HUMAN RESOURCES AND FOREIGN DIRECT INVESTMENT
WITH A FOCUS ON THE ELECTRONICS AND GARMENT INDUSTRIES

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1 Introduction

There is now increasing recognition that wages and value added act in more dynamic ways than merely through price relationships to influence multinationals activities (including relocation) in developing economies. Governments have focused strongly on education – including higher education – and enacted various instruments (incentives and taxes) to stimulate increased outlays in training and other human resource practices. In some of these economies, multinationals have participated strongly in such human resource activities: e.g. the skills development levy in Singapore (from 1979), and the human resource development fund in Malaysia (from 1993). Intermediary organizations with strong government coordination have also assisted skills development involving extensive participation by multinationals in the state of Penang in Malaysia. From merely looking at such intervention passively at resolving market failure, the emphasis has taken a more dynamic role on how private participation in coordination councils has shaped government policy on harnessing in some cases (e.g. Brazil) and in others on engendering stronger human resource practices (e.g. Singapore and Malaysia).

This background paper seeks to review existing literature on the significance of human capital developed in multinational firms by drawing on the experience of selected economies from Africa, Asia and Latin America. The focus consists in examining differences in Human Resources (HR) practices between foreign and local firms amongst developing economies located at different points in the development ladder; and in the
export-oriented industries of electronics and garments, which constitute arguably one of the most sought platforms for foreign direct investment (FDI). Because of shortcomings associated with existing approaches, an alternative framework is adopted here. This technological capability approach is not new (see Lall, 1992; Wignaraja, 2002; Rasiah, 2003; 2004), but it is only now gaining prevalence. Because spillovers are external to firms studied generate both positive and negative effects and hence cannot be measured exhaustively, this approach examines the potential by comparing technological capabilities in foreign and local firms.

Because the embedding environment has a bearing on technological intensities, firms in a list of economies with a range of institutional support strength are tested for differences in technological intensities between foreign and local firms. Indonesia and Philippines have weak basic and high tech infrastructure (see Table 1). Export-oriented multinational subsidiaries are largely located in export processing zones where fairly good basic infrastructure facilities are available. Brazil, Malaysia, South Africa and Thailand enjoy good basic infrastructure at least in the regions where the electronics and garment firms are located. South Africa and Brazil are endowed with fairly good high tech infrastructure in the regions where the firms are examined. Malaysia and Thailand are faced with relatively weak high tech infrastructure – especially human capital. Korea and Taiwan are endowed with strong basic and high tech infrastructure.

Economies with similar per capita incomes and FDI levels with Costa Rica and enjoying the presence of electronics and garment industries were chosen for the econometric assessment of determinants. Malaysia enjoys good basic infrastructure but its high tech
infrastructure – especially human capital supply – is weak. South Africa and Brazil (the state of Sao Paulo where the firms studied were picked) enjoy good basic infrastructure and better high tech infrastructure than Malaysia. Costa Rica as a country is obviously small in size compared to the three economies chosen, but their experience in the electronics and garment industries should be useful.

2. Human Capital Benefits of Multinationals

Extensive but intensely contested work exists on the contribution of multinational companies (MNCs) to the development of human capital and other spillovers in developing economies (see Lall and Streeten, 1977; Jenkins, 1984; Rasiah, 1995; Kapstein 2002; Blomstrom and Kokko, 2002; Fukasaku, 2001). A synthesis of past work is attempted here for the purpose of this background paper to examine the findings and conclusions that relate to the contributions of multinationals to human capital in developing economies. Two types of work are examined here before the technological capability framework is expanded to compare and explain the determinants of human resource intensities in foreign and local companies in the electronics and garment firms.

2.1 Production Function Estimations of Spillovers

Evidence about the spillover contribution of multinationals is dominated by assessments compiled from production function estimations. Caves (1974) presented arguably the first systematic production function estimation of spillovers, which led to a plethora of works extending the framework (e.g. Blomstrom and Persson (1983), Blomstrom and Wolfe
Urata (2001) and examining the nexus between investment and exports in Asia. Sjoholm (1999) and Blomstrom and Sjoholm (1999) showed that foreign firms in Indonesia enjoyed higher productivity than local firms and also generated positive spillovers. Others have since refined and expanded the models to introduce panel data and variables such as location, technological gap (differentiating samples on the basis of gap estimations) and import-intensities (Haddad and Harrison, 1993; Aitken, Hansen and Harrison, 1999; Borensztein, De Gregorio and Lee, 1998). Tan and Batra (1995) undertook a cross-country statistical study involving Colombia, Indonesia, Malaysia, Mexico and Taiwan with samples ranging from 500 to 56,000 firms and found that foreign ownership was associated with increased training in Malaysia and Taiwan. Some have used total factor productivity as the dependent variable whilst others have used labor productivity.

These studies have produced mixed results. On the one hand, Blomstrom and Persson (1983), Blomstrom and Wolff (1994), Sjoholm (1997) and Kokko and Sjoholm (1998) produced evidence of positive spillovers from the presence of foreign firms. On the other hand, Haddad and Harrison (1993) yield evidence that showed a lack of spillovers from foreign presence.

However, criticisms of the production function estimation and explanations of spillovers have been mounting since the efforts of new growth (see Roemer, 1986; 1987a; 1987b; 1990, 1994; Lucas, 1988; see also Vaitsos, 2003 for a comprehensive critique of the Solowian framework to understand technical change) and evolutionary theorists (see for e.g. Nelson, 1994) questioned the very use of total factor productivity and the residual constant to refer to technical change. Not only have questions cropped up in the way
capital is estimated but also the assumption of excluding embodied technical change (in
capital and labor) from its estimation, and the static nature of estimating productivity
effects from factor inputs. Since the production function constitutes the core of the
spillover models used above, the undermining of the root model from Solow (1956; 1957) has opened the door for similar criticisms against similar work seeking to estimate
spillovers.

In addition, Lall (1992) and Rasiah (2004) question the very use of the production
function approach without tracing inter-firm and other links with individuals, institutions etc where firms are connected since spillovers are external to firms. Spillovers can not be measured exhaustively owing to its externality characteristics, and they also vary in intensity and type. Spillovers have both positive (spread effect) and negative (backwash effect) dimensions. Regressing productivity or value added estimations of foreign firms against those of local firms would exclude the actual causal variables with a number them producing non-pecuniary effects. The production function approach also does not allow the dynamic construction of human capital movement between firms undertaken by Saxenian (1994) and Rasiah (1994; 1995).

2.2 Case studies

Case studies have also produced mixed accounts of the significance of foreign firms in the
development of human capital in developing economies. Sender (1986) and Emmanuel
(1989) argued that foreign firms were instrumental in engendering economic growth and
creating jobs in Africa. Kilby (1965; 1969) and Harris (1971) argued that the lack of
entrepreneurship denied local firms’ the opportunity to gain from the tacit knowledge
acquired in foreign firms to expand operations in Nigeria. Black (2001) and Oyeyinka (2003) produced evidence to demonstrate the diffusion of learning from foreign to local firms. Rasiah (1994) traced inter-firm linkage relationships to show the diffusion of technology from foreign MNCs to local firms in Malaysia. Managers, professionals and technical staff who gained tacit and experiential knowledge working in multinationals relocated to start off support local firms and other multinationals in Malaysia. Ariffin and Bell (1999) and Arrifin and Figueredo (2003) replicated this finding using a wider range of multinationals in Malaysia.

