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FOREIGN DIRECT INVESTMENT AND INTELLECTUAL CAPITAL FORMATION IN SOUTHEAST ASIA

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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

Ce Document technique examine dans le cas de l'Asie du Sud-Est le rôle joué par les firmes multinationales dans le transfert des connaissances et la formation du capital humain dans les pays récepteurs d'IDE. L'auteur étudie notamment l'évolution de la nature des IDE dans la région et la diversité des environnements dans lesquels s'installent. Ces travaux montrent que les multinationales investissent dans les régions disposant déjà d'un stock de compétences, qu'elles renforcent ces dernières et génèrent un "effet de retombée" au-delà de leurs propres activités, effet qui dépend de l'environnement national. L'auteur suggère que l'Etat crée des partenariats avec les multinationales et coordonne les interactions entre les acteurs économiques afin de maximiser la formation de capital humain dans l'économie tout entière.

SUMMARY

This paper takes the case of Southeast Asia to examine the role played by multinational corporations (MNCs) in the transfer of knowledge and formation of human capital in FDI host nations. It explores the changing nature of FDI within the region and the diversity of environments in which FDI operates. The author finds that there is evidence to support the idea that MNCs not only locate to regions where there is already a stock of skills, but that they enhance these skills and cause a "spillover effect" outside their own operations, depending on the domestic policy environment. The paper concludes that the state must form a partnership with MNCs and co-ordinate interaction between economic actors in order to maximise human capital formation in the economy as a whole.

I. INTRODUCTION[1]

There is little argument that foreign direct investment (FDI), primarily in the form of multinational corporations (MNCs), has played an important if not leading role in the economic growth of Southeast Asia. Less clear, however, is the impact FDI has had on the formation of human capital — especially the knowledge and skills found in the workforce of the local economy.

The relationship between FDI and human capital formation is complex and multidimensional, and for these reasons opaque. From a cross-sectional perspective several important facets exist, all of which are interrelated. The first is the relationship between skills and investment. Are skills necessary to attract MNCs or do MNCs increase the demand for knowledge and skills *after* setting up operations? The second dimension is the nature and extent of MNC involvement in the formation of human capital, and whether this capital, if formed, is transferred from foreign firms to local enterprises. Critical issues here include the levels and types of training and technology within MNCs as well as the absorptive capacity of local firms. The third dimension is the nexus between the national public sector education and training regime and MNCs. In particular, what are the aims of the education and training system? Is the system used to support developmental strategy or other ends? Where supportive, do states design policies to create skills that can then be used to attract FDI or to leverage FDI once it exists, or both? And perhaps most importantly, to what extent does the education and training system encourage the participation of private firms in the formation of human capital[2]?

Answering these questions is complicated by the fact that domestic and international factors have changed the way industrialising countries utilise FDI in their development strategies, especially over the last 30 years or so. For example, although many of the countries in Southeast Asia continue to maintain vestiges of import substitution industrialisation strategies, the core development strategy is now export-led industrialisation, as in the countries of Northeast Asia. But whereas in Japan, Korea and Taiwan the government nurtured local firms into internationally competitive exporters, in Southeast Asia governments have overwhelmingly relied on foreign MNCs to drive export-led industrialisation. Nevertheless, relying on FDI as a driver of industrial upgrading has not reduced the institutional requirements for development. In fact, this more “globalist” approach is at least as institutionally intensive as earlier “nationalist” development strategies, if not more so (Doner and Ritchie, forthcoming).

This observation animates the purpose of this paper, which is to begin to understand how policies and institutions influence the way Southeast Asian countries leverage (or fail to leverage) MNCs for a particular but central component of industrial

upgrading: human capital development. Forming knowledge and skills is a complex process characterised by lumpy investments, specific assets, potentially far-reaching externalities and spillovers, and long gestation periods. The inevitable result is myriad collective dilemmas that, if unresolved, hamper the formation of intellectual capital (Ritchie, 2001*a*). The extent to which countries can successfully address these issues depends on their national system of human capital development — the policies, institutions, organisations, processes, and actors involved in developing knowledge and skills in the local labour force.

I restrict my analysis to Southeast Asia for several reasons. First, it is widely held that Asian economies have leveraged FDI for economic growth more effectively than other regions of the world (see, inter alia, Zhang, 2001). Thus, there may be significant policy lessons that can be learned from the "East Asian" developmental experience and applied to other countries. In many respects, however, this "Asian" perspective is overly coarse. In reality, Asia is not a large homogeneous bloc wherein FDI has been used equally effectively, or even similarly. Rather, significant political and economic differences exist among the countries and sub-regions of Asia[3]. Therefore, understanding the variation within these sub-regions may do more to clarify the relationship between FDI and economic development than prior, more regionally based, comparisons. And finally, although FDI has been important in the development of other regions, it has played a disproportionately important role in the development of Southeast Asia.

The remainder of the paper will be as follows. I begin in Section II by briefly exploring the changing role of FDI in the development strategies of Southeast Asian countries over time. Using the general analysis in Section II as a foundation, I examine in Section III both the theoretical and empirical relationships between FDI (in particular MNCs) and intellectual capital formation and dissemination. In this section I examine the direction of causation between skills and investment, the extent and focus of training provided by MNCs, and the degree to which knowledge and skills spillover from MNCs to local firms. Following, in Section IV, I compare the human capital development systems of Southeast Asian countries and the capacity of each to incorporate MNCs into the greater public effort to create world-class intellectual capital. Particularly important, I contend, are the linkages that connect public and private as well as local and foreign actors within the national human capital development system. Finally, I conclude with some tentative theoretical and policy conclusions.

II. THE CHANGING ROLE OF FDI IN SOUTHEAST ASIA

The impact of FDI on human capital development in Southeast Asia can only be understood with some historical perspective. While an extensive longitudinal analysis of timing, technological orientation, and industrial focus is well beyond the scope and purposes of this paper, a brief review of changing global conditions and their impact on policies and institutions is necessary to provide context and foundation for further analysis.

To begin with, Southeast Asian countries have generally been more open to FDI than the countries of Northeast Asia, although levels of openness have certainly fluctuated over time and across space. Prior to World War II, much of the difference between the two regions could be traced to the influence of Western colonialism. Motivated by a combination of rich natural resource endowments and new markets, colonial governments emphasised resource extraction, local market penetration, and liberalised trade. In this environment it should be no surprise that MNCs began manufacturing operations in Southeast Asia soon after the turn of the century[4]. By and large these foreign-owned firms either produced for local or regional markets, or exported raw materials and raw material-based products back to the home market (Sieh and Yew, 1997). In contrast, Japan, which controlled Korea and Taiwan, pursued a "technonationalist" development strategy in which the state nurtured infant industry by restricting internal and external competition, allocated capital to targeted industries, and facilitated the transfer, absorption, and assimilation of foreign technology (Johnson, 1982; Samuels, 1994; Westphal *et al*., 1984)[5].

In the two decades following World War II, however, the dramatic egress of newly independent nations in Southeast Asia altered the trade and investment regime in the region. With independence, most countries adopted a more nationalist approach to FDI and MNCs[6]. Although in the aggregate FDI rose steadily until the 1970s, the rise was marked by fairly dramatic swings in each country[7]. Nor was investment policy similar across countries. In Indonesia, for example, FDI was encouraged in the natural resource sectors, especially oil, but constrained in most other sectors, notably agriculture and manufacturing (Saad, 1995)[8]. In the Philippines, FDI was encouraged in both natural resource and import substitution industries. Nevertheless, political upheaval in the Philippines during the 1970s caused a marked downturn in FDI. At the same time FDI was growing rapidly in Malaysia and Singapore, which had both precociously begun encouraging export-oriented FDI[9]. In comparison, Thailand was somewhat different in that it had never been colonised and so put more emphasis than the other countries on developing local capital[10]. Even so, by the early 1950s Thailand had begun to court earnestly foreign investment to both correct balance of trade problems and kick-start the sagging industrial sector by addressing the investment-savings gap (OECD, 1999*a*)[11].

By the late 1970s and early 1980s, however, at least three changes in the global economy — two of them gradual and one discontinuous — resulted in a tremendous surge of FDI throughout Southeast Asia, and indeed throughout the developing world more generally (see Table II.1)[12]. First, substantial technological progress, especially in transportation and communication technologies, made international economics more cost effective than in the past (UNCTAD, 1997). Changing technology spawns new and more efficient ways of organising business processes, makes possible extended production networks, increases outsourcing, and hastens innovation and product cycles. These technologically driven changes are applying competitive pressure on firms to expand into other countries in search of "location-specific assets". While these assets include natural resources, cheap labour, local markets, and physical plant and assets, intellectual capital is becoming the most important (Dunning, 1998)[13].

