specifically, other things being equal, countries with poor investment climate conditions in four categories — financing,

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corruption, high taxes and business consultation — saw their existing businesses grow an average total of 10.5 percentage points less than those with positive ratings in all of these categories. Investment too was highly associated with business environment constraints: countries with poor conditions in the areas of financing, high taxes, corruption and policy predictability saw their businesses' investment levels grow an average of 10.5 percentage points less than those with positive ratings in all of these categories.

Adding Firm Capabilities — Investments in Technology and Human Capital

This paper examines results of a special module of the survey administered in a fairly standard fashion in 28 of the WBES countries that focused on issues of competition, trade and firm capabilities in terms of technology and worker education and training. The paper examines their responses to identify patterns manifested in these countries in each of the areas covered by the module, and then relates the unique investment climate variables together with indicators of firm capability, to the firm's reported performance from the main questionnaire.

The supplemental module was implemented in five regions. Most of these countries — 19 — are in the Latin America and Caribbean region (Table 5.1). The sample includes three East Asian newly-industrialised countries (China, Singapore and Malaysia), two East Asian developing countries (Indonesia and Philippines), two North American OECD countries (United States and Canada) and one South Asian country (Pakistan)[4] (Table 5.2).

By size (Table 5.1) it is clear that most of the firms interviewed were SMEs, having 500 or fewer employees, and a third of the total sample were small enterprises having fewer than 50 employees. Just over a quarter were large. By design, the great majority of firms identified by sector were in either the manufacturing sector (43 per cent) or services sector (49 per cent), with relatively few firms in the construction and agriculture sectors.

Table 5.1. **Sample Composition by Region, Size and Sector**

Region	Total	Small	Medium	Large	Manufacturing	Services	Agriculture	Construction
East Asia/NIC China	301	134	89	78	146	129	3	23
East Asia Dev	200	64	88	47	65	123	4	8
South Asia	103	39	43	21	49	51	1	1
Latin America	2 085	655	876	554	726	746	36	101
OECD	201	67	83	51	50	130	4	16
All regions	2 890	959	1 179	751	1 036	1 179	48	149

Table 5.2. **Leading Type of Technological Innovation by Region**

(Percentage of respondents)

Type	East Asia/ NIC China	East Asia Dev	South Asia	Latin America	OECD	All Regions
New products	41.4	31.0	36.1	40.6	44.4	40.1
New productions /process techniques	18.8	11.4	8.4	17.6	26.9	17.6
New management techniques	15.1	20.3	22.9	12.3	12.9	13.4
New quality controls in production	15.6	8.9	8.4	5.1	7.6	6.4
Other	9.1	28.5	24.1	24.5	8.2	22.4
Total	100.0	100.0	100.0	100.0	100.0	100.0

Investments in Technology and Skills

Firms confronting competitive pressures or positive incentives to improve productivity may respond in several ways. First, there is the question of the form of innovation — which can include introducing new products, altering production technology or techniques, upgrading management methods and introducing improved quality controls in production (or service delivery), among others. Of course, firms may use any or all of these approaches simultaneously. In order to get a sense of which three types of innovation were the most commonly used, the WBES asked firms to rank which were the three most common new management techniques.

As shown in Table 5.2, across all regions, the leading form of technological innovation reported was development of new products (identified by over 40 per cent of enterprises). Overall, "new productions and process techniques" was the second most common form of innovation, and "new management techniques" was the third most comon form. However there was some regional variation. In NIC/East Asian, OECD and Latin American countries (i.e. the generally more developed regions) new production and process techniques were the second most important form of innovation, while in developing East Asia and South Asia new management techniques were more important than production and process innovation. As a further variant, in NIC, East Asia quality controls in production were the second leading form of innovation.

When the sample is broken down by size (Table 5.3A), the same pattern holds true. For small, medium and large firms, introduction of new products is their leading form of technological innovation, accounting for 40 per cent of

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responses. For SMEs, introduction of new production and process techniques is the second most common form of innovation, while for large enterprises this is nearly equal to the application of new management techniques. Patterns hold true by sector categories as well — leading form of technological innovation is new products, followed by new production processes and new management techniques, except agriculture where new production techniques and new management techniques are equally prevalent as the leading form of innovation (Table 5.3B).

Table 5.3A. **Leading Type of Technological Innovation by Firm Size**
(Percentage of respondents)

Type	Small	Medium	Large	Total
New products	39.6	41.4	38.8	40.1
New productions /process techniques	18.8	17.8	15.8	17.6
New management techniques	14.3	11.1	16.1	13.4
New quality controls in production	5.3	7.4	6.2	6.4
Other	22.0	22.3	23.1	22.4
Total	100.0	100.0	100.0	100.0

Table 5.3B. **Leading Type of Technological Innovation by Sector**
(Percentage of respondents)

Type	Manufacturing	Services/ Commerce	Agriculture	Construction	Total
New products	39.1	38.7	40.5	43.2	39.2
New productions/process techniques	17.0	19.6	16.7	15.9	18.2
New management techniques	12.8	14.6	16.7	13.6	13.8
New quality controls in production	7.4	5.1	9.5	6.1	6.2
Other	23.7	22.0	16.7	21.2	22.5
Total	100.0	100.0	100.0	100.0	100.0

How Do Firms Obtain New Technology?

A second key choice firms confront is how to obtain new technology. In broad terms, they can develop it themselves, purchase it, or hire people or firms to develop it, but even within these categories there are multiple possibilities. The WBES asked firms about their leading method of acquiring new technology. The most common category for technology acquisition was "bought off-the-shelf in

international markets". Overall, 36 per cent of respondents reported this method was one of their top three. A second leading source was local development within the firm. This was one of the leading means of technological acquisition for 34 per cent of firms. Another common means of acquiring new technology was to buy it "off-the-shelf" in domestic markets — this method was used by 31 per cent of firms.

Looking across regions, it is clear that global aggregation masks crucial differences. Specifically, in OECD and East Asia the leading source of technology is "developed locally within the firm". However, in South Asia the leading source is "bought off-the-shelf domestically" and in Latin America "licensing bought off-the-shelf in international markets" provides the leading source.

By size, buying off-the-shelf in international markets is the leading method of technological acquisition for all categories of firms, and buying off-the-shelf domestically comes in a consistent second. Surprisingly, small firms report themselves more likely than large ones to develop technology locally within the firm as their primary source of technological acquisition. Large firms are more likely to have purchased turnkey operations than smaller firms.

Table 5.4. **Leading Means of Acquisition of Technological Innovation**

(Percentage of respondents)

	Most Important	Second Most Important	Third Most Important	One of top three (total)
Tech licensing off-the-shelf in international market	22.1	9.7	3.9	35.7
Bought off-the-shelf domestically	19.5	7.3	4.2	31.0
Developed locally within firm	14.5	11.8	7.9	34.2
Transferred from parent company	6.4	4.5	2.9	13.8
Turnkey operation off-shelf in international market	6.4	5.0	2.0	13.5
Developed in co-operation within equipment supplier	5.4	6.5	4.3	16.2
By hiring key personnel	5.1	8.6	10.1	23.8
Adapted within firm locally	3.7	9.6	7.1	20.4
Trade fairs	3.5	4.7	7.6	15.8
Developed in co-operation with other firms	3.1	4.8	4.0	11.9
Developed in co-operation with client firms	2.4	4.7	4.6	11.7

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Table 5.5. **Leading Means of Acquisition of Technological Innovation**

(Percent of respondents)

	East Asia/ NIC China	East Asia Dev	South Asia	Latin America	OECD	All Regions
Tech licensing bought off-the-shelf in international market	10.6	7.8	**19**	**26.6**	5.3	22.1
Bought off-the-shelf domestically	**14.1**	**8.4**	**25**	**21.4**	**14.4**	**19.5**
Developed locally within firm	**19.2**	19	18	11.6	**33.2**	**14.5**
Turnkey operation bought off-the-shelf in international market	1.2	3.4	9	7.7	1.1	6.4
Transferred from parent company	6.7	7.8	3	6.6	4.8	6.4
Developed in co-operation with equipment supplier	5.9	**12.3**	4	4.3	11.2	5.4
By hiring key personnel	9	5	6	4.1	10.2	5.1
Adapted within firm locally	3.1	5	0	4	2.1	3.7
Trade fairs	6.7	5	1	3.3	1.6	3.5
Developed in co-operation with other firms in my activity	3.9	7.3	3	2.3	6.4	3.1
Developed in co-operation with client firms	7.5	6.1	2	1.4	2.7	2.4
Consultants	1.6	2.8	1	1.9	2.1	1.9
Study tours	1.2	2.2	1	1.5	1.1	1.5
Business/industry association	4.3	3.9	1	0.6	1.6	1.2
Developed in co-operation with a mechanic or repair shop	0.4	1.7	2	0.9	0.5	0.9
Other	2	0	3	0.9	0	0.9
From an industry association	1.6	1.1	1	0.6	1.6	0.8
From universities, public institutions	1.2	1.1	1	0.5	0	0.6

Table 5.6. **Leading Source of Technology Acquisition**

	Small	Medium	Large
Tech licensing bought off-the-shelf in international market	20.5	22.7	23.2
Bought off-the-shelf domestically	19.0	19.4	20.4
Developed locally within firm	16.8	13.7	12.9

Skills Upgrading

Which Firms Train?

There is broad agreement that human capital, defined to include both education and post-school training, contributes to economic growth through raising the productivity of workers and facilitating the adoption and use of new technologies[5]. Firms' ability to train employees can be critical to their ability to adopt and adapt new technology; upgrade production, financial and management capabilities; flexibly respond to market forces; and otherwise improve productivity. A wealth of international evidence points to the role that effective investments in employee training can yield, in the context of well-functioning markets and supportive institutions (e.g. see Tan and Batra, 1995; and Batra *et al.*, 2003).

The WBES data suggest regional variations in the amount and pattern of investment in formal training offered by firms. Regionally, South Asian (Pakistan) firms provide less training than do other regions. Firms in OECD countries are the most likely to train, while those in Latin America train more than other developing regions. Small firms are generally less likely than medium or large firms to provide their employees with training. The main exception is the OECD countries, where SMEs as a group have a higher rate of training their employees than do large firms.

Table 5.7. **Percentage of Firms that Provided Training to Their Employees in 1998**
by size and region

Region	Small Firms	Medium Firms	Large Firms	Manufacturing	Services/ Commerce	Agriculture	Construction	All
East Asia/NIC China	58.2	57.3	58.4	56.2	55.8	n.a.	60.9	56.8
East Asia Developing	56.3	70.5	63.8	69.2	62.6	n.a.	50	64.0
South Asia	33.3	51.2	47.6	38.8	45.1	n.a.	100.0	43.7
Latin America	68.4	75.6	77.4	74.1	76.8	77.8	67.3	73.8
OECD	76.1	76.1	70.6	80.0	69.2	n.a.	81.3	73.1
All regions	65.2	72.7	72.8	69.9	70.8	n.a.	67.1	70.2

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How Do Firms Train Their Employees?

Firms that elect to train their employees have several training options. By a substantial margin, the most common method by location, size and sector is to utilise their own in-house facilities and trainers. It is surprising that small firms are just about as likely as larger ones to provide in-house training, since it is generally presumed that small firms are less able to provide such facilities and staff internally. Small firms in OECD countries show the highest incidence of using their own facilities to train their workers. South Asian firms, while less likely to train overall, are also less likely to use their own facilities, relying relatively more heavily on outside private facilities and trainers. Latin American firms make the greatest use of outside private training facilities. Such outside private facilities and trainers are consistently the second leading source of training in all regions except NIC, East Asia and China. There, public training facilities and trainers provide training to over 30 per cent of small and large firms and 16 per cent of medium firms. In Developing East Asia, public training disproportionately serves large firms, while in OECD it is more likely to reach small firms.

Table 5.8. **Average Percentage of Worker Training at Different Facilities**
by region and firm size

Training facilities	Own Facilities & Trainers			Outside Public Facilities/ Trainers			Outside Private Facilities/ Trainers		
	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
East Asia/NIC China	44.9	55.8	39.4	31.1	16.1	30.4	17.8	18.6	24.1
East Asia Dev	49.0	57.2	41.4	8.4	6.0	13.3	21.7	21.8	20.8
South Asia	37.1	24.1	15.0	0.6	0.0	2.0	27.5	15.7	8.5
Latin America	51.7	50.3	50.5	7.6	8.7	9.5	39.3	40.0	40.1
OECD	63.3	73.6	50.8	15.3	10.1	3.6	17.4	16.0	26.5
All regions	51.3	52.3	48.5	10.9	8.9	10.9	33.6	35.2	36.3

Are There Market Failures in Training?

Each firm, in deciding how much to invest in training, is taking into consideration a number of factors. In general, a majority of firms provide at least some training, but there are substantial differences in how many and how much firms train. WBES asked respondents the extent to which they agreed with a series of statements embodying factors previously identified in the literature as influencing firm-level decisions on how much to invest in training workers.

Overall, a majority of firms agreed with three major reasons for not training workers more (Table 5.9). First, many firms felt they could easily hire skilled workers who did not need additional training[6]. Second, a great many firms identified the technologies they use as "mature", hence not requiring worker training[7]. Third, a bare majority of firms feel their "on-the-job" or informal approaches to training were adequate, hence formal training was not required. This pattern holds true by firm size as well. It is noteworthy that none of these reasons necessarily involves a market failure. This contrasts with other explanations that may be associated with market failures — such as the view that worker skills imparted by training would be lost to other firms through labour turnover, that training (although worthwhile) was unaffordable because of financing constraints, or that the benefits and/or techniques of training were simply unknown.

A regional analysis suggests that there might be market failures in training provision (Table 5.9, below). In South Asia, firms are generally more likely to agree with reasons for not training, and stand out in their agreement with the unaffordability of training (suggesting financial market failures) and concern about labour turnover (externalities to training). Latin American firms stand out in their use of mature technologies as a justification for not training more, as well as in their satisfaction with the supply of skilled workers available for hire. The reasons for not training more vary surprisingly little by enterprise size. Contrary to expectation, small firms do not, on average, report feeling more constrained than do medium or large firms, nor are they particularly more likely to identify key market failures as the reason for not training more.

Table 5.9. **Firms' Perceptions of Investing in Training, All Firms**

(Mean scores where 1 is strongly disagree and 5 is strongly agree)

	East Asia/ NIC China	East Asia Developing	South Asia	Latin America	All
Unaffordable owing to firms' limited resources	2.2	2.3	3.4	2.5	2.5
Cost of high labour turnover	2.6	2.6	3.5	2.7	2.7
Lack of knowledge about techniques	2.4	2.3	2.7	2.1	2.2
Mature technology used & workers proficient	3.3	3.1	3.5	3.5	3.5
Skilled workers hired elsewhere	2.9	2.7	3.5	3.9	3.6
Adequate skills acquired from school	2.3	2.3	3.1	2.9	2.7
Scepticism about benefits of training	2.0	2.4	2.4	1.9	2.0
Adequate in-house informal training	2.6	3.0	3.2	3.5	3.3

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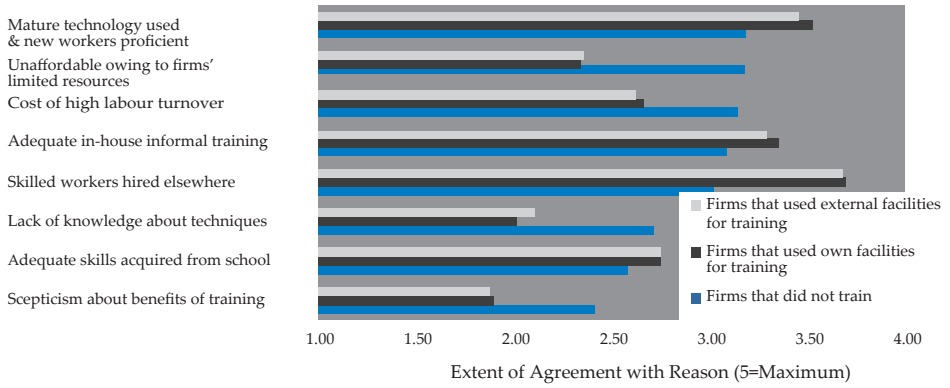
However, once one separates the firms that do not train their workers from those that do, a familiar story appears. Firms that do not train their workers are substantially more likely than firms that do to agree with three reasons for not training more:

1) Training is unaffordable owing to firms' limited resources. If training truly has a high payoff to firms (see econometric analysis below) then the inability to finance a profitable investment would reflect a financial market failure.