However, Anuwar Ali (1992) and Capanelli (1999) produced empirical evidence to show that foreign firms only sourced low value added and low technology related inputs from local firms, thereby exposing personnel to low levels of technology diffusion in Malaysia. Similarly, Katz (1987), Lastres and Cassiolato (2000) and Cimoli and Katz (2003) argued that local firms have not benefited significantly from the operations of foreign firms in Brazil. Costa (2001) argued that foreign firms were not engaged in technology-intensive activities in Brazil, while Ariffin and Figueiredo’s (2003) showed no obvious technological differences between foreign and local consumer electronics firms in Manaus.

While philosophical and methodological differences largely account for these contradictory results, case studies also tend to miss important “trees” that make up the “forest”. Hence, work involving case studies have tended to lack representativeness and statistically tested evidence. Given the richness associated with individual cases, a robust study can aggregate several cases to make up the “forest”. However, this is an expensive option.
2.3 Inter-firm Movement of Experiential HR Spillovers

Arguably the most straightforward approach to examining human capital spillovers is to trace the movement of human capital from one firm to another. This approach captures the experience gained by local employees while working in multinationals who then carry them to the local firms they either join or start. The methodology employs case studies but traces their movement from one firm to another. Such experience covers a wide range of knowledge – e.g. production, marketing and supplier networks.

Allen and Donnithorne (1957) showed how local employees gained experience working in Western multinationals in Malaya and Indonesia before starting local firms. Katz (1969) presented findings of how managers gained experience from working in multinationals in Argentina. Rasiah (1994; 1995) used a snowballing research methodology to identify the movement of managers, engineers and technicians from foreign electronics and garment multinationals to local firms in Malaysia. A number of these officials actually helped start vibrant new firms. These works contrast with that of Richman and Copen (1972; cited in Kapstein, 2002: 13) who argue that few US firms had made strong efforts to develop internal management and that many have not even identified a strategy of development management training in their subsidiaries. UNCTAD (1999) provided a similar assessment several decades later. Rasiah (1996) and Hobday (1995; 1996) argued the hiring and deepening of local human capital among multinationals in the electronics industry have shifted considerable engineering and innovation activities in Southeast Asia. In other cases, through the use of instruments, government such as Taiwan and Korea used elaborate policies to attract their citizens endowed with tacit knowledge gained in multinationals abroad, to start or join local
firms. In Taiwan for example, TSMC, Windbond, ASUS and Vanguard are just a few of the many firms led by personnel who gained tremendous experience working in multinationals abroad (see Lin, 2003).

Rasiah (1994; 1995; 2002) used a more sophisticated framework to examine the movement of technical, professional and managerial local employees who gained experience working in multinationals to local firms. Using a snowballing research methodology, these works traced substantial knowledge appropriation in multinationals and the subsequent significance of that knowledge for the firms they started or worked for in the state of Penang in Malaysia. Drawing from the work of Saxenian (1994), five layers of supplier firms were traced in these studies. Working in electronics and precision machinery firms led to the exposure of local engineers, technicians and managers to cutting edge technology that became beneficial for their operations in Penang. Although the scale and depth was less, Rasiah (1995) also found substantial numbers of managerial staff who gained experience working in garment multinationals before relocating in local firms in Penang, Perak and Johore.

The approach of tracing inter-firm movement of human capital as well as human resource effects through interaction between employees is clearly dynamic and offers arguably the most exhaustive account of human capital spillovers. However, this is an extremely expensive and time consuming approach. Also, it is also difficult to obtain the cooperation of all connected firms to provide know how on the skilling and movement of employees.

The first approach has obviously contributed little to the estimation of real spillovers. Although the second and third approaches actually provide information of human capital
spillovers, owing to the difficulty and the problems of amassing sufficiently large data sets, they have gained relatively little currency in international research. These two approaches nevertheless, have opened the door to a dynamic understanding of human capital spillovers. The conclusions from these approaches demonstrate that differences in findings and conclusions on the extent of training and experience gained by local employees in multinationals is often conditioned by firm strategies, which is a result of the industry (facing specific factors and final markets) and the stage of production or service in the value chain, years of operation of the firm involved at the host-site and the embedding environment. Transient labor-intensive firms from US and Japan in the 1970s and Taiwan and Korea in the late 1980s were reported to have trained workers little. Price-based competition led these firms to seek a transient labor force that they hired and fired depending on the business cycles (Lim 1978; Rasiah, 1993). However, the same American and Japanese firms reliant on technology intensive operations from the late 1980s no longer sought such methods. In fact, these firms were among the main ones that influenced the Penang Development Corporation (PDC) to start the Penang Skills Development Center (PSDC) in 1989 to offer off-firm generic training at the host-site.¹ Hence, this paper uses the last two approaches to formulate an alternative framework – which is less dynamic as it does not capture inter-firm relationships – but uses a conceptual design to estimate human capital intensities between firms. This exercise is undertaken in the next section.

¹ The author followed the origin of the discussion and the implementation of the PSDC between 1988 and 1990 when he was engaged in a role of research and policy advice to the PDC and to the Ministry of International Trade and Industry (MITI).
2.4 Alternative Framework

In light of the problems associated with the above approaches, the assessment of the contribution of multinationals in the local economy involving electronics and garments takes a different approach. In addition to case studies, statistical analysis is attempted to examine the relative contribution of foreign and local firms from selected countries. The evidence explaining multinationals’ international production activities generally point toward a range of push and pull factors (see Rasiah, 2002). Building on his ownership, location and internalization (OLI) framework, Dunning (1993) articulated that the potential for multinationals to impact positively at host sites depends considerably on their motivations and hence their subsequent strategies. Dunning (1993) emphasized the ownership advantages of multinationals over local firms – which includes technology (including human resource know how). Where the objectives of foreign firms include the creation of capacity, then, their conduct often includes the hiring and training of human capital, and R&D activities. Indeed, Cantwell and Mudambi (2001) found evidence of the relationship between competence creating objectives and R&D conduct of firms in England.

Attempts to formulate a more robust yet relatively affordable methodology to examined differences in human resource intensity differences between foreign and local firms. First, the embedding environments within which firms operate have a strong bearing on firm-level strategies, including human resource practices. A myriad of literature have documented the role of host governments in creating the conditions for stimulating spillovers at host sites. New growth expositions recognize market failure and missing markets and hence open room for government intervention to quicken learning and
technical change (Roemer, 1986; Lucas, 1988). Powerful arguments on the importance of government policy in creating the conditions for FDI inflow and subsequent stimulation of spillovers from foreign firms can be traced to Hirschman (1958) and Warren (1971). Lall and Streeten (1977) and Lall (2000) and Moran (1998) subsequently argued over the importance of FDI and technology policy to engender learning and technology diffusion from multinationals.

