



Foreign Direct Investment and the ICT Cluster in Costa Rica: Chronicle of a Death Foretold?

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Abstract

Costa Rica has been successful in attracting high-tech foreign direct investment (FDI). An aggressive FDI-assisted development strategy was pursued by the country in the 1980s as a response to the economic crisis; yet there are serious concerns about the effectiveness of such strategy from a development point of view.

In this paper, we focus on the effects of the FDI-assisted development strategy on the Costa Rican ICT companies. We present such strategy since the decade of the 1990s and the characteristics of the companies in the ICT sector. Based on this presentation, we discuss the positive and negative effects of the FDI strategy on local software firms, which are the majority of the indigenous ICT firms.

A balance of the situation shows that the current FDI-assisted development strategy presents more negative effects than positive ones to local ICT companies. By large, this is due to the lack of spillover effects from MNCs to indigenous ICT firms. We present factors able to explain the existence of few spillover effects and provide recommendations for public policy to increase the possibilities for obtaining more positive benefits from a high-tech FDI-assisted development strategy.

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The understanding of such factors and the articulation of effective policies capitalizing on them are fundamental to avoid Costa Rica falling victim of its own success.

1. Introduction

In response to the 1980s economic crisis, Costa Rica adopted an outward-oriented development strategy based on promoting non-traditional exports and attracting FDI. While initially focusing on attracting FDI from agriculture and unskilled-labor intensive manufacturing, the country made a shift in the 1990s towards skilled-intensive industries. Intel's announcement in 1997 to build an assembly and testing plant in Costa Rica reaffirmed the viability of attracting high-tech FDI and consolidated the country's FDI-assisted development strategy.

Nowadays Costa Rica is considered a successful country within Latin America in attracting high-tech FDI and following a FDI-assisted development strategy.³ However, economic results during the last decade have been disappointing, with the presence of weak and volatile economic growth, a growing gap between GDP and GNDI due to greater payments to factors of production owned by foreigners, scarce productive linkages between foreign-owned firms and nationally-owned firms, limited spillover effects from FDI, and increasing income inequality (Mata Marín 2007). These results raise questions about the effectiveness of Costa Rica's FDI-assisted development strategy.

Additionally, there are indications that the implementation of this strategy has put domestic companies in a disadvantageous situation in relation to subsidiaries from multinational corporations (MNC). Tax incentives are offered to MNCs that operate under the regime of export processing zones (EPZ) and these companies also have access to better infrastructure, simplified procedures, and credit at lower rates than local firms. This unlevelled playing field could negatively affect indigenous companies.

This paper explores the effects of Costa Rica's FDI-assisted development strategy on local ICT firms, particularly software companies. FDI could have positive effects on domestic firms through linkages and spillover effects. Given the emphasis of the FDI strategy in the country towards high-tech companies, particularly ICT related companies, domestic ICT companies could be the most likely to benefit from this strategy. This is based on the literature on clusters which argues that spatial proximity is a major factor to lower the cost of knowledge transmission by means of interpersonal contacts and labor mobility among firms (Breschi and Malerba 2005). On the other hand, indigenous ICT companies compete with high-tech MNCs for qualified human resources.

This paper is organized in six sections. Section 2 presents the high-tech FDI-assisted development strategy currently pursued in Costa Rica. Section 3 describes the characteristics of the firms in Costa Rica's ICT sector. The positive and negative effects of

³ See for example Mortimore (2003).

the FDI-assisted development strategy on local ICT firms are discussed in section 4 and 5, respectively. Section 4 also explores possible factors affecting the occurrence of positive effects. Finally, conclusions and policy recommendations are presented in section 6.