2) Cost of high labour turnover. This constraint indicates that firms face an externality — labour turnover means they cannot capture the full benefit of investments in worker training, leading them to underinvest.

3) Lack of knowledge about techniques or scepticism about the benefits of training. Both of these responses, in the face of systematic evidence about the benefits of training, may indicate that the firm suffers from information failure in its ignorance or scepticism about the benefits or appropriate methods of training[8].

Figure 5.1. **Reasons For Not Training Workers More**



It is useful to note that firms that do not train are also less likely to innovate. In the total sample, 70 per cent of respondents offer some employee training while 30 per cent do not. Of firms that train, 12.5 per cent report no innovation. Of firms that do not train, 25 per cent report that they did not innovate. This raises the possibility that some of the same market failures leading to under-investment in training may influence investments in innovation.

Investment Climate Constraints to Competitiveness

Ultimately, firm adoption of technology and employee training are means to an end, namely, to be more competitive and hence more profitable. To place the importance of training and technology concerns in broader context, the survey asked respondents to rate a variety of potential constraints to their competitiveness. These ranged from taxation and regulations to restrictions imposed by foreign governments on their exports. In their top priorities, these special ratings are quite consistent with firms' general constraint rankings globally, placing taxes and regulations and financing concerns ahead of other concerns (Table 5.10A). But it is important to note that the third leading constraint cited was the quality and supply of skilled technicians, identified by 54.5 per cent of firms as a moderate or major obstacle. Supply chain concerns also rank high — nearly 53 per cent of firms rated the lack of high quality local suppliers as a major or moderate constraint.

Table 5.10A. **Constraints to Competitiveness**
(% of respondents)

	No Obstacle	Minor Obstacle	Moderate Obstacle	Major Obstacle
Government regulations, taxes	16.0	21.4	29.4	33.1
Access to & cost of working capital finance	21.7	21.6	25.8	30.9
Quality and supply of skilled technicians	19.1	26.4	32.3	22.2
Lack of high quality local suppliers	24.1	23.1	26.6	26.2
High cost of labour	24.0	29.3	28.4	18.4
Quality of infrastructure	27.2	26.5	26.2	20.1
Lack of machinery, etc.	28.0	26.4	25.2	20.4
Quality supply of production workers	28.9	28.5	27.9	14.7
Restrictions on hiring/firing	30.9	28.7	24.1	16.3
Barriers imposed by foreign governments	41.1	23.6	18.9	16.4
System of export incentives	42.7	20.7	21.0	15.6

By region, firms in East Asia NIC/China are systematically less constrained than those in other regions (Table 5.10B). Those in South Asia are most constrained overall. South Asian firms identify themselves as especially constrained by taxes and regulations and infrastructure, but are also disproportionately constrained by the quality and supply of skilled technicians, lack of machinery, quality of production workers and foreign governments' barriers to their exports. By size, there is little variation, implying that all sizes of firms are constrained in roughly the same ways.

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Table 5.10B. **Potential Constraints**

	East Asia/NIC China	East Asia Dev	South Asia	Latin America	All
Government regulations, taxes	1.9	2.8	3.1	2.9	2.8
Access to & cost of working capital finance	2.1	2.5	2.9	2.8	2.7
Quality supply of skilled technicians	2.2	2.5	2.8	2.6	2.6
Lack of high quality local suppliers	2.0	2.7	2.9	2.6	2.5
High cost of labour	2.5	2.7	2.6	2.4	2.4
Quality of infrastructure	1.7	2.6	3.1	2.5	2.4
Lack of machinery, etc.	1.9	2.6	2.8	2.4	2.4
Quality of supply of production workers	2.2	2.2	2.7	2.3	2.3
Restrictions on hiring/firing	1.9	2.4	2.4	2.3	2.3
Foreign governments' barriers	1.7	2.4	2.9	2.1	2.1
System of export incentives	1.5	2.1	2.7	2.2	2.1

Investment Climate, Firm Capabilities and Firm Performance

Dimensions of enterprise performance

Ultimately, the true test of the importance of constraints imposed by the investment climate and firm capabilities lies in their performance in markets. The WBES data provide us with three measures of firm performance: *i)* sales growth; *ii)* investment growth; and *iii)* employment growth[9]. Thus three independent equations were specified in order to explore the relationship of performance to explanatory investment climate variables and technology and training variables as follows:

1) Sales growth = F(Investment Climate indicators, Technology and Training variables, Other Firm attributes such as age and size);

2) Investment growth = F(Investment Climate variables, Technology and Training variables, Other Firm attributes);

3) Labour growth = F (Investment Climate variables, Technology and Training variables, Other Firm attributes).

In each equation, "growth" is defined as the percentage change in performance variable recorded by a firm over the previous three years as reported in WBES: its change in sales, investment or total full-time workers. Depending on firm performance, these variables can take on positive, negative or zero values[10].

A series of investment climate variables were tested in stepwise fashion in a multivariate ordinary least squares (OLS) equation. Given the potential multicollinearity[11] of related variables, different characteristics (e.g. finance and technology) were ultimately reflected by a single variable, selected through a sequential testing process. In addition, given the high likelihood of heteroskesdasticity in cross-sectional data of this type, the Stata robust specification was applied to all regressions to correct for potential heteroskedasticity[12]. The final equations included the following variables:

a) *Bribes:* A binary variable that takes the value of 1 when a firm pays more than 1 per cent of its annual revenues to public officials as unofficial payments "to get things done". Given that it constitutes an additional cost to the firm, its coefficient is expected to be negative in the regression.

b) *Financial Constraints:* Here, different variants of financial constraints were tested and employed in the different regressions.

i) In the sales growth regression, finance is represented by "collateral", a scale variable reflecting the degree to which firms find collateral requirements by banks or other financial institutions constraining. It takes the value 1 if firms rated collateral requirements as no obstacle; 2 if they rated it a minor obstacle; 3 if rated a moderate obstacle; or 4 if rated a major obstacle. It is expected to affect sales growth negatively. Thus, a negative coefficient of this financial variable will be interpreted as follows: an increase in the firms' perception that collateral requirements constitute a constraining factor is associated with a decline in sales growth.

ii) In the investment equation, finance is represented by "interest", a scale variable reflecting the degree to which firms find high interest rates constraining. Like collateral, it takes a value between 1 and 4, reflecting whether the firm rated it no obstacle (1), minor (2), moderate (3) or a major obstacle (4). The interest rate variable is expected to be negatively related to investment growth.

iii) In the employment regression, a general finance variable is used. "Finance" is a scale variable that reflects the overall degree to which firms find financing a problem. It does not distinguish between collateral and interest rates. This variable also takes a value from 1 to 4, depending on the rank assigned it by a responding firm[13].

c) *Tax administration and regulations* constraint (*tax_reg*) is another scale variable ranging from 1 to 4, reflecting whether the firm rated it no obstacle (1), minor (2), moderate (3) or a major obstacle (4). Its coefficient is expected to be negative in the regression as the burden of regulatory constraints is associated with lower sales growth.

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d) *Policy uncertainty (uncertainty),* is a scale variable ranging from 1 to 4, using the same definitions as the other ranking variables. Its coefficient is expected to be negative.

e) *Labour regulations* constraint *(labour_reg),* a categorical/scale variable ranging from 1 to 4 capturing severity of labour regulations as a constraint to firms' operation and growth. Its coefficient is expected to be negative as heavy labour regulations constitute an implicit cost to business.

Firm capability (knowledge) variables include:

f) Here, different explanatory variables for *technology* were applied in different equations:

i) In the sales growth equation, technological innovation is captured by *innovation (innovation),* a binary variable which distinguishes between product innovations and innovations in management techniques, quality controls and the like. It takes the value of 1 if technology was acquired via new management techniques and quality controls in production or any other ways other than through the introduction of new products and new production processes. Its coefficient is expected to be positive in the regression.

ii) In the investment and employment growth equation, technology is captured by a dummy variable *(shelf)* which is 1 if technology was acquired *off-the-shelf* in the international market (technology licensing) and zero if it was not. Its coefficient is again expected to be positive.

g) Training is represented by *private sector training (train priv.)* that represents the percentage of a firm's total training carried out by formal training through private external means, and *public sector training (train public),* representing the percentage of a firm's total formal training carried out through public external means. As it is commonly agreed that training/human capital affects growth, both coefficients are expected to be positive.

Firm attributes include:

h) *Firm size* is captured by two dummy variables, medium and large. *Medium* takes the value of 1 if the firm employs from 10 to 99 employees; *large* takes the value of 1 if the firm has 100 or more employees. *Small* is the reference case: if both medium and large variables take the value zero, then the firm is small, having from one to nine employees.

i) *Firm age* represented by a continuous variable (*age*) which is simply the number of years of existence of the firm. It is calculated as the difference between year 2000 and the year of establishment of firm (=2000-year of establishment).Its coefficient is supposed to be negative in the regression as suggested in the literature.

j) *Firm ownership* captured by a binary variable reflecting whether the firm has any foreign ownership or is entirely domestically owned. "Foreign" that takes the value of 1 if the firm has a foreign ownership, and 0 otherwise. One would expect its coefficient to be positive as foreign-owned firms are more productive than domestic ones for many reasons including an easy access to technology through their parent company, for example.

k) *Export orientation* measured by an indicator variable that takes the value of 1 if the firm exports some positive proportion of its total output, and 0 otherwise. Its coefficient is expected to be positive because exposure to international competition generally makes firms more efficient.

l) *Infrastructure* in employment growth regressions is mainly captured by the *quality of postal services,* represented by a categorical variable (*qpost*) ranging from 1 to 6, with 1=very bad, 2=bad, 3=slightly bad, 4=slightly good, 5=good, 6=very good. Because qualitative infrastructure variables are highly correlated, this indicator proved to be a useful proxy for the overall state of infrastructure services in a country[14]. The coefficient is expected to be positive.

m) In order to capture fixed firm differences across *regions*, alternatively and depending on the regression, four regional dummy variables were introduced*: Latin America, East-Asia China, East-Asia developed, and OECD (latin, easch, eased, oecd). Southeast Asia* was the reference region.

What Factors are Related to Sales Growth?

The first equation tests the relationship of explanatory variables and firm characteristics with sales growth. The regression results suggest a variety of factors have a significant associations with enterprise sales growth. Unless otherwise noted, the coefficients of explanatory variables are significant at the 5 per cent level.

Among investment climate indicators, bribes, financing constraints, taxes and regulations and policy uncertainty all bear a significant and negative relationship with sales growth. Specifically:

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a) Bribes: Firms that make any additional payments of 1 percentage point or more of sales have 4 percentage points lower sales as compared with firms that do not pay bribes.

b) Finance: An increase in the perceived severity of collateral requirements by one point on the four-point scale is associated with a 1.5 percentage point reduction in sales growth.

c) Tax administration and regulations: A 1 point increase in the perceived severity of tax administration and regulations is associated with a 2 percentage point lower rate of sales growth.

d) Policy instability and uncertainty: A 1 point increase in the perceived severity of policy uncertainty is associated with a 2 percentage point lower rate of sales growth. This relationship is significant at the 10 per cent level.

In addition, among technology and training variables, technology acquisition and training (both public and private) bear a significant and positive relationship with sales growth. Specifically:

a) Technology Acquisition: Firms that had strengthened their technological capacity through investments in management, quality control and the like had a 6 percentage points higher sales growth rate than firms that did not.

b) Training: The use of external private training facilities has a small but significant positive association with sales growth. Specifically, a 10 per cent marginal increase in the percentage of training provided by private external trainers is associated with a 0.5 percentage point increase in sales growth.

Finally, certain firm characteristics have a significant relationship with sales growth. Specifically:

a) Sales growth increases with firm size (that is, larger firms in the sample grew faster). Large firms report a growth rate 6 percentage points higher than small firms.

b) Sales growth decreases with age (younger firms in the sample reported higher sales growth). For example, on average an 11 year-old firm will have experienced growth of 2.5 percentage points less than a one year-old firm.

c) Finally, firms that export report higher sales growth. This relationship is strong — firms that export, other things being equal, report a 3.4 percentage points higher level of sales growth than firms that do not.

Table 5.11. **Sales Growth as a Function of Investment Climate, Technology and Training and Firm Characteristic Variables**
(Regression results)

Robust				**R-squared = 0.0571**		
Saleschange	Coef.	Std. Err.	t	P>t	[95% Conf.]	Interval]
Bribe	-4.14	1.14	-3.63	0.02	-7.29	-0.98
Collateral	-1.47	0.51	-2.86	0.05	-2.90	-0.04
Tax admin. and regulation	-2.04	0.50	-4.09	0.02	-3.42	-0.65
Uncertainty	-2.20	0.98	-2.25	0.09	-4.91	0.52
Innovation	6.22	1.05	5.94	0.00	3.31	9.12
Private training	0.05	0.01	7.29	0.00	0.03	0.06
Public Training	0.09	0.04	2.03	0.11	-0.03	0.21
Age	-0.24	0.02	-12.40	0.00	-0.29	-0.19
Medium	2.90	1.99	1.46	0.22	-2.62	8.41
Large	6.38	1.70	3.76	0.02	1.67	11.08
Foreign owned	1.82	1.12	1.63	0.18	-1.29	4.93
Export	3.42	0.38	8.88	0.00	2.35	4.48
Latin	-6.36	0.72	-8.86	0.00	-8.35	-4.37
Eastasiachina	-12.49	1.83	-6.82	0.00	-17.57	-7.40
Eastasiadev	-8.58	0.67	-12.73	0.00	-10.45	-6.71
OECD	-0.26	0.91	-0.29	0.79	-2.79	2.27
Constant	28.73	2.39	12.01	0.00	22.09	35.38

What Factors are Related to Employment Growth?

The second equation tests the relationship of explanatory variables and firm characteristics with enterprise employment growth. The regression results suggest a somewhat different constellation of factors are significantly related to employment growth than those related to sales growth.

