

# **MULTINATIONAL KNOWLEDGE SPILLOVERS THROUGH LABOR MOBILITY AND VERTICAL INTEGRATION IN COSTA RICA**

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**Document prepared as a workshop paper for the 35<sup>th</sup> EIBA ANNUAL CONFERENCE  
RESHAPING THE BOUNDARIES OF THE FIRM IN AN ERA OF GLOBAL  
INTERDEPENDENCE, Valencia, Spain, - December 13<sup>th</sup>-15<sup>th</sup>, 2009**

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## 1. Introduction

Multinational corporations (MNCs), mainly those in the high-technology area, tend to be characterized at a global level by the possession of the most modern knowledge in their fields. Recent studies have found *knowledge spillovers* from MNCs to local firms in some countries that receive foreign direct investment (FDI), which has favored productivity growth among those local firms and a resulting growth in productivity of the economies of the host countries as a whole. Saggi (2002) describes three channels through which knowledge spillovers from multinational corporations to local companies may occur: (i) *demonstration effects*, which include imitation, or reverse engineering of the products or practices of the multinational corporations by local businesses; (ii) *labor mobility*, which allows employees who have been trained by multinational corporations to apply their knowledge in local businesses, when they stop working in the multinational corporations, and (iii) *forward and backward vertical linkages*, between multinational corporations and their local suppliers.

Görg and Strobl (2005) have indicated that although important efforts are being made intended to identify the existence of knowledge spillovers, in particular in developing economies, one of the limitations of these studies is that they address the specific mechanisms by which these spillovers are supposed to happen as “black boxes”. In the light of this argument, Smeets (2008) explored the most recent literature and found that in many cases, these studies use econometric analyses that attempt to show the existence of knowledge spillovers, but without an in-depth exploration of the ways in which they actually occur, the type of knowledge that is transferred from the MNCs to local firms, or the way in which the latter use this knowledge to improve their own productivity.

It is worth mentioning that, of the studies where knowledge spillovers have been best studied and identified; only three investigations were carried out in Latin America. Kugler (2006) found positive effects of backward vertical linkages between MNCs and local manufacturing

businesses in Colombia, while Markusen and Trofimenko (2007) found positive impacts of labor mobility from MNCs, in the same country and sector. In addition, Poole (2008) found positive externalities in the case of workers who move from MNCs to local businesses in Brazil.

As shown in Section 3 of this document, Costa Rica has been one of the most successful countries in the attraction of Foreign Direct Investment (FDI) during the past twenty years, especially in the area of high technology. It is thus appropriate to ask to what extent knowledge spillovers of the type described above are occurring in the Costa Rican economy, and this document is a systematic effort to provide information on this subject. The available evidence will be studied to try to determine whether there is some possibility that *knowledge spillovers* may exist from the MNCs operating in Costa Rica to the rest of the country's production sector.

The document is organized in five sections, including the introduction. The second section presents the theoretical framework and methodology used in the study. The third section analyzes the importance of FDI flows attracted by Costa Rica during the past twenty-three years under the Export Processing Zones (EPZs) regime, within the context of unilateral liberalization of the national economy. The fourth section analyzes the potential existence of *knowledge spillovers* in the Costa Rican economy, produced through two channels: (a) the transfer of workers from MNCs to the rest of the Costa Rican production sector (*labor turnover*), and (b) the production linkages between MNCs and local providers of inputs and intermediate goods. Primary and secondary information sources were used to carry out this analysis. The fifth and last section presents some final considerations, including discussion of lines of future research which the results of the present study suggest would be especially useful in clarifying and extending our knowledge of knowledge spillovers.

## 2. Theoretical framework and methodology

MNCs operating in a host country may become an important source for the acquisition of knowledge by local businesses through commercial arrangements between multinational corporations and their local suppliers (*knowledge transfer*), or through *knowledge spillover* from MNCs to local firms. Knowledge spillovers are particularly important because their existence represents a positive externality for the rest of the host country's economy. At the level of a business, a knowledge spillover is defined as the knowledge created by a multinational corporation which is used by a local company in the host country, for which the multinational corporation does not receive any compensation (Javorcik, 2004).