Table II.1. **Foreign Direct Investment, net**
(BoP, current $ million)

	1975-79	1980-84	1985-89	1990-94	1995-99
Japan	-6 650	-20 089	-122 447	-124 576	-99 883
China		2 053	9 081	68 168	191 684
Korea	225	-51	-132	-3 407	75
Malaysia	2 211	5 653	3 993	20 861	18 109
Thailand	371	1 412	3 412	8 561	18 593
Philippines	318	196	1 945	3 455	6 259
Indonesia		872	2 211	7 499	10 619
Singapore	1 501	6 404	10 509	15 297	12 260
India		208	1 186	2 441	13 139

Source: World Bank Development Indicators, 2001.

Second, there have been changes in the availability of different types of development capital. The global debt crisis of the early 1980s greatly reduced the amount of debt capital available to developing countries. Moreover, the crisis led to declining balance of payments, increasing unemployment, weak domestic demand, and diminishing foreign assistance, all of which made it harder for developing countries to secure the scarce debt financing that still existed. Concurrent with the decrease in the aggregate amount as well as access to debt capital, the potential supply of equity funds was increasing. By the mid-1980s developed countries, especially Japan, were experiencing strong balance of payments and increasing pressure to re-value their currencies upward. Japan responded by significantly re-valuing the yen at the Plaza Accords of 1985. A stronger yen simultaneously made production in Japan more expensive while lessening the costs of production overseas. Coincident currency devaluations in Southeast Asia made the potential for direct investment even more attractive (United Nations, 1998).

Finally, changes in ideology — not only in response to the exigencies of the capital market but also in longer-term economic thought — reduced the policy leeway of developing countries to implement nationalist development strategies while simultaneously pressuring them to implement liberal trade and investment regimes. From a short-term perspective, the debt crisis forced liberalisation through two channels. First, attracting FDI, especially MNCs, required both investment and trade liberalisation[14]. Although FDI already

existed in these countries to some extent before the debt crisis, developing countries tended to view FDI at least cautiously if not suspiciously; few governments were willing to pay the price of unfettered access, which they perceived as a complete sacrifice of local industry. In most cases liberalisation was contained within export processing zones (EPZs) and licensed manufacturing warehouses (LMWs)[15]. Within these zones foreign MNCs were provided 100 per cent foreign ownership, access to local capital, and tax incentives. However, in most cases the local government required that at least 80 per cent or more of the product be exported. Outside the export enclaves local markets are still tightly controlled and protected leading to a "dualistic economy"[16]. And second, sources for emergency bailout funds were limited primarily to international sources, such as the World Bank (WB) and International Monetary Fund (IMF). In both cases, conditions for receiving these "restructuring" funds included trade and financial liberalisation.

But in addition to these short-term pressures for liberalisation, ideological forces for long-term economic liberalisation have also increased. Bi- and multi-lateral world trade agreements reflecting the liberal ideologies of the first Washington consensus and the second Washington consensus, the consolidation of the General Agreement on Tariff and Trade (GATT) into the World Trade Organization (WTO), and the operations of the WB, and the IMF have acted to reduce barriers to trade and capital flows, resulting in a steady reduction in the aggregate worldwide level of formal tariff barriers (Evans, 1995).

Both short- and long-term pressures for liberalisation fundamentally altered the bargaining relationship between firms and states, thereby rendering nationalist development strategies more difficult to implement[17]. Accordingly, most of the capitalist countries of Southeast Asia adopted a developmental strategy wherein they solicit FDI to meet technology, capital, and employment needs, usually in the form of MNCs. Nor was this shift isolated to a few countries. Since 1980, and especially in the 1990s, trade and investment liberalisation has led to a "remarkable level of *de facto* convergence of government policy approaches towardss FDI among countries from all regions" (UNCTAD, 1994:286, quoted in Noorbakhsh *et al*., 2001:1593). Perhaps as significant, as FDI expanded, its form also changed fundamentally. Instead of joint ventures and minority partnerships, the bulk of FDI took the form of wholly owned subsidiaries of foreign MNCs. The convergence towards a "technoglobalist" development strategy, albeit varying by degree across countries, emphasises free trade and mobile capital, integrating local firms into productive niches within the global production networks of MNCs, and leveraging the technology assets of foreign firms[18].

Policy and institutional convergence is apparent in a number of areas. Virtually all of the capitalist (and even some of the communist) countries of Southeast Asia actively solicit FDI through aggressive tax and other financial incentives. Each has also addressed issues of political and macroeconomic stability, infrastructure, industrial relations, trade and financial liberalisation, and bi- and multi-lateral economic relationships with varying degrees of success. In addition, whereas early FDI was more likely to be targeted towards natural resource extraction or import substitution manufacturing, the bulk of recent FDI is targeted towards industries manufacturing for worldwide export. And lastly, although FDI in Southeast Asia is distributed across numerous industries, it is increasingly concentrated in electronics (see Table II.2).

Table II.2. **Electronics and FDI, 1996**

	Singapore	Indonesia	Malaysia	Thailand
Exports of Electronic Products ($ million)	34 262	1 665	14 768	6 387
Share of Finished Goods in Exports (%)	67.1	80.2	65.3	64.8
Imports of Parts as a Percentage of Exports of Finished Goods	32.7	26.7	38.5	60.1
Imports of Parts as a percentage of Total Exports	21.9	21.4	25.2	39.0

Source: (OECD, 1999*b*)

Yet, despite unprecedented policy and institutional convergence, outcomes continue to diverge dramatically. That is, the ability of countries to successfully leverage the technology assets of foreign MNCs to create local technological capacity varies greatly among countries. Of particular importance, leveraging foreign technology to create local technological capacity requires, at a minimum, expanding and deepening the knowledge and skills of a nation's work force[19]. Significantly, one of the few areas over which governments still retain broad control is their country's human capital development system.

So far, however, the relationship between human capital formation and FDI has been opaque and not well understood. Some suggest, for example, that the rapid economic growth in Asia was the result of MNCs utilising pre-existing stocks of intellectual capital as the basis for highly efficient manufacturing operations in the host country (Noorbakhsh *et al*., 2001). There has been much less said, however, about whether MNCs facilitate skills and knowledge formation as well as technological spillovers and externalities in the host country, and if so, how governments might facilitate these outcomes. As most "late, late" industrialising countries must implement development strategies while embedded within the global economy as opposed to protected from it, this question seems especially pertinent and will occupy the remainder of the paper.

III. MNCs AND HUMAN CAPITAL FORMATION

To this point I have discussed the changing nature of the international economy and the impact these changes have had on FDI flows, particularly in Southeast Asia. I stressed the changing development strategies and the range and type of policy tools available to states to pursue these strategies. As I noted, dramatic policy convergence with respect to FDI and globalist development strategies has not led to a similar convergence in outcomes. In particular, some of the countries of Southeast Asia have been able to leverage MNCs for human capital formation much more effectively than others. Clearly there are a number of potential explanations of this variation, e.g. trade orientation, share of FDI in overall domestic investment, rates of employment, training incentives, levels of trade unionism and organised labour, connective linkages between public and private actors, and so forth[20]. Nevertheless, the linchpin of any globalist development strategy is the capacity of the host country to leverage the technological capabilities of MNCs to develop local technical knowledge and skills. Taking appropriate account of the changing international context outlined above, in this section I evaluate the relationship between MNCs and skills formation in three areas. First, what is the causal relationship between skills and FDI? That is, do skills attract FDI or does FDI attract skills? Second, once located in a country, do MNCs train, and, if so, whom? And finally, to the extent that MNCs do train, do the skills they create transfer or disseminate to the local economy?

Do Skills Attract FDI or Does FDI Create Skills?

The simple answer to this first question seems to be “yes”. *Ceteris paribus*, MNCs are more likely to locate in areas that have pre-existing stocks of highly trained human capital. Noorbakhsh *et al*. (2001) find that levels of human capital, defined as accumulated years of secondary and tertiary education, are a significant determinant of FDI inflows (see also Wang, 1990). The importance of a well-educated and trained labour force as a determinant of FDI has been increasing over time. According to Florida (1997), the globalisation of innovation is driven by technical factors, especially access to scientific and technical human capital. Firms, then, are looking to utilise latent pools of technological capability wherever they exist in the world.

But beyond simply attracting FDI, some scholars argue that a minimum threshold of skills must be achieved in advance of MNCs setting up their operations if the host country is to ever successfully transfer, absorb, and disseminate foreign technology (Xu, 2000). Such a view bodes well for countries like Korea and Taiwan, which encouraged significant FDI only *after* developing a highly educated work force. But what about the countries of Southeast Asia in which there was a tremendous upswing in the number of

MNCs *before* the formation of a significant pool of intellectual capital? Are these countries then consigned to a low-skill equilibrium[21]?