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Table 5.12. **Employment Growth as a Function of Investment Climate, Technology and Training and Firm Characteristic Variables**
(Regression results)

Robust					**R-squared**	**= 0.0691**
Labourchange	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Interest rate	-2.64	0.765339	-3.44	0.026	-4.760811	-0.51097
Uncertainty	-1.59	0.166483	-9.54	0.001	-2.049701	-1.12524
Labour_reg	-2.47	0.570918	-4.32	0.012	-4.053839	-0.88359
Shelf	3.12	1.188755	2.62	0.059	-0.1809117	6.42012
Train_private	0.038	0.007704	4.88	0.008	0.0161938	0.05897
Train_public	0.002	0.028115	0.06	0.955	-0.0763608	0.07976
Postal	1.461	0.267666	5.46	0.005	0.7174678	2.20379
Age	-0.22	0.033529	-6.61	0.003	-0.3148238	-0.12864
Medium	2.941	1.260211	2.33	0.08	-0.557985	6.43983
Large	5.754	0.991648	5.80	0.004	3.001031	8.50754
Export	1.266	0.407408	3.11	0.036	0.1345665	2.39686
Foreign owned	-0.53	1.238132	-0.43	0.688	-3.972112	2.9031
Latin	0.936	0.378017	2.48	0.068	-0.1133325	1.98575
Easch	-1.02	1.416563	-0.72	0.512	-4.950981	2.91504
Eased	1.769	0.558443	3.17	0.034	0.2184885	3.31946
OECD	5.489	0.580878	9.45	0.001	3.876435	7.10199
Constant	16	3.493212	4.58	0.010	6.305757	25.7032

Among investment climate indicators, financing (as measured by high interest rates), policy instability and uncertainty, and labour regulations have a negative association with employment growth, while infrastructure quality (proxied by the assessed quality of the postal service) is positively related. Specifically:

a) Finance: An increase in the perceived severity of the constraint high interest rates by one point on the four-point scale is associated with a 2.6 percentage point lower rate of employment growth.

b) Policy instability and uncertainty: A one point increase in the perceived severity of policy uncertainty is associated with a 1.6 percentage point lower rate of employment growth.

c) Labour regulation: A one point increase in the perceived severity of labour regulations as a constraint is associated with a 2.5 percentage point lower rate of employment growth.

d) Infrastructure: A one point increase in the perceived quality of postal services is associated with a 1.5 percentage point higher rate of employment growth.

Among technology and training variables, both technology acquisition (off-the-shelf) and private sector training are associated with higher levels of employment growth.

a) If a firm acquired technology off-the-shelf in the international market it had, on average, an employment growth rate of 2.6 percentage points higher than a firm that did not. This relationship is significant at the 10 per cent level.

b) A 10 per cent marginal increase in the use of training provided by private external trainers is associated with a 0.2 percentage point increase in employment.

Several background characteristics of firms were also related to employment growth. As with sales growth, firm age was negatively related to growth, but firm size was positively related to growth. However, there was no significant association between either foreign ownership or exporting and employment growth. Specifically:

a) Other things being equal, an 11-year old firm would be expected to have employment growth rate of 2.2 percentage points lower than a one-year-old firm.

b) A large firm on average would have an employment growth rate of almost 6 percentage points higher than a small firm and nearly 3 percentage points higher than a medium firm. The difference between medium and small firms is significant at the 10 per cent level.

What Factors are Related to Investment Growth?

The third equation relates explanatory variables and firm characteristics to changes in enterprise investment. Again, a different set of factors is significantly related to investment growth as opposed to sales or employment growth.

Among investment climate indicators, financing (as measured by high interest rates), taxes and regulations, and labour regulations have a negative association with investment growth. Specifically:

a) Finance: An increase in the perceived severity of the constraint "high interest rates" by one point on the four-point scale is associated with a 1.7 percentage point lower rate of investment growth.

b) Tax administration and regulations: A one point increase in the perceived severity of tax administration and regulation is associated with a 1.7 percentage points lower rate of investment growth.

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c) Labour regulation: A one point increase in the perceived severity of labour regulations as a constraint is associated with a 1.4 percentage points lower rate of employment growth. This coefficient is significant at the 10 per cent level.

Table 5.13. **Investment Growth as a Function of Investment Climate, Technology and Training and Firm Characteristic** Variables

(Regression results)

Robust					**R-squared**	**= 0.0510**
Investment change	Coefficient	Std. Err.	t	P>t	[95% Conf.	Interval]
Interest rate	-1.691397	0.4534612	-3.73	0.02	-2.950407	-0.4323863
Tax administration & regulations	-1.847554	0.5598605	-3.3	0.03	-3.401976	-0.2931319
Labour_regulation	-1.384768	0.5415821	-2.56	0.063	-2.888441	0.118905
Shelf	4.280643	0.4474301	9.57	0.001	3.038378	5.522908
Train_private	0.0571664	0.0081923	6.98	0.002	0.0344209	0.079912
Train_public	-0.0043279	0.0240602	-0.18	0.866	-0.0711299	0.062474
Age	-0.1971853	0.0436332	-4.52	0.011	-0.3183305	-0.0760402
Medium	2.436163	2.367143	1.03	0.362	-4.136079	9.008404
Large	5.43165	1.331769	4.08	0.015	1.734068	9.129232
Foreign own	5.046149	1.073859	4.7	0.009	2.064639	8.027659
Export	4.329344	0.892068	4.85	0.008	1.852567	6.806122
Latin	1.83471	0.1662715	11.03	0	1.373066	2.296353
East Asia NIC/China	-7.213346	1.432616	-5.04	0.007	-11.19092	-3.235767
East Asia developing	-4.179145	0.3305304	-12.64	0	-5.096845	-3.261446
OECD	-1.414099	0.2602996	-5.43	0.006	-2.136807	-0.6913917
Constant	22.82811	1.397906	16.33	0	18.9469	26.70932

Technology and training variables also bear a significant relationship with investment growth. Both technology acquisition (off-the-shelf internationally) and private sector training are associated with higher levels of employment growth.

a) If a firm acquired technology off-the-shelf in the international market it had, on average, an investment growth rate of 9.6 percentage points higher than a firm that did not.

b) A 10 per cent marginal increase in the use of training provided by private external trainers is associated with a 0.6 percentage point increase in investment.

Investment growth is also significantly related to several background characteristics of firms. As with employment and sales growth, firm age was negatively related to growth, but firm size (specifically large size) was positively related to growth. Unlike employment growth, both foreign ownership and exporting are positively related to investment growth. Specifically:

a) Other things being equal, an 11-year old firm would be expected to have an investment growth rate of 2 percentage points lower than a one-year-old firm.

b) A large firm on average would have an employment growth rate of 5.4 percentage points higher than a small firm. The difference between medium and small firms is not statistically significant.

c) Foreign ownership is associated with a 5 percentage points higher level of investment growth over the previous three years than domestic ownership.

d) Other things being equal, an exporting firm in the sample would have an investment growth rate of 4.3 percentage points higher than a firm that did not export.

Summary and Conclusions

In summary, this analysis of the unique WBES module on the investment climate, competitiveness, investments in firm capabilities including technology and training, adds a great deal of information and nuance to the messages of the main dataset. Table 5.14 summarises the main relationships observed. It confirms that key attributes of the investment climate critically affect firm performance as measured by sales growth, employment growth and investment growth. Corruption, financing, tax administration and regulations and policy uncertainty all matter in explaining firm outcomes. Furthermore, this analysis reveals the negative relationship between burdensome labour regulations and employment growth, but also suggests that excessive labour regulations may deter investment.

The new data on firm capabilities suggest that firm investments in technology and skills are significantly associated with firm performance. Investment in technological capacity strongly relates to sales growth, while international technological acquisition relates clearly to employment and investment growth. Training matters as well, and it is quite clear that investments

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in private training services are significantly associated with all dimensions of firm growth. What is equally clear is that, in the robust specification, *public* training bears no significant relationship with firm performance. To the extent that many private sector providers can deliver training that meets employer needs and is cost effective, they offer an important means of expanding the resources available for skill development.

Finally, the analysis indicates that being large and being young are positively associated with all dimensions of firm growth. Exporting is positively associated with sales growth and investment growth, but not with employment growth. Other things being equal, investment grew faster in foreign-owned firms.

Table 5.14. **Explaining Enterprise Growth**

	Investment Climate Factors	Firm Capability Factors	Firm Characteristics
Sales Growth	Negative: Corruption (bribes), Finance (collateral), Tax administration and regulations, Policy instability/uncertainty	Positive: Technological capacity via investments in management, quality control, etc.; Private external training.	Positive: Large size, Exporting Negative: Age
Employment Growth	Positive: Infrastructure service quality Negative: Finance (high interest rates); Policy uncertainty; Labour regulations	Positive: Technological acquisition -- international off-the-shelf technology; Private external training	Positive: Large size Negative: Age
Investment Growth	Negative: Finance (high interest rates); Tax administration and regulations; Labour regulations	Positive: Technological acquisition -- international off-the-shelf technology; Private external training	Positive: Large size, Foreign ownership, Exporting Negative: Age

In sum, what does this imply for policy? Undoubtedly the essential message that a good investment climate stimulates growth must be heeded. As shown in earlier WBES analysis, an essential priority for governments that want to encourage growth is to address the fundamentals in terms of good governance, well-functioning financial systems, reasonable administrative burdens from tax and regulatory compliance, and stable policies. Another important finding in this work is that excessive labour regulation is negatively associated with both employment and investment growth. This resonates well with recent international findings that suggest excessive labour regulation suppresses employment and encourages informality (World Bank, 2003).

Second, the analysis shows that firm investments in capabilities are strongly correlated with performance. Investments in technological capacity or foreign technology consistently relate to measures of firm performance. Investments in private training are also consistently positively associated with firm growth. Firms that make no investment in training appear disproportionately influenced by three types of market failures. This link has direct implications for governments as they shape technology policy and training policy. First, it appears to argue for a regime that enables easy acquisition of technology and technological capacity, while protecting intellectual property[15]. Second, it appears that training policies should be designed to facilitate firms' investments in private training, rather than emphasising public supply. Third, it may argue for incentive regimes for training that counter market failures, such as training levies that are refundable against private training expenses.

The policy intervention in training that is appropriate depends on the nature of the market failure. When poor information is the constraint, for example, the appropriate policy response is to disseminate best practices in training know-how and information about the availability and cost of services. High rates of labour turnover may suggest that there are externalities in training; to the extent that firms are unable to internalise the benefits of training because skilled workers can be hired by other firms, there will be underinvestment in training. Mandates, collective action or incentives can help to internalise some of these externalities. This section focuses on some of these public policy instruments employed in various countries and provides some examples of good practice[16].

Table 5.15. **Rationale and Policy Options for Public Intervention in Training**

Reason for intervention	Kind of Intervention		Complementary policies
	Finance training	Provide training	
External benefits	Preferred	Not justified	None
Market imperfections	Second-best	Not justified	Preferred: deal with source of market imperfection
Weak private training capacity	Not justified	Second-best or preferred	Preferred: build firm training capacity
Equity	Second-best	Not justified	Preferred: selective scholarships

Source: Middleton *et al.* (1993), page 116.

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Finally, perhaps the most challenging of the findings concern the characteristics of faster-growing firms, which are consistently large and young. Clearly, most firms start out small and the great majority of firms in the world are small or medium-sized. Are these firms somehow doomed to slower growth? An optimistic interpretation would say no, if conditions exist to facilitate or even encourage smaller firms to be more like the larger and faster growing firms. The most obvious point arises from the WBES finding that smaller firms are systematically more constrained by investment climate weaknesses than large firms (see Batra *et al.* 2003; and Schiffer and Weder, 2001). Small firms would thus benefit disproportionately from investment climate reforms that address the critical conditions constraining growth, described above. Second, policies that facilitate small firms to invest in enhancing their technological capability, acquiring foreign technology or providing workers with private training, would all appear likely to encourage growth. The data here are not specific enough to recommend which policies would best encourage efficient investments in technology and private training, but there is a substantial prescriptive literature in this regard which addresses how policies can address potential market failures or scale economies limiting small firm investments in enhancing their capabilities (Batra and Tan, 2002). Finally, since exporting clearly relates to firms' sales and investment growth, policies that link smaller firms to export markets appear likely to stimulate long-term growth.

Annex A. Sample Composition by Country, Size and Sector

Country	Total Firms Surveyed	Size			Sector				Total Firms Identified by Sector
		Small	Medium	Large	Manufacturing	Services	Agriculture	Construction	
Bolivia	100	33.00	39.00	28.00	42	40	0	3	85
Colombia	101	14.85	34.65	50.50	38	57	3	1	99
Costa Rica	100	22.00	40.00	38.00	37	27	0	6	70
Dominican Republic	111	21.62	40.54	37.84	49	28	3	6	86
Ecuador	100	23.00	55.00	22.00	35	28	1	3	67
El Salvador	104	37.50	32.69	29.81	38	28	1	4	71
Guatemala	106	36.79	43.40	19.81	26	33	0	7	66
Haiti	103	51.46	29.13	19.42	33	37	5	3	78
Honduras	100	49.00	32.00	19.00	38	35	1	2	76
Mexico	100	18.00	61.00	21.00	31	22	0	6	59
Nicaragua	100	55.00	28.00	17.00	36	35	2	6	79
Panama	100	18.00	38.00	44.00	33	32	2	1	68
Peru	108	31.48	31.48	37.04	33	36	8	7	84
Trinidad & Tobago	101	50.50	34.65	14.85	33	29	4	6	72
Uruguay	100	16.00	65.00	19.00	50	22	0	5	77
Venezuela	100	38.00	22.00	40.00	33	34	0	7	74
China	101	44.55	29.70	25.74	61	36	1	3	101
Pakistan	103	37.86	41.75	20.39	49	51	1	1	102
Malaysia	100	50.00	30.00	20.00	53	40	2	5	100
Indonesia	100	38.38	35.35	26.26	20	70	4	6	100
Singapore	100	39.00	29.00	32.00	32	53	0	15	100
Philippines	100	26.00	53.00	21.00	45	53	0	2	100
Argentina	100	33.00	46.00	21.00	29	49	3	10	91
Brazil	201	14.93	70.15	14.93	58	113	1	12	184
Canada	101	24.75	48.51	26.73	28	65	1	7	101
Chile	100	32.00	35.00	33.00	40	44	2	2	88
US	100	42.00	34.00	24.00	22	65	3	9	99
Belize	50	66.00	30.00	4.00	14	17	0	4	35
Total	2 890	33.19	40.81	26.00	1 036	1 179	48	149	2 412

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Annex B. Training Policies

B.1. The Payroll Levy Grant System

The payroll levy is a common instrument in Latin America for overcoming the under-provision of training. Argentina, Barbados, Brazil, Chile, Colombia, Costa Rica, Ecuador, Honduras, Jamaica, Paraguay, Peru and Venezuela have implemented levies, with mixed success. Brazil's levy, one of the oldest, suggests that factors influencing success include administrative independence of the levy fund, a combination of private ownership and public mission, and a management structure that includes industry and government. In Chile small and medium-sized enterprises have overcome the tendency for levy funds to over-subsidise large firms by grouping together on a sectoral basis. Sectoral centres have also been established in Argentina, and small and medium-sized enterprises have negotiated a sectoral rate with the national supervisory agency.

Levies can also be set and controlled through industry sector bodies (as in Mexico and South Africa), industry collective agreements (Belgium, Denmark, France, Greece, the Netherlands, Sweden), or national insurance levies for displaced workers (France, Sweden). Levy exemption schemes have also been used as a means of subsidising smaller firms and adult training providers (Austria and Germany); similar levy schemes have been implemented in Morocco and Turkey. Levy-rebate schemes have been used in Jordan, Korea, Malaysia, Mauritius, Singapore and Chinese Taipei. Some countries have modified payroll levies. Peru lowered the levy and diversified the sources of finance. Argentina, Brazil and Colombia have co-financing arrangements with enterprises, communities and vocational schools. Singapore and Chinese Taipei have used matching grants.

Experience with levies yields several lessons:

— *Keep employers in charge.* Industries need to own the levy. Argentina, Brazil and Chile have vested supervision of levies in industrial bodies.

— *Design to increase competition in provision.* Levy funds are not cost-effective when they support only government training providers.

— *Earmark funding strictly.* Funding levels are better maintained with levies than with government grants which tend to decline with shrinking budgets. But levy funds should not be used for other government expenses, as has happened in the past in Costa Rica.

— *Provide support for smaller enterprises.* These schemes have typically been used by large firms and enterprises that already have a high skills base—support mechanisms are needed for small and medium firms and farms to participate.

