MNC-dominated clusters and the upgrading of domestic suppliers: the case of Costa Rican Electronics and Medical Device industries

Luciano Ciravegna
Development Studies Institute, The London School of Economics, UK
INCAE Business School, Costa Rica
l.ciravegna@lse.ac.uk

Elisa Giuliani
DEA, University of Pisa, Italy
SPRU, University of Sussex, UK

*p* Draft version, please do not circulate or quote without permission. An improved version of this paper has been submitted to Routledge and will be part of the publication “Dynamic Capabilities Between Firm Organisation and Local Systems of Production”, edited by R. Leoncini & S. Montresor, due to be commercialised in the year 2008. The authors would like to thank Tommaso Ciarli, Alfredo del Pino, Mario Cimoli, Andrea Morrison and Roberta Rabellotti for their contribution at various stages of this project and for comments on a previous version of this paper. Support by the Inter-American Development Bank, CEPAL, IRES (Torino), and INCAE is gratefully acknowledged. Thanks go also to Leiner Vargas and colleagues at CINPE Universidad Nacional de Costa Rica, to Ronal Arce Perez at Procomer, Abraham Sanchez and the CINDE, and the staff of Camtic. All disclaimers apply.

1 Corresponding author.
1 Introduction

Costa Rica is a small country that, unlike its Central American neighbouring countries, has managed to attract considerable high-tech FDI over the past decade. This has contributed to improving its export performance and terms of trade (Ciarli and Giuliani, 2005). However, very little is known of the impact that such FDI has had on the formation of well-functioning MNC-dominated clusters (Altenburg and Meyer-Stamer, 1999) and on the upgrading processes of domestic firms, which may link up to MNC located in the country. Drawing on the literature about the role of Multinational Companies and Global Value Chains (Gereffi, 1999) for development, this paper explores the impact of foreign investors in the electronics and medical device (hereinafter EMD) industries on the learning and upgrading processes of Costa Rican firms. Moreover, this paper explores whether these processes of knowledge transfer lead to the formation of well functioning EMD MNC-dominated clusters in Costa Rica, as suggested by Altenburg and Meyer-Stamer (1999). These are clusters formed around the multinationals that have been attracted to invest in the EPZ as an explicit instrument of economic policy from the 1990s onwards. Our aim is to assess whether the inclusion of local producers into global value chains lead by EMD multinationals has ignited any upgrading of their products, processes, or functions. The paper shows that the majority of local firms has upgraded products and processes, whilst only a small share has upgraded their functions. Upgrading, especially of production processes, occurred to a large extent as local firms attempted to comply with the requirements of multinationals in order to become suppliers. Only in few cases the linkages established with multinationals seem to have directly promoted upgrading. In most cases multinationals provided the demand stimulus for local firms to upgrade, but did not actively support it.

This paper is organized as follows: in Section 2 we provide a brief description of the FDI and exports trends recently followed by Costa Rica. Section 3 outlines our theoretical framework and develops the research questions. Section 4 explains the methodology used in our analysis, and Section 5 presents the empirical results. Section 5 is divided in two parts: the first part (Section 5.1) analyses the formation of backward linkages and knowledge flows from MNC to domestic firms, drawing on statistics of MNC inputs’ procurement at the local level and on survey data collected on the field. Section 5.2 explores upgrading at the micro-economic level by providing an in-depth qualitative analysis of MNC-suppliers relations on a sample of domestic suppliers. Section 6 concludes.

2 Costa Rica, FDI and MNC-clusters in Electronics and Medical Device Industries

Costa Rica has often been seen as an exception in Latin America, and especially in Central America. Unlike most other Latin American countries, it does not have an army, and it has been governed by a stable democracy for over 50 years. Partly thanks to its political stability, partly because of its social policies, Costa Rica has achieved the highest literacy rates and lowest poverty rates in Latin America. More recently, this country has also attracted the attention of academics and development practitioners for its economic policies (e.g. Ferranti et al, 2002).

Since the 1980s Costa Rica has shifted away from import substitution industrialization, and pursued a policy of FDI attraction, aimed at increasing the valued added of its export base. Although Costa Rica’s policies only started generating a significant increase in FDI flows towards the second half of the 1990s, FDI is generally considered to have been very successful in promoting non traditional exports and pushing a shift in the country’s industrial structure
A great share of the FDI that has flowed into Costa Rica since the late 1990s has been in high tech industries (Monge-González, 2005), whereas in most of Latin America, foreign investors have targeted mainly resource-based industries and privatized utilities (Cimoli and Katz, 2001). Beside the country endowment of well-educated human resources and its economic and political stability, high tech foreign firms have been attracted to Costa Rica by the special regimes guaranteed by the government in the so-called Export Processing Zones (EPZ). In EPZ, foreign firms benefit from the same legal protection as national firms, they also do not pay any import taxes, and are exempted from income taxes for 8-12 years. The number of companies operating in EPZ is estimated to be between 200 and 250, employing in 2002 over 35,000 people (Monge-Gonzalez et al, 2005; PROCOMER, 2002). Since 1997, EPZ absorb around 45 per cent of total FDI per year, meaning that between 1997 and 2003 they have received each year an average of US$240m of foreign direct investment. Since the second half of the 1990s, a great share of foreign direct investment has been in electronics and medical devices (Ciarli and Giuliani, 2005). This means that firms in these sectors manufacture products ranging from chirurgical tools to microprocessors or filters for mobile communication. Given the small size of the Costa Rican market, FDI in EMD is mainly export-oriented. In 2001, EMD exports amounted to 24.1 per cent of total export value (PROCOMER, 2002). More significantly, almost a quarter of Costa Rican exports are generated by EMD firms, which tend to operate in EPZ (Monge-Gonzalez, 2005). This wave of EMD FDI has generated employment opportunities for skilled labour, especially technical professionals such as engineers.

The localization of EMD multinational firms within Costa Rican territory has moreover given rise to a rather sectorally specialized industrial agglomeration, which we call here an ‘MNC-dominated cluster’, around the capital city of San Jose, where most of the industrial activities are concentrated. Within this territory there is no clear spatial border between the medical devices and electronics MNC subsidiaries that are situated within the 10 EPZ existing in the country, located at short distance from San Juan International Airport, in the Valle Central. Most of the MNC suppliers are also thereby located, specifically because the Valle Central is the business core of the country, endowed with better infrastructure, and where over 80 per cent of the Costa Rican population resides.

Overall, about 60 MNC subsidiaries were operative in 2004, and more than 80 per cent of investment was from the US (Procomer, 2004). Among the firms that have invested in Costa Rican EPZ, Intel, arrived in 1997, is certainly the most noticeable example. Intel has boosted the pace of FDI in EMD industries and has gradually increased the population of the EMD MNC-cluster, as also reported by the CINDE (2004). In a recent study, Altenburg and Meyer-Stamer...
found that MNC-dominated clusters in high tech industries were a potential “growth pole” for the domestic economy in Costa Rica (see Section 3.1). In order to explore whether this is the direction undertaken in Costa Rican, we analyze the linkages that are being formed between MNC and local firms and the impact that they have on the domestic economy.

