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SKILL UPGRADING
IN DEVELOPING COUNTRIES:
HAS INWARD FOREIGN DIRECT
INVESTMENT PLAYED A ROLE?

by

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Research programme on:
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PREFACE

This paper is one of five presented at a meeting on FDI, human capital and education in developing countries held in Paris in mid-December 2001. They examine the links between FDI and human capital development, notably the interaction between the host country's policies affecting multinational enterprises (MNEs), its educational and training system, and the education and training activities of MNEs. The five papers are: 1) by Ethan Kapstein situating this issue in the broader context of current debates on globalisation, growth and poverty; 2) by Matthew Slaughter looking at the implications of FDI for skill demand and supply; 3) by Dirk Willem te Velde examining the interaction between FDI promotion policy and human capital; 4) by Bryan Ritchie reviewing the relationship between domestic policy, FDI and human capital in East Asia; and 5) by Magnus Blomström and Ari Kokko reviewing the literature on human capital spillovers for the purposes of defining a new research agenda.

Over the last ten years, globalisation has become a contentious issue. Much of the debate has focused on the role of capital inflows and FDI. There is substantial evidence that short-term capital flows, and portfolio capital in particular, increase the susceptibility of developing countries to financial crises, while FDI appears to be more stable and less subject to reversal and rapid outflows. Over the last decade an increasing number of emerging market economies have opened their countries to FDI, and have made attracting FDI an integral component of their development strategies. In Latin America alone, for example, net FDI flows climbed from \$18 billion in 1990 to more than \$85 billion in 1999.

At the same time, the composition of FDI has changed. The majority of FDI from OECD countries to developing countries now goes into services, rather than manufacturing and natural resource production. This change of composition has been accompanied by a change in purpose. As a result, FDI is now more likely to finance a large initial surge in capital goods imports, bringing advanced technology, know-how and organisational techniques. Is, however, FDI causing a race to the bottom as countries compete to attract investors, or to a race to the top as governments recognise the need for an educated workforce? Is it contributing to greater income inequality by increasing the demand for skilled labour, or to an increase in opportunities for workers at all income levels?

The possibility that FDI is contributing to widening wage and income inequalities has revealed an important but relatively unexplored link with human capital and human capital policy, education and training. In this context, and building upon research that the OECD Development Centre has done on globalisation, the Centre's meeting was organised to examine the links between FDI and human capital development. It

particularly examined the three-way interaction between the host country's incentives to attract FDI and its policies affecting MNEs, its educational and training system, and the MNEs education and training activities.

The general conclusion that can be drawn from these papers is that MNEs can and do generate substantial human capital spillovers in developing countries and that appropriate policies can maximise these. For instance, training policies are essential to creating positive synergies with MNEs but must be seen as not FDI-specific — they are necessary for the competitiveness of all enterprises. At this point very little is known about the training activities that MNEs are actually engaged in, and to what extent local employees and managers of MNEs subsequently work in domestic firms, or start new firms themselves.

Further research is needed on the relationship between human capital and FDI, that could be extremely fruitful for both policy makers and MNEs. In particular, we need to know more about the transmission mechanisms and the ways in which policies can support them. These five Technical Papers, each of them written by eminent specialists, provide a sound basis for further work which can enhance development potential in very practical ways.

Jorge Braga de Macedo
President
OECD Development Centre
29 July 2002

Technical Paper No. 191, *Virtuous Circles? Human Capital Formation, Economic Development and the Multinational Enterprise*, by Ethan B. Kapstein, August 2002.

Technical Paper No. 192, *Skill Upgrading in Developing Countries: Has Inward Foreign Direct Investment Played a Role?*, by Matthew J. Slaughter, August 2002.

Technical Paper No. 193, *Government Policies for Inward Foreign Direct Investment in Developing Countries: Implications for Human Capital Formation and Income Inequality*, by Dirk Willem te Velde, August 2002.

Technical Paper No. 194, *Foreign Direct Investment and Intellectual Capital Formation in Southeast Asia*, by Bryan K. Ritchie, August 2002.

Technical Paper No. 195, *FDI and Human Capital: A Research Agenda*, by Magnus Blomström and Ari Kokko, August 2002.

RÉSUMÉ

Comment les firmes multinationales affectent-elles l'offre et la demande de compétences sur les marchés du travail des pays dans lesquelles elles s'installent ? Du côté de la demande, l'investissement direct étranger peut accroître la demande de main-d'œuvre qualifiée dans les pays d'accueil, par plusieurs canaux. Il ressort de la plupart de données empiriques que ces canaux sont à l'œuvre à l'intérieur des firmes elles-mêmes, plutôt que par une diffusion des connaissances vers les entreprises nationales. Du côté de l'offre, il est beaucoup plus difficile de savoir comment l'IDE modifie le développement du capital humain. Les firmes multinationales peuvent faciliter de deux manières l'investissement dans le capital humain. La première se manifeste via les activités à court terme, au niveau de la firme, par lesquelles chaque entreprise interagit avec le marché du travail du pays d'accueil. L'autre se manifeste via les activités à long terme, au niveau du pays, par lesquelles l'ensemble des multinationales contribuent à la mise en place d'un environnement macroéconomique global permettant à la politique budgétaire d'impulser et de financer une politique d'éducation.