Box 5.1. **Well Designed Levy-Grant Schemes can Motivate Firms to Train**

Several East Asian economies have used direct reimbursement of approved training expenses, funded through payroll levies, to encourage firms to train their employees. Successful schemes are flexible, demand-driven, and often accompanied by an information campaign and technical assistance to smaller firms.

The introduction of such a scheme in Chinese Taipei led to dramatic increases in training, which continued after the programme ended in the 1970s. Singapore uses a levy on the wages of unskilled workers to upgrade worker skills through the Skills Development Fund. The fund's aggressive efforts to raise awareness of training among firms, to support development of company training plans and to provide assistance through industry associations have led to a steady rise in training, especially among smaller firms. However, such schemes can also create disincentives to train when rigidly administered. In Korea, which required that training last a minimum of six months or that firms pay a fine, many firms paid the penalty rather than train to this standard. In addition, the fund provides grants for developing training plans, organises regional courses on training need assessments, and administers a variety of subsidised programmes targeting small enterprises. A recent analysis indicates that the scheme has significantly increased the incidence of training.

In Malaysia, the Human Resource Development Fund (HRDF) was established in 1993 with a matching grant from the government. It replaced the training tax incentive scheme (the double deduction incentive for training) that had been in operation since 1987, and which was widely acknowledged to have been relatively ineffective. The Act created a council (HRDC), with representatives from the private sector and from responsible government agencies, and a Secretariat to administer the HRDF schemes. Eligible employers with 50 employees and above are required to contribute 1 per cent of payroll to the HRDF. Those who have contributed a minimum of six months are then eligible to claim a portion of allowable training expenditures up to the limit of their total levy payments for any given year. The HRDC set rates of reimbursement, varying by type of training and generally lower for larger firms.

Source: Batra (2003).

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B.2 National Training Councils and Levy Administration

Many countries have established national training councils (Argentina, Australia, Brazil, Chile, Côte d'Ivoire, Malawi, Mauritius, South Africa and United Kingdom). Their experience suggests that locating country management of training with the social partners (business, unions and government) can improve the quality, relevance and the flexibility of training. Training funds managed by training partners have tended to become more diversified in their sources and uses, including their use in the informal sector.

In Argentina, Brazil, Chile, Mauritius and Peru, industry associations have assumed responsibility for administering the levy. It has been important for these industry bodies to have responsibility for the bulk of the funds and to work with both training providers and enterprises. The Japan Industrial and Vocational Training Association is an association of employers that provides training programmes for industry trainers. The association receives no funding but charges membership and course fees. The semi-autonomous Vocational Training Corporation in Jordan is an industry body that works closely with government and industry in providing in-house and external training.

In the United Kingdom, industry-administered training funds at the regional level, through Training and Enterprise Councils, are being replaced by regional Learning and Skills Councils that will combine a broader range of education and training functions.

There are many mechanisms for distributing training funds. Financing can go to state-run training institutions, it can be directed selectively to enterprises on the basis of training plans (Germany, Korea, Singapore), or it can be distributed through open tender, with the state as purchaser rather than supplier of training (Australia, Chile). A more radical measure has distributed funds to the user or trainee through voucher schemes, such as the United Kingdom Training Credits scheme.

Because different types of firms and workers require different types of training, it is important that the training market should not be too inhibited through institutional constraints. In Colombia, despite an extensive and well-funded training system, many skilled workers have not used the formal training system.

B.3 Matching Grants Schemes

Some countries use matching grants schemes to increase training. The most successful schemes are demand-driven, with private sector implementation, and aim to facilitate the creation of sustained markets for service provision. Programmes in Chile and Mauritius use private sector agents to administer the matching grants schemes. Both have reported positive results. So has Mexico's programme. An increased investment in training has been matched by a reduction in enterprise failure. A side benefit has been the development of a network of industry management training consultants who are available to enterprises that want to invest in enterprise-based training. Singapore has undertaken a programme to build up its stock of industry trainers, and Japan's Industrial and Vocational Training Association has trained over 30 000 industry trainers in the past 30 years.

Matching grant schemes can support the development of a training culture by providing both an incentive and a means of investing in training. It is important to build a training culture with a high level of training capacity in enterprises and a high propensity for workers to undertake training, so that enterprises continue to invest in training. In Japan most managers have a training function, and regularly engage workers in informal training. The Basic Law for Vocational Training in Korea is designed to encourage in-company training. Strong training cultures have been established in some Asian countries (Japan, Korea, Singapore), some northern European countries (Germany, Netherlands, Scandinavia), and, judging on the basis of levels of in-company training, some Latin American countries (Brazil and Chile).

Matching grants schemes can also link educational and human resource development policies. The Singapore Skills Development Fund was designed and successively modified to provide an incentive for enterprises to increase the skill and pay levels of their workers. But a matching grants scheme, by itself, will not lead to an expansion of the training market. And grants should not be restricted to state-run training institutions. Funds should support strengthening and diversifying the supply of training and stimulating demand. Mexico's Integral Quality and Modernization Program concentrates on the productivity of small enterprises, using both private training consultants and government and private training institutions (see Box 5.2).

Training for the informal sector is typically provided as informal apprenticeships, often through non-government organisations, which help to diversify the funding for training programmes for the poorer sections of the economy. Argentina, Costa Rica and Peru have successful programmes of this type.

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Box 5.2. **Mexico's Proactive Approach to Small and Medium-Sized Enterprise Support**

The Integral Quality and Modernization Program (CIMO), established in 1988 by the Mexican Secretariat of Labour, has proved effective in reaching small and medium-sized enterprises and assisting them to upgrade worker skills, improve quality and raise productivity. Set up initially as a pilot project to provide subsidised training to small and medium-sized enterprises, CIMO quickly evolved when it became apparent that lack of training was only one of many factors contributing to low productivity. By 2000, CIMO had provided an integrated package of training and industrial extension services to over 80 000 small and medium-sized enterprises each year and training to 200 000 employees. Private sector interest has grown, and more than 300 business associations now participate in CIMO, up from 72 in 1988.

All states and the Federal District of Mexico have at least one CIMO unit, each staffed by three to four promoters, and most units are housed in business associations which contribute office and support infrastructure. These promoters organise workshops on training and technical assistance services, identify potential local and regional training suppliers and consulting agents, and actively seek out small and medium-sized enterprises to deliver assistance on a cost-sharing basis. They work with interested small and medium-sized enterprises to conduct an initial diagnostic evaluation of the firm, as the basis for training programmes and other consulting assistance. CIMO is expanding its support in two directions: assisting groups of small and medium-sized enterprises along specific sectoral needs, and providing an integrated package of services, including information on technology, new production processes, quality control techniques, and marketing as well as subsidised training.

Evaluation studies (in 1995 and 1997) found CIMO to be a cost-effective way of assisting small and medium-sized enterprises. The study tracked two groups of small and medium-sized enterprises over three years, one with firms that participated in CIMO in 1991 or 1992, another with a broadly comparable control group of enterprises that had not participated in the CIMO programme. CIMO firms tended to have lower performance indicators than the control group prior to participation in the programme, but by 1993 labour productivity had either caught up or exceeded that of the control group. Other performance indicators showed similar improvements — increased profitability, sales, capacity utilisation rates, and wage and employment growth and reduced labour turnover, absenteeism and rejection rates for products. The most dramatic impacts of CIMO interventions were among micro and small firms.

Source: STPS-INEGI (1999), Tan (2001).

Notes

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2. For a general treatment of the findings of the *World Business Environment Survey*, see Batra *et al.* (2003). Other research shows that the effectiveness of direct enterprise assistance is critically dependent on the prescence of a sound business enabling environment (Batra and Mahmood, 2003).
3. Derived from Batra *et al.* (2003).
4. Later studies of India and Bangladesh show patterns of training and technological adoption very similar to observed in Pakistan in the WBES.
5. Support for this view is found in three lines of research — on human capital and productivity, on technology and innovation, and on models of endogenous growth. The evidence on the links between education, technology and productivity is strong. In the technology literature, microeconomic case studies have identified the critical role of educated workers in the innovative process (Setzer, 1974; Carnoy, 1990; Pack, 1992), and industry-level studies have found more recent vintages of capital (or technology) to be complementary with the education of the workforce (Bartel and Lichtenberg, 1987). A large body of human capital studies, principally using developed country

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data, has also shown that educated farmers and workers are more productive in a rapidly changing environment, and thus earn higher incomes (Welch, 1970; Tan, 1980; Mincer, 1989). Finally, studies of endogenous growth, which stress the importance of purposive human capital investments as the driver of economic growth (Lucas, 1988; Romer, 1989), show that schooling enrolment rates are important explanatory variables of aggregate differences in growth across countries.

6. Of course, the availability of skilled workers in the market could reflect the external benefits of a few firms with a higher propensity to train to a larger number of firms with a lower propensity to train. But it could also simply reflect the effective functioning of labour markets in supplying skills.

7. This raises the question of why firms are using mature technologies.

8. See Tan and Batra (1995). Firm surveys in Malaysia, Indonesia, Colombia and Guatemala revealed that while many firms do not train because the derived demand for skills from using old technology was low, many firms and SMEs in particular were also constrained by high labour turnover (and loss of training investments), poor knowledge about how to train or the benefits of training, and access to finance for training.

9. While these three performance measures are common in the literature, the authors recognise the value of relating these factors to productivity. However, the current data do not support such an analysis.

10. The authors recognise the potential for endogeneity and that causation could in fact run from the "performance variable" to the "explanatory variable" in some cases. For example, it is often observed that the best performing firms are likely to be rewarded by a well-functioning financial system with more financing, hence may appear less constrained. Therefore, we urge caution in attributing causation to significant coefficients.

11. Multicollinearity occurs where two or more predictor variables in a regression model are themselves highly correlated. It can lead to poor estimation of coefficients.

12. Heteroskedasticity occurs where there is a data sample in which the errors are drawn from different distributions for different values of the independent variables. In its most common form, the errors vary with variable magnitude.

13. The negative value of financial constraint coefficients is not a foregone conclusion — in some investment climate assessments the most productive or fast-growing firms have found themselves the most constrained by finance, as their investment needs are greater. The potential endogeneity of finance variable in growth equations discussed in the previous footnote is not treated here.

14. See, for example, the application of this indicator as an instrumental variable in Batra *et al.* (2003).

15. A growing body of work suggests that protection of intellectual property rights, if disciplined by effective attention to competition policy, encourages technological transfer through three channels: exports to developing countries of high technology goods, foreign direct investment and licensing. See, for example, Branstetter *et*

al. (2004); Maskus and Yang (2003), and Primo-Braga and Fink (2000). Toth (1997) also notes the importance of the systems and institutions supporting metrology, standardisation, testing and quality (MTSQ) for innovation.

16. Many countries, both advanced and developing, have put into place different policies designed to foster increased in-service training among their enterprises, including payroll-levy training funds and tax incentives for employer-sponsored training. These employer-targeted training policies take many forms: *i)* levy-grant schemes, where fund administrators use earmarked levies to make grants to employers for approved training, as in Singapore and previously in the United Kingdom; *ii)* training levy rebate schemes, where employers are partially reimbursed for approved training out of their payroll levies, as in Malaysia, Nigeria and the Netherlands; *iii)* levy exemption schemes where employers are exempt from levy payments provided they spend a given percentage of their payroll on training, as in France, Korea and Morocco; and *iv)* tax incentives for approved training paid out of general revenues, as in Chile and previously in Malaysia (see Annex B).

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MNE Spillovers in Developing Asian and Latin American Countries: Trends and Policies*

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Abstract

This article explores the main trends of multinational enterprise (MNE) spillovers involving technology and human resources development, with special attention to policy implications, in the developing countries of Asia and Latin America with the Caribbean. Developing Asian countries have dynamically attracted foreign direct investment (FDI) and have been successful in instituting policy measures to enhance MNE spillovers, with positive impacts on domestic productivity. Latin American countries have lagged behind developing Asian countries as regards enhancing MNE spillovers. Despite a convergence of the inward FDI trend in the two regions, with the recent catching-up trend of Latin American countries, the latter region shows more limited spillovers. Selected research findings are surveyed and various policy measures suggested, particularly in relation to two policy issues: *i)* complementarity, co-ordination and synchronisation; and *ii)* targeting specific firms, industries and HRD (mostly in training and education).

* This article is one of six resulting from an expert workshop convened by the Development Centre on Financing Development. Spanish translations of these articles have been published together by the Colegio de México in a book entitled *Inversión extranjera directa, tecnología y recursos humanos en los países en desarrollo*. See Preface to the collection at the end of this article.

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Introduction

It is well known that any multinational enterprise (MNE)[2] operating in developing countries has increasingly come under pressure from local governments, non-governmental organisations, consumers, shareholders and international institutions (UN, OECD, the World Bank), to demonstrate responsible business practices in its operations. Motivated largely by the reputation strategy of the firm, most efforts related to corporate social responsibility (CSR) have focused on particular issues concerning the environment, occupational health, links with domestic production chains and the quality of life in communities near the facilities of the subsidiary. All these efforts often require direct and indirect MNE spillovers of technology and training. Beyond the social benefits of such CSR efforts, the transfer of technology and the development of human resources are among the most important long-term contributions MNEs can make to the growth of developing economies.

This article explores the main trends of MNE spillovers involving technology and human resources development with special attention to policy implications, in developing countries of South, East and Southeast Asia (referred to as "developing Asian countries" in this article), and in Latin America and the Caribbean, which are considered together. A point of departure is the fact that with economic globalisation, governments of these regions have been successful in attracting growing inflows of FDI in the last 15 years. The question is, however, whether these FDI policies have been explicit and effective in inducing relevant spillovers with relevant multiplying effects in the host economy.

This article is mainly concerned with the following research questions: How important are MNE spillovers in developing Asian and Latin American countries? What is the relationship between these spillovers and economic performance? What are the principal mechanisms by which MNE spillovers occur in the two regions studied? What private action by domestic and foreign enterprises can induce greater positive spillovers? What are the main policy requirements for FDI with wide spillovers? What public policies can enhance MNE spillovers? Is the answer to each of these questions in developing Asian countries similar to the corresponding answer in Latin America and the Caribbean? Various research findings are surveyed for the answers to these questions. After reviewing the principal FDI global trends during 1970-2003 in the second section, policy measures to attract FDI in the two regions under

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study are briefly discussed in section three. MNE spillovers in these regions are studied in the fourth section; important policy mechanisms to enhance domestic MNE spillovers are reviewed in the fifth section; and concluding remarks are presented, with policy recommendations, in the sixth and final section.

FDI Global Trends

From the early 1990s to the year 2000, FDI inflows grew rapidly throughout the world, with a tremendous increase in 1997-2000 before a sharp decline in 2000-2003. Despite this decline, however, inflows in 2003 were about three times those of ten years before (UNCTAD, various years). The developing economies' share of world FDI inflows was around 30 per cent in 1970-2003, with wide fluctuations, and growing recently from 18 per cent to 31 per cent in 2000-2003 (Figure 6.1a). The world growth trend has followed the growth trend in the developed countries that accounts for an annual rate of around 70 per cent on average, as illustrated in Figure 6.2. The increase in investment flows to developing countries in the last two decades has been particularly noteworthy. Developing countries' inward stock of FDI amounted to about one-third of their gross domestic product (GDP) in 2002, compared with just 10 per cent in 1980.