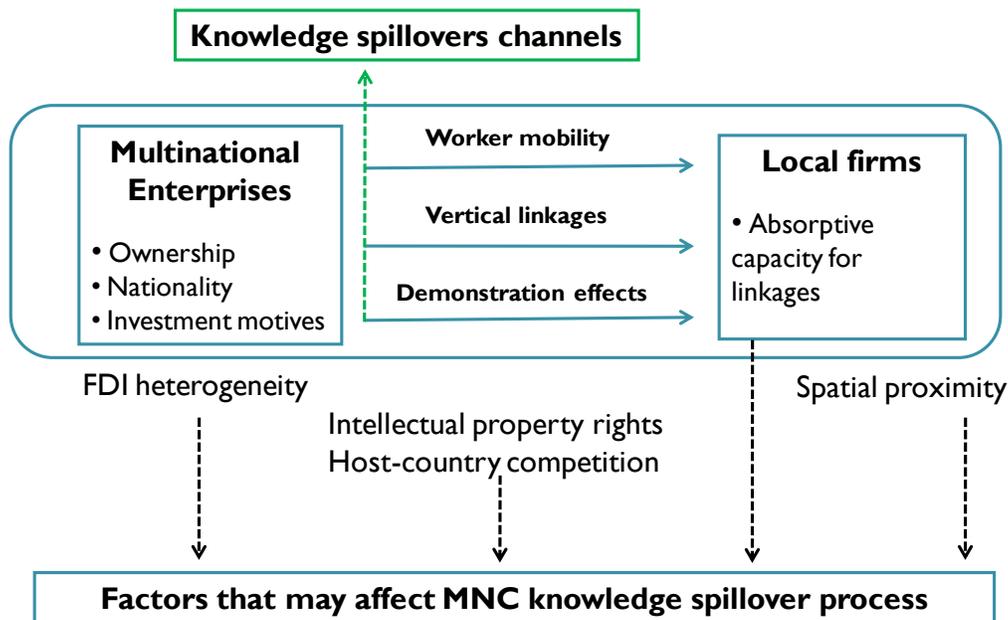
As mentioned in the introduction, there are three channels through which knowledge spillovers may be generated from multinational corporations to local businesses: (i) *demonstration effects*, (ii) *labor mobility*, and (iii) *and forward and backward vertical linkages*. It is important to note that in the two first channels positive externalities exist, while in the third channel this is not the case. According to Smeets (2008), it is difficult to tell the difference between *knowledge spillover* and a *knowledge transfer*, in which the multinational corporation may be receiving compensation for the knowledge transferred, and the knowledge transferred thus does not constitute a positive externality. Some examples of knowledge transfer are: exchange of best practices, acquisition of specialized equipment to which there would not be access unless this relationship existed, acquisition of technology and *know-how*, acquisition of information processing systems, access to specialized databases to which other businesses do not have access, acquisition of specialized productive processes, exchange of lessons learned in other subsidiary companies in other parts of the world, quality certifications (e.g., ISO), specialized audits and access to the capital market.

Following Smeets (2008), Figure 1 shows the three possible channels for the occurrence of knowledge spillovers, as well as the necessary conditions for said spillovers to occur and have

a positive effect on local businesses. Saggi (2002) has pointed out that the extent to which inward FDI contributes to technological and knowledge externalities depend on the country's trade policy; Paus and Gallagher (2008) as well as Cordero and Paus (2008), emphasize that the potential of backward linkages depends on the domestic absorptive capacity for linkages by local companies, while Smeets (2008) adds to these requirements the spatial proximity between MNCs and local firms, as well as the FDI heterogeneity in terms of ownership, nationality and investment motives, as shown in Figure 1.