2. Costa Rica's FDI-assisted development strategy

Costa Rica's current export-oriented FDI-assisted development strategy came as a response to the economic crisis suffered during the early 1980s. Throughout the 1970s, it was difficult for the country to generate enough economic resources to maintain rising wages, to finance ambitious social projects and to fund public enterprises. At that time, several factors came together to trigger the country's first economic crisis since the 1930s, among them were increased foreign debt, especially from commercial banks at variable interest rates, a sharp decline in coffee prices, and shocks in oil prices (Seligson and Martínez 2005).

Similar to other developing countries, Costa Rica adopted an EPZ regime in 1981. This regime offered tax free imports of inputs and equipment to foreign companies, a complete exemption on income tax for the first 8 years, and the obligation to pay only 50% of taxes for the next 4 years (Rodríguez-Clare 2001). The country also joined the Caribbean Basin Initiative (CBI) to gain access to the US market in 1984. Furthermore, the Costa Rican Investment Promotion Agency (CINDE), a private non-profit organization, was created in 1983.

CINDE's initial efforts were focused primarily towards agriculture and unskilled-labor intensive manufacturing sectors. However in the early 1990s, this organization realized that the country was losing competitiveness in unskilled-labor intensive industries to other members of the CBI. In addition, the North American Free Trade Agreement (NAFTA) would give Mexico better access to the US market than CBI country members. Consequently, CINDE changed its strategy and decided to focus its FDI attraction efforts on sectors "that were a better match for Costa Rica's relatively high education levels (i.e., skilled-labor intensive industries)" (Rodríguez-Clare 2001, 7). In its 1993 strategic plan, CINDE determined that it would concentrate on sectors associated with the electrical, electronic and telecommunications industries. By that time, several companies of the electronics sector were already established in the country (e.g., Motorola, Trimpot, Sylvania, and Espion), a good supply of technicians and engineers were available in the country, the country benefited from political stability, and a developed legal system was in place, making these sectors a good selection. Figure 1 shows the inflows of FDI from 1975 to 2006, which prove that the proposed change in strategy provided good results in terms of FDI attraction.

Intel's decision in 1997 to invest US\$300 million in a period of two years (2.1% of the national GDP) and a total investment of US\$600 million for building an assembly and testing plant in Costa Rica consolidated CINDE's strategy, and from that moment on CINDE's strategy became a national strategy (Larrain et al 2000, Rodríguez-Clare 2001).