3 Theoretical Framework

3.1. MNC-dominated clusters and knowledge flows

The logic underpinning FDI attraction policies is that foreign firms can not only substitute for the scarcity of capital prevailing in developing countries, but they can also be an important driver for the development of organizational and technological capabilities of local firms. More specifically, MNC subsidiaries are often associated with the generation of technological externalities through the ‘leak out’ of relevant knowledge (Blomstrom and Sjoholm, 1999), which may eventually enhance domestic firms’ technological capabilities (Lall, 2001), and allow them to achieve efficiency gains. The generation of this type of externality is associated to several mechanisms. Among these, the formation of backward productive linkages with domestic firms in the host economy is considered here.\(^4\) Backward linkages are often associated with the transfer of knowledge along the value chain (Blomstrom and Kokko, 1998). As argued by Görg and Ruane (2000), in developing countries “inter-firm linkages can have positive effects on the economy through the emergence of externalities, which result in the expansion of output of sub-supplier firms in response to the establishment of new manufacturing firms.” (p. 218). In the same vein, Belderbos et al. (2001) stress that backward linkages “are associated with frequent information flows, which allow for quality improvements, reduced delivery times, and fast upgrading of designs in response to changing demand conditions for final products.” (p. 190).\(^5\)

The studies that consider FDI to be a source of technological externalities and a driver of industrial development are supported by empirical evidence about countries that seem to have managed a successful FDI-focused industrial development policy. Among them, Ireland, a country that Costa Rican politicians like to use as a benchmark, is one of the most cited. This is due to its success in building up a large and fast-growing Information and Communication Technologies (ICT) cluster through FDI attraction policies (White, 2004). In Ireland, MNC have been an important vehicle for the transmission of state-of-the-art technology to local firms via backward, lateral, and forward linkages (Görg and Ruane, 2000). The Irish FDI strategy is believed to have generated an ICT cluster, where the relevance and technological capability of local firms has steadily increased through time (White, 2004; Hewitt-Dundas et al, 2005). Beside the Irish case, there have also been successful cases of MNC-dominated clusters in the developing world, such as in Taiwan and Malaysia. In both countries, a policy of FDI attraction generated MNC-dominated clusters, where domestic firms have not only prospered, but gradually acquired complex technological capabilities and diversified into more sophisticated product lines (Lall, 2001; 1999; 1994; Contractor and Kundu, 2004; Pack, 2001; Kishimoto, 2003).

\(^4\) The focus here is only on backward linkages established with input suppliers. However, forward linkages are increasingly important for the development process of host countries, especially in those industries where marketing networks are crucial for competitiveness (Gereffi and Korzeniewicz, 1994; Schmitz, 2004; Kelegama and Foley, 1999).

\(^5\) It should be noted that several studies on the impact of MNC on domestic firms for a number of advanced and industrialising countries, have produced contradictory results (Rodrik, 1999; Görg and Strobl, 2001; Lipsey, 2002; Moran et al., 2005). Some have failed to find a significant effect for host countries’ domestic firms (Aitken and Harrison, 1999; Javorcik and Spatareanu, 2005).
Altenburg and Meyer-Stamer (1999) provide a thorough description of MNC-dominated clusters, suggesting that EMD agglomerations in Costa Rica may be considered as such, because they show a high degree of specialization and inter-firm trade. However, they emphasize that the main weakness of MNC-dominated clusters is that, in high tech industries, MNC operate at such a high level of technological sophistication that it generates a gap with the domestic industry, which is difficult to bridge. In other words, MNC-dominated clusters could potentially offer a great opportunity for local suppliers to access cutting edge technology, but they rarely do so. In this vein, Altenburg and Meyer-Stamer (1999) point out that in the case of the Mexican electronic cluster of Guadalajara, despite various institutional and grass root initiatives to promote a greater involvement of local suppliers, linkages seem to have remained weak and similarly poor was the generation of technological externalities.

The question for Costa Rica is whether these high tech EPZ can become well-functioning MNC-dominated clusters, as is considered to have occurred in Ireland, Taiwan, and Malaysia, or if it will simply result in the formation of high tech enclaves in the EPZ as in Guadalajara. More specifically, this paper makes an attempt to follow up on Altenburg and Meyer-Stamer (1999) and addresses the following research question: do MNC subsidiaries in the Costa Rican EMD cluster generate knowledge flows to their domestic suppliers?

3.2 Shifting perspective: the domestic suppliers and local cluster’s upgrading

In this section, we shift the perspective of analysis and focus on the processes of upgrading occurring within the domestic suppliers tied to MNC companies. In fact, we believe that while it is important to analyse business linkages between MNC and local firms – measuring, for example, the amount of products and services purchased locally – it is equally valuable to look at the processes occurring within the local firms that operate in the MNC-dominated clusters (Lall, 2001). Do local firms effectively benefit from operating in MNC-dominated clusters by accessing cutting edge technology, foreign markets, information, and organizational techniques? Or do they benefit from it simply because of the business volume that MNC generate?

Among the different conceptual approaches to explore these questions, we adopt here the Global Value Chain approach (Gereffi, 1994, 1999; Humphrey and Schmitz, 2001). Scholars of GVC have been at the forefront of the research analysing the impact of globalization, or integration into global value chains, on local firms and clusters. According to them, the globalization of value chains follows different logics depending on the technological and capital intensity of sectors. In sectors that are not capital and technology intensive, such as apparel, textiles, footwear and the like, MNC tend to act as global buyers, retaining design and marketing activities, but not engaging significantly in production. These value chains are defined as buyer-driven. In technology and capital intensive sectors, such as the Costa Rican EMD, the decisional power concerning strategies, technology and products is held by MNC that tend to set up plants abroad rather than simply buy from abroad, thus they are said to be operating in producer-driven value chains (Humphrey, 2002; Gereffi, Humphrey and Sturgeon, 2002). Producer-driven value chains are the context of analysis here. They have been considered an important vehicle of knowledge, as well as an important link to the international markets, for firms located in the developing world (Humphrey, 2000; Giuliani et al., 2005). Using the GVC terminology, being integrated in a GVC, for example by becoming a supplier within a MNC-dominated cluster, can be a key driver of industrial upgrading.

The concept of upgrading refers to several kinds of shifts that firms or groups of firms might undertake to improve their position in global value chains. (...) It involves insertion into local
By way of its linkages to global actors, a firm may upgrade its position in the GVC by improving its product (product upgrading), and its processes (process upgrading), or by learning how to perform new functions, for example developing product design or marketing functions (functional upgrading). However, becoming integrated in a global value chain may also imply a set of limits on the strategic choices available to a firm such as the products it will develop, or the functions it decides to perform, depending on the extent to which the MNC exercise control over the chain (Gereffi, 1994, 1999; Humphrey and Schmitz, 2001).

In producer-driven value chains, MNC subsidiaries may have an interest in promoting the upgrading of their suppliers only as far as it increases the efficiency of their operations, and as far as it is not cheaper within the local trade regime to import rather than to procure locally their inputs. However, once MNC obtain processing or manufacturing efficiency along their value chain, they may not have any incentive to promote the upgrading of the functions performed by their suppliers, as shown by Bazan and Navas-Aleman (2001) and by Giuliani et al. (2005). If they operate in EPZ, their first choice will not be to promote the upgrading of local suppliers, but to attract ‘follow sourcing’ – namely, FDI by their global suppliers. Follow sourcing, very diffused in high tech EPZ, allows MNC to save not only on search costs – they do not have to look for local suppliers – but also on all of the mechanisms that regulate inter-firm relations, such as quality standards, systems of communication, etc. (Posthuma, 2001). Therefore, upgrading for local suppliers in MNC-dominated clusters is not an automatic process and, as suggested by Bell and Marin (2005), MNC should not be viewed as ‘leaky containers’ of knowledge, generating benefits to the neighbouring firms just as a result of their localization.