Pack and Saggi (2006) indicate that, for the formulation of public policies, it is important to study certain important aspects of knowledge spillovers: a) identifying which MNCs generate spillovers and in which local firms or sectors; b) estimating the sizes and impacts of those spillovers; c) identifying the potential effects of FDI on problems regarding coordination of local industry; d) identifying which local companies can benefit from those spillovers, under which specific conditions and competitiveness requirements.

Figure 1. Framework for analyzing MNC knowledge spillover



Source: Prepared by the author, based on Saggi (2002), Smeets (2008), and Cordero and Paus (2008)

To study *knowledge spillovers through labor mobility* in Costa Rica, it was first necessary to obtain a list of the principal MNCs operating in the country which were attracted by the Costa Rican Investment Promotion Agency (CINDE). According to Monge-González *et al.* (2009) CINDE has played a very significant role in the attraction of FDI flows to Costa Rica; the flows that CINDE has attracted represent an average 42% of the total FDI received by the country during the last ten years (1997-2007), as well as 89% of the FDI attracted under the Export Processing Zones (EPZs) regime during the same period.

Once the names of those MNCs were obtained, the registries of the Costa Rican Social Security Institute about employees were searched for information about employees hired by these corporations, as well as about employees who ceased working for them, between 2001 and 2007, inclusive<sup>2</sup>. It was possible to identify 41,149 MNCs employees in this fashion who either left the MNCs to work in other Costa Rican firms, or who stopped participating in the country's labor market. The latter case includes workers who retired, those who went to work outside the country and those who started their own firms (*spin-offs*). For each one of the 41,149 identified workers it was possible to obtain their name, identity card number, gender and age at which they stopped working for the MNC. In addition, in cases where workers went from working in a MNC to another Costa Rican firm, the name of the company that hired them was determined, as well as the year in which the new employment began.

Based on the previous information, Section 4 explores the possibility of knowledge spillovers being generated through labor mobility, based on answers given to questions such as: what is the relative importance of the amount of workers that go from MNCs to companies in the Costa Rican production sector? How long does it take Costa Rican workers who leave their jobs in a MNC to find a new job? How old were these workers have when they stopped working for a

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<sup>2</sup> Limitations on the information available for the years before 2001 made it impossible to obtain information for those earlier years. However, given that CINDE attracted FDI in the high-technology area mainly starting in the second half of the 1990s, the period studied may be considered satisfactory for the purposes of the present study.

MNC? Were they still workers of highly productive ages? To what type of company or organization did former MNC employees go to work? How important are small- and medium-sized businesses (SMEs) in this context? Do the companies or organizations from the Costa Rican production sector belong to the same type of industry as the MNCs where some of their new employees previously worked?

In the fifth and last section of this document, some future lines of research regarding knowledge spillovers through labor mobility in Costa Rica are discussed based on the information and findings presented in the present document.

In the particular case of the study on knowledge spillovers through vertical linkages, secondary information from various sources is analyzed. In brief, some previous studies carried out in this field by the author are discussed: Monge-González *et al.* (2005 and 2009), as well as the works of Rodríguez-Clare (1997), Alfaro and Rodríguez-Clare (2005), Paus (2005), Cordero and Paus (2008), Beltran and Gutierrez (2008), and Monge-Naranjo (2008).

### **3. The Costa Rican context<sup>3</sup>**

As part of a new development model based on economic opening beginning in the mid-1980s, Costa Rica started a unilateral foreign trade liberalization process, which has continued to the present date<sup>4</sup>. Monge-González and González-Vega (1995) show that vested interests from pressure groups in Costa Rica were successful in limiting the scope of the reform. As a result, the anti-export bias caused by the Import Substitution Industrialization Strategy (ISIS) was reduced, but not eliminated. Moreover, the lack of efficient customs administrative infrastructure created

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<sup>3</sup> Some parts of this section are based on Monge-González *et al.* (2009, section 3, “Policy outcomes”).