The answer here seems to be no. Slaughter (2002) argues that the evidence is strong that MNCs increase demand for skilled workers, primarily through technology transfer from parent firms to overseas subsidiaries. Higher levels of technology within MNCs create demand for more highly skilled workers. This is consistent with the empirical evidence from Southeast Asia. First, literate, trainable, and unorganised labour with basic skills appear to have been sufficient to attract FDI, at least in low-end manufacturing[22]. Importantly, however, none of the countries of Southeast Asia created institutions for industrial upgrading and skills development *before* FDI came, but rather upgraded incrementally as domestic capabilities evolved to allow for sequential leveraging of prior and future investments. For example, McKendrick *et al*. (2000) show how hard disk drive companies initially located in Southeast Asia to take advantage of low-wage, unskilled, *but highly trainable* human resources. Over time, rising levels of process and product technologies increased the demand for higher skilled workers. Similar dynamics were also discernible across the region in optics, precision engineering (tool and die), automobiles, rubber, palm oil, and micro chips[23].

Demand by itself, however, is only one component of skills formation. Sources of supply to meet this new demand must be found. Although publicly provided education and training inevitably create the bulk of skills and knowledge in any labour force, the challenge of matching the skill sets in the supply of labour to the demands of industry is always great. But, as Tan and Batra (1995) note, when training is provided or sponsored by the private sector, matching supply with demand is much easier. Thus, whether MNCs train is an important determinant of whether appropriate skills and knowledge will be created in the local economy.

Do MNCs Train? And, if so, Whom?

That MNCs perform significant training is well documented (ILO, 1981; Lindsey, 1986; Ritchie, 2001*b*). But simply stating this does little to help us understand when firms train, who receives training, and the frequency and type (especially technological content) of that training. Fortunately, several fairly recent studies shed light on these questions for Southeast Asia as well as for developing nations in other regions.

First, when do firms train? The evidence suggests that the amount of training performed by MNCs appears to be much greater than training offered by local firms (Gerschenberg, 1987). Abdullah (1994) argues that MNCs in Malaysia have been much more proactive towards human capital and technological development than local firms. Tan and Batra (1995) come to a similar conclusion looking at training incidence in five developing countries, two of which (Indonesia and Malaysia) are in Southeast Asia. Sector-specific evidence across Southeast Asia, for example in the hard disk drive industry, supports this conclusion (McKendrick *et al*., 2000; Ritchie, 2001*b*). In addition to the importance of foreign ownership for training, several studies show that firms in Southeast Asia are more likely to train if they are large, involved in export manufacturing, utilise higher technology, and receive training remuneration, support, and incentives from the government (Tan, 2001; Tan and Batra, 1995; World Bank, 1997).

Since the economies of the capitalist countries of Southeast Asia are heavily weighted towards large, technology-intensive MNCs, one might conclude that the overall incidence of training would be quite high. But while MNCs do train more than local firms, overall training levels, even within the MNCs, remain sub-optimal throughout the region (Arnold *et al*., 2000; Ritchie, 2001*b*).

Second, who gets trained? Here, several studies that include evidence from Indonesia, Thailand, Singapore and Malaysia argue that workers who are higher skilled, more educated, younger, unionised, members of management, and higher paid will receive comparatively more training (Ritchie, 2001*b*; Tan and Batra, 1995; World Bank, 1997). Gender, however, does not seem to influence training decisions, at least not in Malaysia (Tan and Batra, 1995).

Lastly, what is the frequency and type of training conducted by MNCs in Southeast Asia? In all of the countries in the region, except perhaps in Singapore, manufacturing firms tend to underinvest in training. When coupled with weak public education and training systems, the result is an acute shortage of technically skilled workers. Pangestu (1997:219) reports that electronics firms in Indonesia feel that unskilled labour is available and highly trainable, but that it is virtually impossible to meet the needs of more high-tech ventures for engineers, scientists, and technicians. Firms report hiring expatriates and then resorting to local training to fill the gap. However, resource constraints and collective dilemmas make it virtually impossible for firms to create all of the skills they need. In the end, a lack of high-level technical skills conspires to keep MNC technology at a middling level at best, which simultaneously prescribes and proscribes the level of training Indonesian employees will receive.

Similar conditions exist in the Philippines, Thailand and Malaysia. In the Philippines, MNCs conduct in-house training, as well as send higher-end workers overseas to the parent facilities for training and education. At the same time, many firms bring in expatriate technical advisors to assist with operations and management through Filipino middle managers (Aquino and Bolanos, 1995).

In the data storage industry, for example, firms in Malaysia and Thailand provide significant formal technological training for the few high-level technicians and engineers in the company. The rank and file assemblers, on the other hand, receive training only on the processes and equipment necessary to do their jobs[24], which is often limited to operations, assembly, and testing (Salleh, 1995, p. 151). While this training is certainly not insignificant and does improve overall skill levels, it does little to provide the skills and knowledge needed to move beyond operation into higher skill activities, such as product development[25].

When MNCs Train, Do New Skills Spill Over Into the Local Economy?

Having established that MNCs do train, even if sub-optimally, to what extent do skills and knowledge developed within the MNC transfer to the local economy? Rasiah (1995) shows that in Malaysia up to 17.6 per cent of professionals and 10.9 per cent of technicians and supervisors in local firms had prior experience in MNCs. In many cases the entrepreneurs who founded these Malaysian technology firms also had their professional beginnings in foreign hi-tech MNCs. The same is true for many firms in

Thailand, the Philippines, Singapore and Indonesia. While tracing the entrepreneurial links between MNCs and local firms is beyond the scope of this paper, it is important to point out that entrepreneurship has its roots in firms rather than universities and schools. That entrepreneurship plays such a pivotal role in technological upgrading underscores the importance of firm involvement in processes of human capital development[26].

But if skills and knowledge do transfer, by what mechanism are they transferred? Much of the economic literature bearing on this question adopts an explicit neoclassical position, and can be summed up in the following quote: "it is difficult to prevent knowledge from being transferred to the local employees of the firm who work with and observe the technical and managerial techniques of the firm. After some initial learning period, the workers become capable of opening a rival firm, or of transferring their knowledge to new firms in related industries. This becomes a positive externality effect for the local economy arising from the presence of the multinational" (Markusen, 1991, p. 19). To the extent that the intellectual capital transferred from the MNC becomes part of the host country's human capital, the MNC has permanently changed the factor endowment in that country (*ibid*.:16).

"Black boxing" this spillover process (see Fosfuri *et al*., 2001), however, ignores many important causal considerations including levels of entrepreneurial talent, market size, market access, general business and management skills, skill specificity, breadth of production processes, levels of tacit knowledge, and effectiveness of government intervention. These factors have an impact not only on the rate at which skills transfer from MNCs into the local economy, but, equally important, on the type of skills transferred. For example, to the extent that skills are company or industry-specific, they are less valuable to the economy as a whole[27]. Or when MNC operations in foreign countries are only a cog in a network of production activities, the technologies to reproduce an entire production chain do not exist[28]. Finally, simply transferring codified embodiments of technology is not sufficient to ensure formation of the tacit knowledge necessary to appropriately apply the new technology[29].

Drawing on empirical evidence from the market economies of Southeast Asia supports a more complex understanding of MNCs and human capital formation and transfer. In many cases extensive MNC training has led to an increase in certain kinds of knowledge and skills, but it is often unclear whether these skills are appropriate to develop endogenous technological capacity, and this varies widely, even within countries.

Beginning with Indonesia, Saad (1995) argues that although MNCs have effectively transferred technology through imported equipment and machinery and through an inflow of managerial and production expertise, the question remains as to how effectively these skills and knowledge have been transferred to their Indonesian partners and employees. Since most technological transfer takes place through on-the-job training, the rate of transfer is slow. The chief problem has been low absorption capacity due to low education levels and an absence of significant R&D activities, both public and private, within the local economy. Maintaining an import substitution growth strategy that prefers capital- and technology-intensive industries to labour- and knowledge-intensive industries exacerbates the wide gap between foreign technology and local capabilities (*ibid.*:212). Thus, for example, the Indonesian electronics industry

continues to import a high proportion of its output, both for finished goods and intermediate inputs. In 1992 foreign consumer electronics firms in Indonesia reported importing 87 per cent of inputs and domestic firms 80 per cent. Higher technology MNCs assembling electronic components imported 94 per cent of inputs and the average MNC imported 66 per cent of its inputs from within intra-firm channels (Pangestu, 1997:215).