The empirical evidence on the importance of government policy in stimulating foreign firms to train and employ cutting edge human resource practices is mixed. However, Rasiah’s (2004; see Yeung, 2001 for an account on Singapore) work shows that strategic government policy varies with the location of a region or country within the technology trajectory. A diagrammatic explication of the different roles of government according to the level of technological development of host-sites to stimulate learning and innovation locally is shown in Figure 1. The extent to which host governments can, and the possible strategies they should pursue, to extract maximum gains from the operations of multinationals is often conditioned by host-site endowments. In technological terms it refers to the ascribed and achieved endowments in the technology trajectory. Whilst governments can organize financial institutions and strengthen institutional and systemic links to stimulate maximal appropriation of multinational synergies, the opportunity costs facing their alternatives force many to adopt sequencing along the technology trajectory.

The importance of human capital supply and the nature and depth of human resource practices, including training in production and R&D activities in multinationals, rise with the location of regions or economies in the economic development ladder. The successful
FDI-driven development experiences of Singapore, Ireland and Israel support this fundamental point. Indeed, FDI has figured as an integral part of long-term economic development policy in these economies (see Rasiah, 2004a). Even in FDI scarce economies such as Korea and Taiwan, there has been a surge of mergers and takeovers by foreign direct investment seeking firms with high-tech human capital (see Lin and Rasiah, 2003; Kim, 2003).

In addition to firm-level strategies, foreign firms’ efforts to hire, train and undertake R&D activities are conditioned by supply-demand side pressures and institutional and systemic support available at the embedding environment (see Rasiah, 2004). Rising production costs domestically, and in some cases the exhaustion of labor reserves and financial incentives for low-wage low-value-added activities have acted as push factors. Resource endowments (e.g., petroleum reserves, minerals), literate or potentially literate labor reserves (e.g., China, Philippines and Vietnam), host-country incentives (including protection) have acted as pull factors. In addition to these push and pull factors, critical endowments that multinationals often seek include good basic infrastructure (including transport, telecommunications, and legal and customs coordination), political stability and bureaucracy at host sites. Apart from natural resource endowments such as petroleum and other minerals, multinationals have hardly relocated in sites rich in literate labor reserves gripped with bureaucratic problems and political instability (see Narula and Dunning, 2000). Some host economies have overcome overall poor infrastructure by concentrating resources in export-processing zones (e.g., Philippines and Indonesia).
**Figure 1:** Towards a Model of Foreign Firms and Strategic FDI Policy

- **Parent plant in Developed Economy**
  - Embedded in Superior BI and NIS
  - In some cases, strong network cohesion (systemic links)

- **Subsidiary in Middle-income Economy**
  - With good BI, but weak NIS and NC

- **Government Policy in Developing Economies**
  1. Understanding dynamics of FDI (microcosm) – including motivation of FDI, home-country national and local IS and host-site local and national IS.
  2. Framing strategies to use FDI to complement learning and innovation in host-sites
  3. Host-government efforts to strengthen high tech infrastructure to spur upgrading by FDI

- **Subsidiary in Middle-income Developing Economy**
  - Embedded in Good BI and moderate NIS
  - In some cases good NIS and network cohesion

- **FDI without significant internal overseas knowledge base**

Source: Rasiah (2004a: Figure 1.2).
From a focus on just labor, successful upgrading in Ireland and Singapore using multinationals have stimulated a plethora of work that emphasize human capital (Best, 2001). Countries where multinationals have relocated to harness host-site supply of human capital from the outset include India (especially in locations such as Bangalore where the requisite software skills are found in abundance) and hardware skills in Brazil (especially from capabilities created in Sao Paolo under Telebras) (see Quadros, 2003; Rasiah, 2004) and a mix of both in South Africa (example in Johannesburg) (see Rasiah and Gopane, 2004). Countries where multinationals upgraded owing to the rising human capital content include Ireland and Singapore, which developed their education policies to constantly deepen human resource as well as adopt liberal in-migration policies to attract high value added foreign human capital (see Best, 2001). The United States has benefited extensively from importing human capital from abroad: California’s Silicon Valley and Massachusetts’s Route 128 have off-set increasing deficits in domestic supply of engineers and scientists by issuing green cards to foreigners (see Saxenian, 1994; Best, 2001). There is also anecdotal evidence that multinationals have encouraged skilling and training at host sites (Berman and Machin, 2000).

Although Malaysia, Mexico and Thailand have not managed to step up human capital supply sufficiently well and imports of foreign experts remains a problem, the operations of the early multinationals who initially sought low wage labor have produced tacit and experiential knowledge that have been used effectively to ramp up facilities for new multinationals to relocate or local firms to upgrade. In addition, Malaysia enacted the Human Resource Development Act in 1992 and opened the Human Resource Development Council in 1993 to “pressure” firms to train. Although critics have argued
that the HRDF may have forced excessive training, and in addition enjoyed little penetration owing to weaknesses in the supplier organizations, several studies show that training in firms have risen considerably since in especially local medium firms (see Rasiah and Osman, 1997; Hong and Batra, 1996).\textsuperscript{2} The states of Penang in Malaysia and Jalisco in Mexico have also managed to engender strong training synergies as alternative regional systemic initiatives to constraints imposed by national policies has helped the creation of private-public training institutions to resolve growing deficits in human capital (see Rasiah, 2002; Rasiah, 2004). However, such initiatives have not penetrated the supply of R&D human capital, and hence new product development remains very much scarce in both states.

The reverse flow of human resource know how can be observed in Korea and Taiwan, where the institutional support for human capital production is strong. Hence, multinationals have acquired local firms endowed with strong human capital in Korea and to some extent also in Taiwan. Such takeovers were particularly common in Korea following the meltdown of 1997-98 when firms exposed to severe financial liabilities were sold cheaply to foreign capital. Korea and Taiwan rely little on foreign human capital as their overseas personnel generally originate from nationals who gained tacit and experiential knowledge working abroad – especially in the United States.