SUMMARY

How do multinational firms affect both the demand for and supply of skills in host country labour markets? On the demand side, inward FDI can stimulate demand for skilled workers in host countries through several channels. Most empirical evidence indicates that these channels work mainly within multinationals themselves, rather than through knowledge spillovers to domestic firms. On the supply side, the question of how inward FDI influences the development of human capital is much more difficult to answer. There are two different modes by which multinational enterprises (MNEs) can facilitate investments in human capital. One involves short-term, firm-level activities by which individual firms interact with host country labour markets. The other involves long-term, country-level activities by which MNEs collectively contribute to an overall macro environment where fiscal policy can support and drive education policy.

I. INTRODUCTION

An important part of globalisation in recent years has been the continuing rise in foreign direct investment (FDI). UNCTAD (2000) reports that from 1979 to 1999, the ratio of world FDI stock to world gross domestic product rose from 5 to 16 per cent, and the ratio of world FDI inflows to global gross domestic capital formation rose from 2 to 14 per cent. One consequence is that an increasing share of developing countries' output is accounted for by foreign affiliates of multinational enterprises (MNEs). The foreign-affiliate share of world production is now 15 per cent in manufacturing and other tradables (Lipsey *et al.*, 1998).

How do these multinational affiliates influence host labour markets in developing countries? In this paper, I offer some insights on this question by examining the issue of "skill upgrading", which I will define in terms of both labour demand and supply. Each side of the labour market will be addressed in turn.

On the demand side, the academic literature on multinationals suggests several channels by which inward FDI stimulates demand for skilled workers in host countries. These include technology transfer to host country affiliates; technology flows — both market-mediated and *via* spillovers — to host country firms; and investments in physical capital related to new technologies. I will discuss both the theoretical concepts and empirical evidence for these various channels. There is compelling evidence on the importance of within-firm technology transfer and capital investment as modes of boosting host country demand for skilled workers. The evidence is much more mixed on technology flows to domestic firms, particularly *via* spillovers. But contrary to what is commonly assumed, I will argue that a lack of spillovers is not necessarily a bad thing in light of the stronger evidence on the significant roles played by within-firm technology transfer and capital accumulation.

On the supply side, the question of how inward FDI influences the development of human capital is much more difficult to answer. This link is, correctly, at the centre of this discussion, as not a lot is known about it. I will distinguish two different modes by which MNEs can facilitate investments in human capital. One involves short-term, firm-level activities by which individual firms interact with host country labour markets through on-the-job training, support for local educational institutions, and the like. The other involves long-term, country-level activities by which MNEs collectively contribute to an overall macro environment where fiscal policy can support and drive education policy. To the extent that MNEs contribute to a good macro environment in host countries — through raising worker productivity, providing a relatively stable source of foreign capital, paying host country taxes — they contribute to the ability of host countries to fund education. Even if at this point generalisations of successful firm-level educational

initiatives are hard to come by, as these efforts continue sight should not be lost of the country-level contributions.

The rest of this paper is organised as follows. Section II addresses the theory and empirical evidence on how MNEs affect the demand for skills in host countries. Section III turns to the supply-side issues. Section IV concludes the paper.

II. MULTINATIONALS AND THE DEMAND FOR SKILLED LABOUR

Theoretical Links

In what ways does the nationality of firm ownership influence the demand of firms for labour in developing countries? Note that if there were no such influence, then MNEs would merit no particular attention when thinking about skill upgrading. There is widespread agreement among researchers in many fields that a distinguishing feature of these firms is their possession of *knowledge assets* — patents, proprietary technology, trademarks, etc. — that can be deployed in affiliates outside the parent country. This knowledge intensity is important for understanding the nature of MNE labour demand in host countries.

From an industrial-organisation perspective, Dunning (1981) formalised a framework in which MNEs are firms possessing three particular sets of advantages, known together as “OLI”. First is the ownership advantage, i.e. the ownership of a firm-specific asset. Second is the location advantage, i.e. it must be more cost efficient for the firm to exploit that asset abroad than in just the home country. And third is the internalisation advantage, i.e. the firm must be better off using its asset itself rather than contracting with another firm.

In international trade, over the last two decades there has been substantial progress in modelling multinational firms in general equilibrium. This theoretical literature contains mostly uni-dimensional theories of multinationals, which focus on either *horizontal* or *vertical* FDI.

The vertical FDI view is that multinationals arise when firms want to take advantage of international factor price differences¹. These firms generally engage in two activities: headquarter services to develop and maintain the firm’s knowledge assets, and production of output. Headquarter services are intensive in physical and human capital, while production is intensive in manual labour. When factor prices differ across countries, firms become multinational by locating production in countries where manual-labour costs are relatively low and headquarters in countries where skilled-labour costs are relatively low.

Even though the production activities may be low-skill intensive relative to headquarter services, for host countries they likely will be skill intensive relative to their initial activity mix.

The horizontal FDI view is that multinationals arise because trade barriers make exporting costly². The formal setup is one in which firms have high fixed cost headquarters and one or more production plants. When trade costs are low, a firm

produces all output in domestic plants and serves foreign consumers through exports. When trade costs are high, a firm becomes multinational by building production plants both at home and abroad, each serving only local consumers. This type of FDI is called horizontal because the multinational has the same activities (here, production) in all countries.

One sign indicating that MNEs are knowledge-intensive firms is their intensity of research and development (R&D). In the aggregate, this is supported by evidence of an overlap between countries that perform much R&D and countries that headquarter many MNEs. It is commonly calculated that approximately 90 per cent of the world's R&D is performed in just five countries: the United States, the United Kingdom, France, Germany and Japan (Keller, 2001). These five countries are also among the largest source countries for world FDI flows. At the firm level, Slaughter (1998) reports that over the past 20 years the US parents of US-headquartered MNEs — only 2 727 firms in 1994 — have consistently performed over half of all US R&D.