As illustrated in Section 2, FDI in EPZ in Costa Rica has initiated a process of formation of high tech industrial agglomerations in EMD. FDI in high-tech EPZ may become a driver for the development of more advanced MNC-dominated clusters, not only if linkages to the domestic economy are formed, but also if they contribute to the upgrading of domestic suppliers. Otherwise, high tech EPZ will evolve into highly efficient and technologically advanced processing zones with very few linkages with the local economy. Thus, the following research question is elaborated: what forms of upgrading are carried out by domestic suppliers of MNC in EMD? How far does upgrading (in all of its forms) result from the linkages that local firms have with MNC? This work looks at upgrading by dividing it into the categories “product, process, and functional”, as suggested by the GVC framework. The aim is not only to assess whether there have been upgrading processes, but also to explore the mechanisms through which MNC subsidiaries may have promoted them.

To summarize, the paper intends to explore the following research questions: Do MNC subsidiaries in the Costa Rican EMD cluster generate knowledge flows to their domestic suppliers? And, do local firms effectively benefit from operating in MNC-dominated clusters by accessing cutting edge technology, foreign markets, information, and organizational techniques? Or do they benefit from it simply because of the business volume that MNC generate? Finally, what forms of upgrading are carried out by domestic suppliers of MNC in EMD industries?

Section 4 Methodology

The research draws on two sets of sources of firm-level data. First, we relied on the Costa Rican Foreign Trade Corporation (PROCOMER) data on the population of firms that operate in EPZ
in the EMD industries. This database is primarily used here to explore the formation of backward productive linkages of foreign firms with domestic companies. The database contains information on the goods acquired by each EMD subsidiary in Costa Rica in 2001, 2002 and 2003 and the goods are classified using a 6-digit levels industrial classification (Harmonized Systems 1996 and 2002). Accordingly, it was possible to measure the procurement of subsidiaries and its industrial composition. Drawing on Ciarli and Giuliani (2005), we use an indicator of ‘domestic procurement propensity’ (DPP), defined as the value of goods procured in the domestic market divided by the sum of domestically procured and imported goods. Hence, DPP expresses how much of the inputs are acquired in the domestic market on the total inputs used for manufacturing. Moreover, the import and domestic procurement data have been classified according to the technological classification developed by Ferraz, Rush, and Miles (1992) for Latin American countries (Ferraz classification). As illustrated in the Appendix, this classification groups industries according to their degree of technological intensity, ranging from a minimum in the case of Industrial Commodities to a maximum in the case of Diffusers of Technical Progress.

The second source of data is based on two original, separate and sequential surveys, consistent with the double perspective of this study: first that of the multinational companies and, second, that of their suppliers. Both surveys were based on face-to-face interviews using structured questionnaires, which took place between June and August 2004. In both surveys the interviews were directed at production managers or senior managers. The first survey was carried out using a sample of 26 EMD subsidiaries, drawn randomly from the population of MNC in the EMD industry in the Procomer dataset (see Table 1 for details). Apart from general information, a relevant aspect of the questionnaire used in this first survey concerned the collection of network data. The questionnaire adopted a roster study with a ‘free choice’ design (Wasserman and Faust 1994) such that our respondents were asked to name the firms operating in Costa Rica, with whom they had established several types of relations. In this study we use two types of relations: first the formation of backward linkages, measured by the existence of client-supplier relations, and, second, the transfer of inter-firm knowledge for the solution of technical problems related with the production process.

On the basis of this relations, two different types of networks were constructed, which included both the EMD subsidiaries interviewed and the firms that they mentioned to have established a linkage with. For simplicity, each linkage maps the existence of a relationship, not its strength, so that all linkages have the same value across the network. Finally, the network data were pooled within two separate matrices, each corresponding to a different relationship (i.e. one for the backward linkages and another one for the knowledge flows).

The second survey was conducted to analyse the process of upgrading in domestic suppliers of EMD subsidiaries in Costa Rica. This survey sequentially followed the first one, an aspect that allowed a sample of 20 domestic firms to be randomly drawn from a list of domestic suppliers indicated by our respondents in the first survey. The sample includes domestic manufacturers of: electrical equipment, precision mechanics, plastic moulds, and specific packaging material. It also includes providers of business software applications and services. The sample does not include the following type of suppliers: traders of imported goods, providers of security, legal,}

---

6 It should be noted that the rate of domestically procured goods is calculated on the goods that are acquired at the domestic level, but that are not necessarily manufactured in Costa Rica. For further details, see Ciarli and Giuliani (2005).
7 The questionnaires used for this analysis are available from the authors.
8 See Ciarli and Giuliani (2005).
9 In the questionnaire, respondents were asked to provide the name of the MNC subsidiary’s main suppliers operating in Costa Rica and the name of the firms operating in Costa Rica to which the MNC subsidiary has transferred knowledge for the solution of technical problems.
accounting, and transport services, suppliers of stationary and other low value added office material and suppliers of food. Furthermore, our sample has been selected in order to have a roughly balanced representation of firms that supply MNC subsidiaries operating in electronics and medical devices. Among our sampled firms, 30 per cent are suppliers of medical devices and 40 per cent of electronics MNC, whilst the remaining thirty per cent supply MNC subsidiaries in both industries (for further details on the sample, see Table 1). Apart from general information, the questionnaire used for this second survey was designed to collect information on: (i) the development of new products (product upgrading), (ii) the modification of production processes (process upgrading), and (iii) the introduction of new functions (functional upgrading) in the last three years. We have also collected more qualitative information on the type of relationship they have with MNC subsidiaries, questioning whether the latter have promoted or hampered upgrading processes.

### Table 1. Sample features

<table>
<thead>
<tr>
<th></th>
<th>MNC subsidiaries (n=26)</th>
<th>Domestic suppliers (n=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td><strong>N° of employees</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-30</td>
<td>3</td>
<td>11.5%</td>
</tr>
<tr>
<td>31-100</td>
<td>6</td>
<td>23%</td>
</tr>
<tr>
<td>&gt;100</td>
<td>17</td>
<td>65.5%</td>
</tr>
<tr>
<td><strong>Year of foundation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990 to today</td>
<td>16</td>
<td>61.5%</td>
</tr>
<tr>
<td>1950-90</td>
<td>6</td>
<td>23%</td>
</tr>
<tr>
<td>Before ’50</td>
<td>3</td>
<td>11.5%</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Type of activity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturer</td>
<td>23</td>
<td>88.5%</td>
</tr>
<tr>
<td>Service provider</td>
<td>2</td>
<td>8%</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

### Section 5 Empirical results

#### 5.1 EMD subsidiaries, backward linkages and knowledge flows

In this section, we analyse whether EMD MNC subsidiaries have generated backward linkages in the domestic economy. For this purpose, we adopt the indicator of ‘domestic procurement propensity’ (DPP) defined in Section 4. Table 2 reports the aggregate results of the propensity of EMD subsidiaries to source locally in 2001 as well as their average in the period 2001-2003, when data were available. In 2001 the value of domestically-procured goods is cumulatively of US$6.5 Million and, in the same year, EMD subsidiaries have sourced locally an average of US$114,000 from an average of 45 domestic suppliers. The reported DPP in 2001 is 0.051, meaning that EMD subsidiaries sourced about 5 per cent of their intermediate inputs from domestic suppliers in 2001. Practically the same features are found on average for the 2001-2003 period, although a slight improvement of all the indicators can be observed.