Malaysia, in comparison, has acquired significant operational and process skills and technology (Ariffin and Bell, 1999; Lall, 1999; Salleh, 1995). Salleh (1995:151) suggests that this "cumulated capability is evidenced by the reverse technology transfer of the production process expertise from several American-based firms to their parent or sister companies elsewhere". Yet Lall (1999) contends that the technological capacity of both MNCs and local firms is much lower than the industrial structure would suggest it should be. Part of the reason, according to Salleh, is that Malaysia has not acquired concomitant skills in product design and development. Instead, the bulk of technological development is limited to a narrow range of process and production technology. Beyond basic products and services, few local firms outside of Penang meet the quality requirements of the MNCs to become regular suppliers. The trend in many industries has been away from developing locally owned firms as suppliers and towards attracting existing supplier networks to relocate to the local economy[30]. In such cases MNCs account for needed inputs and final outputs, and indigenous firms do not participate in the production network at all or in very technologically insignificant ways[31].

Although Thailand has not reached Malaysia's overall level of technological sophistication, Wisarn and Bunluasak (1995) report that in their Thai study all local supplier firms gained a basic knowledge of product, quality control, and process technology from foreign MNCs. Even so, they note that these spillovers are most often confined to low-level manufacturing process skills (Wisarn and Bunluasak, 1995)[32]. Indicative of overall dismal levels of technological skills in Thailand, R&D currently performed by Thai businesses lags 10-15 years behind where Korea was during the 1980s when Korea was at a similar level of manufacturing and industrial development. To "catch up" to where Korea was in 1980, Thailand would have to increase business-level R&D by 20 times (Arnold *et al*., 2000).

The Philippines, by most measures, occupies a position somewhere between Thailand and Indonesia in terms of technological sophistication (McKendrick *et al*., 2000, p. 127). Ironically, this may be partially because the Philippines has a much higher number of Japanese MNCs, which are often seen as less open to skills or technology transfer, although government policy must shoulder its share of the blame.

In contrast, Singapore is the technological leader in the region. Although process and production technology make up a significant portion of the country's technological foundation, local entrepreneurship within technically sophisticated local firms is growing steadily[33]. As with Penang, I argue that government policies and incentives have played an important role in both human capital formation and transfer.

The evidence from these countries implies that although skills might transfer over time based on a neoclassical model, the much more important consideration is what type of skills are transferring. Simultaneously encouraging growing aggregate levels of industrially relevant skills and knowledge, fostering technological upgrading within MNCs, and facilitating the ease with which skills and knowledge transfer from MNCs to the local

economy is an institutionally demanding prospect. Thus, leveraging foreign MNCs to develop local technological capacity requires more, rather than less, statecraft and, as the evidence from Southeast Asia shows, both policy design and implementation matter. But, unlike the commonly envisioned dirigiste executive of the “developmental state”, I argue that the state must function as a facilitator of co-operative and linkage-based processes that connect the public with the private and the foreign with the local[34].

IV. GOVERNMENT POLICY AND MNC PARTICIPATION IN NATIONAL SYSTEMS OF HUMAN CAPITAL DEVELOPMENT

At this point it should be clear that MNCs operating in an increasingly liberal and technically complex global economy have contributed to expanding skills and knowledge formation in developing countries. Nevertheless, without strategic and targeted government policy intervention, it is unlikely that competitive pressures alone will result in an upgrading trajectory capable of intersecting the technological frontier. That is, to upgrade technologically requires that both skills *and* the technological sophistication of firms be raised simultaneously. Herein lies the real challenge: developing world-competitive industrial and technologically skilled human capital and providing sufficient incentives for firms, especially foreign MNCs, to help create them, use them, and upgrade them.

The problem is that even when firms train, they lack sufficient resources or incentives to provide for all of the education and training needs within a society. At the same time, even when governments are able to marshal the resources necessary to provide significant education and training, without input from the private sector, it is difficult if not impossible to match the supply of skills and knowledge with industry demand. Creating virtuous circles of human capital development thus requires the resources of the state and the co-operation, direction, and participation of both public and private actors. Since Singapore has been the most successful of the countries of Southeast Asia in creating these co-operative linkages, it has gone the furthest in creating a base of scientific and technical human capital (see Table IV.1). Even so, there exist pockets of excellence in other countries of the region, most notably Malaysia's state of Penang.

In this section, I examine each country's national human capital development system and the capacity of its institutional and policy structure to concurrently *i)* increase the general supply of technically trained human resources; *ii)* match supply and demand through active firm participation in the education and training system; and *iii)* encourage both MNCs and indigenous firms to upgrade technologically over time.

Table IV.1. **Science and Technology Indicators for Asia**

	Indonesia	Japan	Korea	Malaysia	Philippines	Singapore	Taiwan	Thailand
IMD world competitiveness ranking (2000)	45	17	28	25	39	2	22	33
Secondary school enrolment (% of total, 1995)	51.5	103.4	100.9	58.7	77.5	73.4	*	54.1
R&D exp. (% of GDP)	0.10 (1994)	2.96 (1995)	2.71 (1995)	0.22 (1996)	0.2 (1994)	1.13 (1995)		0.10 (1997)
S&T Human Resources (per million capita, 1995-98)	206	5 736	2511	280 (1998)	179	2 619 (1995)	2 980	159 (1995)
High- tech exp. (% of man exports)	20	38	39	67	56	71	*	43
Internet hosts per 10 000 capita	0.1212	21.47	6.51	2.04	0.2520	76.23	*	0.6826
Computers per 1 000 people (1995)	3.74	152.5	120.8	39.75	11.4	172.4	*	15.32
S&T students as % of total tertiary students	38.97	20.67	57.8	27	22.27	*	*	57.5[a]
Patents filed by residents (1997)	40	340 861	68 446	221	163	215	240	203

a) This figure includes a substantial number of students pursuing degrees in medicine.

Sources: *World Development Indicators*, World Bank, various years; Business International Indices of Corruption and Institutional Efficiency, measured from 1980-1983; Transparency International Corruption Perception Index, 1999; *National Science and Technology Databook*, Malaysian Science and Technology Information Centre, 1998; *National Survey of R&D in Singapore,* Singapore National Science and Technology Board, 1999; and *World Competitiveness Yearbook*, International Institute for Management Development (IMD), 2000.

The Orientation of the General Education and Training System[35]

Without a strong general education and training system, it is virtually impossible to leverage MNCs for skills formation beyond the immediate needs of the firm. Not only is there no general or standard level of skills in the work force on which to build, but there is also no system in which to incorporate the participation of private actors to supply public goods. Whether primarily public or private, there must be some overarching co-ordination and management knitting together the greater education and training system. But as much as the structure of the general education and training system influences levels of private actor participation and public-private co-operation, its focus determines, to a large extent, the type and orientation of the skills and knowledge that will be most prevalent in the local labour force[36].

For example, with Singapore's exit from Malaysia, the government reformed the education and training system to match the needs of industry, especially MNCs manufacturing for export. What had previously been a hodgepodge of vernacular and ethnic schools were merged into a single national education system, which the government designed to meet the needs of international business by selecting English as the medium of instruction, requiring 12 years of mandatory education, focusing the curriculum on technology, and explicitly tying vocational education, especially at the tertiary level, to specific industrial sectors and skill needs[37].

In comparison to Singapore, Malaysia overhauled its education system as a major component of its post-independence, social restructuring process. Instead of English, Malay was chosen as the national language of instruction. While not problematic in a more "technonationalist" development environment, language proved to be a significant barrier to co-ordinating human capital supply and demand for human capital between the largely foreign-owned manufacturing sector and the public education and training system. Second, instead of 12 years of mandatory education, the requirement was initially for only 6 years. Finally, with the exception of Penang, there was little effort to link vocational education to the needs of firms in the export enclaves.

Thailand's education and training policies in many ways resemble those of Malaysia, although often for different reasons. First, even though educational reform in Thailand was not driven by the exigencies of independence, political considerations have always been primary. While this is no longer the case today, in the recent past the country's best and brightest were groomed for the civil service as opposed to private industry. In addition, although Thailand was the first country in Southeast Asia — and the second country in all of Asia behind Japan — to implement compulsory education, it was compulsory for only six years until well into the final decade of the 20th century. Even today the requirement is for only 9 years, although the system will support those who want to remain in school for a full 12 years.

Like Malaysia, the Philippines restructured its education system as part of the transition from colonial subject to independent nation. But unlike Malaysia, the Philippines chose to adopt the US system, virtually part and parcel. At first glance, the evidence suggests that the system performs well, even matching Singapore in terms of

enrolment (see Tables IV.2 and IV.3), but the overall numbers of scientists, engineers, and high-level technicians are lower than in Malaysia and Thailand (see Table IV.1)[38].