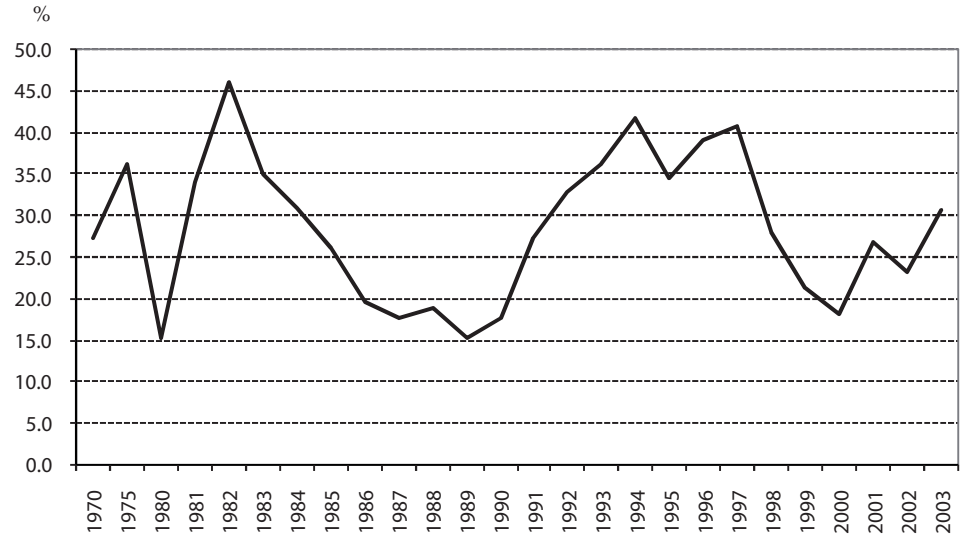
Two main trends can be distinguished in terms of developing economies' share of FDI inflows. First, Asia's share (Japan and Israel excluded) of FDI inflow in developing countries grew in the 1970s and 1980s and declined in the 1990s. Second, the share of Latin America and the Caribbean decreased throughout the 1970s and 1980s and grew in the 1990s. These trends imply that the two developing regions have been strategically more substitutes than complements. Africa's already low share declined in the 1990s. The economies of Central and Eastern Europe also had a low share which grew in the late 1990s and early 2000s, surpassing that of Africa since 1992. (See Figure 6.1b.)

These main opposite trends of the two developing regions studied imply that the growth trend of FDI in developing countries followed the trend of Asia in 1970-90 and then that of Latin America and the Caribbean in 1990-2003, as can be observed in Figure 6.2.

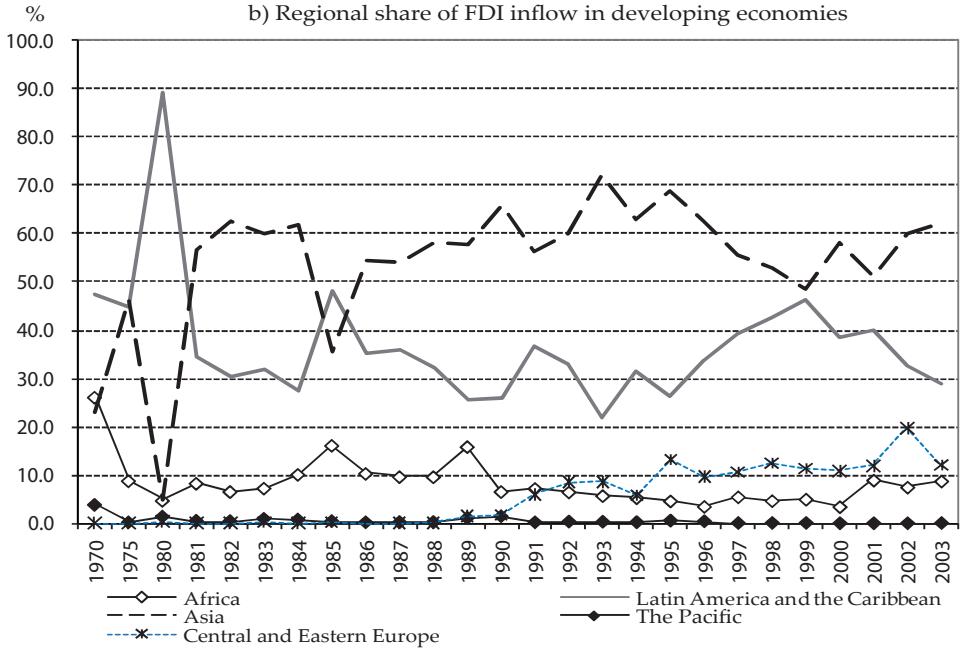
Figure 6.1. **Share of Developing Economies in the World**

FDI Inflows in 1970-2003

a) Share of developing economies in the world FDI



b) Regional share of FDI inflow in developing economies



Source: UNCTAD various years.

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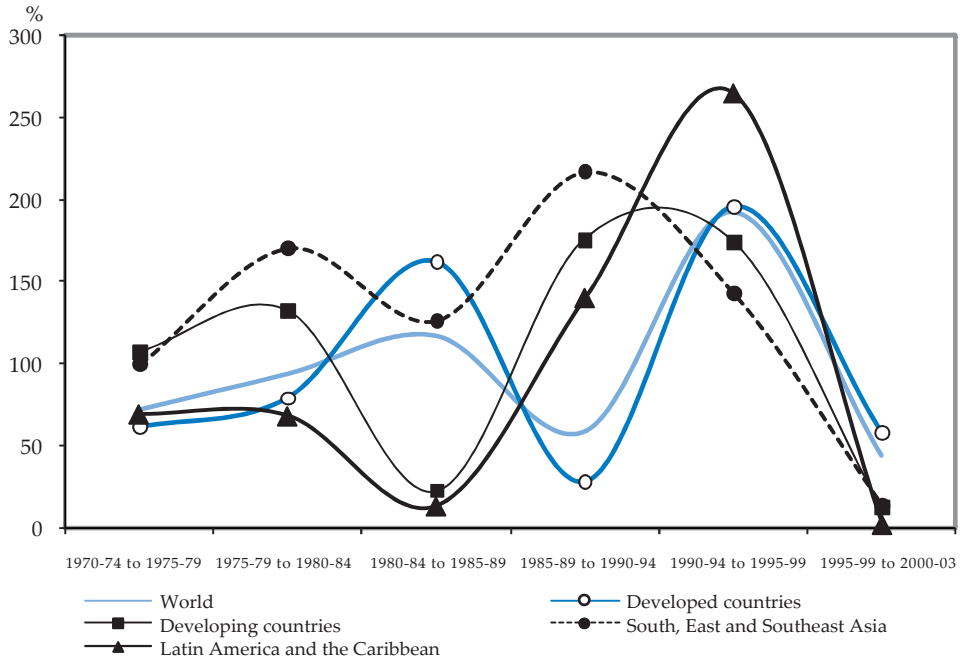
Figure 6.2. **Growth Trend of FDI Inflows in the World,**
Asia and Latin America in 1970-2003



Not only have FDI inflows been upward, but their relative importance has also grown as a percentage of gross fixed capital formation (GFCF), of which the world average grew from less than 5 per cent in the 1970s and 1980s to more than 15 per cent in the year 2000. This world trend has closely followed the trend of the developed countries. In the 1970s, particularly early in the decade, the relative importance of FDI was higher in developing than in developed countries. This changed a little in the late 1980s, with higher percentages of FDI with respect to GFCF in the developed than in the developing countries, but the developing countries reached much higher percentages of FDI with respect to GFCF in the 1990s, and a declining convergence followed in 2000-03 (Figure 6.3A). With the exception of the Pacific, which attracted high percentages of FDI with respect to GFCF in the 1970s and 1990s, all other developing regions had a growth trend from less than 10 per cent to more than 10 per cent) in 1970-2003. This growth trend is more pronounced in Latin America and the Caribbean than in Asia (see Figure 6.3b).

There is a convergence trend of FDI attraction in developing Asian and Latin American countries (Figure 6.3), with a recent catching-up trend in the latter.

Table 6.1. **FDI Inflows in Asia and Latin America, by host economy, by five-year periods 1970-2003 -- Top ten in 2000-2003**

(Annual average every five-year period in $m)

Region/country	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-03
World	**17 734.11**	**30 514.72**	**59 178.52**	**128 596.28**	**204 006.20**	**598 049.54**	**860 963.41**
Developed countries	13 763.22	22 254.05	39 967.26	104 955.37	134 745.45	399 112.91	633 987.20
Developing countries	3 970.90	8 247.47	19 184.16	23 528.17	64 982.42	178 555.56	200 456.02
Asia (developing countries)	**428.89**	**2 965.78**	**10 623.15**	**12 624.97**	**41 690.70**	**99 886.06**	**114 855.80**
West Asia	-568.47	974.37	5 237.50	427.67	2 537.15	3 458.30	3 819.54
Central Asia	0.00	0.00	0.00	1.26	497.20	2 473.85	3 998.28
South East and Southeast Asia (SESEA)	997.35	1 991.41	5 385.65	12 196.04	38 656.34	93 953.92	107 037.98
a) Top ten FDI 2000-03)	*894.25*	*1 642.41*	*5 061.15*	*11 461.95*	*36 256.54*	*88 740.87*	*106 310.92*
China	0.00	0.02	617.40	2 619.90	16 028.48	42 056.91	48 460.07
Hong Kong, China	128.89	406.38	1 288.34	2 978.19	4 588.19	13 477.40	27 239.36
Singapore	212.62	389.98	1 386.67	2 426.92	5 180.54	11 617.36	12 348.28
Korea	122.00	96.80	92.80	568.20	755.80	4,074.20	4 737.00
India	41.16	33.36	53.61	155.90	413.94	2 619.20	3 360.00
Chinese Taipei	52.54	79.20	153.80	789.60	1 154.40	1 763.80	2 733.75
Thailand	83.28	76.37	287.45	732.27	1 990.20	4 374.27	2 508.38
Malaysia	210.16	442.22	1 130.76	798.71	4 422.80	5 208.81	2 504.75
Viet Nam	0.66	0.99	11.12	3.26	779.99	1 870.92	1 309.85
Philippines	42.94	117.10	39.20	389.00	942.20	1 678.00	1 109.50
b) Other 15 countries in SESEA	*103.11*	*349.00*	*324.50*	*734.09*	*2 399.80*	*5 213.04*	*727.06*
Latin America and the Caribbean (LAC)	**2 422.26**	**4 116.65**	**6 949.19**	**7 927.03**	**19 094.86**	**69 769.55**	**71 688.68**
a) Top ten FDI (2000-03)	*1 743.94*	*3 379.81*	*6 214.68*	*7 635.91*	*17 025.48*	*62 878.79*	*65 766.45*
Brazil	737.84	1 801.84	2 074.92	1 367.92	1 518.56	18 324.74	20 492.58
Mexico	413.20	789.80	2 159.71	2 614.88	6 248.19	11,881.32	17,222.35
Bermuda	487.71	350.58	560.24	1 207.55	2 065.02	4 482.02	8 795.98
Cayman Islands	0.37	40.19	164.47	134.98	198.96	3 071.28	4 596.73
Chile	-2.05	120.17	319.03	556.19	1 207.16	5 286.23	3 482.46
Argentina	81.07	180.05	439.00	729.80	3 026.79	10 599.32	3 461.98
Venezuela	-140.40	-69.18	-15.04	327.59	836.20	3 449.00	2 923.50
Colombia	33.86	72.21	398.03	559.00	818.24	2 795.80	2 199.16
Peru	40.23	49.76	60.32	22.04	801.02	2 350.20	1 371.75
Ecuador	92.12	44.38	54.00	115.97	305.34	638.89	1 219.96
b) Other 30 countries in LAC	*678.32*	*736.84*	*734.51*	*291.12*	*2 069.38*	*6 890.77*	*5 922.23*

Source: UNCTAD (various years).

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Among developing Asian countries, China has been the most dynamic host country in attracting FDI. The leading developing countries in terms of FDI inflows changed mainly as an effect of China's dynamic emergence. In the 1970s and early 1980s, Hong Kong, China; India and Singapore attracted most of the FDI inflow into the region. In the late 1980s, however, China irrupted as a major host country, topping the list in the early 1990s, while India's share was sharply reduced (Figure 6.4a). These four economies were among the top ten developing Asian countries for inward FDI in 2000-2003, along with South Korea, Chinese Taipei, Thailand, Malaysia, Viet Nam and the Philippines. It is estimated that in 2000-03 China had an annual average of inward FDI of $48 460m, Hong Kong, China $27 239m and Singapore $12 348m (Table 6.1).

The ratio of FDI inflows with respect to gross fixed capital formation tended upward in the cases of China; Singapore; Hong Kong, China; Thailand and (a little bit) Chinese Taipei. The trend was generally constant in Malaysia, Korea and India (see Figure 6.3C).

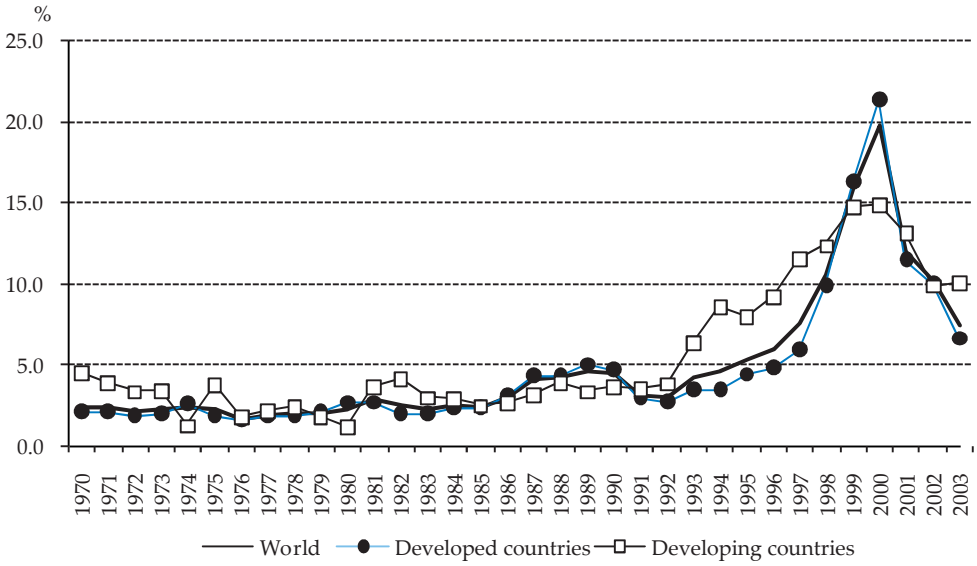
In Latin America and the Caribbean, Brazil and Mexico have exchanged leadership in FDI inflows in this region during 1970-2003. Brazil was the main Latin American host country in the 1970s, but in the 1980s Mexico took top position. In the late 1990s Brazil became the main host country again, but Mexico has been close. These two economies accounted for about half of total FDI inflows in Latin America and the Caribbean from 1975 to 2003 (Figure 6.4b). Other important FDI host countries in the region have been Bermuda, the Cayman Islands, Chile, Argentina, Venezuela, Colombia, Peru and Ecuador. According to UNCTAD, from 2000-03, Brazil's annual average for inward FDI was $20 493m, Mexico's was $17 222m and Bermuda's was $8 796m (Table 6.1).

With the exception of Ecuador, which attracted high percentages of FDI with respect to GFCF in the 1970s and 1990s, all the other Latin American countries had a growth trend (from less than 10 per cent to more than 10 per cent) in 1970-2003 (see Figure 6.3D).