Using a range of proxies, it can be seen in Table 1 that the gap in basic infrastructure (BI) index between the economies listed was high only against Indonesia, Philippines and Thailand. The gap was much higher involving high tech infrastructure (HTI). Korea and

\textsuperscript{2} Manufacturing firms with an employment size exceeding 50 workers are required under the Act to contribute 1\% of the payroll to the Human Resource Development Council, which they can then claim by using approved expenses.
Taiwan enjoyed superior high tech infrastructure compared to Brazil, Indonesia, Philippines, Malaysia, Thailand and South Africa. Among the latter economies, Brazil and South Africa had the advantage and much of it a consequence of the presence of R&D engineers and scientists, encouraging multinationals to participate in R&D activities in especially electronics, pharmaceuticals and auto part industries (see also Rasiah, 2004). In addition to the large population denominator involving South Africa, the high supply of R&D scientists and engineers has driven multinationals to shift a number of R&D activities there. Interviews by the author in 2002 suggest that automobile and parts, pharmaceuticals and engineering firms will expand such activities further if only crime and bureaucratic inconsistencies can be overcome. Arguably even more impressive is China’s position. China not only enjoyed an R&D scientists and engineers per thousand ratio four times higher than Malaysia despite its huge population, its RDI score also was much higher than that of the latter (see Table 1). In addition, China can also rely on its strategy of attracting back its own human capital working abroad. The focus of multinational expansion in Southeast and Eastern China also means that the country enjoys a concentration of R&D support and good infrastructure with a population exceeding that of the United States and Europe put together. Little wonder that China managed to attract over 600 multinationals to open R&D centers – especially since the country targeted support for such activities from 2002 (Star, 18/08/04: 42). Among the electronics multinationals to locate R&D operations in the municipalities of Shanghai, Beijing, Tianjin and Provinces of Guangdong and Jiangsu include IBM, Nokia, Sony-Eriksson, Microsoft, Matsushita and Hitachi. Brazil’s situation is similar when the focus is only on Sao Paolo state where much of the R&D operations and the human capital are
located. Sao Paolo also enjoys superior basic infrastructure and R&D support from universities.

Although the dynamics have been different, the examples of multinationals relocating higher value added activities or simply upgrading their host economy operations have been influenced strongly by the availability of human capital – either developed domestically or imported from abroad. The industrial upgrading impasse facing Malaysia and Thailand is largely a consequence of the lack of sufficient supplies of human capital to drive innovative activities. Lacking a sufficiently large labor force to support a critical mass of firms, small middle income economies endowed with strong supplies of human capital such as Costa Rica should attempt building a framework based on extracting and adapting the Singapore-Ireland style policy framework rather than the China and Brazilian ones.

**Table 1: Basic and High Tech Infrastructure Index, 1998-2000**

<table>
<thead>
<tr>
<th></th>
<th>FDI/GCF(%)</th>
<th>BI</th>
<th>HTI</th>
<th>( \text{RD}_\text{HC} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>19.4</td>
<td>0.364</td>
<td>0.142</td>
<td>178</td>
</tr>
<tr>
<td>China</td>
<td>12.3</td>
<td>0.415</td>
<td>0.105</td>
<td>455</td>
</tr>
<tr>
<td>Korea</td>
<td>8.1</td>
<td>0.544</td>
<td>0.446</td>
<td>2255</td>
</tr>
<tr>
<td>Taiwan</td>
<td>3.8</td>
<td>0.613</td>
<td>0.490</td>
<td>2960</td>
</tr>
<tr>
<td><strong>Malaysia</strong></td>
<td><strong>11.2</strong></td>
<td><strong>0.416</strong></td>
<td><strong>0.029</strong></td>
<td><strong>150</strong></td>
</tr>
<tr>
<td>Thailand</td>
<td>32.2</td>
<td>0.296</td>
<td>0.019</td>
<td>110</td>
</tr>
<tr>
<td>Philippines</td>
<td>17.3</td>
<td>0.117</td>
<td>0.021</td>
<td>160</td>
</tr>
<tr>
<td>Indonesia</td>
<td>-8.1</td>
<td>0.109</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>South Africa</strong></td>
<td><strong>5.1</strong></td>
<td><strong>0.418</strong></td>
<td><strong>0.208</strong></td>
<td><strong>1031</strong></td>
</tr>
</tbody>
</table>

Note: Basic Infrastructure (BI) calculated using the proxies of adult literacy rate (education), doctors per thousand people (health) and main telephone lines per thousand people (communication) using the normalisation formula in Rasiah (2004: model 4) and the 96 countries where data were available from World Bank (2003). The same approach was used to calculate High Tech Infrastructure (HTI) using the proxies of R&D scientists and engineers per million people, and R&D investment in Gross Domestic Investment and 55 countries where the data was available from World Bank (2003) and national ministries. See Rasiah (2004: Table 2) for the formulas and proxies used. Both the BI and HTI scores were eventually divided by the highest score in the respective categories so that their scores fell in the range \( 0 \leq X \leq 1 \). \( \text{RD}_\text{HC} \) refers to R&D scientists and engineers in population per million. Source: Computed from World Bank (2003); Taiwan (2004); Malaysia (2004); Thailand (2004); Indonesia (2004); Philippines (2004).
Human resource and skills intensities simply refer to the intensity of human resource practices and skills intensities of firms. Like all industrial organization measures of concentration which only refer to potential rather than actual market power, technological intensities only denote the potential, i.e. the extent of learning-diffusion that can occur in a locality. Although the capacity to absorb new knowledge is easier when the gap between the leader and learner is small, there is neither a rigorous argument nor empirical evidence that convincingly substantiates this point. As Hirschman (1958; 1970) has argued the bigger the gap the larger will be the potential for learning and catch-up. Marx (1853) had established the basis for rapid technological transformation when he argued over the positive role of colonialism, in how pre-capitalist modes of production give way to capitalist production. Despite the destruction and dislocation that accompanies capitalist integration; the phase did quicken technical change in India (see Kumar and Desai, 1983). Unlike colonialism where the objectives of the regime in power targeted policies primarily for accumulation within the borders of the colonial grandmaster, post-colonial governments have enjoyed relative autonomy to engender technical change to generate domestic accumulation (see Warren, 1971; 1980).

Hence, this paper seeks to use an alternative methodology where the focus is directly on embodied technology that is used in firms. By using technological intensities, the assessment can be focused simply on the potential spillovers that can arise at host-sites.\(^3\)

Although higher technological intensities need not translate into commensurate levels of

\(^3\) Using a range of economies, Rasiah (2004a; 2004b; 2004c) showed that differences in technological intensities between foreign and local firms also varied with the level of institutional and systemic strength embedding firms.
absorption by local economic agents – including firms – it is a more reliable indicator to examine than spillovers when the data collected comes only from individual firms. A better method of examining spillovers will be to study the firms as a network of interconnected economic agents (e.g. Rasiah, 1994; 1995). However, this methodology is too expensive and requires enormous sacrifice by researchers to construct a national database.

To examine differences in technological intensities between foreign and local firms, it is also important to establish the institutional base within which these firms are operating. As Dosi (1982) and Pavitt (1984) have argued, taxonomies and trajectories are important when examining technological capabilities and demands in firms. Foreign firms with access to sophisticated technology from their plants at developed parent sites will tend to show higher overall technological intensities than local firms facing underdeveloped support domestically (Rasiah, 2004a).

However, the pattern of differences would vary between human resource (HR) practices, process technology and R&D. Foreign firms are likely to show higher intensity levels than local firms in the easy to move internalized practices associated with HR, and machinery and equipment and process technology associated with it. Industry differences matter here as most garment firms are likely to enjoy similar labor-intensive technologies owing to the abundant supply of labor in Indonesia. Owing to Indonesia’s underdeveloped high tech infrastructure, conduct of firms to undertake R&D essentially at parent sites (see Vernon, 1966; OECD, 1998, cited in Amsden, Tschang and Goto, 2001),⁴ and the risks involved in intellectual property rights, R&D intensities in foreign

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⁴ The OECD (1998; cited in Amsden, Tschang and Goto, 2001) reported that only 12% of R&D invested on average by companies in OECD economies is undertaken outside parent locations.
firms will be low in Indonesia. Indonesia’s high tech infrastructure is too underdeveloped to stimulate significant levels of R&D in local firms. Hence, both foreign and local firms are likely to face low R&D intensities. However, foreign firms generally enjoy higher product technologies as they access the know-how and brand name from their plants abroad.