### Table 2: Domestic procurement of EMD MNC subsidiaries
Beside being limited in scale, locally procured inputs tend to be of poor technological content. Table 3 compares the technological content of domestically procured goods with that of imported goods. As explained in Section 3, imported and domestically procured data have been classified using the Ferraz sectoral classification. As reported in the table, the procurement of domestic goods in 2001 has been concentrated mostly in ‘industrial commodities’ (31.46 %) and ‘traditional sectors’ (50.01 %), while only about 17 per cent of goods acquired on the domestic market are represented by the category of ‘diffusers of technical progress’. Conversely, MNC imports are concentrated in those goods that are ‘diffusers of technical progress’ (87 %), followed by ‘traditional sectors’ (9.44 %) and ‘industrial commodities’ (2.7 %).

**Table 3: Technological intensity of domestic procurement and imports in 2001**

<table>
<thead>
<tr>
<th>Ferraz classification</th>
<th>Domestic procurement</th>
<th>Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Industrial Commodities)</td>
<td>31.46%</td>
<td>2.70%</td>
</tr>
<tr>
<td>2 (Agro-based commodities)</td>
<td>0.09%</td>
<td>0.00%</td>
</tr>
<tr>
<td>3 (Traditional Sectors)</td>
<td>50.01%</td>
<td>9.44%</td>
</tr>
<tr>
<td>4 (Durable goods)</td>
<td>0.94%</td>
<td>0.34%</td>
</tr>
<tr>
<td>5 (Automotive Sector)</td>
<td>0.07%</td>
<td>0.01%</td>
</tr>
<tr>
<td>6 (Diffusers of Technical Progress)</td>
<td>16.69%</td>
<td>87.30%</td>
</tr>
<tr>
<td>Missing</td>
<td>0.73%</td>
<td>0.22%</td>
</tr>
<tr>
<td>Total</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

Thus, if compared to the overall business value, EMD MNC subsidiaries in Costa Rica have rather weak backward linkages and of poor technological content. These statistics are not entirely surprising. The literature reports many cases of ‘enclave’ foreign direct investment, where the actual linkages established by MNC with domestic economies are weak. Remember moreover that these statistics do not allow domestically manufactured goods to be separated from the overall domestic procurement. This suggests the formation of business linkages that involve domestic manufacturers to be more limited than the one reported above.

This consideration is supported by the results of the original fieldwork, also visualised in Figure 2. It illustrates the backward linkages formed by MNC subsidiaries (square nodes) and domestic firms (circles). Each linkage maps the presence of a trade flow of inputs. Domestic firms are classified according to their activity, as manufacturers, traders and service providers. The figure clearly shows that only about a half of domestic suppliers are manufacturers, whereas the remaining half is composed mainly of traders of imported goods and a few service providers.
Accordingly, domestic procurement of EMD multinational subsidiaries generates only a partial inclusion of the domestic manufacturing industry.

Figure 2: MNC backward linkages with the domestic economy

![Diagram of MNC backward linkages with the domestic economy.]

Note: Square nodes represent foreign firms, circles represent domestic firms. Red nodes represent manufacturers, white nodes represent traders, black nodes represent service providers.

Source: Own elaboration based on survey data using UCINET 6.

We explore now the transfer of knowledge generated by the sample MNC. As explained in Section 3, knowledge flows are measured here by way of the informal technical of advice seeking and giving. This refers to inter–firm transfer of knowledge, done with the specific purpose of solving a problem related to the manufacturing process or to aspects related to the business. The network of inter-firm knowledge transfer is visualized in Figure 3. This analysis is based on the Girvan-Newman algorithm that seeks to create clusters of nodes that are closely connected within, and less connected between clusters (Newman and Girvan, 2003). As visualized in the figure, the network of knowledge transfer is characterized by the presence of four non-overlapping communities of highly connected firms. Each of these communities is highlighted in the figure by different colours and by a label – i.e. embedded, quasi-embedded and enclave. These communities, three of which are linked together by a bridging domestic firm – indicated by the black circles – differ in many respects.

---

10 The approach is that of “block modeling” (Wasserman and Faust, 1994). Rows and columns in the matrix of relations are moved to try to create “blocks” where all connections within a block are present, and all connections between blocks are absent. This matrix configuration constitutes a sort of benchmark against which the observed data are fitted. The best fit generates clusters of nodes, which describe the structural properties of the network observed.
The largest community – the ‘Enclave’ in Figure 3 – is composed mainly of foreign firms (square nodes), indicating that most of the knowledge diffused by our respondent firms flows within a restricted community of mainly multinational companies. In more detail, these are all subsidiaries of EMD companies, with manufacturing plants in Costa Rica, which have predominantly invested in the country during the 1990s for efficiency-seeking purposes. The pattern observed in this group is reminiscent of what von Hippel (1987) defined as ‘know-how’ trade. Some of the respondents in the ‘Enclave’ group described these linkages as highly informal relationships through which information on, for example, plant maintenance, repairing and the characteristics of domestic suppliers is exchanged. In spite of the fact that the survey was aimed at collecting network data on technical problem-solving, a lot of communication turned out to be of the type ‘who knows whom’ or ‘who knows what’ – i.e. of shallow technical content. However, in some cases, especially when subsidiaries share a similar technological specialisation, more sophisticated technical knowledge on products and processes was transferred for problem solving purposes. Whatever the content of the knowledge flowing among EMD subsidiaries in Costa Rican EPZ, the relevant aspect here is that the subsidiaries taking part in this group have not yet created substantial knowledge linkages with the domestic economy, and are therefore still operating as a ‘technological enclave’. This may also be due to their recent localisation in Costa Rica and/or their limited overall DPP.

A higher involvement of domestic firms in both technical advice seeking and giving is instead found in the smaller communities ‘Embedded (1)’, ‘Embedded (2)’ and ‘Quasi-Embedded’. In the latter, five EMD subsidiaries have established linkages with 6 domestic firms, which operate mainly in the plastic industry (50%), while the rest are equally divided among electronics, service and metalworking. In the third community, ‘Embedded (1)’, there is essentially one subsidiary, operating in the electronics industry, that operates as a hub of knowledge for the rest of the domestic firms in the subgroup. This subsidiary is a special case in this study being one of the first MNC established in the country (in 1950), following market-seeking purposes. Our respondent reported that in the firm there is a strong co-operative behaviour between them and their clients/suppliers in the country. However, he remarked that things have changed over time, “up until about 10-15 years ago we had to transfer a huge amount of technical knowledge to our domestic suppliers, I was more of a ‘professor’ for them than for my employees. Now things have changed, in spite of the fact that we still have strong co-operative relationships with our long-standing suppliers, we do now select new suppliers on the basis of what they already are qualified to do and we are less keen to transfer technical knowledge as intensively as we used to do in the past.”
A very similar case to ‘Embedded (1)’ is found in the other embedded community (‘Embedded (2)’), which is entirely disconnected from the other three groups. Here, one subsidiary, established in 1970 through the acquisition of a domestic TV producer, operates also as a hub, keeping the small groups of both foreign and domestic firms cognitively connected. More importantly, this subsidiary, now a producer of electrical switches and lamps, transfers technical knowledge mainly to its domestic suppliers of plastics, paper and raw materials. It also visits them once a year in order to better understand their requirements and promote technical upgrading.