<sup>4</sup> Monge-González and Lizano (1997) point out that the new model was characterized by (1) greater integration of the Costa Rican economy with the global economy through the elimination of protection for activities that competed with imports and created distortions in local markets of factors and goods; (2) the reduction of the size of the State and its modernization, in such a way as to not hinder private sector growth but rather facilitate its development; (3) the temporary concession of compensatory subsidies and other incentives to non-traditional exports to offset the anti-export bias generated by the Import Substitution Industrialization Strategy (ISIS); (4) the adoption of stable macroeconomic measures that are consistent with the model of market opening; and (5) the reduction taxes on exports.

burdensome procedures and red tape for business growth at that time. These characteristics of the Costa Rican trade policy represent serious constraints on the attraction of Foreign Direct Investment (FDI) that would foster productivity improvements through knowledge spillovers. It has therefore not been possible to attract foreign firms oriented to exports to third markets (i.e., outside Central America) without compensatory measures (fiscal incentives).

The Export Processing Zones (EPZs) emerged in Costa Rica during the same period as a mechanism to attract FDI, thus promoting exports of non-traditional products, creating new employment opportunities, improving the balance of payments, and supporting diversification of the national productive base. The EPZ regime is a set of incentives and benefits granted by the Costa Rican government to companies (mainly MNCs) making new investments in the country. The most important incentive is an income tax exemption of up to 100% for 8 to 12 years, and 50% for an additional 4 to 6 years. There are other incentives like the exemption from all taxes and consular duties on imports, exemption from all municipal taxes and licenses for a 10-year period, and additional exemptions from income taxes for those companies that make reinvestments in the country, after they have been operating four years under the EPZs regime. One important aspect of the EPZs is their possibility to generate knowledge spillovers from MNCs, an important type of positive externality.

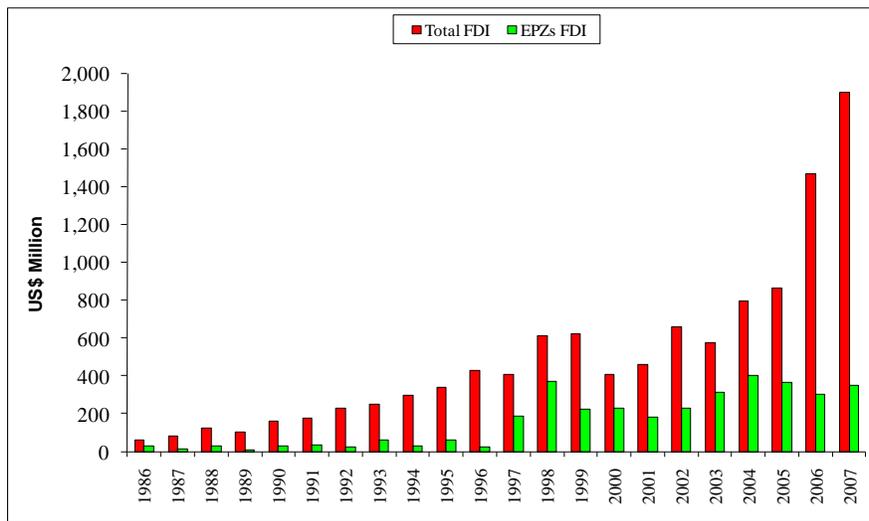
Looking at Costa Rica's experience with MNCs, we see that between 1985 and 1990, the exports from EPZ firms rose from US\$7 million to US\$94 million. Annual EPZ investments did not show significant growth, but the FDI stock from EPZ companies grew almost five times, from US\$28.6 million to US\$106.6 million. During the same period, total FDI inflows in Costa Rica were US\$434 million. Between 1986 and 1995, on average, FDI in EPZs represented 20% of total FDI inflows.<sup>5</sup> At the beginning of the 1990s, EPZs started to grow significantly, and have clearly established their importance to the Costa Rican economy since the middle of the 1990s.

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<sup>5</sup> Estimations by the author based on data from PROCOMER and the BCCR.