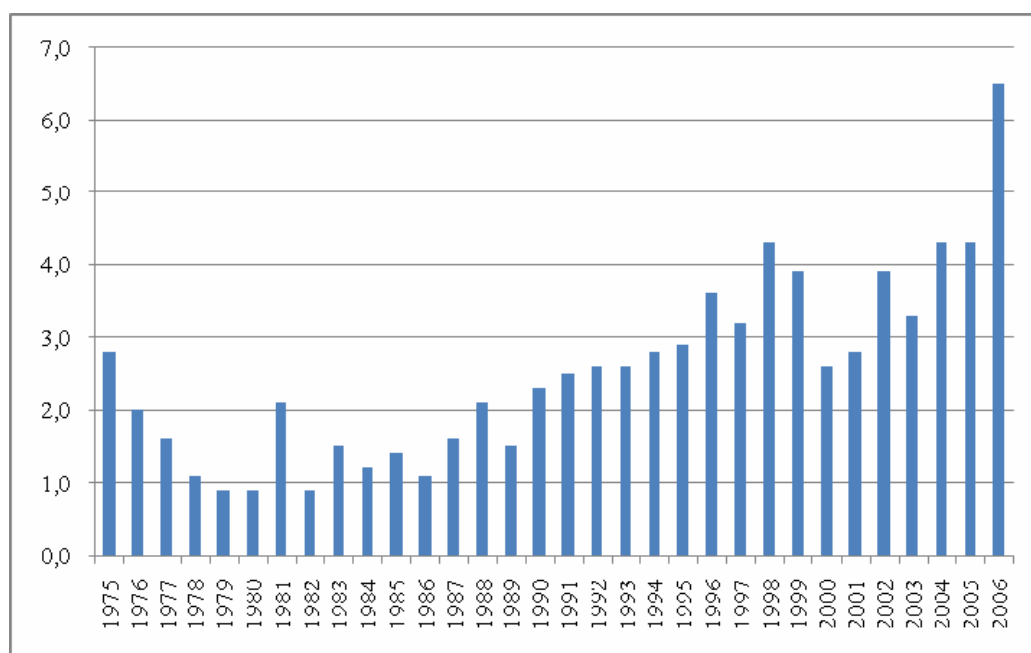


Figure 1. FDI inflows (% of GDP)
Source: Central Bank of Costa Rica

The economic effect of Intel to the country's GDP became apparent from the beginning of the operations of its plant in Costa Rica. In 1999, Intel's production contributed 5 percentage points of the 8% real GDP growth of the country, accounted US\$330 million in value added --approximately 7% of the GDP at domestic real prices--, and registered around US\$1,496 million in net exports --approximately 9.8 % of the GDP (Larrain et al. 2000). According to Ketelhöm and Porter, "[t]he Intel plant marked a milestone in the development of the economy and the latest step in forming what the government called 'the electronics and information technology cluster'" (2006, 1).

3. Costa Rica's ICT sector

An indigenous ICT cluster began to develop in Costa Rica since the 1980s. A survey conducted to 97 software companies in Costa Rica in the year 2000 revealed that 70% of these companies were created before 1995: 3% before 1980, 30% in the 1980s and 37% between 1990 and 1995 (Mata and Jofré 2001). Although the exact number of indigenous ICT companies is unknown, it is estimated that more than 500 such firms could exist in the country. Approximately twenty of these companies lead this group, among them Artinsoft, CODISA, Exactus, Sysde and Tecapro (El Financiero 2007).

Even though local ICT companies precede the installation of Intel in the country, the decision of this company to invest in the country represented a high-point for the ICT cluster. Furthermore it created a ripple effect, inducing Procter and Gamble to open in Costa Rica a global business services center in 2000, Western Union to establish a customer interaction center (contact center) in 2000, and Hewlett Packard to install a

business process outsourcing center in 2003, among other MNCs that have decided to have global operations based in Costa Rica.

Statistics from the Costa Rican Association of ICT companies (CAMTIC) and the Costa Rican Export Promotion Agency (PROCOMER) revealed that the total sales of the ICT sector in 2006 was US\$2,524 million, equivalent to 14% of the GDP. Exports from this sector for the same year were estimated in US\$2,327 (92% of the total sales for the sector and 30% of the total exports of the country). During that year the ICT sector employed 33,555 persons (1.92% of the economically active population) (Mora 2008).

Notable differences exist between ICT MNC and indigenous companies in Costa Rica, as it can be observed in Table 1. It can be concluded from this table that an uneven profile exists among the two types of companies, being the local companies more in number, yet smaller in size, with lower sales and less employees than the MNCs. Domestic companies focus on IT direct services (database services, network services, customized software development, consulting, and other related services) and development of horizontal and vertical software solutions, being the majority of them software companies which offer outsourcing services. On the other hand, MNCs have established mainly operations in IT enabled services (global business services, customer interaction services or contact centers, back-office operation services, business process outsourcing, etc.) and electronic components (production of microprocessors, design and production of electronic circuits, etc.). Figure 2 presents a list of MNCs that have established IT enabled services in the country, the largest group of ICT MNCs.

Table 1
Characteristics of indigenous and multinational ICT companies
in Costa Rican for the year 2006

Characteristic	Indigenous	MNCs
Number	600	95
Size	Micro, small and medium	Large and medium
Main industries	IT direct services (350 companies) Development (250 companies)	IT enabled services (60 companies) Electronic components (35 companies)
Total sales (US\$ in millions)	300	2,224
Total employees	9,405	24,150
Average sales per employee	31,898	92,091

Source: Elaborated using statistics from the Costa Rican Association of ICT Companies (CAMTIC) and Costa Rica's Export Promotion Agency (PROCOMER) cited by Mora (2008)

Figure 2. IT enabled service MNCs established in Costa Rica



Source: CINDE, 2008

Since the majority of the local ICT firms are software companies, we select the software industry in Costa Rica to analyze the positive and negative effects provided by the high-tech FDI-assisted development strategy in the following sections.