Having established that MNEs tend to be very knowledge intensive firms, we can now elaborate on how this knowledge intensity can help raise host country demand for skills. At least three important channels can be identified.

One is technology transfer. The simple idea here is that MNE use of knowledge assets often entails the transfer of technology from parents to affiliates. Inward FDI, then, can mean new production technologies for the host country, which in turn can boost demand for more skilled labour within host country affiliates to the extent that the innovations are skill biased. This can occur whether the inward FDI is horizontal or vertical in nature. In either case, FDI expansion is likely to entail skill-biased innovations³.

A second demand channel is that these new technologies may also reach domestically owned firms in host countries. This may happen through market mediated arrangements such as patent licensing, in which domestic firms pay MNEs for the right to use their technologies. New technologies may also reach domestic firms thanks to “productivity spillovers” *via* non-market channels. Either way, the presence of inward FDI may stimulate domestically owned firms to demand more skilled labour.

Spillovers of knowledge from affiliates to domestic firms are an often-claimed benefit of inward FDI, so it is worth outlining possible spillover channels. The general idea that interaction among firms can generate spillovers dates back to at least Marshall (1920). Caves (1974, 1996) has had an early and ongoing interest in analysing this possibility of multinationals interacting with host country firms. Mansfield and Romeo (1980) present some early survey evidence — all consistent with multinational spillovers — in which US multinationals reported the frequency and pace at which their technology deployed in foreign affiliates reached host country competitors.

Theoretical work on the mechanics of spillovers ranges from general discussions, often leavened with anecdotes, to formal general-equilibrium models. Broadly speaking, spillovers are commonly hypothesised to fall along industry or regional lines. An example of multinational spillovers along industry lines is cited by Rodriguez-Clare (1996), where affiliates increase a host country's access to specialised varieties of intermediate inputs, the improved knowledge of which raises the TFP of domestic producers. Less formally, it is often hypothesised that domestic firms learn from affiliates in the same industry *via* a

range of informal contacts: e.g. trade shows; supplier/distributor discussions; exposure to affiliate products, marketing, and patents; technical support from affiliates; and reverse engineering. Depending on how narrowly or broadly industries are defined, if the key contacts are between suppliers and/or distributors, then spillovers may be classified as intra-industry or inter-industry⁴.

Other spillover mechanisms may operate along regional lines. One commonly proposed avenue (since at least Marshall, 1920) is *via* labour turnover. If at least some of the knowledge particular to foreign affiliates is embodied in their labour force, then as affiliate employees leave to work for domestic firms this knowledge may move as well. For example, Song *et al.* (2001) use US patent records to trace the movement of scientists between domestic and foreign firms (also see Motta *et al.*, 1999, and Moen, 2000). This knowledge need not be firm-specific (e.g. inventory control or management techniques). If inter-regional labour mobility within a country is low, then these spillovers are likely to be concentrated within regions where the affiliates operate rather than dispersed countrywide. More generally, regional labour market spillovers can be thought of as one important kind of agglomeration economy that can induce firms to locate near each other in space. Krugman (1991) offers some formal models of agglomeration issues⁵.

A third channel for boosting host country skilled labour demand, for both foreign and domestically owned firms alike, is capital investments. Implementing new technologies often entails making new capital investments (e.g. computers and office products). To the extent that capital and skills are complements in the factor demands of firms, skill upgrading may arise not only directly from new technologies but also indirectly from the capital investments induced by these new technologies.

Empirical Evidence on These Links

For the empirical evidence on how MNEs influence the mix of host country labour demand, consider in turn each of the three channels — within-MNE technology transfer, affiliate to local technology transfer, and capital investment.

An important implication of within-MNE technology transfer from parents to affiliates is that, relative to host country domestic firms, this transfer and/or its resultant boost in demand for skilled workers should lead affiliates to pay higher wages. This implication enjoys a lot of empirical support. Many studies — of both developed and developing countries — have found that establishments owned by multinational firms pay higher wages than domestically owned establishments, even when controlling for a wide range of observable worker and/or plant characteristics such as industry, region, and overall size⁶. To the extent that production technology is largely unobservable in these studies, the regularity of this “multinational wage premium” may stem from the superior technology and thus labour-demand mix of these firms⁷.

More direct evidence on the transfer of technology and resultant labour-demand mix for MNEs can be obtained from data on US-headquartered MNEs. Since the late 1970s, the Bureau of Economic Analysis (BEA) in the US Department of Commerce has collected data on both the domestic and foreign operations of these companies. One piece of evidence consistent with rising within-firm technology transfer is the rising share

of MNE-wide R&D performed by foreign affiliates. In 1982 foreign affiliates performed 6.4 per cent of worldwide R&D for these firms; by 1994 that share had nearly doubled, to 11.5 per cent. If one role of R&D is to facilitate technology transfer, then this rising R&D share suggests rising technology transfer.

As for the labour-demand mix, the BEA requires (in its census years) that foreign affiliates in manufacturing distinguish non-production from production employment. Following a number of studies in the trade and wages literature, one can define the former to be skilled and the latter to be unskilled⁸. Table II.1 reports the skill mix of affiliate employment in 1977 and again in 1994 (the most recent year for which these data are available) for the overall world and for a set of prominent developing countries.