Three HR practices – training expenditure in payroll (TE), cutting edge HR practices (CHR) and training mode (TM) - were normalized to denote human resource intensity levels (see Appendix 1). Skills intensity (SI) was measured separately as a share of the professional and technical labor in the workforce. The two variables were kept separate as the former refers to the processes that help enhance HR intensity while the latter generally refer to hirings from the economy, including “poaching” from other firms. Given industry-level specificities, the hypotheses examined here are defined separately for the two industries chosen, i.e. electronics and garments.

3 Foreign and Local firms in the Electronics and Garment Industries

For reasons explained earlier, the electronics and garment industries are chosen for examination here of the HR and skills-intensity levels comparisons between foreign and local firms. Owing to the costs of tracing representative international inter-firm links, an assessment is made instead here to simply compare and explain the determinants of differences in HR and skills-intensity differences between foreign and local firms in selected representative economies. It was established earlier in Section 2 that the spillover literature using production functions does not offer the actual feel of HR and
skills spillovers. Hence, the argument here seeks to examine if foreign firms show statistically significant and higher levels of HR and skills spillovers in these two industries. The framework adopted in the paper is predicated on the notion that the position of technological endowments in the host-site along with firm structure and strategies explains differences in these variables, and that such differences should not occur if competitive high technology industries such as electronics are compared. So long as the intensity levels of foreign firms are not inferior to local firms a case can made be that the presence of foreign firms provides latent HR and skills-intensity synergies for the domestic economy.

From earlier work using detailed firm-level observations in over 300 firms (Rasiah, 1994; 1995; 2004a; 2004b), Rasiah (2004) had argued that human resource practices of foreign and local firms in identical export-oriented electronics sub-industries will be similar across economies. Cross country differences that are exceptional to this norm are generally a result of compositional differences in sub-industries, stage differences in the value chain and trade orientation of the firms involved. UNCTAD (1994; cited in Velde, 2002: 13) provided a similar set of findings, making the point that transnational affiliates generally trained more than local firms but that the differences vary according to size, industry, entry strategy and motivation for investment. Owing to the lack of international data at the firm level to compare the intensity of human capital development by foreign and local firms, this paper relies on data collected from two surveys, vis, one, ADB and two, United Nations University. Given industry level specificities, an effort is made to detail the dynamics of international production and specialization in the electronics and garment industries before implications are drawn for human capital in the selected
economies. Both surveys attempted to collect data using random sampling but as the response rate were low the national consultants decided to send the questionnaires to all firms with a registered address with the statistical authorities of the respective countries. Owing to the escalating costs the Brazilian survey was confined to the state of Sao Paolo in Brazil, Western peninsular for Malaysia, all firms in the list of the national industry associations in South Africa, the Island of Java for Indonesia, and the industry associations for Thailand, Philippines, Taiwan and Korea.

3.1 Electronics
The dynamics of global production in electronics shows a shift toward key host-sites. Unlike textile and garments, critical aspects of R&D still remain entrenched at home sites in the developed economies. Much of the lower value added activities were initially shifted to developing economies with good infrastructure, literate and potentially trainable labor force, bureaucratic coordination, political stability and low labor strife. Singapore and Malaysia were early recipients of large scale labor intensive assembly operations in the late 1960s and early 1970s (Lim, 1978). The first electronics firms in Korea and Taiwan were foreign owned, though, expansion of the industry has rested on local firms. Philippines and even the small economies of Puerto Rico and Barbados also had electronics assembly in the 1970s and 1980s – including the flagship firm of Intel. Whilst Intel has retained the assembly of memory chips in Philippines, its subsidiaries in Puerto Rico and Barbados were closed in the mid-1980s (Rasiah, 1988). China has become a major site for electronics especially since the 1990s – which apart from
threatening to pull firms from other parts of the world has also increasingly applied pressure on the low wage paying garment firms in the labor market.

Brazil, Mexico and Costa Rica in Latin America, South Africa in Africa, and India in South Asia have become important platforms for electronics multinationals. Whereas Malaysia has never been a major market for electronics sales, Brazil, Mexico and South Africa (including Sub-Saharan Africa) have been important in attracting market-seeking electronics multinationals. Domestic and regional markets and strong human capital supply has been the prime attraction in Brazil, Mexico (including NAFTA) and South Africa. The concentration of software skills has attracted multinationals to India. Intel’s relocation in Costa Rica has much to do with its human capital; good infrastructure and bureaucratic promptness (see Monge, 2004). The relocation of flagship firms that demonstrate a management structure has also attracted global service providers (GSPs). Contract GSPs include Sanmina, Solectron, Flextronics and Tatung. Owing to the rising human resource requirements of supplier firms – who themselves are either engaged in OBM or ODM activities – electronics value chains have become skill-intensive. In fact, firms have increasingly installed innovative capabilities to compete in export markets.

In addition, the rising skills requirements in the electronics industry have intensified differentiation and division of labor in regions offering strong human capital. Silicon Valley (California), Route 128, Ireland, Singapore and Taiwan have experienced substantial growth in new firms as employees gaining tacit and experiential knowledge in older firms have exited to start or work for new firms. Locations with a strong human capital base – especially strong domestic education policies - have facilitated such regional synergies much more. This feature is corroborated by empirical evidence on re-
investment by American, Japanese and European electronics firms in Malaysia (Rasiah, 1995; 1996). Singapore – affected strongly by the government’s policy to upgrade the R&D infrastructure – has attracted high tech operations by American, European and Japanese electronics firms (Sigurdson, 2000; cited in Te Velde, 2000: 12). Despite its small size, Costa Rica’s strong supply of human capital offers strong potential. Intel’s location since 1998 adds another dimension to stimulate differentiation and division of labor. With its typical developmental conduct, Intel-driven synergies have already encouraged the opening of local supplier firms (see Monge, 2004).

It can be seen in Table 2 that statistical differences in means between foreign and local firms are only significant in Brazil and Indonesia. None of the remaining differences in means were statistically significant. This difference is explained by compositional differences between foreign and local firms in the state of Sao Paolo in Brazil – i.e. foreign and local firms are in different sub-industries where the emphasis on HR is different. Foreign firms in the state – as opposed to locations such as Manaus – specialize in higher value added segments of precision components to meet government conditions to sell in domestic markets.5 Ariffin and Figueiredo’s (2003) study on consumer electronics firms in Manaus showed no obvious differences, though the proxy used related more to technology. In addition, the Brazilian sample is also dominated by R&D operations by some foreign firms who have absorbed engineers and managers who had gained their tacit and experiential knowledge working for Telebras. The statistical difference involving the Indonesian sample is largely a reflection of the export-orientation of multinationals against the local orientation of domestic firms (see Rasiah,

5 Author interview with four electronics firms in June 2002 in the state of Sao Paulo
2004). In other words, export-oriented firms in the same sub-industries – vertically and horizontally - in electronics use similar HR levels to compete in global markets.