Indonesia is the laggard among it peers. Although the number of technologically advanced firms has grown substantially since the mid-1980s, until recently little has been done to upgrade the education and training infrastructure. As Tables IV.2 and IV.3 show, Indonesia enrols only around 50 per cent of its secondary age children and 11 per cent receive a tertiary education. Added to these low enrolments, only a small fraction pursues technical courses of study.

In summary, economic and military vulnerability encouraged Singapore to reform education and training with a bias for technological, scientific, and industrial skills. Malaysia, Thailand, Indonesia, and the Philippines, on the other hand, could rely on rich natural resource endowments to generate foreign exchange, so acquiring technological skills was less pressing. Accordingly, each of these countries focused its education and training system primarily on political, as opposed to economic, objectives, albeit to varying degrees. These political objectives include maintaining national unity, independence, ethnic equality, and political power. As a consequence, there is a dearth of science and engineering skills and knowledge, making it difficult for these countries to fully support or leverage FDI for technological progress (Pang and Hill, 1992). Again, however, it is important to point out that there is wide variation both among and within these countries, as we will see in the sections below.

It is possible that many of these trends will reverse in the near future. The Asian financial crisis of the late 1990s, coupled with the current global economic slowdown, has increased the urgency of economic reform, and with it educational reform, in the countries of Southeast Asia. Slowing levels of FDI growth together with increased competition, especially from China, for that FDI, has put pressure on these countries to move up the ladder of technological sophistication. And yet, unfortunately, efforts for reform are often resisted or dismantled by powerful vested interests for the status quo. Even where reform succeeds, it often only addresses quantitative issues of supply while ignoring qualitative issues of the appropriateness of that supply.

Table IV.2. **Secondary Education Enrolment for Select Countries**

Country	1975	1980	1985	1990	1995
Brazil	26.3	33.5	35.4	38.4	
Chile	47.4	52.5	66.9	73.5	69.5
China	46.2	45.9	39.7	48.7	65.8
Indonesia	20	29	41.3	44	51.5
Japan	91.8	93.2	95.4	97.1	103.4
Korea	56.3	78.1	91.6	89.8	100.9
Mexico	35.5	48.6	56.5	53.3	61.2
Malaysia	45.7	47.7	52.9	56.3	58.7
Philippines	53.9	64.2	64.4	73.2	77.5
Singapore	51.9	59.9	62	68.1	73.4
Thailand	25.1	28.8	30.5	30.1	54.1

Source: World Bank Development Indicators, 2001.

Table IV.3. **Tertiary Education Enrolments for Select Countries**

Country	1975	1980	1985	1990	1995
Brazil	10.1	11.1		11.2	
Chile	14.8	12.3	15.6		28.2
China	0.6	1.7	2.9	3	5.3
Indonesia	2.3	3.8		9.2	11.3
Japan	26.3	30.5	27.8	29.6	
Korea	8.8	14.7	34	38.6	52
Mexico	10.2	14.3	15.9	14.5	15.3
Malaysia		4.1	5.9	7.3	11.7
Philippines	16.4	24.4	24.9	28.2	29
Singapore	8.4	7.8	13.6	18.6	33.7
Thailand	3.3	14.7	19		20.1

Source: World Bank Development Indicators, 2001.

Matching Skills and Knowledge with Firm-Level Demand

As I have just argued, a strong general education and training system focused on technological objectives is the first step to incorporating MNCs into the greater national human capital development system. Even so, to ensure that the supply of skills matches industry demand, the most important step governments can take is to incorporate the private sector into the education and training system as an active participant. Although governments can foster private-sector participation in several ways, in this section I focus on "pay for play" strategies, in which governments reimburse firms for the training they do. In particular, I concentrate on levy-grant training schemes[39].

As with policies to attract FDI in general, there is strong convergence across the region in the policies to leverage FDI for human capital formation. Each country has implemented tax subsidies for training and research and development (R&D) expenses. Likewise, various programmes exist to subsidise firms for sending their local employees to the firm's home operations for training; programmes also exist to bring experts from abroad into the country to provide on-site training[40]. Finally, in some cases, countries have implemented a skills development levy-grant fund where firms are required to contribute to a training fund. From these funds participating firms can draw money to be used for training. Despite the similarities among these policies, however, the implementation and outcomes vary widely.

By the mid-1970s Singapore had addressed its unemployment problems by attracting MNCs involved in low-skill, low-wage, and labour-intensive manufacturing. By 1979 the economy was experiencing labour shortages associated with full employment. In response, the government reoriented its focus for attracting FDI from low-skill and labour-intensive industries to high-skill, capital- and knowledge-intensive industries (Singapore Skills Development Fund, 1999*a*). Both to ensure that its labour force could support this transition and encourage firms to participate in the process, the government implemented the Skills Development Fund (SDF) in 1979.

Designed as a "tax" on low-wage labour, the scheme extracts 1 per cent (variously as high as 4 per cent) of all wages for workers who earn less than S$750 (now S$1 500) per month. These funds are then made available to any firm that will use them for

approved training, both in and out of house. Over the last two decades the programme has been tremendously successful. The latest report indicates that 100 per cent of firms with more than 10 employees and 33 per cent of firms with less than 10 employees utilised the fund to pay for training (Singapore Skills Development Fund, 1999*b*).

The success of the programme, I believe, lies in its tight internal linkages both within government and between public and private-sector actors. These linkages go beyond simple consultation to active participation. Perhaps one of the best examples of these linkages can be found in the organisation and operation of the SDF.

The primary responsibility of the SDF resides with the Productivity and Standards Board (PSB), a statutory board under the Ministry of Trade and Industry. However, the PSB does not implement the programme alone. First, the Economic Development Board (EDB) provides critical information on the skills demanded by industry; the Ministry of Manpower (MoM) develops corporate training centres that are built with resources from the SDF; the Ministry of Education (MoE) provides training facilities; and the National Trade Unions Congress (NTUC) provides information on, and organises labour's participation in, education and training. Even within the PSB various departments participate: with help from the Ministry of Finance one department disburses the training funds while another department, more closely tied to the EDB, decides where the funds should be spent. Thus, the group making the funding decisions is not the same group dispersing the funds and vice versa.

Private actors play an even more prominent role as the directors of the programme. The technical committee, the group responsible for the day-to-day functioning of the SDF, is comprised mostly of private business leaders, many of them from foreign MNCs. Even the chair of the committee is from a private firm[41].

In addition to industry, labour plays a pivotal role. Although labour often has little power over issues such as collective bargaining, the image of organised labour as ineffectual on other issues, especially those surrounding education and training, is less accurate[42]. In Singapore, the NTUC significantly shaped the direction and utilisation of the SDF. For example, after the fund had been in operation for only a few years, the government realised that firms were concentrating their training efforts on management and high-end employees. The NTUC went to the government and requested a new fund be established to meet the needs of lower to mid-level employees. In response, the government requested that organised labour develop a programme that would work within the existing framework. Accordingly, the NTUC created the Skills Redevelopment Program (SRP). The SRP enlisted funds from the SDF to pay for training, co-operation from the Ministry of Education to provide training facilities in the country's Institutes for Technical Education, assistance from the Ministry of Manpower for funds to reimburse businesses for time employees were off the job being trained, and participation from private firms to deal with temporary employees and understaffed shifts while employees were being trained. In the end, broad, crosscutting co-operation led to a tremendous surge in training for lower to mid-level employees.

As this evidence shows, these actors are not incorporated simply for the government to extract viewpoints before technocrats formulate and implement policies in isolation from the private sector. Instead private-sector actors are expected to take the lead in developing and implementing the policies. These dense interconnecting networks

of participants steer the fund towards market-led development objectives while concurrently creating a mechanism of checks and balances that makes it difficult to use the SDF inappropriately.

Like Singapore, Malaysia has implemented a levy-grant training scheme which, according to Tan (2001), promotes increased firm-level training, even after controlling for technological change. In addition, he finds that the programme has strongly impacted productivity growth.

Created in 1993, the Human Resource Development Fund (HRDF) began collecting a 1 per cent levy on total wages from firms with more than RM50 million in revenues. The funds are deposited into an account specifically for the contributing firm. When the firm conducts approved training, it can use these funds.