**Table II.1. The Skill Mix of Employment
in Foreign Affiliates of US-Headquartered Multinationals**

Country	1977 P Emp	1977 NP Emp	1977 NP Share	1994 P Emp	1994 NP Emp	1994 NP Share
World	2 370.0	1 400.0	0.37	2 093.4	1 422.6	0.41
Brazil	179.5	116.7	0.39	133.9	91.4	0.41
India	19.3	14.9	0.44	8.2	7.6	0.48
Malaysia	19.0	6.7	0.26	67.3	42.9	0.39
Mexico	103.1	68.1	0.40	284.2	131.0	0.32
Philippines	44.7	16.4	0.27	29.1	23.1	0.44
Singapore	27.4	5.1	0.15	44.5	24.6	0.36
Chinese Taipei	45.3	13.0	0.22	22.3	15.7	0.41

Notes: "P Emp" indicates production worker employment, in thousands. "NP Emp" indicates non-production worker employment, in thousands. "NP Share" indicates the share of total employment accounted for by non-production workers.

Source: All data come from the Bureau of Economic Analysis.

The key message of Table II.1 is a widespread shift in the skill mix of affiliate employment. In 1977, manufacturing affiliates of US MNEs employed 2.37 million production workers worldwide. By 1994 this number had fallen to just 2.09 million. Over that same period, non-production employment actually increased slightly, from 1.40 million to 1.42 million. This means that the skilled labour share of total manufacturing employment in affiliates has been rising, from 37.2 to 40.5 per cent. This rise is matched in all individual countries in Table II.1 except Mexico, regardless of whether the overall level of affiliate employment was rising or falling.

To put these share changes in context, during this same period in the United States the skilled labour share of employment across all manufacturing plants rose from 26.1 to 30 per cent. This was a period of widespread skill-biased technological change in US industries (Haskel and Slaughter, 2001), yet the share increase in the United States was only slightly larger than that in US affiliates. And this share increase in affiliates does not simply reflect shifting relative size among industries of different but constant skill intensities. Slaughter (2000) reports that for the standard 32 BEA industry groups within overall manufacturing, 24 had rising skilled employment shares⁹.

The shift in relative employment in Table II.1 is strongly suggestive of technology transfer that stimulates demand for skilled workers. More generally, this rising employment within affiliates of skilled workers has been widely documented in many

countries — developed and developing — in recent decades (Berman *et al.*, 1998; Haskel and Slaughter, 2001; Berman and Machin, 2000). Such employment shifts in the face of flat or rising relative wages for skilled-workers is commonly cited as evidence consistent with skill-biased technological change.

Taken together, this evidence on affiliate wages, R&D, and skill-mix is consistent with the idea that foreign affiliates stimulate demand for skilled workers thanks to technology transfer from the parent firms. Let us hold for now the question of whether this technology somehow reaches other firms in host countries, and turn first to the issue of capital accumulation.

Many studies have documented how new technologies are often embodied in new capital goods (as opposed to simply changing production techniques for unchanging capital goods). The most prominent recent example of this is the recent surge in innovation in information and communication technology (ICT) products: desktop and laptop computers, fax machines, pagers, cell phones. In turn, there is also a large body of evidence (see the survey in Hamermesh, 1993) that capital investment stimulates the demand of firms for skilled workers.

Data on US MNEs are again consistent with this. From 1977 to 1994, the affiliate share of worldwide capital within these firms rose from about 19 to 23 per cent. In manufacturing, the affiliate capital share rose in 22 of the 32 primary BEA industries. The coincidence of affiliate capital deepening and shifting relative employment is consistent with capital-skill complementarity related to technology transfer. More generally, to the extent that FDI involves, by definition, host country capital accumulation by foreign-owned firms, it is not surprising that affiliate expansion should be a force raising demand for skilled workers.

What about the transfer of technology from affiliates to domestic firms in host countries? Existing evidence on whether there are productivity spillovers is of three types. First, there are case studies. Cases can offer rich description about episodes and exemplify general issues, but they do not always offer quantitative information and cannot be easily used to generalise.

Second, there are industry-level studies (Caves, 1974 and Blomstrom, 1986). Many have documented a positive correlation between FDI inflows and productivity. But the causal meaning of this industry-level correlation is unclear. It may be that inward FDI raises host country productivity *via* spillovers. It may also be that inward FDI raises host country productivity by forcing the exit of low-productivity domestic plants, or simply by raising the market share of foreign firms which are, on average, more productive. Or it may be that multinationals tend to concentrate in high-productivity industries. This latter interpretation is consistent with the knowledge-capital models of multinational firms outlined above.

The third set of studies are micro-level analyses. These studies examine whether the productivity of domestic plants (or firms) is correlated with FDI presence in the industry and/or region of the domestic plants. These micro-level studies are the best suited approach for identifying productivity patterns consistent with spillovers that industry-level studies cannot identify.

For developing countries, however, there is very little micro evidence supporting knowledge spillovers. Haddad and Harrison (1993) find increased industry-level FDI is correlated with lower, not higher, domestic plant productivity in Moroccan manufacturing plants. Aitken and Harrison (1999) find the same negative result for Venezuelan manufacturing. For developed countries the results are more mixed. Chung *et al.* (1998) report no evidence that Japanese automobile firms operating in the United States boosted the productivity of their American component-supplier firms *via* technology spillovers. Haskel *et al.* (2002) report some of the strongest micro-level evidence of FDI spillovers. For a panel of plants covering the entire UK manufacturing sector from 1973 through 1992, they estimate a significantly positive correlation between a domestic plant's TFP and the foreign-affiliate share of activity in that plant's industry.