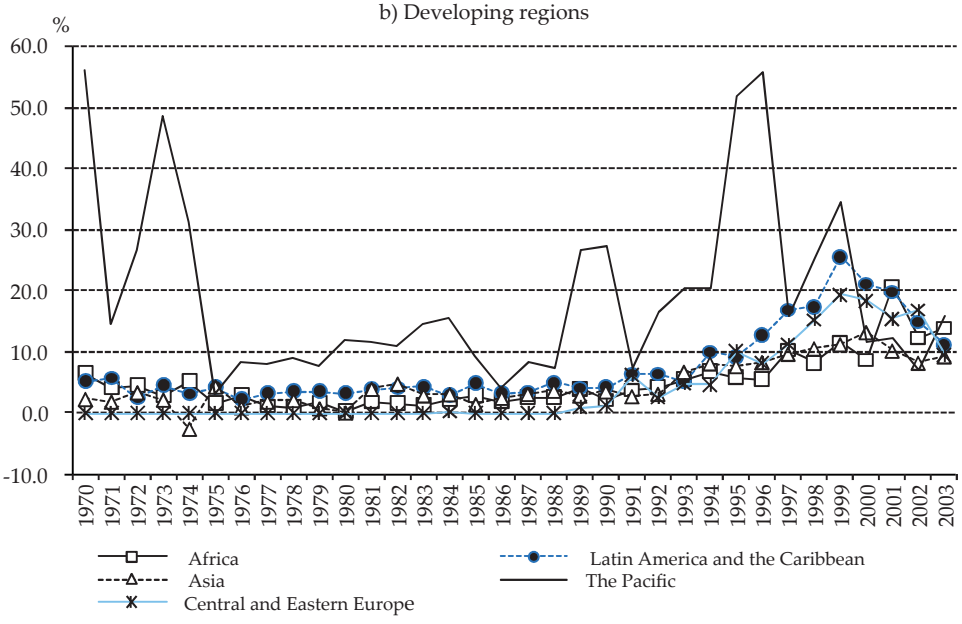
In the case of Mexico, the North America Free Trade Agreement (NAFTA) has proved to be a major policy instrument for attracting growing inflows of FDI. Apart from a decline in 2001 and 2002, FDI has increased in the ten years from 1993 to 2003. In 2001, Mexico became the developing country with the second highest FDI inflow in the world (following China that year) (Mercado, 2006).

Figure 6.3. **FDI Inflows as Percentage of Gross Fixed Capital Formation 1970-2003,**

a) World trends



b) Developing regions



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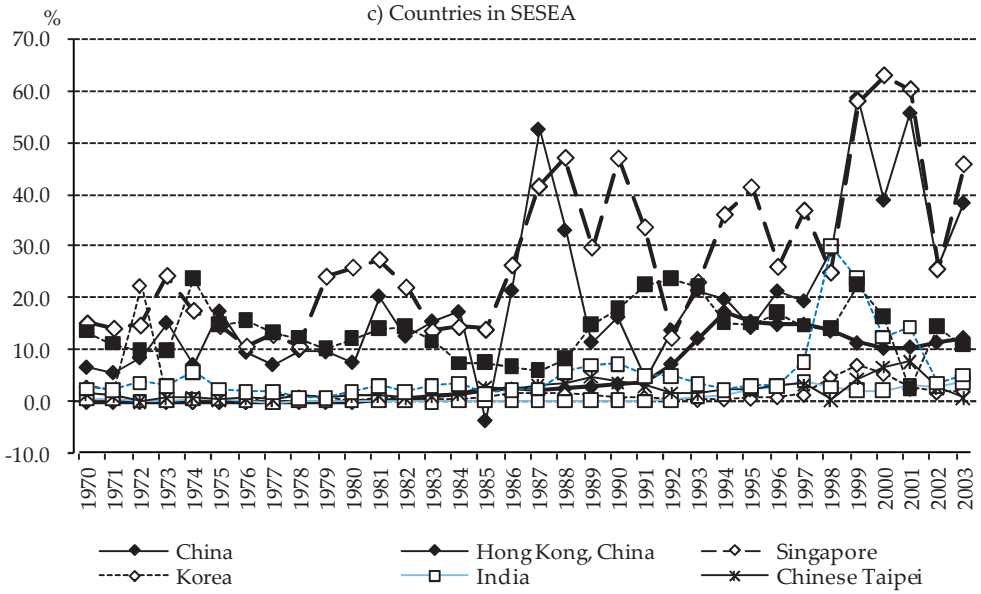
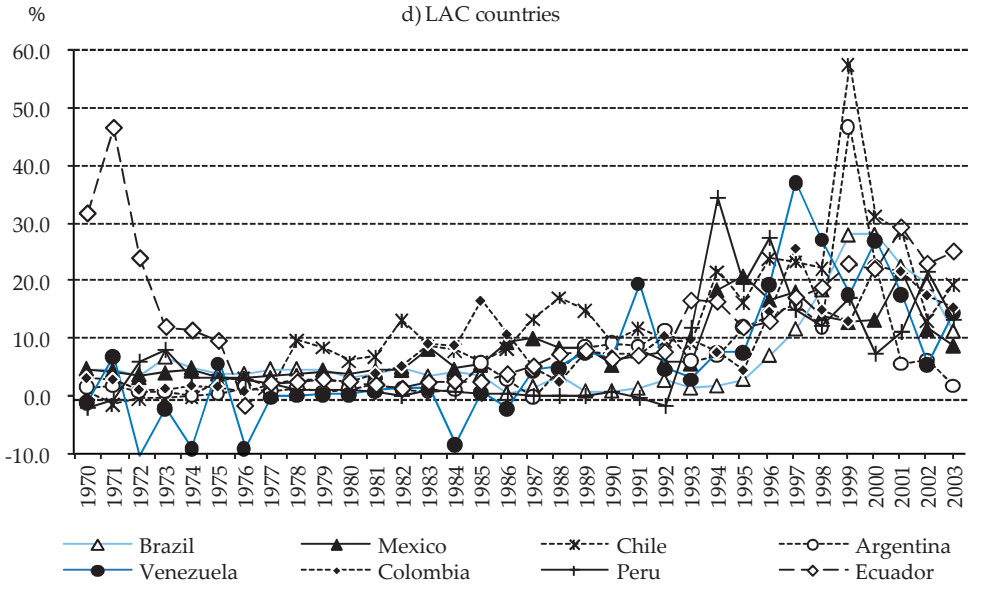
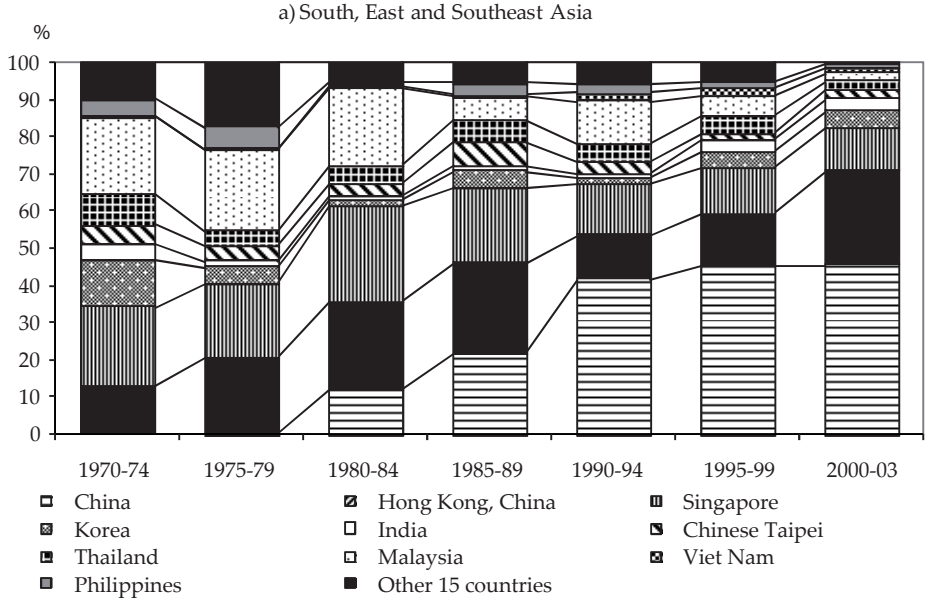




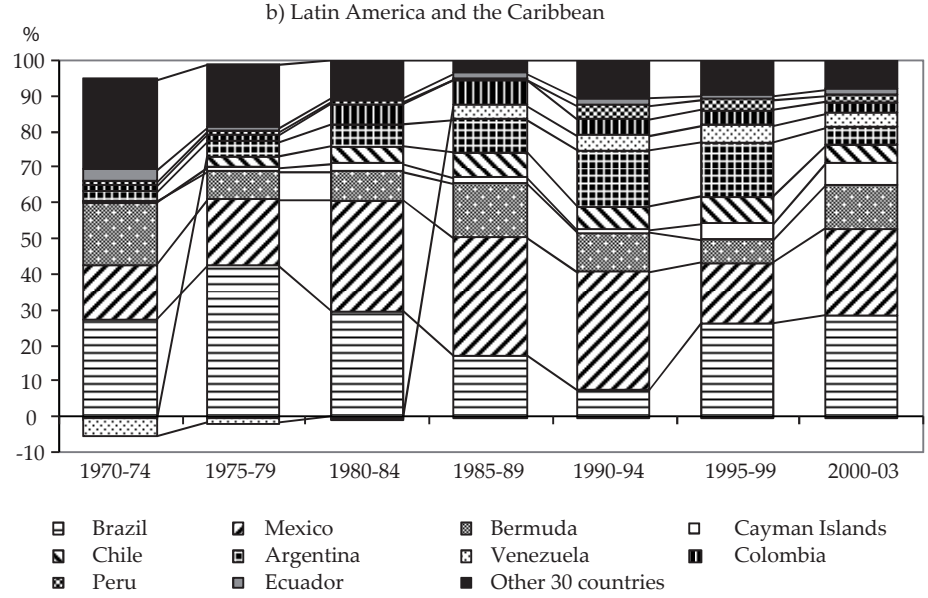
Source: UNCTAD.

Figure 6.4. **Share of the Top Ten FDI Hosting Economies in South, East and Southeast Asia and Latin America and the Caribbean**

a) South, East and Southeast Asia



b) Latin America and the Caribbean



Source: UNCTAD.

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Policies to Attract FDI

All over the world, and especially in developing countries, there is a considerable need for explicit domestic policies to attract FDI. Therefore the domestic climate for investment has depended on economic policy. During the 1990s particularly, FDI regulations were reduced and relaxed in a growing number of countries in the two regions studied by the introduction of new laws, decrees, constitutional amendments and foreign exchange regulations. On the other hand, various free trade agreements were designed or redesigned, incorporating liberal investment rules. Trade liberalisation was accompanied by legal reforms in favour of foreign investors and multinational companies in the biggest Latin American and Asian developing economies (as also, more recently, in China)[3]. Furthermore, bilateral investment treaties (BIT) and double taxation treaties (DTT) have been widely diffused, signatory countries indicating their commitment to providing a favourable investment climate. Over 1 800 BITs were registered by UNCTAD as available online in 2003 (UNCTAD, 2004). The signature by members and non-members of the *OECD Declaration on International Investment and Multinational Enterprises* has been interpreted as the formal will of many countries "to provide national treatment for established foreign controlled enterprises, to avoid conflicting requirements on those enterprises, and to work together to improve the investment climate" (Goldstein, 2004).

The domestic stability of the main macroeconomic variables, modernisation of public infrastructure (including telecommunications), promotion of privatisation and even political democracy are further measures adopted by governments in the two studied regions to make the domestic environment for FDI more attractive. As an outcome of these policy measures, FDI inflows in the two regions have grown dynamically.

MNE Spillovers

There are many channels through which MNE subsidiaries contribute to the HRD of a host developing country. *Direct channels* include the provision of technology, enterprise training, and support for formal education. MNEs also contribute to HRD through *indirect channels* via labour turnover, spinoffs, and vertical and horizontal linkages. Even more indirectly, MNEs can induce greater investment in HRD through their impact on returns to schooling (reflected in wage premiums). Therefore, if education is subsidised by the government

host countries may contribute to HRD in anticipation of greater employment opportunities in MNEs for educated workers. All these channels are considered in this section.

The following empirical questions involving MNE spillovers were posed in the introduction. How important are such spillovers in practice? What is the relationship between MNE spillovers and economic performance? What are the principal mechanisms by which MNE spillovers occur? What private action by domestic and foreign enterprises can induce greater positive spillovers? These questions are explored here with evidence from developing Asian and Latin American countries.

Developing Asian Countries

a) Spillovers

Several studies have found relevant MNE spillovers in developing Asian countries. In the case of Chinese Taipei and Indonesia, Chuang and Lin (1999) and Sjoholm (1999) reveal significant knowledge spillovers from MNEs. China in the year 2000 is studied by Hale and Long (2006) through a survey interview of 1 500 firms, including 382 foreign firms. They find that two key mechanisms through which MNEs exert positive spillovers on domestic firms with higher initial productivity are a *labour mobility* channel and a *network effect* channel. The transfer of technology occurs through the movement of highly skilled workers from MNE subsidiaries to domestic firms, as well as through network externalities among high-skilled workers. The authors also find various types of MNE spillovers in China. Positive spillovers are found for more technologically advanced firms and no, or negative, spillovers for more backward firms. MNEs have positive spillover effects on domestic firms with higher absorptive capacity (higher relative initial total factor productivity). These domestic firms tend to hire younger and more highly skilled workers, which helps in facilitating technological transfer and MNE spillovers (Hale and Long, 2006)[4].

Particular differences among MNEs are also found in Indonesia. For instance, there is greater significant knowledge diffusion from MNEs to Indonesian firms when foreign investment is associated with knowledge-enhancing activities such as R&D and training. Knowledge diffusion from MNEs not engaged in such activities is weak or absent (Todo and Miyamoto, 2002 and 2006)[5].

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b) HRD and economic performance

If there are spillovers in terms of HRD, a question for study is the impact of HRD on firms' economic performance and wages. Positive effects on productivity and employee wages are expected, but these may depend on the conditions of a developing economy, its policy and institutional conditions (which together constitute the investment climate), and interaction with other variables such as the rate of technological change. If firms struggle to compete in global markets, one key response to competition is the effort to improve technological capabilities and skills, as Batra and Stone argue. The importance of strengthening firms' capabilities in the context of an increasingly knowledge-based global economy is well recognised in the literature (see, for example, World Bank, 2001). Up to now, however, there has been a relative lack of systematic international data about how firms upgrade their capabilities and whether this results in better performance (see Katz, 1987; Chuang and Lin, 1999; Görg and Strobl, 2001; Alfaro and Rodríguez-Clare, 2003; Blomström and Kokko, 2003).

The World Bank's World Business Environment Survey (WBES) finds that firms' investments in skills and technology are critically associated with company performance. Investment in technological capacity strongly correlates with sales growth, while the import of technology is clearly related to employment and investment growth. Training is also important, and it is clear that investment in private training services is significantly associated with all dimensions of firm growth. Firms that do not invest in training appear disproportionately inclined to fail.

Recent findings with different methods of research in various developing Asian countries suggest a generally positive relationship between HRD and firms' economic performance (see, for instance, Tan 2001; Ariga and Brunello 2005). Increases in training investment have demonstrated strong positive impacts on productivity growth in Malaysia too (in 1985-1996), especially when training is continuous (Tan, 2001)[6]. Moreover, statistically significant returns from training which are comparable or superior to returns from education are found in Thailand and the Philippines. Particularly in Thailand, both on-the-job and off-the-job training significantly increases future earnings (Ariga and Brunello, 2005)[7].

c) Education and technology

Other empirical questions for research are: What is the relation between education, training and technology? Why do firms underinvest in training activities?

A positive relation between training by MNEs and technological change is expected for a win-win outcome: private competitiveness and social economic welfare. Technological change, either by adopting innovations or by undertaking R&D activities, tends to enhance the positive effects of HRD. A positive training-technology relationship is confirmed by recent research findings from Indonesian and Malaysian studies. R&D activities and human resource development conducted by MNEs stimulated knowledge diffusion from MNEs to domestic firms in the Indonesian manufacturing sector in the mid-1990s. More knowledge was diffused from MNEs to domestic firms where foreign investment was associated with knowledge-enhancing activities conducted by the MNEs, domestic firms, or both (Miyamoto and Todo, 2003)[8]. Training has raised firm-level productivity growth in Malaysia, and these productivity effects were enhanced by continuous training and when training was accompanied by the introduction of new technology in 1985-96. The role of technological change in inducing enterprise training seems to be considerably more important in small firms than in big firms (Tan, 2001).