This empirical evidence seems to suggest that, with the exception of a few MNC – i.e. those of the ‘Embedded’ communities - the vast majority of our surveyed EMD subsidiaries have not yet established substantial knowledge linkages with the domestic industry. On the contrary, they still seem to operate as a technological ‘enclave.’ There are therefore weak signs of knowledge flows being generated from MNC subsidiaries in the domestic economy, which gives a first indication of the fact that a well functioning MNC-dominated cluster has still not yet been formed in Costa Rica. This is further explored in the following section, which provides an in-depth exploration, on a number of selected domestic suppliers, of the characteristics of their upgrading processes.

5.2 The upgrading of domestic suppliers

The second research question - How is upgrading carried out by domestic suppliers of MNC in EMD? – is explored through a qualitative analysis of the information collected from the twenty suppliers interviewed, meant to shed light on the processes of upgrading of domestic firms. Following the theoretical suggestions of Humphrey and Schmitz (Humphrey, 2000; Humphrey and Schmitz, 2002a, 2002b), we have used the concept of upgrading to highlight improvements in the quality or range of products offered by a given firm (product upgrading), improvements in the processes involved in the creation of the good or service produced, such as the adoption of new organizational structures or new machinery (process upgrading), and the diversification of the functions performed by the firm, such as the adoption of previously external design or research operations (functional upgrading).

First, we analyse patterns of product upgrading. Second, we investigate whether there has been an improvement in production processes. Finally, we explore functional upgrading, providing qualitative evidence related to the cases where it has occurred. After presenting a description of upgrading patterns, we question whether MNC have promoted it, and how they may have done so.

5.2.1 Product upgrading

Overall the firms in our sample seem to have been quite active in upgrading their products from 2001 to 2004. As indicated by Table 4, most of them (79%) have introduced new products or improved their range of existing products (either increasing quality or introducing new characteristics and/or functions) since the year 2001. 73 per cent of the firms, have improved the quality of their products, probably as a result of process upgrading, for example adopting more rigorous quality control procedures or new machinery. A packaging material manufacturer, for example, introduced weather resistant labelling, and a higher range of colors for its labels, thanks to the purchase of more sophisticated machinery. The new products have been created to supply demand from MNC, but have also improved the market positioning of the local
manufacturer in its local firms market: the average price per unit of packaging sold has increased as a result of better quality provided.

A slightly lower percentage of firms (63%) declare that their products incorporate more sophisticated technology when compared to their previous production line, indicating that there has been some improvement in the technological complexity of suppliers’ products. Other suppliers, for example a plastic mould manufacturer, affirm that the quality of their goods has increased, generally because it was required by MNC, but that the technological complexity has remained the same.

For all of the indicators of product upgrading, such as the introduction of new machinery or of new organizational structures, improvements seem to have been slightly more widespread among suppliers operating in the electronics cluster than among those operating only in the medical devices cluster.

MNC did not result to have implemented specific programs to support the product upgrading of their suppliers. However, they required suppliers to improve the quality of their products in order to win new contracts. Domestic suppliers felt, and feel, a strong pressure to improve their products, as not only is there domestic competition, but the threat of ‘follow sourcing’11. Thus, on the one hand, MNC provided incentives for suppliers to carry out product upgrading. On the other hand, most local firms upgraded their products autonomously, either to defend their position as suppliers, or to become suppliers in a context where MNC have no incentives to source locally.

Improvements in the quality of a firm’s product often reflect both product and process upgrading. However, whilst on the one hand it is highly probable that quality improvements stem from process upgrading, process upgrading does not necessarily lead to quality improvements. Process upgrading can reduce the costs of producing a given good without actually improving its quality. Therefore, despite the strong inter – relation between product quality and production processes, it is necessary to analyze process upgrading as a different dimension of upgrading.

### Table 4. Indicators of product upgrading

<table>
<thead>
<tr>
<th>Indicators of process upgrading:</th>
<th>Total EMD</th>
<th>Suppliers of Medical Devices MNC</th>
<th>Suppliers of Electronics MNC</th>
<th>Suppliers of both Electronics and Medical Devices MNC</th>
</tr>
</thead>
<tbody>
<tr>
<td>New or improved products</td>
<td>79%</td>
<td>50%</td>
<td>100%</td>
<td>85%</td>
</tr>
<tr>
<td>Increase in product technological complexity</td>
<td>63%</td>
<td>33%</td>
<td>100%</td>
<td>57%</td>
</tr>
<tr>
<td>Improvement of product quality</td>
<td>73%</td>
<td>50%</td>
<td>100%</td>
<td>70%</td>
</tr>
</tbody>
</table>

*Source: Own elaboration from the second survey*

5.2.2. Process upgrading

Improvements in product quality are related to process upgrading: MNC often require their suppliers to obtain quality certifications, which imply improving the quality of the final good by

---

11 The Quality Control Manager of a Costa Rican supplier described to us the threat of follow sourcing: “If we do not continuously improve our products, especially in terms of quality, our clients (MNC) may attract here their global suppliers. (...) Even if we offer better prices, these firms tend to have preferential agreements for they are suppliers of the (MNC’s) headquarters, in their home-country.” Quality Control Manager, Specialized packaging material producer, supplier of medical devices MNC.
implementing quality control systems throughout the whole production process. Thus, quality certifications, such as ISO 9000 or CMM, could be used as an indicator of process upgrading. According to this indicator, our sample of firms has performed well as 90 per cent of the firms have either already obtained quality certifications or are in the process of doing so (Table 5). However, firms may also implement process upgrading without applying for a certification. For this reason, we provide a summary of process upgrading by looking at certifications but also at other indicators, such as investment in new instrumental goods and adoption of new organizational techniques.  

In the survey we asked suppliers to indicate whether they have introduced various forms of quality control within production. 79 per cent of respondents confirmed having done so, with a lower rate of positive responses among suppliers of electronics MNC. The firms in our sample seem to have mainly carried out process upgrading in the area of quality control and certification. This stems from the fact that MNC impose strict requirements in these areas. Local firms upgraded their processes, generally without support from MNC, in order to qualify with the necessary criteria to become MNC suppliers.

A strikingly high percentage of suppliers of MNC in electronics (100%) have purchased new machinery from 2001 to 2004. This specific aspect of process upgrading did not result to be related to the requirements of MNC, but rather to local firms’ perception of the importance of technology in their industries. As they put it: “operating in high technology, to have the most modern equipment is practically necessary to compete. You can’t have less advanced equipment than your competitors, and new technology is developed everyday.” (CEO and Founder, Supplier of electronics MNC, component manufacturer). Finally, only 36 per cent of firms have adopted organizational changes. Summarizing the results, MNC affected process upgrading mainly by creating a demand stimulus, and by providing specific requirements to which local firms had to comply in order to become suppliers, especially quality certifications. MNC did not tutor their suppliers into process upgrading, nor did they finance such upgrading. The acquisition of new machinery generally resulted from local firms’ will to remain competitive, rather than from the requirements of MNC, or from their direct technological assistance.