Why is the evidence on FDI spillovers so mixed? One possible explanation is the pro-competitive effects of affiliate operations. It may be that foreign entrants take market shares of domestic firms as they stimulate product market competition, and thereby force domestic incumbents up their average cost curves. This argument is consistent with Baily and Solow (2001), who survey a wide range of micro evidence indicating that international competition of many forms — including both FDI and trade — tends to spur competitive responses in exposed firms. An alternative explanation is simply that domestic firms in developing countries do not have sufficient absorptive capacity to realise knowledge transfers from affiliates.

Summary of Empirical Evidence and Policy Implications

Consistent with standard models of MNEs, there is compelling evidence that affiliate demand for skilled labour is stimulated by their receipts of parent technology and their investments in physical capital. Purely through a compositional shift, then, more inward FDI can raise host country demand for skilled workers. The evidence is mixed, however, for determining whether affiliates also stimulate this host country demand *via* technology transfer to domestic competitors.

The ambiguous evidence, at best, on knowledge spillovers from foreign to domestic firms may strike some as unfortunate. Such spillovers are an often touted benefit of inward FDI. It is important to emphasise, however, that externalities of this kind are, by definition, market failures. In theory, if profit maximising MNEs are aware of their ability to generate spillovers, then their operational decisions may be endogenous to this possibility and thus may try to minimise spillover benefits to local competitors.

The survey evidence on MNE expansion strategies in Mansfield and Romeo (1980) supports this minimisation argument. For example, US MNEs report they transfer only older technologies to affiliates that are joint ventures — and where knowledge spillovers are more likely — a precaution that does not seem necessary for affiliates they wholly own.

The analysis of Shaver and Flyer (2000) is also consistent with this observation. They argue that when firms vary in their inherent technological abilities and other measures of firm performance, then these firms differ in the net benefits they realise from agglomerating near each other. "Best practice" firms have the least to gain and the most to lose from clustering: few other firms can offer them new ideas, yet their good ideas

can benefit a large number of other firms. Thus, with heterogeneous firms agglomeration may be characterised by adverse selection, where the firms with the most to offer by clustering have the least incentive to do so. Their analysis of location choices of greenfield investments into the United States supports this idea: better-practice foreign plants, proxied by measures such as size, were less likely to locate near domestic firms.

An important policy implication of this endogeneity of knowledge spillovers is that host country policies that aim to encourage knowledge transfer can have the paradoxical effect of aggravating rather than solving the underlying market failure — and thereby of reducing, not enhancing, the host country benefits of foreign presence.

The recent work by Moran (2001) makes precisely this point. He carefully examines two industries with extensive global activity in FDI, automobiles and computers/electronics. For each industry he distinguishes two types of host countries. One is those that allow parents to maintain tight control over affiliate operations and thereby allow affiliates to be integrated into MNE-wide production networks as the firms see best. The other is countries that impose relatively stringent and/or widespread performance standards on affiliates — e.g. ownership caps, domestic-content requirements, and various technology-sharing mandates. Moran's (p. 32) description of the latter group presents a striking set of performance differences between the two types of policy regimes.

“The implications for the development prospects of the host are not favourable. Resources are wasted. Not only are host country consumers penalised, but so too are host country producers that rely on the use of the resulting goods and services to establish their own competitive positions in the marketplace ... the plants utilise older technology, and suffer lags in the introduction of newer processes and products in comparison to wholly owned subsidiaries without such requirements. At considerable variance with the dynamic infant industry perspective, the plants are locked systematically into a position well behind the cutting edge of the industry”.

Put differently, there is compelling evidence that inward FDI brings new technology and capital investment to host countries within the boundaries of affiliate operations. The evidence that this technology spills over to domestic firms is much more mixed. But one should not automatically assume that more of the latter would be better, because in general equilibrium it may come at the cost of less of the former. Policy makers need to keep this in mind. If policy makers care only about raising aggregate productivity, then they should be indifferent about the nationality of ownership of their more productive firms.

Let me offer two examples of this point. First is a country, Ireland. Ireland enjoyed a booming economy throughout most of the 1990s, driven in large part by a surge in inward FDI — and thus in technologies and capital investment — that was concentrated in high-technology sectors like computers and pharmaceuticals. Today, foreign affiliates of US firms account for about 16 per cent of Irish GDP. Does it matter for Ireland whether its surge in output related to strong technology and investment gains has been largely or even entirely within the boundaries of foreign affiliates operating there? By extension, does it matter for any other country?

My second example is an industry, ICT products. In recent years ICT industries have been central to the aggregate economic performance of the United States and other countries. For the United States, about two-thirds of the acceleration since 1995 in labour-productivity growth is accounted for by the combination of the production and the use of ICT products (Slaughter, 2001). Prominent ICT-producing firms such as Microsoft and Intel are widely regarded as worldwide best-practice firms, and policy makers worldwide profess their intention to host a rising share of worldwide ICT activity.

It is instructive to note the large and rising role for MNEs in these ICT sectors. Table II.2 offers some evidence on this. For two key ICT industries, industrial machinery and electronic goods, it reports the share of total US sales accounted for by the sales of goods of US parents of MNEs whose main line of business is in those industries. Shares are reported for 1982, 1989, and 1996; similar shares for overall manufacturing outside these ICT industries are also reported¹⁰.

Table II.2. The Share of US Sales in ICT Industries
Accounted for by the US Parents of US-Headquartered Multinationals

Industry	1982	1989	1996
Machinery	54.8	58.6	62.2
Electronics	73.2	66.6	77.6
Other Manufacturing	45.0	49.1	49.3

Notes: Cell entries report the share (in percentage terms) of each industry's US sales accounted for by the sale of goods of US parents of US-headquartered multinationals whose main line of business is that relevant industry. Other manufacturing is all manufacturing less machinery and electronics.