4. Positive effects of the Costa Rican high-tech FDI-assisted development strategy on local ICT firms

FDI can offer small developing countries, like Costa Rica, the possibility of development that might not exist under an inward-oriented or nationalistic strategy because of their limited financial resources, human resources, and market size (Paus 2005). In terms of promoting economic development, Klein, Aaron and Hadjimichael (2001) suggest that FDI can serve as a vehicle for transferring “best practices” across borders; through FDI developing countries can “import” larger, more productive firms.

According to Paus (2005), the most valuable contribution of MNCs to the development of a country is the creation of assets based on knowledge, particularly due to spillover effects which can widen the technological potential of local producers. The following possible spillover effects from ICT MNCs can be synthesized from the literature: 1) demonstration effects, 2) knowledge effects, 3) reputation effects, and 4) access to complementary resources. Demonstration effects are effects in the behavior of companies as the result of other firms’ actions (Paus 2005). Knowledge effects refer to knowledge diffusion about best practices to other companies, particularly local ones (Klein, Aaron and Hadjimichael

2001). Reputation effects are created due to the association of a local company to a MNC; such effects are able to reduce the cost of market access for domestic firms (Porter 1998). Finally, access to complementary resources refers to the provision of important resources, such as funding, marketing and managerial capacities by MNCs to local firms (Giarratana et al. 2005).

Intel's decision to install an assembly and testing plant created strong demonstration effects, by showing other companies Costa Rica's advantages as an investment destination. This in turn motivated other ICT MNCs to establish operations in the country, enlarging the ICT cluster.

However, there is limited evidence of other spillover effects from MNCs on local ICT firms in Costa Rica. Regarding knowledge spillovers, two channels for obtaining such spillovers are linkages between firms and labor mobility. In general, linkages between MNCs and domestic companies in Costa Rica have been scarce and restricted mostly to services, packing and printing industries (Paus 2005). Furthermore, there is no reported evidence that labor mobility has been able to create spillovers. This situation could be explained because wages in MNCs tend to be higher than in indigenous firms, limiting labor mobility from MNCs to indigenous ICT companies.

Furthermore, there are not many examples of spillovers due to reputation effects and access to complementary resources in the software industry in Costa Rica. Major exceptions are, however, Artinsoft and Exactus, companies that have formed alliances with Microsoft⁴ and have received capital investments from Intel⁵.

The fact that there are only limited spillover effects from MNCs to local software firms raises questions about the possible reasons for this situation. Overall, spillover effects are not created spontaneously or automatically (Paus 2005) and depend on the absorptive capacity⁶ of the host economy and the local companies. According to Klein, Aaron and Hadjimichael (2001, 5), "adequate levels of education and infrastructure are required to fully benefit from FDI". Furthermore, differences in technological capabilities between MNCs and local firms lower the intensity of linkages (Lall and Narula 2004).

To explain the limited spillover effects observed, we propose two possible explanations related to the technological capacity of local software firms. In addition, we present two additional explanations, one related to the capacity of indigenous ICT firms to hire workers from MNCs, and the other related to the limited demand of local software by MNCs.

In relation to the technological capacity of the local software firms, most local software companies provide outsourcing services, focusing on low-value activities and using commonly available technology. Also, the majority of the indigenous software companies

⁴ Microsoft has appointed Artinsoft as global migration services provider (Microsoft 2001) and distributes software from Exactus (El Financiero 2006).

⁵ El Financiero 2002, 2003.