Despite the HRDF's successes, several problems remain. First, training is concentrated in mid to large-sized companies. Participation rates are minimal in smaller firms where the need for training is greatest. Second, even in the mid to large-sized companies, participation in the Malaysian fund is only just over 50 per cent[43]. One explanation for differences in participation rates compared to Singapore's SDF is simply time: Singapore's programme has been operating much longer than Malaysia's and is hence more mature. Even so, while time undoubtedly impacts outcomes, there are other differences that might also matter. One such difference is the amount and kind of participation by actors outside the government in the creation and operation of the HRDF. Unlike the SDF, the HRDF engages private business leaders in a consultative rather than participative role. Private actors are polled for their opinions and insight, but they are not directly involved in the actual formulation and implementation of policies. Also, the range of input is much narrower and does not include the same degree of input from foreign MNCs. And, while MNCs participate in the HRDF as required by law, the spillovers between MNCs and local firms are much less evident than in Singapore, with the exception of Penang.

Penang, though, is the exception that proves the rule. To both solicit and leverage foreign MNCs, the Penang government created the Penang Development Corporation (PDC) in 1969, which functions much like the EDB in Singapore. The PDC then created the Penang Skills Development Centre (PSDC) in co-operation with foreign MNCs. With co-ordinating help and incentives from the PDC, foreign MNCs provide financial support through membership in the PSDC, supply equipment and trainers, help design the curriculum, and utilise the centre extensively for their training needs. When the HRDF was introduced, a tightly co-ordinated training structure existed in which firms could effectively utilise their training HRDF funds. Close linkages between government, business and academia have produced a deep supply of technical skills closely matched to the needs of industry, both local and foreign (see Rasiah, 1995, pp. 159-162; Rasiah, 1999, p. 234; Ritchie, 2001*b*). Without the linkages forged by a co-ordinating body such as the PDC, similar initiatives in other states in Malaysia, such as the Selangor Human Resource Development Centre, have been less successful. Despite this regional variation, in the final analysis the HRDF as it now stands must be judged as a major policy and institutional achievement that has propelled the Malaysian education and training system far ahead of most of its neighbours' education and training systems.

Unlike Singapore and Malaysia, the other countries of the region have yet to implement a true skills development fund. Thailand implemented what it calls a Skills Development Fund, but without mandatory involvement of private firms the fund soon devolved into a rotating student loan programme[44]. Although recent initiatives have aimed to upgrade the programme into a true levy-grant system, they have foundered on the vested interests of a relatively strong private sector[45] opposed to forced levy-grant training schemes (Ritchie, 2001*b*). The result has been a disconnect between MNCs and the country's education and training system. In one glaring example, Thailand's largest technology company reported that not one of its employees had received technical training at the Ministry of Labour and Social Welfare's training institutes in the two years after these had been upgraded at a cost of $153 million[46].

Like Thailand, the Philippines and Indonesia have not implemented a levy-grant training system, nor have they developed the public-private linkages capable of supporting a PSDC. In the Philippines, the result has been a dearth of technical education and training in skills such as electronics and precision engineering, despite the existence of a relatively large and technically sophisticated electronics sector (Aquino and Bolanos, 1995). Since in Indonesia the electronics firms conduct even less sophisticated operations, it lags even further behind.

Technological Upgrading in Local and Foreign-Owned MNCs

The combination of a strong general education and training system and extensive participatory involvement of private actors within that system ensures an appropriate supply of and demand for skills and knowledge *that match current levels of technological capability in the local economy.* But how do countries upgrade their human capital over time and what is the role of MNCs in this perpetual process? Assuming that new technical knowledge and skills originate in MNCs, it is critical to first upgrade the level of technology within MNCs and then facilitate transfer of new technology to local firms. As levels of technological sophistication rise within firms, demand for more sophisticated knowledge and skills, *as well as the incentive to help create the needed knowledge and skills, also* rises (Tan and Batra, 1995), setting in motion a virtuous cycle of technological progress. The key question, then, is how do states encourage firms, especially MNCs, to upgrade technologically? There are at least three areas where government intervention has influenced firm-level technological upgrading in Southeast Asia. These are financial incentives, public research institutes, and supplier upgrading programmes.

Financial Incentives

Financial incentives have been used to influence technological upgrading in two main ways. First, whereas initial pioneer investment incentive policies in virtually all of the Southeast Asian capitalist economies rewarded employment and the size of the initial capital investment, in some countries both new and renewed incentives contain clauses for R&D or other technological upgrading. For example, as early as 1970 the Singapore government began to phase out incentives for labour-intensive industries and focused recruiting on more skill- and knowledge-intensive industries. In one prominent case, the Singapore government used a combination of tax and grant incentives to convince a

large hard disk drive company to select Singapore as one of its four worldwide R&D locations[47]. Similar pressures, driven mainly by conditions of full employment, have led to comparable efforts in Malaysia to tie investment incentives to increased levels of R&D, although with less success. In Thailand, the Philippines and Indonesia other considerations, particularly employment, still dominate decisions to award or renew financial incentives[48].

The second option is to use financial incentives to compensate firms directly for innovative behaviour. The most popular method used universally across the region is to offer tax exemptions for expenses associated with formal R&D. This is problematic, however, since defining R&D is often difficult and determining qualifying expenditures even more so. To address these problems, Thai firms, for example, have created separate R&D subsidiaries with separate books to isolate qualifying expenditures and make tax reimbursements easier. Even here, though, the process is anything but smooth[49].

Public Research Institutes

Like financial incentives, public research institutes have variously been able to foster firm-level innovation. Where public research institutes are well linked to government, academia and industry, their potential to spur technological upgrading is high indeed.

Singapore's system of public research institutes is perhaps archetypal. Thirteen different institutes, including advanced materials handling, electronics and biotechnology, have been created to link research initiatives in government, firms and academia together. The government provides initial funding for the institutes, which then solicit membership funding from private firms. Researchers in the institutes are either university faculty or employees of member companies. In addition to carrying out joint research projects, the institutes conduct training, provide research opportunities for university students, and co-ordinate the development initiatives for general research for the industry (Ritchie, 2001*a*). Of particular importance is the level of basic research performed in the institutes, which is then made available to member firms. Having access to this base of intellectual resources and knowledge both encourages firms to locate higher technological processes on the island and upgrade those that already exist.

Public research institutes also exist in Malaysia, Thailand, the Philippines and Indonesia, although linkages with private firms and academia are fewer and weaker. Thus, the institutes are less likely to play the co-ordinating role they do in Singapore. Instead, they often end up competing with private firms or simply resorting to political lobbying as a primary activity.

Local Supplier Upgrading

Finally, efforts to link indigenously owned supplier firms with foreign "mentor" multinational corporations can be an effective way of improving levels of technology, particularly in local firms. For example, the Singapore government implemented the Local Industry Upgrading Program (LIUP) in 1986 under which the EDB enters into remunerative contractual

relationships with MNCs to transfer experienced technical and managerial employees from the MNCs to local firms. With the help of these "mentors", local firms gains the expertise and capacity to supply the mentoring MNC. Partly as a result of this initiative, local Singaporean firms have been able to transition out of low-wage, labour-intensive industry into more capital- and knowledge-intensive industries, including high technology electronics manufacturing, petrochemicals, and a nascent bioscience industry (McKendrick *et al*., 2000; NSTB, 1999)[50].

In 1986 Malaysia implemented the "vendor development" programme, which functions very much like the LIUP in Singapore. However, rather than provide firm-specific incentives, the Ministry of International Trade and Industry (MITI) provides general tax breaks for MNCs willing to participate in its subcontracting exchange programme. The number of participating firms, however, has been low[51], although this varies by industry and location[52]. In the aggregate, Malaysia has been less successful than Singapore in upgrading the technological content of firms over time; while leading industrial sectors have changed from primary commodities and textiles to high-end electronics[53], the technological level of firms remains relatively low and jobs remain lower skilled and labour-intensive[54]. This said, outside of Singapore, Malaysia has been more successful than any of the other countries in Southeast Asia at fostering technological upgrading, with results in Penang approaching those of Singapore.

Unlike Malaysia and Singapore, the tremendous inflows of FDI into Thailand during the 1980s and 1990s[55] have done correspondingly little to promote linkages between foreign MNCs and local firms. Although the Board of Investment (BOI) created the BOI Unit for Industrial Linkages and Development (BUILD), the programme never became more than a matchmaking service. As late as 2000, the BUILD was focused on introducing local firms to MNCs rather than systematically encouraging MNCs to mentor and contribute to the development of local firms[56].