Over the 1980s and into the 1990s, US parents of MNEs account for over 60 per cent of total US sales in these two prominent ICT industries. Moreover, the importance of these industries has generally been rising over time. In machinery this sales share rose from 54.8 per cent in 1982 to 62.2 per cent in 1996. In electronics this sales share actually declined over the 1980s, but surged in the 1990s from 66.6 to 77.6 per cent. This prominent presence for US parents in these industries is far larger than their presence in the rest of manufacturing. The parent sales share for other manufacturing rose from 45 per cent in 1982 to 49.3 per cent in 1996. And during the 1990s this share was virtually unchanged in the rest of manufacturing, while it was rising substantially in the two ICT industries.

All this suggests that MNEs account for a sizeable share of total US ICT activity, a share which has been rising over time — particularly over the 1990s — and which appears larger than in most other industries. It is also of interest to know how prominently foreign affiliates appear in the worldwide activity of these firms. Do MNEs in ICT industries look more global than those in other industries in terms of affiliates representing a higher share of firm-wide activity?

Data answering this question are in Table II.3. It reports the share of worldwide firm value added and employment accounted for by majority-owned foreign affiliates. These shares are reported for 1982, 1989, and 1997 for machinery, electronic goods, and all industries together. Table II.3 shows that in 1997, foreign affiliates in these central ICT industries accounted for between 26 and 40 per cent of worldwide firm value added

and employment. These shares were generally rising by several percentage points over the 1980s and 1990s. They also were uniformly higher by 1997 than for the broad economy, where the increases were generally smaller.

Table II.3. The Share of Worldwide Activity of US-Headquartered Multinationals
Accounted for by Foreign Affiliates

Industry	Activity Measure	1982	1989	1997
Machinery	Value Added	28	39	38
Electronics		14	18	26
All Industries		22	23	25
Machinery	Employment	26	34	40
Electronics		23	26	33
All Industries		21	21	25

Notes: Cell entries report the share (in percentage terms) of worldwide activity of US-headquartered multinationals accounted for by foreign affiliates (where data are available for majority-owned affiliates only).

The global presence of these ICT industries involves not just high-income but many middle- and low-income countries as well. The McGraw Hill Companies *et al.* (2000) reports that in many central ICT industries, many low-income countries such as Mexico, Malaysia, Philippines, and South Korea are large exporters running net trade surpluses. This is consistent with global production networks in which these countries tend to import ICT intermediates, add value to these intermediates, and then export them on to other countries. There are also compelling studies of international production networks for very specific activities within ICT sectors — for example, McKendrick's coverage of hard-disk drive production (McKendrick *et al.*, 2000). A generation ago these disk drives were physically produced in the United States, but since then have migrated to lower-cost regions in various lower-income countries, primarily in Southeast Asia. Consistent with all this, Hanson *et al.* (2001) report that from 1982 through 1998, for affiliates of US multinationals the fastest growing industry-region combination was computers/office products in Southeast Asia.

It is also important to emphasise that for many producers of ICT products, foreign customers may be served much more effectively through foreign affiliates than through exports. This may be particularly true for ICT services, many of which require firms to interact on-site with customers. Affiliates of MNEs, then, can also figure prominently in terms of serving foreign markets.

Table II.4 demonstrates this predominance of foreign affiliate sales in US exports for the key ICT industries of computer services, data-processing and network services, and electronic information services. For these industries, this table reports both total foreign sales by majority-owned affiliates and total US exports in three years over the 1990s — 1992, 1994, and 1998¹¹. Affiliate sales were about eight times larger than exports in 1992, and by 1998 this gap had grown to nearly 20 times. This shows that for many ICT services, foreign affiliates have become an increasingly important channel for serving foreign markets.

Table II.4. The Relative Importance for ICT Services Industries of US Exports versus Sales by Foreign Affiliates of US-Headquartered Multinationals

Year	1992	1994	1998
US Exports	1 417	2 332	3 412
Affiliate Sales	11 545	25 859	65 056

Notes: Cell entries report the value of either total US exports or total affiliate sales, in billions of current dollars, for the ICT industries of computer services, data-processing and network services, and electronic-information services (where data cover majority-owned affiliates only).

So not only do the US parents of MNEs account for a high and rising share of US activity in central ICT industries (Table II.2), but within these firms in these industries a high and rising share of total activity (Table II.3) and total foreign-market sales (Table II.4) is accounted for by their foreign affiliates. Together, all this suggests that MNEs mediate an important share of total world ICT activity. Again, from the standpoint of policy makers interested in attracting ICT firms, does this matter? If these firms choose to minimise knowledge spillovers — a plausible assumption for such information intensive sectors — does that mean that host countries should not try to attract them?

III. MULTINATIONALS AND THE SUPPLY OF SKILLED LABOUR

On the supply side, the question of how inward FDI influences the development of human capital is much less clearly answered. This link is, correctly, at the centre of this discussion, as not a lot is known about it. I will distinguish two different modes by which MNEs can facilitate investments in human capital.