⁶ Defined as the "firm's ability to identify, assimilate and exploit knowledge from the environment" (Cohen and Levinthal 1990, 128).

are small, which limits their technological capabilities, reputation and their access to key resources.

In relation to the first explanation, most software companies in Costa Rica offer outsourcing services either for the national or international markets. Such services usually concentrate on labor-intensive processes, such as software coding and testing or technical support, which have low value-added, as opposed to software analysis and design (Heeks 1998). Low value-added activities constrain the technological capabilities of the firms. As differences in technological capabilities between MNCs and local firms constrain the intensity of linkages, spillover effects will also be limited (Paus 2005).

In addition, outsourcing companies tend to use commonly available technology to both MNCs and local ICT companies, rather than develop state-of-the-art technology. The use of common available technology levels off the technological capacity of the local firms and makes them similar in the eyes of the MNCs, as their products and services are more standardized than specialized. In this case, MNCs are less likely to develop a long-term relationship with a particular local firm that could lead into significant spillover effects.

Regarding the second explanation, a survey carried out in 2007 comprising 125 ICT Costa Rican companies, mainly local software companies, revealed that 73% of those firms are small companies with 30 or less employees (Hewitt and Monge 2007). Firm size may also limit the technological capabilities of the local software firms due to lack of labor specialization and limited managerial capabilities. Similar to the previous case, this situation weakens the potential linkages between MNCs and local companies, due to larger differences in technological capabilities between the two groups of firms. This fact limits again the possibility of spillovers.

In addition, small companies might have limitations to access resources in the factor markets, particularly financial and human resources.⁷ Such limitations impact, not only their technological capabilities, previously discussed, but also their efficiency.⁸ Less efficient firms are less likely to be competitive and establish linkages as suppliers or to establish collaborations with MNCs that would enhance their reputation or give them access to complementary resources.

Thirdly, labor mobility is a possible factor for obtaining knowledge spillover effects in the software industry (Giarratana et al 2005). In the case of Costa Rica, labor mobility from MNCs to local firms is limited, since wages in indigenous companies are usually lower than in multinational firms.⁹ Therefore, recruiting MNC employees is difficult for local ICT firms.

Finally, software demand by MNCs in the country is limited, since subsidiaries usually use software developed or acquired by their headquarters located in other countries. Few

⁷ The case of human resources is explained in more detail in the next section.

⁸ The optimal size of a firm is generally linked to the search of efficiency through the pursuit of economies of scale and economies of scope (see Barney 2002).

⁹ Wage disadvantages for domestic ICT firms are discussed in the next section.

MNCs in the country have discretionary decision-making authority to develop or contract software in Costa Rica.

The case of Artinsoft illustrates the previous discussion. Artinsoft's services are based on proprietary, not commonly available, migration technology which allows translating legacy systems in old programming languages into more modern ones. Artinsoft's software has high added-value. The development of migration proprietary technology and its use of Microsoft .NET framework made Artinsoft attractive to Microsoft, leading to a strategic alliance between these two companies. This alliance includes services, a strategic equity investment, and the provision of software developed by Artinsoft at no cost to Microsoft's Visual Studio .NET customers to upgrade to Visual Basic .NET from Visual Basic 6.0. Based on this alliance, Microsoft named Artinsoft as the "preferred supplier of worldwide upgrade services for customers" (Microsoft 2001), enhancing the company's reputation. At the time the partnership with Microsoft was established, Artinsoft was not a small company and had already a reputation of its own, not only in Costa Rica but also in other countries.

5. Negative effects of the Costa Rican high-tech FDI-assisted development strategy on the local ICT firms

Two major negative effects of the Costa Rican high-tech FDI-assisted development strategy for local ICT firms can be observed: 1) wage disadvantages of indigenous ICT firms to recruit qualified human resources in a tight labor market and 2) cost and infrastructure disadvantages of local ICT firms *vis-à-vis* MNCs operating in the country. Both effects may result in comparative productivity losses for domestic companies and reduced wages for employees in these companies.