Skills-intensity levels and wages can be compared across economies as no normalization was carried out in the single proxies used. Taiwan and Korea enjoyed consistently higher skills intensity levels than the other economies – a reflection of the higher intensity of human capital and the national level. Brazil and South Africa – the former in foreign firms, and the latter in local firms enjoyed higher skills intensity levels than the figures for Malaysia and Indonesia.

Two stark facts emerge from the data. First, higher skills intensity levels are found in economies with higher supplies of human capital, i.e. Korea, Taiwan, South Africa and Brazil. Where data on wages exist, higher human capital shares are also reflected in higher wages. The data on value added per employee tends to follow the same trend, but is not reported here owing to slight variations in classification used across the economies. Owing to the need to utilize latest technologies in export markets in the same production segments in value chains, HR differences are unlikely to exist between foreign and local firms in the electronics industry. However, foreign firms are expected to enjoy higher HR intensities in Brazil and Indonesia because local firms are generally only engaged in supplying the domestic market whilst foreign firms either export or enjoy access to superior practices from their parent plants. The nature of government incentives – targeted at firms engaged in innovative activities – and strong domestic endowments has encouraged foreign firms to pay higher wages and better job packages to attract human capital. Hence, foreign firms are expected to show higher skills intensity levels in Brazil.
The opposite is expected in South Africa because foreign firms are mainly engaged in assembly type activities while local firms participate strongly in software development.
Table 2: Human Resource, Electronics, 2001

<table>
<thead>
<tr>
<th></th>
<th>Human Resource Index</th>
<th>Daily Mean Salaries (US$)</th>
<th>Skills Intensity</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Foreign</td>
<td>Local</td>
<td>t</td>
<td>Foreign</td>
</tr>
<tr>
<td>Brazil</td>
<td>0.59</td>
<td>0.43</td>
<td>2.11**</td>
<td>0.55</td>
</tr>
<tr>
<td>Korea</td>
<td>0.36</td>
<td>0.29</td>
<td>1.21</td>
<td>16.007</td>
</tr>
<tr>
<td>Taiwan</td>
<td>0.32</td>
<td>0.42</td>
<td>-1.48</td>
<td>18.842</td>
</tr>
<tr>
<td>Malaysia</td>
<td>0.48</td>
<td>0.45</td>
<td>0.33</td>
<td>10.393</td>
</tr>
<tr>
<td>Thailand</td>
<td>0.33</td>
<td>0.35</td>
<td>-0.18</td>
<td>2.518</td>
</tr>
<tr>
<td>Philippines</td>
<td>0.45</td>
<td>0.46</td>
<td>-0.53</td>
<td>2.518</td>
</tr>
<tr>
<td>Indonesia</td>
<td>0.43</td>
<td>0.31</td>
<td>2.81*</td>
<td>1.65</td>
</tr>
<tr>
<td>South Africa</td>
<td>0.64</td>
<td>0.53</td>
<td>1.38</td>
<td></td>
</tr>
</tbody>
</table>

Note: Given the use of normalization scores using maximum and minimum values within individual economies instead of across the countries presented above, no cross-country comparisons of the values should be allowed; * and ** represent statistical significance at 1% and 5%, respectively. The scores can of course be adjusted to allow comparisons across countries, but it is avoided here because of time constraints.

3.2 Textile and Garment

The textile and garment industry in the world has undergone several geographical changes in production. Since the 1950s much of the changes have involved dynamics of imports to the developed economies of North America and Europe – trade governance involving the industry shifting eventually to the Multi-fiber Agreement (MFA). Japan and to a less extent Hong Kong and India were the first nations to supply imports on a large scale to North America and Europe – especially until the 1960s. Hong Kong, Taiwan, and South Korea subsequently dominated textile and clothing exports to North America and Western Europe in the 1970s and 1980s. Malaysia and Thailand managed through essentially foreign multinationals considerable exports from the 1970s and 1980s following the opening of Licensed Manufacturing Warehouses. China, Indonesia, Philippines, Bangladesh, Sri Lanka and Vietnam became important from the late 1990s since renovation in the latter and wage costs rose in Malaysia and Thailand. China has become by and large the prime focal point of export-oriented textile and garment manufacturing since the 1980s. China’s sheer size with a labor force exceeding that of the whole of Southeast Asia has become a major platform for textile and garment manufacturing: China accounted for 75% of the labor force of the combined region of China and Southeast Asia in 1999 (computed from World Bank, 2001). The 1990s also saw the proliferation of suppliers in South Asia (Sri Lanka and Bangladesh) and Latin America (Khanna, 1993; Gereffi, 2003).
Gereffi (2003: 78) detailed some of the changes in the source of imports to the United States:

In 1983, the Asian “Big Three” (Hong Kong, Taiwan, and South Korea), plus China, were responsible for two-thirds of U.S. apparel imports; by 2001, this share had dropped to 27 percent. Two main trends emerge in U.S. apparel imports since: (1) a shift within Asia from the “Big Three” to the growing importance of successive waves of exporters: first China, followed by Southeast Asia and then South Asia; and (2) a growth in non-Asian sources of apparel supply, especially the importance of Central America and the Caribbean as a region (which nearly doubled its share of U.S. apparel imports from 8 percent in 1990 to 15 percent in 2001) and, most notably, Mexico, which multiplied its share of U.S. apparel imports more than fourfold from 3 percent to 13 percent in the same period (Gerrefi, 2003: 78).

The textile and garment industry is increasingly gravitating toward low wage economies (see UNCTAD, 2000) as competition has risen following the elimination of quotas under the Multi-fiber Agreement at the end of 2004. However, some economies have managed to retain sizable operations owing to resource proximity (e.g. access to denim fibers involving Brazilian firms), specialization in niche markets (e.g. high value added chemical and radiation resistant garments operations by South African firms), special bilateral arrangements enjoyed by firms from economies with labor compliant practices (e.g. Costa Rica), and fears of multinationals to “put all the eggs in one basket.”

Interviews with Santinil in 2002 showed that the large domestic markets in South America and the availability of denim fibers is likely to support garment manufacturing in Brazil, However, these locations have hardly experienced the relocation of new multinationals owing to high production costs (see Gereffi, 2003). Nevertheless, developments in the value chains – the integration all aspects of production at host sites and the penetration of software-commanded control throughout the chain promises to
insulate the higher value added garment manufacturing in fast industrializing economies such as Brazil, Mexico, Malaysia, Philippines and South Africa. China remains the prime exporter of garments. Small least developed economies (LDCs) – still enjoying access to a range of benefits no longer available to economies with a per capita GDP exceeding US$1,000 – such as Bangladesh and Cambodia – have continued to maintain garment manufacturing operations. Newly emerging LDCs such as Uganda and Lesotho have attracted new garment multinationals, albeit the growth has slowed down.