Worker education is thought to be among the key drivers of training investment because of the complementary nature of education-training. But this complementarity might not be realised in practice. For example, there are mixed findings in Thailand and the Philippines, depending on the employee's occupation or the type of training received. In Thailand there is a negative and statistically significant relationship between educational attainment and on-the-job training (OJT), and a positive and statistically significant relationship between education and off-the-job training (OFFJT). In the Philippines, the impact of education on training incidence is positive for operators but negative among technicians and engineers. These results are explained in terms of relative shifts in marginal cost and benefit schedules for training as the level of educational attainment of workers increases (Ariga and Brunello, 2005).

Latin America and the Caribbean

a) Spillovers

As in the developing countries of Asia, in Latin America too inward FDI can make a relevant contribution to the host economy through the setting up or enlargement of MNE subsidiaries with technological and educational spillovers. In Latin America and the Caribbean, FDI is generally more closely associated with skills formation than with domestic investment. For example, MNEs in Brazil invest more than domestic firms in education and training. In this case,

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MNEs stimulate skills development with higher wages and are relatively more skills-intensive than domestic enterprises (the proportion of employees possessing better education and experience is larger in MNEs than in domestic enterprises) (see Arbache, 2004)[9].

In Argentina, while there is little evidence of widespread MNE spillovers during the 1990s and the beginning of the 2000s, where these have occurred domestic firms had undertaken significant investment in absorptive capacities. The lack of MNE spillovers to the domestic sector seems to be due to various restrictions such as the following: *i)* increased FDI has had a negative competition effect on the domestic sector; *ii)* the movement of workers between the MNE sector and the domestic sector has been rather limited; c) spillovers are concentrated between MNE subsidiaries and the domestic firms that they have acquired. It appears that much MNE activity — particularly after liberalisation — has been of the kind that has limited opportunities for linkages and spillovers (generally, these assets do not easily spill over to domestic firms) (Narula and Marin, 2005)[10].

One of the first findings of MNE spillovers in Mexico was published by Shaiken (1990), who studied a new Ford Motor Company plant in Mexico that provided substantial technical training. More recent evidence in Mexico (Mercado, 2006) suggests that there is not a general behaviour concerning HRD and technology transfer among MNEs but rather a wide variety of behaviours. Various MNE plants behave passively: they are resistant to investing in HRD and provide unsatisfactory training. Other MNE plants are "reactive", providing some training as a reaction to their own requirements in particular moments. A third behaviour of MNE plants is "proactive", as highly active providers of training that perceive HRD to be an important source of competitive advantage (Mercado, 2006)[11].

For most Central American countries the Central America Free Trade Agreement (CAFTA) promises new export market opportunities and growth in FDI associated with higher levels of labour and total factor productivity. This requires initiatives on the part of employers to increase incentives for FDI and technology transfer with a corresponding investment in human capital. However, recent evidence presented by Batra and Keating (2004) based on a survey of 450 firms in Guatemala, Honduras and Nicaragua in 2003 reveals a relatively weak training investment and relative complacency on the part of employers about the role of skills in their companies in the future. The authors recommend some policy measures to exploit the potential benefits of CAFTA.

b) HRD and economic performance

Recent research findings in various Latin American countries suggest a generally positive relationship between HRD and firms' economic performance (see, for instance, Tan and Lopez-Acevedo, 2003; Mercado, 2006). In Mexico, training had large and statistically significant effects on wages and productivity in 1993-99. Joint training and R&D yielded larger returns than investment in just one or the other, and training and technology investment together enabled firms to improve their relative position in the distribution of wages and productivity in this period. These findings indicate that returns to in-firm training are greatest in the most highly skilled groups (Tan and Lopez-Acevedo, 2003)[12]. Another study found that the largest MNE plants in Mexico had a high positive correlation between investment in human resources and the following variables: rate of return on assets; total amount of investment; and investment in marketing in 2002. This suggests that an important set of big MNEs tend to combine their investment in human resources with investment in marketing (Mercado, 2006).

c) Education and technology

It is argued that the education of workers is among the key drivers of training investment if there is education-training complementarity. This relationship has been investigated by various scholars using different methods and data sets for a number of countries. There is evidence in Mexico, as in the Philippines and Thailand, of a mixed situation: the co-existence of *complementarity* (recruitment of educated labour and in-firm training) in various big MNE subsidiary plants, and *substitution* between educated workers and training in other big MNE subsidiary plants. Skilled labour turnover and a local supply of vocational students and professionals appear to be the main determinants of these differences (Mercado, 2006).

A training-technology *complementarity* is also expected for a win-win outcome (social and private). There is evidence in Mexico that the higher the R&D investment, the higher the human resources investment, suggesting a *complementarity* between these two variables with a positive correlation with firms' economic performance (Mercado, 2006). Trade and investment liberalisation seem to stimulate FDI inflows, but a major driver of training spillovers appears to be technology, according to the Mexican experience (Tan and Lopez-Acevedo, 2003).

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Policies to Enhance MNE Spillovers

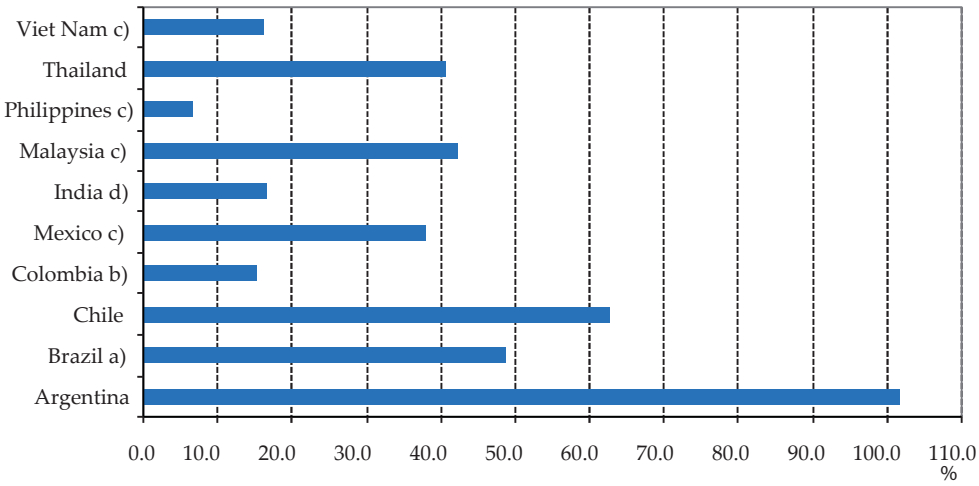
As pointed out above, research findings indicate considerable requirements for the enhancement of MNE spillovers. What are these major requirements? What policy measures have been adopted to induce greater positive spillovers? These central questions are explored here with evidence from the two regions studied. The evidence discussed in the previous section showed various relationships between variables that imply the need for policies to promote the enhancement of MNE spillovers; for instance, government promotion of education and training, inducement to higher competitiveness and absorptive capacity of domestic firms, and the targeting of MNEs with high value added and with positive experiences of spillovers. These seem reasonable policy implications that would move key variables, that in turn would impact positively on MNE spillovers.

Policy Requirements

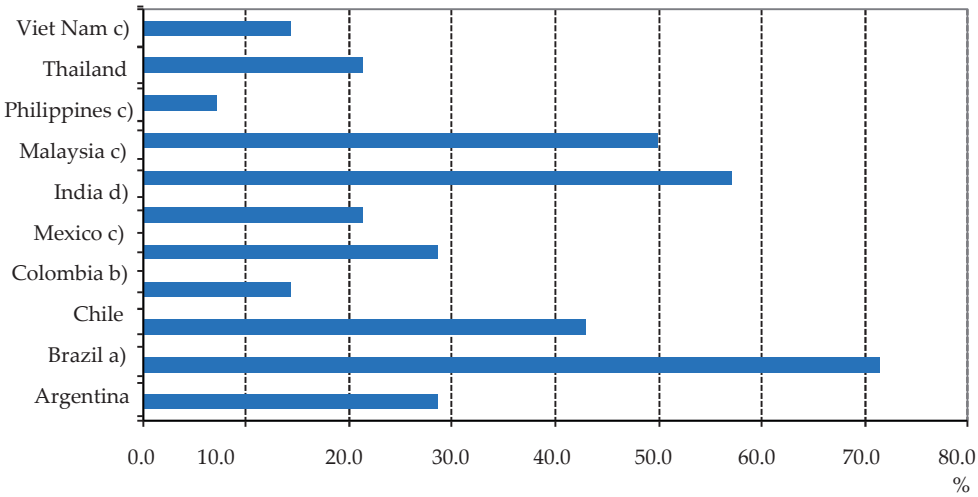
Positive effects on domestic technology and education are required in the two studied regions. For instance, in the developing Asian countries, China has the best R&D performance, while in Latin America Argentina had a similar ratio of researchers per million inhabitants to China in 2003. Chile had 37 per cent, Brazil 51 per cent, Malaysia 58 per cent, Thailand 60 per cent, and Mexico 62 per cent fewer, and the other countries lagged still further behind. Furthermore, Brazil's expenditure on R&D as a percentage of GDP was 29 per cent lower than that of China in 2003, India's 43 per cent less, Malaysia's 50 per cent, Chile's 57 per cent and Argentina's and Mexico's, 71 per cent. A number of countries in both regions are even further behind (see Figure 6.5 and UNESCO, 2006). On the other hand, the structure of educational attainment in the two regions has been far from that in the most developed countries. For instance, in one extreme of educational attainment, while in 2003 the mean in the OECD of people with only primary or no schooling at all was 14 per cent of the adult population and in the United States was 4 per cent, it was 68 per cent in Thailand (2002) and Paraguay (2003), 58 per cent in Indonesia (2002), 56 per cent in Brazil (2002), and between 41 per cent and 46 per cent in Argentina (2002), Mexico (2005) and Peru (2002) (see Figure 6.6). Most Central American countries are located at the lower end of the international scale in terms of school enrolment and the completion of education. Their small economies have suffered from economic shocks and political instability, inducing poor economic performance (Batra and Keating, 2004).

Figure 6.5. **R&D Gap of Selected Countries in Asia and Latin America**
with respect to China, 2003

a) Gap in terms of researchers per million of inhabitants



b) Gap in terms of expenditure on R&D as % of GDP



Notes: *a)* Data of researchers per million of inhabitants refer to 2000.

b) Data of expenditure on R&D as % of GDP refer to 2001.

c) Data refer to 2002.

d) Data of researchers per million of inhabitants refer to 2000 and the researchers per million of inhabitants refer to 1998.

Source: Own calculations with data published by UNESCO (2006).

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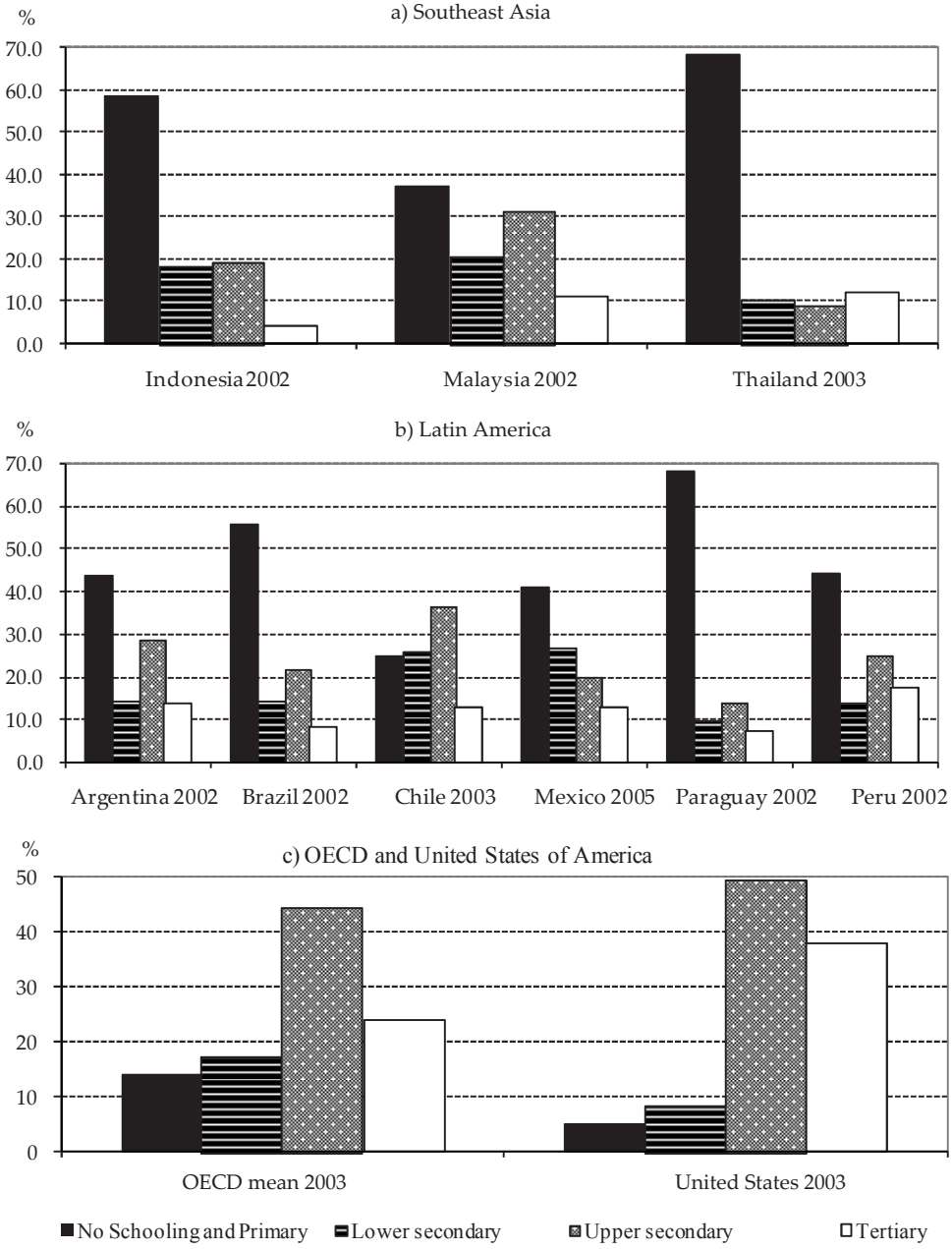
Figure 6.6. **Educational Attainment of the Adult Population**
(Distribution % of the population aged 25 to 64 years, by highest level of education attained)



Source: UNESCO Institute for Statistics - OECD (2005). For Mexico, INEGI (2006).

Various research findings clearly suggest that a good climate for investment is not enough to induce wider local MNE spillovers. Complementarity, co-ordination and synchronisation are suggested by a number of researchers in relation to policies promoting FDI, industrial development, technology, education and training, with a proactive strategy with the objective of promoting virtuous circles of development-FDI. Governments of developing Asian and Latin American countries have recently become aware of these requirements and have therefore started proactively adopting complementary policies and improving their co-ordination with the purpose of enhancing MNE spillovers.

Without complementary measures in the areas of technology, training and education, it is shown that on the one hand the spillovers are rather limited, and on the other that MNEs are not induced to invest in high value sectors. There is strong evidence indicating that outward FDI seeks large markets and good labour skills in developing countries (for the case of US outward investment, see Carr *et al.*, 2004). A high level of human capital is without doubt one of the key ingredients for attracting FDI, as well as for host countries to gain maximum benefits from their activities. Therefore, as Miyamoto suggests for example, host governments have to develop the tertiary education sector.