The operational conditions of indigenous ICT companies have worsen in the present days due to rising demand for qualified labor, from both MNCs as well as local ICT companies, following a strong recuperation of the ICT sector at the global level after the burst of the "technology bubble". Given the small population of Costa Rica and the limited coverage of secondary and tertiary education,¹⁰ this increase in demand has produced a serious shortage of human resources. Under these conditions, MNCs have an advantage in the labor market, since they are more capable of recruiting local qualified personnel in the country at relatively higher wages than local ICT companies, yet still at comparatively lower wages than in other countries.

Although a surplus of qualified workers in the ICT sector existed in the country during the 1980s and 1990s, nowadays there is evidence of a shortage of workers in this sector. A recent survey of 83 Costa Rican companies, including ICT local firms, ICT MNCs and other companies and public institutions, revealed that in 2007 such companies were not able to recruit 2,299 ICT employees, amount that represents 30% of the total ICT workers already hired by these companies (Mata and Matarrita 2008a). The sample used in this survey was selected on the basis of judgment, given the fact that there is not an established sampling frame for such organizations in the country. Therefore, although the results of

¹⁰ In 2006, the gross enrollment rate in Costa Rica was 60.2% in upper secondary and 25.3% in tertiary education (World Bank EdStats).

this survey cannot be used to estimate a total for the whole country, the magnitude of the problem can be seen when the unsatisfied demand is compared to the number of ICT graduates. In 2006, the total number of ICT graduates in all levels of formal education in Costa Rica was an estimated 2,382 (Mata and Matarrita 2008b). This means that Costa Rica's education system would need to at least double the number of ICT graduates to satisfy the demand in that year. The organizations surveyed also indicated that the availability in the labor market for ICT workers is low and that wages would likely increase in the next three years for most ICT occupations considered in the study (Mata and Matarrita 2008a).

Using the data in Table 1, average sales per employee in the ICT sector for MNCs is approximately US\$92,000 versus US\$32,000 for local firms, almost three times higher. Although data on value added and wages is not available, the difference in average sales can be used as an indicator of the ability of MNCs to pay higher wages. Also, the manufacturing sector, for which statistics are available, can serve as reference to this situation. While value added per employee in local manufacturing firms has remained relatively constant around 2-3 million *colones*¹¹, value added per employee in EPZ manufacturing firms remained at about 5 million *colones* in the first half of the 1990s, increasing to over 13 million in 1999, before falling back down but remaining over double its initial value. Moreover, average annual wages paid by the local manufacturing sector increased by a third of their value to just over US\$4,000 from 1994 to 2003. In the same period, average annual wages paid by EPZ manufacturing firms, which started off at a similar value, more than doubled, reaching over US\$9,000¹² (CINDE 2006). Therefore, MNCs have advantage over indigenous ICT firms to recruit employees in a tight labor market, and will continue to do so until marginal cost of labor in Costa Rica exceeds the marginal cost of labor in other countries with similar productivity levels.

The difficulties for recruiting qualified human resources by local firms can limit their absorptive capacity. As explained before, although MNCs and indigenous ICT companies have difficulties recruiting staff, these difficulties are greater for local firms since their disadvantages in paying higher wages seriously affect their ability to hire the best employees in the market. As argued in the previous section, this situation can have an effect in the technological capabilities of the indigenous ICT firms, limiting spillover effects.

To respond to shortages of qualified workers, upgrading to higher value-added and less labor-intensive activities is needed. The Costa Rican government has already announced changes to the incentives offered under the EPZ regimen with the objective of attracting more value-added high-tech MNCs, requiring less, although more qualified, human resources (La Nación 2007). However, in this case, indigenous companies would need also to upgrade their activities in order to be able to pay competitive wages and attract workers. Furthermore, if local companies do not upgrade their activities at a similar pace to that of foreign companies, the gap in the technological capacities between both types of firms will increase, lowering the probability of linkages and spillover effects.