The data available for the textile and garment industry was not sufficiently processed for a similar assessment as for the electronics industry. In addition, the ADB study did not cover textile and garment firms for Taiwan. The textile and garment industry is expected to produce slightly different results when compared to electronics industry owing to the significance of labor-intensive technology used by firms to compete on the basis of price against firms that compete on the basis of new product innovation.

The South African and Brazilian samples show the highest skills intensity levels among the results reported in Table 3. Malaysia had the lowest, though the gap was not as huge as the shares involving the electronics industry. Despite having the lowest skills-intensity, foreign firms’ intensity of use of HR practices was the lowest. Indonesia’s figure was slightly higher. Despite some firms automating and expanding shares in the value chain, textile and garment firms are still essentially engaged in labor-intensive activities in Malaysia. The increasing focus on higher value added activities has resulted in local South African firms intensifying utilization of cutting edge HR practices. High skills

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6 Interview by author with a key official of the Malaysian Textile Manufacturers Association (MTMA) who is also the managing director of Pen Apparel in April 2004
intensity levels have also enabled both local and foreign firms to participate strongly in technology-intensive activities.

Differences in skills intensity levels using two-tail tests of means between foreign and local firms was statistically significant only in the Brazilian sample: foreign firms enjoyed a higher mean than local firms. Ownership differences in HR practices were statistically significant in the Brazilian, Philippines and South African samples. Foreign firms’ enjoyed a significantly higher mean HR intensity level in the Brazilian sample whilst the opposite was the case in the South African sample. Higher endowments of HR and skills intensity have obviously left local South African firms with the capacity to manufacture higher value added garments.

Owing to rising wages and intense competition from low cost economies such as China, the need to utilize latest technologies in export markets in the same production segments in value chains, statistically significant HR differences between foreign and local firms are unlikely to exist between foreign and local firms in the garment industry. However, foreign firms engaged in export markets are expected to enjoy slightly higher HR intensities owing to their ability to afford slightly higher wages than local firms selling primarily in domestic markets. South Africa is expected to be an exception as local firms are engaged in developing higher value added garments for export markets.
Table 3: Human Resource, Textiles and Garments, 2001

<table>
<thead>
<tr>
<th>Country</th>
<th>Human Resource Index</th>
<th>Skills Intensity</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Foreign</td>
<td>Local</td>
<td>t</td>
</tr>
<tr>
<td>Brazil</td>
<td>0.52</td>
<td>0.42</td>
<td>3.69*</td>
</tr>
<tr>
<td>Malaysia</td>
<td>0.410</td>
<td>0.341</td>
<td>1.14</td>
</tr>
<tr>
<td>Philippines</td>
<td>0.599</td>
<td>0.524</td>
<td>1.84</td>
</tr>
<tr>
<td>Indonesia</td>
<td>0.413</td>
<td>0.351</td>
<td>0.76</td>
</tr>
<tr>
<td>South Africa</td>
<td>0.638</td>
<td>0.888</td>
<td>-3.27*</td>
</tr>
</tbody>
</table>

Note: Given the use of normalization scores using maximum and minimum values within individual economies instead of across the countries presented above, no cross-country comparisons of the values should be allowed; * and ** represent statistical significance at 1% and 5% respectively.

3.3 Influence of Export-orientation, Skills, Ownership and Wages on HR Practices

Combining the data from the electronics and garment industries, and adding firms from the auto parts industries, statistical analysis was carried out to examine the influence of wages and skills-intensity on the intensity of human resource practices for Brazil (state of Sao Paolo), Malaysia and South Africa, controlling for a range of variables including size, ownership and industry dummies (see Table 4). The Tobit model was used owing to the dependent variable being censored on the right and left hand sides of the observations (see Appendix 2).

The explanatory variables used are foreign ownership (FO) (a dummy FO=1 when foreign equity is 50% or more, and FO=0 when foreign equity is less than 50%), export intensity (X/Y) (share of export [X] in output [Y]), skills intensity (SI) (share of professional and technical labor in workforce) and wages (W). Size(S), Owner management (OM) (OM=1 when management is partly or wholly from owners; OM=0 otherwise) and industry dummies were used as control variables. Actual foreign equity shares were not used because most firms enjoyed equity of 100% and 0% foreign equity. Because most electronics and garment firms are export-oriented, X/Y is not expected to show a statistically significant relationship with HR, though its sign is expected to be positive. Skills-intensity and wages are expected to show positive correlation with HR. FO is not expected to show any statistically significant relationship with HR in general, but is expected to show an inverse relationship in South Africa given the participation of local firms in higher value added activities in electronics and garments, and the additional training local firms have invested in to sustain upgrading in auto parts.
All three regressions passed the White test for heteroskedasticity and model fit (chi-square distribution). Correlation coefficients involving the independent variables also showed not significant problem of multi-collinearity. Interestingly, HR intensity showed no statistically significant relationship with export-intensity confirming expectations. The same was also observed with skills intensity but the coefficients were positive. This unexpected result did not change significantly even when wages was dropped. The inverse and statistically significant relationship between HR and in South Africa showed that local firms invested more on training and other HR activities than foreign firms only there. Nevertheless, the coefficient of FO was positive – though statistically insignificant – involving Brazil and Malaysia.\footnote{Interviews by the author and Thabo Gopane in May 2002}

Wage was positively and strongly correlated with HR involving the Malaysian sample, demonstrating a strong skills premium. Despite policy instruments such as the HRDF and the double deduction from taxes incentive for manufacturing firms with employment size below 50 employees as well as tax incentives for approved HR institutions, it can be seen that the supply of skilled labor still falls severely short of expectations. The high levels of HC supply in Brazil and South Africa seems to have ensured that there was no wage premium supporting high HR practices. Given the high HC intensity levels of Costa Rica despite its much smaller size, foreign multinationals are likely to extract a similar experience as in Brazil and South Africa rather than that of Malaysia.

Taking the two-tail t tests results in Tables 2 and 3, and the regressions in Table 4 together, a number of conclusions can be drawn. It can be argued that foreign owned firms in Brazil have adopted higher skill and HR intensities compared to local firms owing to the need to meet government regulations that require them to show investment
in R&D activities. Indeed, several foreign firms in electronics in Brazil – e.g. Eriksson and Siemens - are engaged R&D activities in 2002. The Malaysian experience demonstrates that foreign firms with higher wages have managed to hire more skill-intensive workers. Yet, the lack of human capital has also meant that foreign firms have offered higher HR intensities as well. The South African case shows that local firms – engaged in higher value added operations with greater engagement in R&D activities – have hired more skill-intensive workers and have also invested more on HR activities. Local firms in South Africa produce smart light products (including using locally developed software) and high tech radiation and chemical resistant fabric and garments compared the large volume assemblies undertaken by foreign firms.