Multinationals and the Short-Term, Firm-Level Supply of Labour

MNEs can facilitate investments in skilled labour through the short-term, firm-level activities in which individual firms interact with host country labour markets, such as on-the-job training, support for local educational institutions, and the like. MNEs might directly affect labour supplies, as their transferred knowledge might boost the skills of their employees (and, with spillovers, the skills of local employees as well). They might also indirectly affect labour supplies, for example, by influencing the educational infrastructure of host countries in terms of curriculum choices and vocational training. For instance, Hanson (2000) reports that Intel recently chose to establish a large assembly and testing facility in Costa Rica, in part thanks to Costa Rica's agreement to expand high-school training in electronics and English.

There is recurring discussion of the "skills gaps" multinationals encounter in host country labour markets. Knowing how individual firms try to overcome these gaps may hold lessons for the educational initiatives of host country governments. While others may be more familiar with real world cases and can better discuss these approaches and policy lessons, I would like to offer two related points. First, in the training literature it is well documented that educational initiatives by firms tend to be for firm-specific skills, not general skills (Lynch, 1992). This focus on firm-specific skills is understandable in light of the inability of firms to capture the returns on investment in general skills. Second, I reiterate that the knowledge of MNEs is often of competitive value. Government initiatives to have this information flow beyond affiliates may have unintended consequences, as outlined in Section II. Taken together, these two points are not meant to say that individual MNEs cannot engage the institutions of host country labour markets to help build skills. But they do mean to say that the methods of MNE human capital development are often likely to be firm-specific rather than aimed at developing general human capital skills such as numeracy, literacy, and problem solving.

Multinationals and the Long-Term, National Supply of Labour

The other way MNEs can facilitate human capital development is through long-term, country-level activities that collectively contribute to the overall macro environment

in which fiscal policy can support education policy. To the extent that MNEs contribute to a good macro environment in host countries, they contribute to the ability of host countries to fund education.

First, MNEs foster skills acquisition economy-wide to the extent that their affiliate activities of technology transfer and capital investment boost demand and thus wages for skilled workers. These labour-demand drivers were discussed in Section II. If MNEs contribute to rising demand and wages for skilled workers economy-wide, then over the long run they contribute to the general-equilibrium incentive of individuals in host countries to acquire skills through education and/or training. If individuals in host countries have access to these methods of skills acquisition, then they should respond to the price signals coming from the labour market.

Second, the rise in economic activity from MNE affiliates means a rise in host country tax revenue (whether taxes are levied on labour, capital, or both). This broadening of host country tax bases can allow greater government investment in education and training. Of course, FDI output and the tax revenues this generates do not automatically imply greater investment in human capital. But FDI output and tax revenues therefrom do free up budget constraints and thereby make possible these greater investments. This broadly accords with the recent findings of Dollar and Kray (2000) who document for a large set of developing countries that overall economic growth tends to coexist with growth in incomes for these countries' poorest groups.

Third, FDI inflows can improve not just the level of host country economic activity but also reduce its volatility. Many developing countries rely on foreign capital to help fund domestic investment opportunities. Table III.5 (from the World Bank, 2000) reports the composition of net capital flows into developing countries over the 1990s. One prominent fact is the declining relevance of official aid flows, whose share of the total fell from nearly 60 per cent in 1990 to under 20 per cent in 1999. A second prominent fact is that within private flows, FDI has grown in both absolute and relative importance. By 1999 FDI accounted for about two-thirds of total capital inflows and nearly 80 per cent of private inflows into developing countries.

**Table III.5. The Relative Importance of FDI
in Net Capital Inflows in Developing Countries**

Year	1990	1995	1997	1999
Total	98.5	257.2	343.7	290.7
Official	55.9	53.9	39.9	52.0
Private	42.6	203.3	303.9	238.7
FDI	24.1	105.0	170.3	192.0
Equity	2.8	36.1	30.2	27.6
Debt	15.7	62.2	103.4	19.1

Notes: Cell entries report the value of various kinds of developing-country net capital inflows, in billions of US dollars.
Source: These data come from World Bank (2000).

A notable feature of FDI relative to other forms of capital flows is its low volatility. For most of the world's developing countries over the 1990s, year-on-year variation in FDI flows has been much lower than in equity and debt flows. Table II.5 shows this to be the case during the second-half of the 1990s with the run up and subsequent crash down of debt financing and, to a lesser extent, equity flows. In contrast, FDI flows grew steadily over the decade. This pattern in Table II.5 has been documented in many studies. For example, the World Bank (1999) reports that for a sample of 21 developing countries from 1978 through 1997, FDI inflows were less volatile (in terms of sample coefficient of variation, as a share of GDP) than non-FDI capital inflows. Similar evidence can be found in Reisen and Soto (2001).

All this means that over time, for many countries a rising share of their total international capital inflows has been made up of relatively stable FDI. From the standpoint of macroeconomic policy, stable capital inflows are much easier to manage. Accordingly, these FDI inflows help foster macroeconomic stability in which educational investments can better flourish. Again, macro stability — like tax revenue growth — may not be a sufficient condition for FDI to stimulate human capital development, but it may, again, be a necessary condition.

A fourth issue is that FDI inflows can inhibit “brain drain”. In many developing countries an ongoing policy concern is the loss of highly educated natives to employment opportunities abroad (either as these people get education locally and then emigrate or as they get education abroad and then do not return home). To the extent that FDI inflows bring those attractive employment opportunities to host countries, they can inhibit brain drain.