¹¹ 1991 constant *colones*.

¹² These differences in wages may reflect in part differences in the qualifications of the workers hired.

Negative effects of Costa Rica's FDI-assisted development strategy for local ICT firms are also derived from a fragmentation of the investment climate in the country, which makes local companies operate under less favorable economic conditions than their counterpart MNCs (Rodríguez 2006). Most MNCs operate under an EPZ regimen, benefiting from certain tax exemptions and subsidies for infrastructure use, such as lower electricity cost. In addition, the investment climate between MNCs and local firms are segmented in terms of important variables such as interest rates, procedures, customs, and quality of infrastructure (Rodríguez 2006). For example, small and medium enterprises that sell their products in the domestic market have access to credit at high interest rates in *colones*,¹³ while their MNC counterparts have access to credit in dollars, at low interest rates. Government procedures and customs processes have been streamlined for MNCs while local firms have to deal with bureaucratic procedures and processes. In addition, MNCs in EPZ usually enjoy better telecommunications and electrical infrastructure than local companies.

This fragmentation of investment environments can cause local companies to operate under less favorable conditions than MNCs, which might result in lower productivity, which additionally affects their capacity to pay competitive wages. This situation raises serious questions about the "true intentions" of the government to promote indigenous companies in the country, particularly small and medium (SME) ICT companies.

6. Conclusions and policy recommendations

Costa Rica's FDI-assisted development strategy has been effective in attracting high-tech FDI. However, during the last decade the country has presented disappointing economic results. This may be due in part to the fact that growth has been concentrated in certain sectors of the economy, including export-oriented MNCs, which are disconnected from the rest of the economy (Mata Marín 2007). In the case of the ICT sector, for example, there is limited evidence of positive effects of FDI on local ICT companies through linkages and spillover effects. Instead, the FDI-assisted development strategy has negatively affected local firms, which face disadvantages to recruit qualified workers and cost and infrastructure disadvantages *vis-à-vis* MNCs.

As explained above, there is limited evidence of spillover effects from MNCs on local ICT firms in Costa Rica, with the cases of Artinsoft and Exactus being the exception. To explain this situation, we propose two possible explanations related to the technological capacity of local software firms: 1) most local software companies provide outsourcing services, focusing on low-value activities and using commonly available technology, and 2) the majority of the indigenous software companies are small, which limits their technological capabilities, reputation and access to key resources. These factors create a gap in the technological capacity of MNCs and that of local ICT firms, which limits the possibility of spillover effects. Most indigenous ICT firms offer low-value added products and services based on commonly available technology, and therefore they are more

¹³ Domestic interest rates are pushed upward by the fiscal deficit and other macroeconomic disequilibria (Rodríguez 2006).

standardized than specialized. This fact also limits spillover effects, as MNCs will be less willing to establish long-term relationships with local ICT firms. Furthermore, indigenous ICT firms tend to be small which also limits their technological capacity and affects their reputation and possibility to access complementary resources.

Additionally, two more explanations are offered to explain the existence of limited spillover effects. First, labor mobility from MNCs to local firms is limited since wages in indigenous companies tend to be lower than in multinational firms. Second, software demand by MNCs in the country is limited, since subsidiaries usually use software developed or acquired by their headquarters located in other countries.

In addition to limited positive effects from FDI, negative effects on local ICT companies are observed. Inflows of ICT-related FDI have increased the demand for ICT workers, causing wages to rise and shortages of qualified workers. In this context, local firms face disadvantages in hiring workers since MNCs can pay higher wages. Moreover, the local companies operate under less favorable economic conditions than their counterpart MNCs due to incentives offered to MNCs under the EPZ regimen. This situation constrains even more the ability of indigenous local firms to pay competitive wages.