Between 1997 and 2007, average annual FDI inflows from EPZ firms represented US\$286 million (1.5% of GDP on average). Nonetheless, EPZs are not currently the most important source of FDI; total FDI averaged US\$797 million per year for the last decade (Figure 2). Although EPZs have not increased their share of the total annual inward FDI flows, most high-technology MNCs are operating under this system. In recent years, FDI inflows in real estate projects have grown more than any other sector.<sup>6</sup>

Figure 2. Costa Rica: FDI Inflows (Total and EPZs)



Source: Monge-González et al (2009)

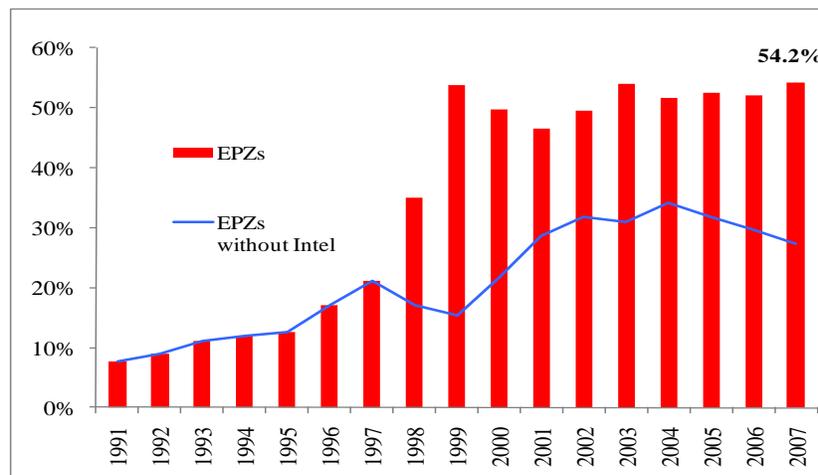
During the last decade the value of EPZ exports more than quintupled; in 1997 the value of such exports was approximately US\$891 million, while in 2007 it was US\$5.074 billion. The share of total exports represented by EPZ exports increased from 21% to 54%, representing an annual average growth of 19%, while exports from domestic companies only grew by 2.6% per year (Figure 3). Bolin (1999) found that the export capacity of countries with EPZs tends to exceed that of countries that do not implement this regime, due primarily to the fact being that EPZs level the playing field for firms vis-à-vis their foreign competitors (in the case of Costa

<sup>6</sup> In the last four years, industry FDI accounted for 35% of total foreign investments, while real estate FDI has accounted for 30% of the total FDI inflows, followed by tourism (12%), and the financial sector (9%) according to data from the Central Bank of Costa Rica.

Rica, EPZs offset the anti-export bias). Intel is the biggest company operating under the EPZ regime; the firm’s exports have represented, on average, more than 40% of total EPZ exports since 1998, and over 20% of total Costa Rican exports.

Intel’s decision to establish a microchip factory in Costa Rica in 1997 marked a quantitative and qualitative change in FDI inflows, based on the demonstration effect it had for other potential foreign investors. During the first years of operation of the EPZ regime, the focus was on attracting FDI only in manufacturing sectors; textiles and apparel were the largest sources of FDI inflow activities in the 1980s and the first half of the 1990s. During the last decade, on the other hand, CINDE has focused its efforts on attracting electronics, medical devices and services (offshore outsourcing) companies. This new FDI targeting has been based on the expected benefits, in terms of possible knowledge spillovers for the local economy, of the presence of representatives of more technologically advanced (high technology) sectors that will strongly attract inward FDI.