### Table 5. Indicators of process upgrading

<table>
<thead>
<tr>
<th>Indicators of process upgrading</th>
<th>Total EMD</th>
<th>Suppliers of Medical Devices MNC</th>
<th>Suppliers of Electronics MNC</th>
<th>Suppliers of both Electronics and Medical Devices MNC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality certifications obtained or pending</td>
<td>90%</td>
<td>100%</td>
<td>71%</td>
<td>100%</td>
</tr>
<tr>
<td>Adoption of quality control systems</td>
<td>79%</td>
<td>83%</td>
<td>71%</td>
<td>83%</td>
</tr>
<tr>
<td>Other organizational changes</td>
<td>36%</td>
<td>0</td>
<td>42%</td>
<td>66%</td>
</tr>
<tr>
<td>Purchase of new machinery</td>
<td>61%</td>
<td>50%</td>
<td>100%</td>
<td>33%</td>
</tr>
</tbody>
</table>

Source: Own elaboration from the second survey

---

12 Standard certifications may not be the best indicator of process upgrading and their importance differs from sector to sector. For example, in the ICT industry it is only recently that certifications have become an important requirement, with the diffusion of the CMM models (Capability Maturity Model for software), whereas in other sectors, such as electrical equipment manufacturing, ISO standards are an almost necessary criteria for local suppliers to be contracted by MNC.

13 Domestic firms operating in the electronics cluster may consider new machinery to be a more important form of process upgrading than other firms. However, it could also be a result of higher product clockspeed in electronics, which makes machinery obsolete faster than in other sectors.
5.2.3 Functional upgrading

According to GCV theory, the most important form of upgrading is functional upgrading. During our interviews we asked firms to specify the functions they perform currently, and to point out whether some of these functions were acquired only recently. Very few firms seem to have acquired new functions at all (Table 6), and fewer firms have acquired them in the last three years. The only relevant instances of functional upgrading have been observed in three firms, two of them supplying MNC in the electronics cluster, and one supplying MNC that operate in both EMD. Interestingly enough, all of the three firms that have upgraded their functions are software producers. In order to explore the dynamics of functional upgrading, the next section provides a specific description of how the three domestic producers acquired new functions, and what those functions are.

Table 6. Indicators of functional upgrading

<table>
<thead>
<tr>
<th>Indicators of process upgrading:</th>
<th>Total EMD</th>
<th>Suppliers of Medical Devices MNC</th>
<th>Suppliers of Electronics MNC</th>
<th>Suppliers of both Electronics and Medical Devices MNC</th>
</tr>
</thead>
<tbody>
<tr>
<td>New functions</td>
<td>14%</td>
<td>0%</td>
<td>28%</td>
<td>14%</td>
</tr>
<tr>
<td>Marketing</td>
<td>14%</td>
<td>0%</td>
<td>28%</td>
<td>14%</td>
</tr>
<tr>
<td>Branding</td>
<td>9.3%</td>
<td>0%</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>Other functions</td>
<td>9.3%</td>
<td>0%</td>
<td>14%</td>
<td>14%</td>
</tr>
</tbody>
</table>

*Source: Own elaboration from the second survey*

5.2.4 Functional upgrading in the electronics cluster: positive signs from software providers

Costa Rica is endowed with a small but growing software industry. This had begun to develop before the wave of FDI, but has benefited from it, since a great share of Costa Rican software providers became suppliers of MNC. This section attempts to explain how three Costa Rican software providers have managed to upgrade their functions, and how related this process has been to the fact that they are suppliers in the EMD MNC-dominated clusters:

- **Firm A**, a corporate software producer that operates for both electronics and medical devices MNC, has recently diversified its range of products to the extent that it had to introduce whole new functions. Previously, it was only developing and selling software. Now it has installed a secure data storing system, in order to provide data management services to MNC. Performing secure data management functions has required not only purchasing new machinery, but acquiring expertise in managing a completely different business line, facing different competitors, and developing a different set of core strategic advantages. Thus, it has implied upgrading products, processes and functions. The firm acquired expertise by hiring a team of external (American) consultants specialized in advising firms that provide data storage services, who had already advised various firms in India. The investment necessary to purchase machinery and acquire consulting services was realized by reinvesting profits, as in Costa Rica the financial market, which is not yet liberalized, does not offer solutions suited to the software industry, at least not in the opinion of the managers interviewed. When asked why it has diversified, considering the costs and risks involved, the CEO answered that it is in these nodes of the value chain that they foresee more potential for growth. Firm A, has introduced new functions independently from its MNC clients. It is now in the process of negotiating new agreements as it wants to exploit its MNC client’s distribution networks...
to sell its new data storage services. In this case being the supplier of an MNC does not seem to have been important for the upgrading process itself. The MNC did not provide incentives for its supplier to upgrade functions, nor did it promote such upgrading through technology transfers. On the contrary, it is not clear whether the MNC will let firm A use its distribution channels for its new services.

- Firm B, a software supplier of electronics MNC, has recently diversified its functions by becoming the certified franchise provider of consulting services on behalf of its MNC client in several Latin American countries, whilst still maintaining its core business. When asked to explain the reason for this diversification, the CEO of the company answered that these new functions are allowing the firm to have a steady income flow during the development phases of its software products, reducing risk and allowing for higher development costs and less time-constrained development periods. Firm B has developed as a corporate software producer, with a side business of ICT services stemming from the need to assist corporate clients. The most important MNC client, satisfied with the services provided, offered to its local supplier the opportunity to become its franchise service provider for Central American markets. Although officially it was the MNC to ask the Costa Rican firm to become its official service provider, unofficially the CEO of the local supplier had previously hinted at the idea to various top representatives of the MNC. Aggressive and risk-taking management was important for the local firm’s functional upgrading. However, it was its linkage with the MNC that allowed functional upgrading to occur. The Costa Rican firm is still not providing services under its own brand, but it has benefited from functional upgrading in two different ways. Firstly, it now has higher and more stable revenues, which have allowed it to increase its investments in R&D. Therefore, performing new servicing functions is allowing it to pursue a more aggressive technological development strategy. Secondly, it is acquiring expertise and know-how in ICT servicing, capabilities that will not fade even if the MNC was to choose a different supplier in future.