In short, government policy in Sao Paolo, Brazil has influenced foreign firms’ participation in innovative higher value added segments that has translated in foreign firms showing higher skill and HR intensities than local firms – though the controlled regressions fall slightly below the statistically acceptable level. In Malaysia, despite government drives through incentives and a penalty system (HRDF), the lack of sufficient supply of skilled labor domestically has led foreign firms to pay higher wages to attract higher HR and skill intensities. In South Africa, local firms focus on innovative products and foreign firms focus on labor-intensive assembly type activities – especially in electronics and garments – has meant that the former enjoys higher HR and skill intensities than the latter. Foreign firms indeed access much of their product technology support from their parent locations.
Table 4: Determinants of Human Resource Intensity, Brazil, Malaysia and South Africa, 2001

<table>
<thead>
<tr>
<th></th>
<th>Brazil</th>
<th>Malaysia</th>
<th>South Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X/Y</td>
<td>SI</td>
<td>SI</td>
</tr>
<tr>
<td></td>
<td>-0.012</td>
<td>0.065</td>
<td>0.031</td>
</tr>
<tr>
<td></td>
<td>(0.65)</td>
<td>(0.63)</td>
<td>(0.33)</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>0.040</td>
<td>-0.023</td>
</tr>
<tr>
<td></td>
<td>(1.25)</td>
<td>(0.64)</td>
<td>(-0.70)</td>
</tr>
<tr>
<td></td>
<td>OM</td>
<td>0.048</td>
<td>0.309</td>
</tr>
<tr>
<td></td>
<td>(1.45)</td>
<td>(1.70)</td>
<td>(10.93)*</td>
</tr>
<tr>
<td></td>
<td>FO</td>
<td>0.083</td>
<td>-0.079</td>
</tr>
<tr>
<td></td>
<td>(1.62)</td>
<td>(1.05)</td>
<td>(-3.01)*</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td>0.000</td>
<td>-0.003</td>
</tr>
<tr>
<td></td>
<td>(0.18)</td>
<td>(3.80)*</td>
<td>(-0.83)</td>
</tr>
<tr>
<td></td>
<td>μ</td>
<td>0.449</td>
<td>0.412</td>
</tr>
<tr>
<td></td>
<td>(7.13)*</td>
<td>(5.95)*</td>
<td>(7.92)*</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>117</td>
<td>148</td>
</tr>
<tr>
<td></td>
<td>χ²</td>
<td>51.56*</td>
<td>147.73*</td>
</tr>
</tbody>
</table>

Note: Figures in parenthesis refer to t statistics; * - statistical significance at 1% level.

Source: Computed from data collected from UNU-INTECH (2002) and using Stata 7.0.
4 Conclusions

This background paper examined the main literature that deals with human capital development issues relating to multinationals. After declaring that works using the production function assessments of human capital spillovers do not really capture the essential dynamics for use in policy analysis, the paper also discussed the significance of case study approaches, snowball approaches to capture experiential knowledge spillovers. The next part focused on skills and HR intensities of foreign and local firms to examine the latent properties for HR enhancement at host-sites as well as strategies governments could adopt to sustain multinational investment as wages rise in the electronics and garment industries. The final part attempted to examine correlations between HR intensity and the explanatory variables of export intensity, skills intensity, wages and foreign ownership while controlling for owner management, size and industry dummies. Auto parts firms were added to this assessment.

It is clear from the experience of a range of economies – both strongly and weakly endowed with reserves of human capital – that higher value added multinationals are attracted to regions with strong human capital intensities. Electronics – especially firms engaged in precision components as well as their assembly into high value added products – have evolved especially from the mid-1980s to value training and skilling as a major instrument to sustain competitiveness. Low wage labor-intensive economies lacking the requisite human capital no longer figure in the value added chains of most electronics products. Textile and garment firms – especially those producing high value
added products with quick changes in fashion tastes in development markets – have increasingly automated and introduced software control from the 1990s so much so that they have forced the redefinition of traditional industries into technology using industries. Garment firms in economies facing rising wages and short supply of labor have increasingly upgraded their operations through hiring technical and skilled labor to sustain their position in export markets. Differences in industrial specificity and the dynamics of specialization in value chains represent departures from such a trend.

HR intensities tend to be uniform across a range of economies located in the technology trajectory in particular electronics sub-industries. Where skills intensities are lower (low human capital endowments), firms have raised HR intensities to compensate for the deficits. In fact, HR intensities have been slightly higher in Malaysia and Thailand than in Korea and Taiwan. In less developed sites, export-oriented multinationals tend to have in place strong HR practices – explaining why export oriented multinationals in Indonesia enjoyed higher HR intensities than inward-oriented local firms.

The embedding structure, including government policy instruments have influenced the relative level of HR and skills intensities of foreign firms compared to local firms in the economies studied. In Sao Paolo state foreign firms’ participation in innovative higher value added segments that has required higher skill and HR intensities than local firms appears largely as a consequence of stringent government policy instruments calling for their participation in technology-intensive activities. Despite government drives through
incentives and the HRDF, the tight labor market has led foreign firms to pay higher wages to attract higher HR and skill intensities. Local firms focus on innovative products and foreign firms focus on labor-intensive assembly type activities – especially in electronics and garments – has meant that the former enjoys higher HR and skill intensities than the latter in South Africa. These three experiences demonstrate that middle income economies must have the capacity to provide human capital and training facilities to attract high value added green field multinationals or stimulate upgrading among brown field multinationals. Panel regressions will be useful to confirm causation.

References


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Appendix 1

Computation of Human Resource (HR) Index

\[ \text{HR} = \frac{1}{3} [\text{TE}, \text{CHR}, \text{TM}] \]  

Where TE, CHR and TM refer to training expense in payroll, cutting edge HR practices and training mode respectively of firm I in 2001. CHR was computed by simply adding one to each of the six cutting edge practices used in the firm: (1), multiskilling, (2), upward job mobility, (3), quality control circles, (4), total quality management, (5), statistical process control and (6), life long learning opportunities. TM was computed as a multinomial logistic variable: 5 when a separate training or HR center was used, 4 when a training or HR department existed, 3 when staff with specific training or HR duties were in employment, 2 when staff with some training or HR duties were employed, 1 when employees were trained using external staff and 0 when no training at all was conducted.

The three proxies was added using the normalizing formula:

\[ X_i = \frac{(X_i - X_{\text{min}})}{(X_{\text{max}} - X_{\text{min}})} \]  

Where \( X_i, X_{\text{min}} \) and \( X_{\text{max}} \) refer to the value of the \( i \)th, minimum and maximum values respectively.

Appendix 2

Tobit Regression on Human Resource

Model: \[ \text{HR} = \alpha + \beta_1 \frac{X}{Y} + \beta_2 \text{SI} + \beta_3 \text{S} + \beta_4 \text{OM} + \beta_5 \text{FO} + \beta_6 \text{W} + \mu \]  

Where \( \frac{X}{Y} = \) exports/gross output, SI = professional, engineering, technical and supervisory staff in workforce, S = size [dummy S=1 when employment is 500 or more, otherwise S=0], OM = owner managed [dummy OM=1 when firm is partly or wholly managed by owner, otherwise OM=0], FO = foreign ownership [dummy FO=1 when foreign equity is 50% or more, otherwise FO=0], and W = wages. Industry dummies were used.