Figure 3. EPZ Exports as a Percentage of Total Costa Rican Exports

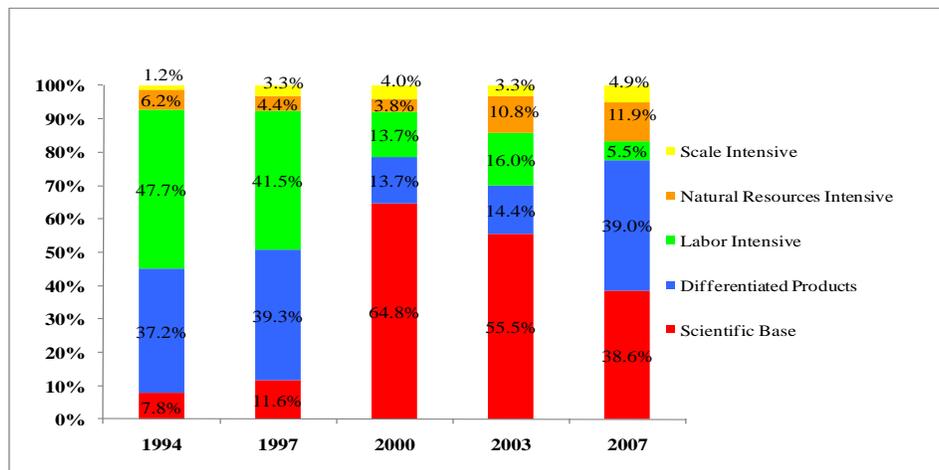


Source: Monge-González et al (2009)

The composition of EPZ exports has changed significantly in the last decade. While textiles accounted for 35% of exports in the middle of the 1990s, their share dropped to less than 10% in 2007, while exports of electronic and electrical goods increased their share from 20% to

near 50% during the same period. A similar trend may be seen in exports of medical devices and pharmaceutical products, which grew from 5.9% to near 15% during that same period. Exports of international services companies (such as back-office and call centers) increased more than five-fold over the last five years. This tendency changed the structure of EPZ (and overall domestic) exports from natural resource-based and low-skilled labor-intensive activities to more advanced high-technology production systems, based on highly-skilled labor, and differentiated and scientifically- based products (Figure 4).

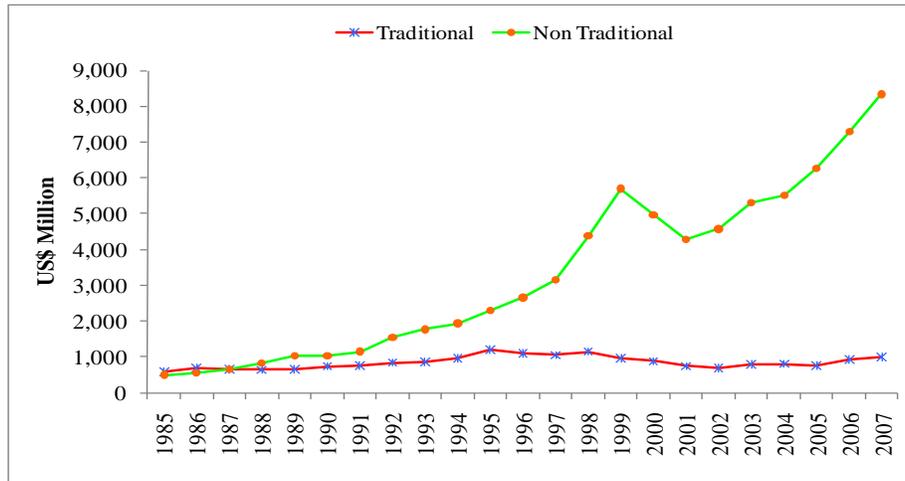
Figure 4. Costa Rica: EPZs Export Composition by Intensity of Production Factors\*



\* OECD Classification  
 Source: Monge-González et al (2009)

The original objective of the EPZ regime was to promote non-traditional exports to third markets (outside Central America). Together with other export-promotion policies implemented during the last decades, the outcome has been very positive (Figure 5). Indeed, traditional exports represent 11% of total exports nowadays, compared to 61% in 1982. Today, EPZ exports account for more than 60% of non-traditional exports; including products such as electronic parts, microprocessors, electrical machinery, testing equipment, and medical devices. In addition, EPZ exports have contributed to market diversification. More than 37% of EPZ exports go to the U.S. market, 36% to the European Union, 9.4% to Asia, and 17% to various other destinations (PROCOMER, 2008).