Again, consider the example of Ireland. The 1990s boom, due in large part to the inward FDI surge, is widely perceived as having boosted demand for skilled Irish workers — with a resulting surge in labour supply driven largely by reverse migration of young Irish back into the country from locations like England and the United States. Over the 1990s the Irish labour force rose by about 60 per cent, with a commensurate rise in the population from 2.8 million in 1961 to 3.8 million today (Brumley, 2001). For several decades before the 1990s, annual net emigration out of Ireland was about 35 000 per year. During the 1990s this reversed to net immigration of about 45 000 per year, of which the majority were Irish returnees. Of course, the Irish experience may be somewhat unique and not representative of developing countries, but it exemplifies well the general idea of the interaction between inward FDI and reverse migration.

Summary of Multinationals and Labour Supply

Even if at this point generalisations of successful firm-level educational initiatives are hard to come by, as these efforts continue sight should not be lost of the country-level contributions that MNEs can make to human capital development in developing countries. This is particularly true for policy aimed at longer time horizons. High MNE wages as an important labour market signal, higher and more stable macroeconomic growth and tax revenue, and reduced emigration incentives: through all these channels MNE affiliates can stimulate long-term skills acquisition in host countries.

IV. CONCLUSIONS

This paper has discussed how multinational firms affect both the demand for and supply of skills in host country labour markets. On the demand side, as multinational affiliates utilise firm-specific knowledge assets and invest in physical capital they raise demand for skilled workers. All this may also occur in domestic firms in host countries if these knowledge assets are somehow transferred, but evidence on this — particularly for externality spillovers — is rather mixed. On the supply side, multinationals can raise the supply of skilled workers both at the micro-level of individual affiliates training workers in-house and *via* interactions with host country education and training institutions. They can also do this at the macro-level through channels such as helping to raise and stabilise output and affecting migration decisions.

Two areas in particular on this interaction between multinationals and skill upgrading may merit closer research. On the demand side, understanding how these firms control the within-firm and cross-firm flows of information may be important for understanding how broadly these knowledge assets spread within host countries. At this point, there simply is not a large, systematic body of evidence on knowledge flows into FDI host countries. This is in part because data requirements for distinguishing alternative stories identifying and analysing these different flows are high: micro-level data on plants, firms, and individuals are really needed. How much can be learned about these issues will largely depend on which countries will be able to provide the necessary data to permit that learning. On the supply side, an ongoing issue is obtaining a clearer understanding of effective micro-level policies for fostering private-public skills building.

NOTES

1. See Helpman (1984) and Helpman and Krugman (1985). This view is also related to models of foreign outsourcing, in which the vertical separation of production occurs *without* multinationals.
2. See Markusen (1984), Horstmann and Markusen (1987, 1992) and Markusen and Venables (1998, 2000). Trade models of this variety are similar to older theories of tariff-jumping FDI. See Caves (1996) for a discussion. There have been some attempts to integrate models of horizontal and vertical FDI into a single framework. See, for example, Markusen (2001).
3. In general-equilibrium trade models with multiple sectors, the “sector bias” of technological change — i.e. what industries these innovations are occurring in — can matter for economy-wide labour demand changes above and beyond any factor bias to these innovations. See Haskel and Slaughter (2001).
4. For example, suppose that knowledge spills over from automobile producers (which fall within US Standard Industry Code (SIC) 3711) to automobile-parts suppliers (which fall within US SIC 3712). Then at the four-digit SIC level spillovers would be inter-industry, but at the two- or three-digit level they would be intra-industry.
5. Spillovers *via* labour turnover might hinge on the mobility of administrative workers — e.g. managers with knowledge of organisational techniques. But it might hinge on the mobility of production workers as well — e.g. assemblers with knowledge of production-line efficiencies.
6. For example, Howenstine and Zeile (1994) and Doms and Jensen (1998) document these wage differentials among US manufacturing plants. Gliberman *et al.* (1994) present similar evidence for Canada; Aitken *et al.* (1996) for Mexico and Venezuela; and Te Velde and Morrissey (2001) for five African countries.
7. Budd *et al.* (2001) argue that if MNEs are, on average, more profitable than domestic firms, then international rent sharing within MNEs could explain this wage premium. For a panel of MNEs in Europe over the 1990s, they estimate a robust correlation between affiliate wages and parent profitability, consistent with this profit-sharing assumption.
8. Berman, *et al.* (1994) document for the United States that employment trends for this job classification measure track quite closely employment trends measured by the white-collar/blue-collar job classification — which in turn closely reflects the college/high-school classification.
9. Also notable is the fact that many developing countries had non-production employment shares below the share for the overall world. This broadly suggests that MNE employment demands respond to cross-country differences in factor prices.
10. Within the widely used Standard Industrial Classification (SIC), many studies term ICT sectors part or all of electrical and non-electrical machinery (SIC 36 and 35, respectively). These industries contain much of the ICT hardware such as computers and office products (SIC 357) and semiconductors (SIC 3674). Other ICT sectors include telecommunication services (SIC 48) and information services (SIC 737). Sales data for these industries in the overall United States come from the National Bureau of Economic Research (2001). Sales data for the US parents of American companies with global operations come from the BEA. What is reported for these parents is their sales of goods only, not of goods and services. This is to maximise comparability with the US industry-wide sales data. That said, one potential limitation of these parent data is they classify all of a parent’s sales of goods into the single industry in which that parent is classified. To the extent that some parents span multiple lines of

business, and thus sell goods across multiple industries, these data may be noisy. For a smaller number of years sales data are also classified by industry of sales, rather than by industry of parent. Sales data across these two methods are very close to each other. In fact, for ICT industries parent sales by industry of sales are slightly larger than parent sales of goods by industry of parent, so this alternative sales measure would make US parents look even more prominent than they already do in Table II.2.

11. The ICT service industries in this table together constitute SIC industry 737.

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