Overall, there are more negative than positive effects of the FDI-assisted development strategy on local firms. This is related to the observation that the EPZ sector remains mostly disconnected from the rest of the economy and the high growth in this sector is not spilling over. In the case of the ICT sector, not only are there limited spillover effects, but we can also argue that MNCs are constraining the possibilities of growth of the local firms.

Since the benefits of FDI on domestic growth ultimately depend on the existence of spillover effects, effective policies are needed to increase the possibilities of these spillover effects from MNCs to indigenous ICT firms. These policies should 1) foster backward linkages between MNCs and local firms, 2) prepare more qualified human resources, increasing the absorptive capacity of local ICT firms and the national economy, 3) improve the conditions for local companies, and 4) change the profile of local ICT firms towards conducting more value-added activities.

Fostering backward linkages between MNCs and local firms will increase the likelihood of spillover effects. This strategy will require a joint effort of the local ICT firms and the government. Although a law exists to promote SME in Costa Rica, it falls short with regards to ICT firms, spillover effects, and MNCs.

Furthermore, the academic sector needs to make an effort to significantly increase the number of graduates in computer sciences and information technology programs. This increase in number has to be hand-in-hand with modifications in the curricula to provide students with knowledge, skills and competences needed by the ICT MNCs and local companies. An important element to include in this modification is the consideration of managerial skills, which can be labeled more generally as “soft skills”. The study conducted by Mata and Matarrita (2008b) reflects the need for both public and private universities to improve the formation of managerial skills of their students. These skills are essential to market ICT products and services, make financial decisions, manage human

resources and projects (Breshnahan, Gambardella and Saxenian 2004, Nicholson and Sahay 2005).

However, a significant increase in the number of graduates depends on the extension of the coverage of secondary and tertiary education. As previously mentioned, this coverage is reduced in the case of Costa Rica, limiting the number of graduates in computer sciences and information technology at both the technical and academic levels.

Additionally, the playing field between MNCs and local firms should be leveled and conditions improved for indigenous ICT firms. This requires investing in infrastructure, improving access to credit, and simplifying procedures. Also, the difference in tax charges to MNCs and local firms should be reduced. It is contradictory that MNCs, which demand a large proportion of the country's human resources, do not make a significant fiscal contribution to financing the education system.

Finally, ICT local companies need to realize that their economic viability depends on offering more value-added services and products. Competing based on low-value added outsourcing services, not only reduces the economic prospects of the firms, but also demands abundant human resources, which is very difficult to obtain in Costa Rica taking into consideration the population size and the capacity of the educational system of the country. While India and China were able to graduate 70,000 (Sing 2003) and 50,000 (Tschang, 2003) ICT professionals in 2001, during that year Costa Rica was only able to graduate 1,000 (Mata et al. 2003), making it clear that Costa Rica cannot compete with these countries in number of ICT graduates.

Also, the upgrading of activities of local firms and offering specialized products and services will increase the possibility of spillover effects. Even if the government were to provide incentives to promote the development of linkages, due to the characteristics of the indigenous ICT firms discussed throughout this paper, the effects of such linkages are likely to be limited. Therefore policies should be put in place to foster the upgrading of local firm's productive activities. Shifting the activities of the indigenous ICT firms towards more value-added activities would require the joint effort of the Costa Rican Association of ICT companies (CAMTIC) and the National Export Promotion Agency (PROCOMER) in creating new markets and strengthening the capacity of the indigenous companies to compete in such markets.

The Costa Rican government and other civil society actors should create the necessary conditions for the local ICT companies to benefit from MNCs. This requires understanding the characteristics of such companies, as well as the country's environment. As presented in this paper, changes are needed in the FDI strategy pursued and additional strategies are needed to foster spillover effects from MNCs to indigenous ICT firms. Failure to make such changes and to create such effective strategies would make Costa Rica fall victim of its own success.

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