Figure 5. Costa Rica: Export Composition

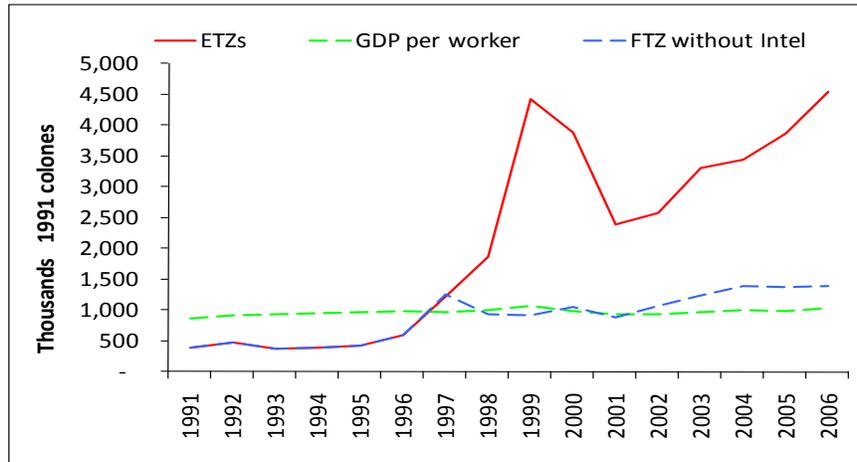


Source: Monge-González et al (2009)

The impact of EPZs on the dynamism and diversification of exports has been significant. Exports have an impact on economic growth (Helpman, 2004). In the case of Costa Rica, evidence supports the claim that economic growth is driven by a growth in exports (Arce, 2000). In addition, what a country exports (the quality of its export basket) significantly influences its economic performance (Hausman et al, 2007).

Firms operating within EPZs have increased their contribution to national output from 0.5% to 9.6% of GDP between the beginning of the 1990s and 2007. Due to EPZs, the structure of the Costa Rican industrial sector has moved considerably towards more high-tech production since the middle of the 1990s. This change is the result of growth in high-tech MNC production, more than an increase of domestic productivity. While Costa Rican GDP per worker grew by 0.5% per year between 1997-2007 average labor productivity in EPZs grew at an average annual rate of 13.5% (Figure 6) during the last ten years. That is, EPZs have been one of the main drivers of labor productivity growth – a result that is highly influenced by Intel’s operations.

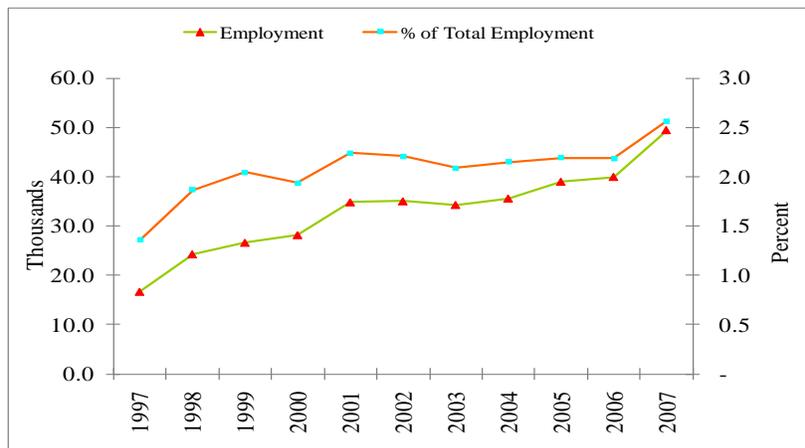
Figure 6. Costa Rica: EPZ Value Added and GDP per Worker (Thousands of 1991 Colones)



Source: Monge-González et al (2009)

EPZs have increased direct employment opportunities in Costa Rica as well, with a recent emphasis on opportunities for highly-skilled workers. The labor force employed by EPZs has grown significantly from 7,000 workers in 1990 to nearly 50,000 today. Employment in EPZs grew by an annual average of 11.5% over the last ten years, while employment in local industry increased by an average of 1.5% each year (Figure 7).