- Firm C, another supplier operating only in the electronics cluster, has carried out functional upgrading, acquiring new branding and client management functions. Initially, the MNC outsourced to the local supplier certain software and IT servicing functions, which it subsequently sold, bundled with some of its products, under its brand. The MNC outsourced to its Costa Rican supplier part of the development and production processes of its value chain, whilst retaining all of the branding, marketing and distribution nodes. During the last three years the supplier developed a new software and began selling it on the national market and in Mexico, without the assistance of the MNC, acquiring also branding and distribution functions. The MNC increased its interest in the product “When it saw that we could penetrate a market that is far more competitive and has far more potential than Central America” (CEO and founder of one of the top five Costa Rican software firms) and sought to acquire the technology. As a result, the MNC negotiated a different deal with its Costa Rican supplier. The MNC purchased the new technology from the local firm and began incorporating it in its products. In exchange, the MNC has gradually let the local supplier undertake all of the marketing, distribution, and client management functions for its products in Central America, stimulating a relevant process of functional diversification and learning. This amounts to an arrangement similar to a franchise, along the lines of the experience of firm B. The Costa Rican firm is benefiting from the MNC distribution network and brand, but is also learning how to manage a range of clients and markets with its own brand. In this case the upgrading was more significant, for the local firm managed to have its own brand recognized by the MNC rather than operate as a subcontractor – the
process observed, for example, in the case of Intel with IBM and Dell. Now the local firm sells a bundled product in Central America with both its own and the MNC’s brands. As a result, not only is the firm building its own brand and developing expertise in a range of functions it did not previously perform, but it is also benefiting from the credibility conferred by bundling its brand with the brand of the MNC. In this case functional upgrading resulted from the actions of both the MNC and its supplier. The Costa Rican supplier invested in R&D, developed a new technology, and attempted to sell it independently of the MNC, with the objective of shifting from being a subcontractor only to being a brand producer of ICT services. The MNC recognized the value of the technology developed, and helped the supplier upgrading its functions, by allowing it to use its distribution and marketing infrastructures. It was the MNC that proposed to the local firm to take responsibility for selling it together with their own solution under joint branding. The MNC, in this latter case, took an active role in promoting functional upgrading, although it possibly did so to avoid competition from its own supplier. The Costa Rican firm benefited from the partnership not only by exploiting an already established, high credibility distribution network, but also by acquiring know how in international distribution and marketing. Nonetheless, it is important to note that the MNC promoted the functional upgrading of its supplier when the latter had already began to acquire new functions. Thus, although the MNC did support and speed up functional upgrading, perhaps the Costa Rican supplier could have managed to acquire the same range of functions by itself. In this case as well, it seems that it has been the local firm’s upgrading to affect its linkage with MNC rather than linkages with MNC driving upgrading processes.

Clearly, in all of the three cases that we have observed, local firms have acquired a certain degree of trust from their MNC clients, which have progressively let them perform more functions, and perform higher value added activities in the value chain. When asked about the process that lead MNC to trust them, the CEO of the three software firms answered that the most important things is that they have proven to be reliable and to have a valid product from the technological side. However, they also all emphasized the importance of pursuing a strategy of investing in R&D, not only to develop new products, but also to explore the possibilities of process improvement and functional diversification. The CEO of firms A, B and C declare to invest between 3 and 5 per cent of their annual sales in R&D. However, they also emphasize that it is very difficult to define R&D expenditure, for in their industry most technicians and engineers employed are encouraged to continuously fine tune and improve the product (software applications) and processes (programming, architecture of the applications). Therefore, although there are in each firm on average 2 – 3 engineers specifically employed to search for product and process innovations, there are minor improvements implemented gradually along the product value chain.

5.2.5 What is the role of MNC subsidiaries in the upgrading of their domestic suppliers?

We have shown that in our sample the majority of firms have mainly carried out two kinds of upgrading: product upgrading, and those operations of process upgrading necessary to improve product quality. Other forms of process upgrading, such as the purchase of new machinery, or the implementation of organizational changes have been less common. We have detected signs of functional upgrading in only three software providers. In this section we try to evaluate how far the upgrading processes have been promoted – or hampered – by the MNC client in the EMD cluster. Accordingly, we have asked managers to evaluate the importance of MNC for
upgrading processes using a 0 to 3 scale, where 0 means irrelevant, 1 means very little relevance, 2 means relevant and 3 means very relevant. The results are reported in Table 7.¹⁴

<table>
<thead>
<tr>
<th>Role of the MNC</th>
<th>Irrelevant</th>
<th>Little relevance</th>
<th>Relevant</th>
<th>Very relevant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product upgrading</td>
<td>0</td>
<td>30%</td>
<td>40%</td>
<td>30%</td>
</tr>
<tr>
<td>Process upgrading</td>
<td>0</td>
<td>30%</td>
<td>45%</td>
<td>25%</td>
</tr>
</tbody>
</table>

Source: Own elaboration from the second survey

Table 7. Perceived importance of MNC for domestic suppliers’ upgrading

In our sample, 70 per cent of all of the firms interviewed have considered the role of their MNC clients to be either relevant or very relevant both in the case of product and process upgrading. Only 30 per cent of the firms have considered the role of the MNC as having limited relevance, and none of the sampled suppliers regard MNC subsidiaries as totally irrelevant. Some of the firms that answered ‘Little relevance’ explained to us that MNC did not promote or contribute to their upgrading. However, they still thought that by virtue of generating demand for their products, MNC have not been completely irrelevant. The majority of firms have evaluated MNC to have had a positive impact on those processes that GVC theory defines as product and process upgrading.

At first glance this result may seem to be striking. According to the analysis carried out in Section 5.1, the transfer of knowledge from MNC subsidiaries to domestic firms is limited. However, the fact that domestic suppliers claim that MNC subsidiaries play a relevant role for both process and product upgrading does not contrast with the results of Section 5.1. When asked to explain how MNC subsidiaries promoted their upgrading processes, local suppliers converged in emphasizing the role of MNC in providing incentives to upgrade. Such incentives rarely included the transfer of knowledge: local firms upgraded in order to become MNC suppliers or to expand their supply contracts. This does not necessarily imply that MNCs assisted them in their upgrading processes.

A more in-depth analysis of the product and process upgrading observed reveals that no significant upgrading occurred beyond the introduction of new products and the improvement of product quality. Although these may be important forms of upgrading, they do not necessarily imply a strong knowledge transfer from MNC. With the exception of software producers, a great share of the product upgrading and process upgrading observed has been the result of mandatory requirements that MNC have established for firms to become their suppliers. The following three quotes highlight why and how suppliers upgraded their products and processes.

We introduced a new product line simply to adapt to our new multinational client. The new product is not necessarily any better, it is just more targeted to the client’s needs, and production has been organized for higher volumes. Multinationals have been important for us because with them we grow much faster. For this reason we have bought new machinery. CFO, software and service provider, supplier of electronics MNC.

We applied ISO 9001 certification because we need it to be a supplier of firm X (a MNC operating in medical devices). After we began the process to get it, other multinationals asked us for the certification if we wanted to be their suppliers. We feel that the quality of our products was already sufficiently good before ISO, but you know, being a small firm in a developing country, you have to struggle to appear

¹⁴ We acknowledge that the analysis carried out is based on the subjective perception of entrepreneurs, which may be influenced by various factors not related to our research question, such as personal relations with MNC managers. Further research by one of the authors is currently being carried out.

18
credible. Now we have also applied for another ISO certification, because it was suggested to us (by a governmental institution) as a strategy to be more competitive. CEO, component manufacturer, supplier of medical devices MNC.

They [MNC] gave us specifications for the part they need, and we adapted our machinery to make it. The main difference is that we get ten times the orders that we would get without them (MNC). CEO, component manufacturer, supplier of medical devices MNC.

In most cases, new products were launched without technical support from MNC, whilst joint product development has been observed only in software firms. Only 35 per cent of our sampled firms have supply contracts that include technical assistance from MNC. Moreover, of those firms that do have contracts involving technical assistance, only two have effectively been assisted by their MNC clients in the adoption of new technology. Although the domestic suppliers interviewed upgraded their products as a response to demand by MNC, the latter did not take an active role in the process. The firms in our sample seem to consider MNC to be important for product upgrading because they constitute a growth factor, not because they are direct sources of knowledge that make upgrading possible.

In the case of process upgrading, MNC have required quality certifications. However, they have not provided the necessary funds or training to obtain them. Various external agents, such as the Inter-American Development Bank in the case of software producers, have provided financing for domestic firms that wish to obtain certifications. Third party consultants have been highlighted as the most common source of training used to obtain their certifications. Thus, as for product upgrading, MNC have created a stimulus for process upgrading for the suppliers interviewed, but they have not promoted it by transferring substantial knowledge and investing their own resources into it. Process upgrading did not occur through the linkages between MNC and local suppliers. The information collected during fieldwork suggests that most local firms could have upgraded their production processes without being MNC suppliers.