Indonesia and the Philippines have yet to create formal programmes to link MNCs with local supplier firms. Since only 32 per cent of FDI in Indonesia has historically been targeted to manufacturing, and the bulk to low-skill, labour-intensive assembly of mostly consumer electronic products (OECD, 1999*b*)[57], the need to link foreign MNCs with local suppliers was initially very small. When US and Japanese consumer and computer electronics firms did arrive in Indonesia, their low-end assembly operations — which supported higher-end design, assembly, and testing operations in Singapore — continued to require minimal linkages with local suppliers. Furthermore, the government did not actively provide incentives for foreign MNCs to upgrade their operations or help develop a base of local suppliers. Weak demand in the small MNC-led manufacturing sector for skilled labour coupled with oil-based economic security lessened priorities for technological upgrading. Without strong linkages between the foreign and domestic sectors of the economy, pressures for maintaining "export-oriented protectionism" have remained[58]. Similar results can be found in the Philippines. Aquino and Bolanos (1995) note that basic inputs, such as packaging and plastic tubes, can be sourced locally, but anything more complicated must be imported.

V. CONCLUSION

Although complex, the foregoing discussion points to several conclusions. First, the international political economy has changed over the last 30 years. Increasing pressures for trade and investment liberalisation have made mercantilist development strategies increasingly difficult to implement. As countries seek to integrate their economies more tightly into the global economy, FDI commands an ever more important developmental role. But while policy initiatives related to FDI and economic liberalisation have shown remarkable convergence in form, they have diverged dramatically in function.

Second, the empirical evidence surrounding these divergent outcomes does not support the minimalist assumption that the mere existence of FDI will eventually result in the transfer of high-end technical and scientific skills into the local economy. Both the quantity and quality of skills creation and transfer is highest when tight co-operative and participative linkages exist among government, industry, academia, and labour.

Third, MNCs locate in developing countries to take advantage of assets *that already exist in the local economy.* Thus, a pool of skilled human capital certainly encourages in-bound FDI and subsequent industrial upgrading; but, since MNCs might only be looking for low wages, skilled human capital may not be necessary. Simply put, MNCs also bring their own assets to the country in which they set up operations. At the same time, increasing skill levels are necessary but not sufficient to cause industrial upgrading. For example, while MNCs do conduct training of their own, the type and technology content varies. Without appropriate government policy, it is possible (and often likely if the country starts from a low base of skills) to get stuck in a “low-skill” equilibrium trap[59]. In this case, although both are necessary, neither supply nor demand alone is sufficient to “break out”.

One is tempted to conclude, then, that FDI will be most beneficial if it comes *after* developing countries have created a sufficient pool of local human capital. If this is true, a developmental model akin to that implemented by Japan, Taiwan or Korea would be more appropriate for the countries of Southeast Asia. That is, first develop a strong base of technological capacity in local firms through extensive licensing, co-operative development between the state and private actors, widespread education and training at all levels, and publicly-funded R&D, all under an umbrella of local market and capital protection.

Beyond being anachronistic, such a conclusion might also be hasty. The evidence from Singapore and Penang argues that early FDI in low-wage, labour-intensive industries need not set a path-dependent precedent for a “low-skill equilibrium”. Nevertheless, to upgrade technologically within a “technoglobalist” development

paradigm requires an increasingly sophisticated institutional structure, especially on the part of the state, that is capable of *simultaneously* fostering greater technology content within MNC operations and a growing pool of industry-relevant knowledge and skills. Rather than simply retreating to the sidelines to function as the game's referee, the state must strategically co-ordinate the interaction between key economic actors in a way that will stimulate deep and crosscutting developmental linkages. These linkages are necessary to facilitate information flow, increase vested interests through participation (as opposed to simply consultation), and improve cross-checked monitoring and implementation — all while maintaining appropriate autonomy from distributional interests. But this new role for the state is also dramatically different from the theoretical role of the developmental state. Instead of simply directing investment and ameliorating risk, the state must now encourage, facilitate, and co-ordinate the formation of *intangible* assets, which often requires more private-sector leadership. Whereas the state can often amass the capital and reduce risk sufficiently to build dams, roads, and other physical infrastructure, creating the skills and knowledge that underlie scientific and technical capacity is a different proposition altogether.

NOTES

1. I would like to thank Richard Kohl and Rajah Rasiah for their comments on earlier versions of the paper. In addition, the paper also benefited greatly from the participants at the OECD's Conference on FDI and Human Capital in Paris, 12-14 December 2001. The usual disclaimer applies.

2. Clearly there are many more than three important dimensions. Of particular importance is the relationship between increasing investment, rising demand for skills, and growing wage and ultimately income inequality. However, this is beyond the scope of this paper.

3. Booth (1999) argues, for example, that Southeast Asia differs dramatically from Northeast Asia on a variety of dimensions, including skills and knowledge development.

4. Ford set up its first manufacturing operation in Singapore in 1932; Bata established shoe manufacturing plants in Malaysia in 1937 (in Singapore in1939); Unilever opened a plant in Malaysia in 1952 to produce soaps and cooking oils from palm oil; and Jardine held significant investment in Malaysian rubber extraction and subsequent manufacture of tires, and so forth (Rasiah, 1995, pp. 59-60).

5. I borrow the terms "technonationalism" and "technoglobalism" from Richard Samuels (1994).

6. Singapore is the exception. With virtually no natural resources other than a deep-water harbour, entrepôt trade was not sufficient to sustain a growing population. In response, the government aggressively pursued foreign MNCs to meet short-term employment needs and long-term capital and technological development needs. See Rodan (1989) and Schein (1996) for very good historical overviews of Singapore's transition to independence and the accompanying economic challenges.

7. For example, despite an aggressive start and dramatic growth in the early 1950s and 1960s, FDI in Thailand levelled off in the 1970s before growing rapidly again in the 1980s. Whereas the government had viewed FDI somewhat ambivalently in the mid-1970s, it now looked to FDI as a key mechanism to recapture earlier growth rates. This shift in attitude towards FDI marked a transition point away from import substitution-led growth to a more export-oriented development platform (Akrasanee, 1988). After a dramatic fall during the 1970s, FDI levels in the Philippines began to recover in the mid-1980s, but did not return to their 1977 levels until after 1987 (World Bank, 2001).

8. Since oil exports provided sufficient foreign exchange, foreign investment was seen as at most a supplemental source of development capital (Pangestu, 1997). Thus, instead of export-oriented industrialisation, Indonesia's overall development strategy remained firmly fixed on import substitution and infant industry protection longer than any of the other countries in the region with an effective rate of protection in 1975 of 121 per cent for all importable goods and 224 per cent for consumer goods (Saad, 1995).

9. Although after independence in 1957, growing economic inequality in Malaysia led to the New Economic Policy (NEP) in 1971, an attempt to restructure the economy along ethnic lines. Important components of this strategy were protection for local industry and an emphasis on local, often publicly owned heavy industry (especially after 1980) in a range of import substituting industries. In 1975 the government augmented the bite of the NEP with the industrial co-ordination act (ICA), which was

created to monitor non-Malay capital vis-à-vis the effort to raise Bumiputra assets. Together the NEP and ICA were often blamed for the decline in FDI between 1975 and1978 (see Rasiah, 1995).

10. See Somsak and Ramstetter (1991). To create conditions favourable to foreign multinational corporations, the Sarit government suppressed labour by banning strikes and forcibly dissolving unions, allowed 100 per cent foreign ownership, allowed MNCs to purchase land, exempted MNCs from taxation, and allowed firms to bypass immigration laws to bring foreign technicians into the country (Anderson, 1998).

11. For example, in 1960 the Ford Motor Co. began assembly operations in Thailand in a joint venture with Anglo-Thai motors. But although the joint venture was incorporated as a wholly-owned subsidiary in 1973, it closed in 1976 (http://www.ford.com.th/about/forthai_e.htm).

12. The figures in the table are net. Some indication of gross FDI is as follows: in Singapore, $140 million in 1972 to a high of over $7 billion in 1998 (World Bank, 2001); in Malaysia, RM3.8 billion in 1983 to RM19.9 billion in 1994 (United Nations, 1998:111); and in Indonesia, $300 in 1986 to $2 billion in 1992 (in 1995 approved investment surged to $40 billion) (Pangestu, 1997:196).

13. McKendrick *et al*. (2000) explain how Singapore has developed process engineering capacity specific to the set-up and tear-down of manufacturing processes for the hard disk drive industry. Since labour costs compose only a tiny fraction of the overall cost of the drives, time-to-volume considerations far outweigh labour costs alone. Thus, the capacity to rapidly take new products from design to volume production dramatically increases yield and hence, profits.

14. In the case of Thailand, for example, tariffs were liberalised from 63 per cent in 1974 to 39 per cent in 1987 for import competing products and from 77 to 55 per cent for non-import competing products. During the same period export tariffs were reduced to zero (Ramstetter, 1997).