It is necessary to introduce tailor-made policies such as the targeting of foreign investors at the level of specific types of firms, industries and clusters, as Goldstein (2004) and Miyamoto suggest, in order to facilitate the transfer of technology and HRD. Miyamoto argues that HRD policies can target constrained enterprises that underinvest in training as a result of market failures, such as small and medium-sized domestic enterprises. These are likely to benefit most from an increase in education and training. FDI promotion policies can also target high value added MNEs likely to bring in new skills and knowledge to the economy and allow technology transfers. MNEs contribute to technology transfers through numerous channels of training spillovers, as explained. Host countries' efforts to improve their technological absorptive capacity have also been shown to facilitate technology transfers. Another policy requirement is to introduce strong incentives for MNEs to participate in local education and R&D. MNEs can contribute to the HRD of the host developing country by providing training and supporting formal education.

A further tailor-made policy is the setting-up of national agencies to market given geographical areas with the aim of matching the *locational* advantages of countries with the needs of foreign investors. It is also necessary to promote the formation of partnerships between MNEs and local firms (Goldstein, 2004).

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There is a need for more consistency between trade and FDI policies. Investment issues included in free trade agreements need more comprehensive rules on investment in all sectors. For example, in Mercosur, the Free Trade Area of the Americas and bilateral negotiations between Europe and South American countries include complex rules of origin that create potential inefficiencies (Goldstein, 2004).

Policy Experience in Developing Asian Countries

The dynamic FDI trends in developing Asian countries have contributed to local development through technological and educational spillovers. For instance, in the case of Chinese Taipei and Indonesia, Chuang and Lin (1999) and Sjoholm (1999) reveal significant knowledge spillovers from MNEs. As mentioned, governments of developing Asian countries have recently become aware of such potential externalities and have therefore started proactively adopting complementary policies and improving their co-ordination with the purpose of enhancing MNE spillovers. Aggressive incentive schemes to encourage MNEs to upgrade their operations in conjunction with efforts to improve complementary infrastructures for advanced activities seem to have generated a positive feedback loop in Asia, first in Singapore and then in neighbouring countries as well (Goldstein, 2004).

FDI has grown sharply in China since its entrance to the WTO with an increasing opening of its economy, Being aware that policies and reforms aimed at building efficient labour market institutions have the additional benefit of enhancing MNE spillovers, the Chinese government has implemented four massive retraining programmes: "Three Year Ten Million Programme", "Training Programme for Starting Your Business", "Highly Skilled Workers' Training Programme", and "Occupational Certificates Training Programme for Higher Vocational Education Institute Graduates". The recent experience in China (in 2000) shows that a well-functioning labour market where labour mobility is undeterred and incentives for human capital accumulation are ample is essential for the transfer of technology and management expertise from foreign to domestic firms (Hale and Long, 2006).

Governments in developing Asian countries have implemented demand-driven training policies which have been playing a basic role in stimulating training finance to minimise financial constraints and market failures and encouraging MNEs to invest in the HRD of their host economy. Most successful training policies have been demand-driven, involving industries, MNEs, and foreign academic institutions that have close ties with advanced developments

in technology, business administration and management. A good example of a demand-driven training policy is the Human Resource Development Fund (HRDF), a training levy-reimbursement scheme in place since 1993 in Malaysia. This scheme has been instrumental in promoting increased enterprise training (Tan, 2001).

Miyamoto and Todo (2003) recommend an explicit co-ordination of education and training policies with promoting policies that enhance training for constrained firms based on experiences of enterprise training in Indonesia. Synchronising key components of HRD policies, i.e. formal schooling, vocational education and training policies (post-formal schooling) is also recommended. Miyamoto maintains that these key components must be coherent and co-ordinated to minimise underinvestment in human capital at each level. Then, if manufacturing firms tend to substitute training with hiring educated workers, as in Indonesia, it is recommended that they adopt measures that strengthen the link between education and training policies, minimise market/policy failures in training, enhance access to the credit market and allow apprenticeship wages below the minimum wage level (Miyamoto and Todo, 2003).

Policy Experience in Latin America and the Caribbean

Since the mid-1980s to the end of the 1990s the main FDI policy in Latin America and the Caribbean was to induce inflows through trade liberalisation and macroeconomic stabilisation policies. Several criticisms of such a policy approach have emerged more recently, stressing that market forces cannot substitute for the active role of governments and suggesting the co-ordination of FDI policies with a proactive industrial policy (Narula and Marin, 2005). Trade and investment liberalisation seem to stimulate FDI inflow, but a major driver of training spillovers appears to be technology, according to the experience of various Latin American countries such as Brazil, Chile and Mexico. Therefore an active promotion of technological change seems necessary.

Some risks of a "race to the bottom" in incentive-based competition for FDI have also been argued, such as that Latin American countries enter into a zero-sum (if not negative) game to allure MNEs, offering them too much (Goldstein, 2004). Now, as in developing Asian countries, various Latin American governments have become aware of risks and potential MNE spillovers and have started to adopt complementary policies and improve their co-ordination with the purpose of enhancing the positive externalities of MNEs. But this approach has been more recent in Latin American countries, and has been slower and less integral. Latin American countries have begun to ponder over policy choices

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to attract more sophisticated MNEs and increase their developmental impact, as in recent experience in Chile (Goldstein, 2004).

The solution for problems caused by the bureaucratic nature and lack of flexibility of development promotion agencies is another pending measure. In Brazil, for instance, considerable inefficiencies are provoked by the large incentives that currently exist to locate factories in Manaus, in the heart of the Amazon jungle. This mechanism results in higher taxes than would otherwise be levied on firms in more suitable industrial locations. At the moment there does not seem to be any prospect of a constitutional change to resolve this situation (Goldstein, 2004).

If investment in training is relatively weak, as in Guatemala, Honduras and Nicaragua, the potential investment benefits of free trade agreements (CAFTA, in these particular cases) should be exploited through taxation and other investment incentives, especially concerning technology transfer. These measures, as suggested by Batra and Keating (2004), might also be complemented by policies designed to distribute the skills developments that accompany and follow technology transfer. Batra and Keating also suggest that an examination of the supply chains of larger companies might reveal opportunities for the distribution of skills through public or levy subsidised training (Batra and Keating, 2004).

Concluding Remarks and Policy Suggestions

The evidence discussed in this article suggests that developing Asian countries have dynamically attracted FDI and have been successful in implementing policy measures to enhance MNE spillovers with positive impacts on domestic productivity and wages. The evidence also suggests that Latin American countries have lagged behind developing Asian countries as regards to enhancing MNE spillovers. Despite a convergence of the inward FDI trend in the two regions with a recent catching-up trend in Latin America, the latter region shows more limited spillovers. In particular these trends can be observed by comparing the cases of Brazil (Arbache, 2004), Argentina (Narula and Marin, 2005), and Indonesia (Miyamoto and Todo, 2003). All three studies find that MNE spillovers tend to be more widespread where foreign investment is associated with knowledge-enhancing activities conducted by MNEs or domestic firms. However, more limited spillovers are found in Brazil and Argentina than in Indonesia.

There are similarities between the two studied regions regarding the positive correlation between HRD and the economic performance of firms, as well as between HRD and wages. These correlations are stronger where training is carried out with R&D activities. (See a study in Malaysia by Tan, 2001; two studies in Mexico by Tan and Lopez-Acevedo, 2003; and another in Thailand and the Philippines by Ariga and Brunello, 2005; and Mercado, 2006). Training-technology complementarities are found in both regions. However, there appears to be a weaker complementarity between formal education and training in Indonesia than in Mexico and Thailand. This difference is due to the stronger presence in the former of factors that induce substitution between educated workers and training, *viz.:* resource constraints, high labour turnover, binding minimum wages and plentiful supplies of vocational students.

Regarding the domestic climate attractive to FDI, according to Tan (2001), Batra and Keating (2004), Mercado (2006), Miyamoto and Todo (2006), Latin American countries appear to be catching up in implementing policies oriented to an investment environment as attractive as that of developing Asian countries, investing more in formal education and co-ordinating technological, educational and trade policies, and introducing new incentives for investment in training and technological learning. However, further improvement is needed in some Latin American countries, particularly in Central America, where there are still low levels of school enrolment and completion and little investment in training.

Taking into account that governments in the studied regions should synchronise their policy measures to attract FDI with measures to enhance MNE spillovers, and that they should manage the risks of a "race to the bottom" in an incentive-based competition, most of policy suggestions put forward here focus on two issues: *i)* complementarity, co-ordination and synchronisation; and *ii)* targeting specific firms, industries and HRD (mostly in training and education).

Complementarity, co-ordination and synchronisation of policy measures are suggested by a number of researchers in relation to policies to promote FDI, industrial development, technology, education and training, with a proactive strategy with the objective of promoting virtuous circles of development-FDI. Breaking down the walls between segments, sectors, policy portfolios and stakeholder interests that oppose structural reforms — particularly in relation to education and labour markets — is a necessary first step in Latin America and the Caribbean (a step already been taken in Chile and more recently in Mexico) to increase the possibilities of promoting MNE spillovers. More concrete suggestions for complementarity, co-ordination and synchronisation are as follows:

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1) An explicit co-ordination of education and training policies with promotion policies that enhance training for constrained firms is recommended (such as in the cases of Indonesia, Malaysia, Mexico and the Philippines). Concerning training, governments should implement and promote not only training but also retraining programs, as in China.

2) The key components of HRD policies, i.e. formal schooling and vocational education and training policies (post-formal schooling) must be coherent and co-ordinated so as to minimise underinvestment in human capital. Then, if manufacturing firms tend to substitute hiring educated workers for training, as in Indonesia, it is recommended that measures are adopted to strengthen the links between education and training policies, minimise market/policy failures in training, enhance credit market access and allow apprenticeship wages below the minimum wage level.

3) There is a need for more co-ordination and consistency between trade and FDI policies. Investment issues included in free trade agreements need more comprehensive rules on investment in all sectors. For instance, it is necessary to reduce the complexity of rules of origin so that potential inefficiencies can be eliminated.

4) The solution of problems caused by the bureaucratic nature and lack of flexibility of development promotion agencies requires co-ordination and efficiency.

Concerning the issue of targeting specific firms, HRD activities (mostly in training and education) and industries, three concrete policy suggestions are stressed:

1) Targeting selected types of MNE for their involvement in HRD and R&D. A key policy requirement for enhancing MNE spillovers is the introduction of strong incentives for MNEs to participate in local education and R&D, such as the Human Resource Development Fund (HRDF) implemented in Malaysia since 1993 (see Tan, 2001). Technological change has induced enterprise training, but the overall impact of HRDF was much greater. In turn, the resulting increase in training investment has demonstrated a clear impact on productivity growth which was observed to be particularly strong when investment was accompanied by the introduction of new technology. Company size is also relevant, since HRDF has a lower impact on small companies. Besides a lack of scale economies in training, small firms generally do not know how to train, and demand low skills. These constraints may be overcame with explicit measures such as the strategy of SMIDEC — the national small and medium enterprises agency — that has started to provide integrated business, training and technology development services to small companies.

2) Targeting HRD (mostly in training and education). Governments should implement demand-driven training policies that can stimulate training finance to minimise financial constraints and market failures. Governments should induce MNEs' subsidiaries to invest in the HRD of the host economy (as in Malaysia). Most successful training policies have been demand-driven, involving industries, MNEs, and foreign academic institutions that have close ties with advanced developments in technology, business administration, and management.

3) It is also necessary to introduce tailor-made policies such as the targeting of foreign investors for selected industries and clusters in order to facilitate the transfer of technology and HRD.

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Notes

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2. Enterprises comprising parent enterprises and their foreign affiliates (UNCTAD, 2004, p. 345).

3. In the case of Mexico, NAFTA has been an effective instrument for attracting FDI and has induced spillovers. Increased competition from expanded trade under NAFTA led MNEs to initiate or expand R&D and, indirectly through R&D, to initiate or increase their provision of in-firm training (Tan and Lopez-Acevedo, 2003). A substantial reform of the protectionist Law of Foreign Investment Regulation (in Spanish: *Ley de Regulación de la Inversión Extranjera*), in force since 1973 was possible with NAFTA at the end of 1993, with further modifications in 1995, 1996, 1998, 1999 and 2001 (Mercado, 2006).

4. Hale and Long (2006) explore two mechanisms of MNE spillovers in domestic firms: labour mobility and network effects (learning and interaction among skilled labour such as managers and engineers). The authors use data from the Study of Competitiveness, Technology & Firm Linkages conducted by the World Bank in 2001. The methodology of the survey is stratified random sampling with the stratification based on sub-sectors of services and manufacturing activities. A stratified random sample of 300 establishments was drawn in five Chinese cities (Beijing, Chengdu, Guangzhou, Shanghai and Tianjin), giving a total sample size of 1 500.

5. Todo and Miyamoto investigate whether or not R&D and HRD affect knowledge diffusion by analysing firm-level panel data for the Indonesian manufacturing sector during the period 1995-97.

6. Tan (2001) analyses the results of three enterprise surveys in Malaysia, conducted in 1988, 1994 and 1997. Tan links these three surveys not only to each other, but also to panel establishment-level data covering the period between 1985 and 1996.

7. Using a unique survey of employees of manufacturing firms in Thailand and the Philippines, Ariga and Brunello (2005) develop and estimate a canonical model of training investment and returns to training in higher earnings. Their estimated model disentangles strong and complex mutual interactions between training incidence, earnings and the cost of training.

8. Miyamoto and Todo (2003) use firm-level panel data in 1996 for the *Statistic Industri* (SI), a large and medium scale manufacturing survey, conducted by the Central Bureau of Statistics of Indonesia.

9. Pooled ordinary least squares (OLS) and fixed-effect panels were estimated by Arbache (2004) to examine the response of schooling and tenure (two classical human capital variables) to FDI. The hypothesis under examination is that industries that experience larger FDI have also experienced a higher increase in human capital. This hypothesis is confirmed by instrumental variable fixed effect models (of which results are consistent with pooled OLS regressions), suggesting that FDI affects human capital formation (notably schooling) (Arbache, 2004).

10. Narula and Marin (2005) examine data from the Innovations Survey in Argentina in 1992-2001 and estimate production functions of skills augmented with FDI participation by industry. They use a plant level specification and model in first differences with a control for fixed differences in productivity levels across industries, which might affect the level of FDI. They include industry and year dummies for the omission of unobservable variables that might undermine the relationship of productivity growth between MNE subsidiaries and domestic firms.

11. Mercado (2006) studied a survey of 86 main investing firms (55 domestic enterprises and 31 MNEs) in 2002, and did not find a statistically significant general behaviour concerning HRD and technology transfer among MNEs. This diversity in behaviour is also discovered by the author in five case studies of leading MNE subsidiaries in Mexico. A qualification index of plant HRD behaviour was estimated for these cases by evaluating their recruitment policy, training activity, HRD motivation and educational linkages.

12. These findings are based on time-series and panel firm-level data in the Mexican manufacturing sector in the 1990s. Tan and Lopez-Acevedo (2003) endogenise training and estimate its wage effects jointly with a training choice equation, invariably finding positive, large and statistically significant effects for all workers as a whole and by occupation in both 1992 and 1999. When training and R&D are jointly determined, as indicated by a bivariate probit model, investment in both training and technology shows the largest wage returns, larger than investment in just one or the other, and these returns are statistically significant in both 1992 and 1999. The authors also find that investment in training and in technology impact on wages and total factor productivity over time, according to estimations based on a panel of firms followed over two sub-periods (1993-96 and 1996-99).

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