This evidence seems to suggest a scenario in which it is more common that linkages with MNC emerge because of upgrading, rather than the other way round: local firms upgrade so that they can try to become suppliers of MNC. Being an MNC supplier does provide advantages, but it is difficult for local firms to become a supplier in the first place, given that MNC do not have many incentives to source locally.

A final comment is given with respect to industries within the EMD MNC-dominated cluster. As a result of the second survey, we found that medical device suppliers have carried out fewer upgrading processes than the rest of the firms, and their upgrading has often been strictly related to achieving the necessary quality certifications to serve MNC. Consistent with this finding, no supplier in the medical devices cluster has found MNC to have been very important for product or process upgrading, and many – four in the case of product upgrading and three in the case of process upgrading – have deemed their role to be of little relevance. On the contrary, the suppliers operating in the electronics cluster have been the most successful in terms of upgrading. Not only have they introduced more products, but they have also purchased more machinery and acquired new functions.15

6 Conclusions

A reason why governments in developing countries make huge efforts to attract foreign investors and global buyers to operate in their countries is that foreign firms can be important

---

15 Further research by one of the authors will explore this difference in greater detail.
drivers for the development of organizational and technological capabilities of local firms. More specifically, foreign firms are often believed to generate technological externalities in the host country through the ‘leak out’ of relevant knowledge (Blomstrom and Sjoholm, 1999), which may eventually enhance domestic firms’ technological capabilities (Lall, 2001), and allow them to reach various forms of upgrading. The literature on the impact of foreign firms on domestic suppliers is however controversial and the empirical evidence in this respect is still quite mixed (Rodrik, 1999; Görg and Strobl, 2001; Lipsey, 2002; Moran et al., 2005). This paper has made an attempt to contribute to this literature, looking at the impact of EMD multinational companies on local suppliers’ upgrading.

This study sheds light on whether a well-functioning MNC-dominated cluster has developed after the Costa Rican successful attraction of EMD foreign investors. This is done with a double perspective: on the one hand, we looked at the behaviour of subsidiaries of MNC in Costa Rica and whether they produced backward linkages and knowledge flows in the domestic economy. As shown by Ciarli and Giuliani (2005), the propensity of domestic procurement was still relatively low and concentrated in low-medium technologies sectors. Moreover, we found that MNC do transfer knowledge to other firms in the country but this knowledge tends to diffuse within an enclave of foreign firms, with only a small number of domestic firms benefiting from it. On the other hand, surveying a sample of domestic suppliers of the MNC mentioned above, we found that MNC had an impact in fostering product and process upgrading in domestic firms, if not directly, indirectly generating a stimulus and a market. Consistent with Giuliani et al. (2005), our findings provide evidence of product upgrading and process upgrading, and very limited functional upgrading in the Costa Rican MNC-dominated clusters. Only in the case of software producers, do there seem to be some promising signs of upgrading. In this sector, MNC have established a close relationship with the largest local firms. Not only have MNC invested in some of the local software producers, but in certain cases they have also assisted and promoted their upgrading of products, processes and functions. The three software firms that upgraded functionally are among the top five national ICT firms and were founded during the late 1980s, early 1990s. In their own words “it was the arrival of MNC that pushed our (national software developers) growth and leveraged us from the status of small software workshops”. However, when MNC ‘arrived’, there was already a small cluster of local software firms, with its own small pool of specialized workers. The MNC-dominated cluster may have boosted the learning processes of local firms and their revenues, but there also seem to be circumstances of MNC benefiting from finding a fabric of local firms that not only began operating as suppliers, but also eventually as distributors and as a training ground for the local workforce.

To conclude, we have provided here evidence that the formation of linkages between foreign investors and domestic firms is still an incipient process in Costa Rica. A certain dualism persists between the two (Ciarli and Giuliani, 2005), with the only exception being the growing domestic software industry. As a result, we could not observe a substantial conversion of EPZ into a well functioning MNC-dominated cluster, as Altenburg and Meyer-Stamer suggested in their 1999 paper. This study, however, leaves a number of interesting issues open to future investigation. Firstly, the development of the software industry merits a more in-depth analysis, as this seems to be the most promising economic outcome associated with EMD foreign investment. Secondly, more accurate research should be carried out to measure the capabilities accumulated by domestic suppliers, especially in industries such as plastics and metalworking, which provide critical inputs for EMD companies. Finally, further research should shift from static analysis to dynamic analysis of networks, tracking the evolution of the linkages between foreign and domestic firms over time.
# APPENDIX: Ferraz Classification

<table>
<thead>
<tr>
<th>Ferraz Categories</th>
<th>Illustrative 4-digit SIC Industries</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INDUSTRIAL COMMODITIES</strong></td>
<td>Dyeing and Finishing Textiles</td>
</tr>
<tr>
<td></td>
<td>Paperboard Containers</td>
</tr>
<tr>
<td></td>
<td>Industrial Inorganic Chemicals</td>
</tr>
<tr>
<td></td>
<td>Iron And Steel Foundries</td>
</tr>
<tr>
<td><strong>AGRO-BASED COMMODITIES</strong></td>
<td>Canned, and Preserved Fruits</td>
</tr>
<tr>
<td></td>
<td>Animal Fats And Oils</td>
</tr>
<tr>
<td></td>
<td>Grain Mill Products</td>
</tr>
<tr>
<td></td>
<td>Sugar</td>
</tr>
<tr>
<td><strong>TRADITIONAL SECTORS</strong></td>
<td>Meat products</td>
</tr>
<tr>
<td></td>
<td>Bakery products</td>
</tr>
<tr>
<td></td>
<td>Apparel</td>
</tr>
<tr>
<td></td>
<td>Soap, Detergents and Cleaning Preparations</td>
</tr>
<tr>
<td><strong>DURABLE GOODS</strong></td>
<td>Household Appliances</td>
</tr>
<tr>
<td></td>
<td>Watches</td>
</tr>
<tr>
<td></td>
<td>Motorcycles</td>
</tr>
<tr>
<td></td>
<td>Bicycles and Parts</td>
</tr>
<tr>
<td><strong>THE AUTOMOTIVE SECTOR</strong></td>
<td>Motor Vehicles</td>
</tr>
<tr>
<td></td>
<td>Passenger Car Bodies</td>
</tr>
<tr>
<td></td>
<td>Motor Vehicle Equipment</td>
</tr>
<tr>
<td><strong>DIFFUSERS OF TECHNICAL PROGRESS</strong></td>
<td>Pesticides and Agricultural Chemicals</td>
</tr>
<tr>
<td></td>
<td>Drugs</td>
</tr>
<tr>
<td></td>
<td>Farm Machines</td>
</tr>
<tr>
<td></td>
<td>Machines Tools</td>
</tr>
<tr>
<td></td>
<td>Communication Equipment</td>
</tr>
<tr>
<td></td>
<td>Electrical Industrial Apparatus</td>
</tr>
<tr>
<td></td>
<td>Aircraft and Space Vehicles</td>
</tr>
</tbody>
</table>

Source: Marin and Bell (2005)
REFERENCES


CINDE (2004), http://www.cinde.org/