15. In 1971, the Malaysian government passed the Free Trade Zones Act to create special economic zones to house foreign MNC's manufacturing operations. Businesses located in these zones are not subject to the import taxes levied on the rest of the local economy. However, these same companies are obligated to export at least 80 per cent of their product if they wish to maintain 100 per cent foreign ownership (Salleh, 1995).

16. On this point, see Edwards (1990); Felker (1998); and Rasiah (1995).

17. Elder (forthcoming) notes that even in Japan the range of policy tools available to the state to manage industrial upgrading has narrowed. Infant industry protection, competition controls, export incentives, and other traditional "technonationalist" development mechanisms are all gone. In their place the Ministry of Economic Trade and Industry (METI, the "transmogrification" of MITI) now focuses on more general upgrading initiatives such as human capital formation, decreasing transaction costs, increasing information flow, resolving co-ordination dilemmas, and so forth. Even so, he notes that while the means may have changed, the ends have not. This is consistent with my own observations about Singapore, which I argue has employed "technoglobalist" means to achieve "technonationalist" ends (see Ritchie, 2001*b* and Doner and Ritchie, forthcoming).

18. Even so, this policy convergence has not developed evenly. Both Indonesia and the Philippines have been slower to reform than the other capitalist countries of the region (Az, 1988). Pangestu describes how early ambivalence and subsequent sluggish reform ensured that Indonesia would remain a secondary site for FDI in the region (1997:219). Likewise in the Philippines where FDI levels have remained less than those in Thailand, and do not begin to approach those in Malaysia or Singapore. Indeed, for cumulative FDI inflows between 1990 and 1997 the Philippines ranks 40th among all countries and 18th among non-OECD countries (OECD, 1999*a*).

19. See the endogenous growth literature, in particular Romer (1986 and 1994) and Grossman and Helpman (1991). Despite the importance of activities such as education and training and research and development to overall economic development, other issues such as transparency (good

governance), shareholder rights, intellectual property rights, judicial independence and so forth are also critical.

20. I am indebted to Rajah Rasiah for many of these ideas which came from comments made on an earlier version of this paper.

21. See Finegold (1991).

22. See Deyo (1989), for an in-depth analysis of labour and industrial development in Southeast Asia.

23. See Rasiah (1995 and 1999); Ritchie (2001*b*); and Doner and Ritchie (forthcoming).

24. Author interviews in Singapore, Malaysia and Thailand (1998-2001).

25. In many cases, the training is not technical at all. To illustrate this, the Thai-Japan Technology Promotion Association, originally created in Bangkok to provide technical training to help increase the level of technology in Japanese MNCs, provides more language training (Thai to Japanese managers and Japanese to Thai workers) than any other kind of training (author interview).

26. On these important points see Best (2001) and Best and Rasiah (2001).

27. The Singapore hard disk drive industry provides a relevant case. Singapore workers are known in this industry for having the skills to quickly ramp up and tear down production processes associated with hard disk drives. While these skills are useful for other MNCs conducting large-scale manufacturing of high-tech products, they have limited applicability to the local Singaporean supplier firms in need of precision engineering and more general manufacturing process skills.

28. It would be impossible, for example, for engineers highly trained in the production technologies for data storage products in Singapore, to use their skills to start a competing hard disk drive company, although their skills might be used to create a company that met some of the needs of the MNC's local production operation.

29. As Scott (1998) eloquently explains, the knowledge and skills that make up technology can be divided into two component parts. The first, and most obvious, is *techne*, or the "specification of how knowledge is to be codified, expressed, and verified, *once* it has been discovered" (Scott, 1998:320). Codified, or explicit, knowledge can be found in equipment, schema, processes, and other similar things that are organised from logical, verifiable, steps. "The systematic and impersonal rules of *techne* facilitate the production of knowledge that can be readily assembled, comprehensively documented, and formally taught, but they cannot by themselves add to that knowledge or explain how it came into being" (Scott, 1998:320). The second, and much less obvious and measurable part, is *metis*, or the tacit and implicit knowledge gained from experience and application. It is this second type that is more difficult to transfer and absorb.

30. This is not true of all industries. The auto industry, for one, tends to source heavily from locally-owned firms.

31. To illustrate it, only one MNC firm in Salleh's study (p. 150) actually has a formal R&D department and those that indicated they performed R&D limit their focus to process engineering. The bulk of technology is supplied by the parent company making only local adaptation of both process and product necessary. The fact that most R&D is done outside of Malaysia lessens the need for local technological capacity. But, in a vicious cycle, since most regions of Malaysia have poor stocks of intellectual capital, there is little capacity to increase R&D activities even if the demand were present.

32. The number of Thai firms in their study to achieve a mid-level understanding of MNC technologies was much more limited, and they report that no firms achieved a high-level of proficiency.

33. See Wong (1999); Doner and Ritchie (forthcoming); Ritchie(2001*a*); and McKendrick (2000).

34. Cf. Weiss (1995) and Ritchie (2001*a*).

35. Unless otherwise noted, the information for this section comes from Ritchie (2001*b*).

36. As a point of comparison with Southeast Asia, it is interesting to note that Japan, Korea and Taiwan reformed their education and training systems to create knowledge and skills sufficient to nurture technologically competitive local industry (Ashton *et al*., 1999).

37. Lee Kuan Yew argues that educational reform was the single most important ingredient (and most difficult process) in Singapore's subsequent development success (see Schein, 1996).

38. Output is measured by the number of scientists, engineers, and high-level technicians residing in the country. In 1995, the Philippines had 179 scientists, engineers, and high-level technicians per million capita. Singapore, in comparison, had 2 619. A plausible explanation for this is that the system does produce a high level of scientific skills and knowledge, but without appropriate demand the supply simply relocates abroad where the skills are in demand.

39. I utilise the term levy-grant to refer also to levy-rebate systems. While there are differences, the similarities are enough to warrant grouping them together. I do not use the term, however, to include tax deduction schemes.

40. Unless otherwise noted, the information in this section comes from Ritchie (2001*b*).

41. For an in-depth discussion of these linkages, see Ritchie (2001*a*).

42. See Deyo (1989).

43. See the 1999 *Malaysian Human Resource Development Annual Report* published by the Human Resource Development Council, Ministry of Human Resources, Malaysia.

44. Author interview.

45. On the strength of Thai capital vis-à-vis government, see Felker (1998).

46. See "Labouring under a misapprehension", in Bangkok Post, 17 June 1998.

47. Author interview.

48. Author interviews.

49. In one case Siam Cement, one of the companies of the Crown Property Bureau, was unable to convince the Ministry of Finance that a major R&D initiative qualified for the tax deduction, even after six years of litigation (author interview).

50. Electronics include, among other things, hard disk drives, multimedia computer add-on cards, computers, tape drives and semiconductors.

51. Salleh (1995) notes that as of 1995, only 18 firms had made inquiries into subcontracting through the subcontractor exchange programme. This may reflect the nature of the protected Malaysian market, but it may also reflect a general resignation of local firms to never reaching the quality and technological levels required by foreign MNCs.

52. Sieh and Yew (1997) point out that the automobile industry sources 30 per cent of its inputs locally while the electronics industry sources 14 per cent despite the fact that electronics have been there longer. Even so, some fear that as the automobile industry moves towards liberalisation in 2005 under the terms of the regional AFTA agreement, the amount of locally sourced inputs is likely to plunge (see Crispin, 2000).

53. While early FDI was associated with commodity exports, such as rubber, tin and oil, over 65 per cent of current manufactured exports are high-technology computer and consumer electronic products (World Bank, 2001).

54. Some of the reasons for low technological capacity include: first, initial levels of highly skilled labour are low, making it difficult for firms to transfer higher technology operations to Malaysia; second, bureaucratic restrictions in the operation of the FTZs and LMWs also restrict linkages between local and foreign firms and therefore restrict technology transfer (Rasiah, 1995, p. 80); and third, since the level of technology within the MNCs in Malaysia is relatively low, there is less technology to transfer, fewer demands to source high-tech inputs from the local economy, and a much lower demand for skills in the local work force (Lall, 1999). In the end, most suppliers are capable of providing only low-tech products such as plastic casings, packaging for silicon chips, solder for joints, spare parts, simple tools, lubricants, and so forth (Sieh and Yew, 1997).

55. Most recent numbers from the World Bank indicate that Thailand has received more FDI than any of the other countries of the region after the Asian financial crisis.

56. Author interview, 2001.

57. If only US numbers are considered, over 95 per cent of FDI was targeted to non-manufacturing ventures.

58. This term was coined by Paopongsakorn and Fuller (1997).

59. See Finegold (1991) for a discussion of low- and high-skill equilibriums.

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