Figure 7. Costa Rica: EPZ Employments and Share of Industrial Employment (1997-2007)

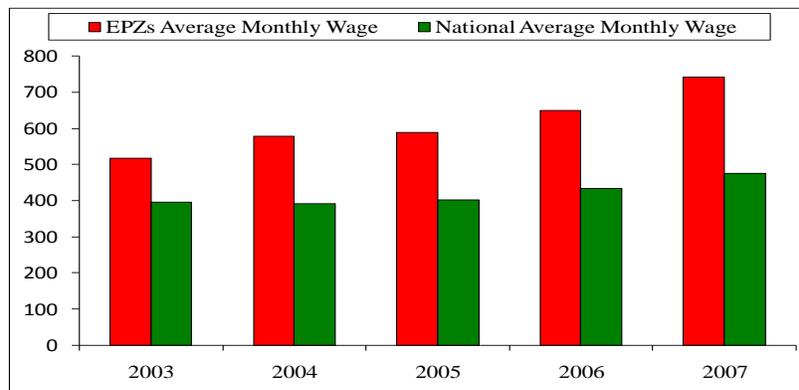


Source: Prepared by the author based on data from PROCOMER and the BCCR.

A characteristic feature of EPZs since the middle 1990s has been their demand for more skilled labor. The gradual shift to more technology- and knowledge-intensive activities, together

with the arrival of high-tech firms in the electronics and medical equipment sectors, has increased the demand for highly-skilled human resources. In addition, international services firms have increased the demand for bilingual employees. As a result, MNCs' demand for skilled labor has promoted the growth of real wages. Monge-González et al (2005) estimated an increase in real wages of US\$25.2 per worker per year for the period 1992-2002. Moreover, the average salaries of EPZ firms are 1.6 times higher than the national average (Figure 8).

Figure 8. Costa Rica: EPZ Wages compared to National Wages (Monthly Average)



Source: PROCOMER (2008)

#### 4. Multinational Spillovers in Costa Rica

This section discusses the mobility of employees from multinational corporations operating under the EPZ regime as a knowledge spillover channel to the rest of the Costa Rican economy during the period 2001-2007, inclusive. An analysis is also carried out to find out to what extent MNCs attracted by this regime transfer knowledge to their local suppliers (vertical integration), without considering whether or not such a transfer consists of knowledge spillover or knowledge transfer. The interesting point here is to find out whether MNCs transfer knowledge to their local suppliers, thereby improving the productivity of the local suppliers.

##### a. Knowledge spillovers through labor mobility

Monge-González and González (2007) found evidence that high-tech MNCs established in Costa Rica provide an important level of training, education and work experience to their employees,

while Monge-González et al (2005), found that 36.2% of the managers, 27.6% of the engineers, and 31.0% of the technicians who work in local companies that are suppliers of MNCs have previously worked in MNCs in Costa Rica. The authors also indicate that 27.6% of local suppliers have at least one owner with previous work experience in one of the MNCs operating in the country. They also found a positive and statistically significant relationship between the level of productivity of local companies that are MNC suppliers and whether these suppliers have employees who had previously worked in MNCs in Costa Rica.

In spite of the importance of these findings, such empirical evidence is not enough to demonstrate a generalized knowledge spillover from MNCs to the rest of the Costa Rican economy through employee mobility, because the study by Monge-González et al (2005) only addressed mobility of workers from MNCs to their local suppliers, whose number is quite small.<sup>7</sup> The following sub-sections of this document address this topic in greater detail, based on new sources of information that have become available since the original studies were carried out.

### ***Labor mobility in multinational corporations***

According to the records of the Costa Rican Social Security Institute (CCSS), 117 multinational corporations operating under the EPZ regime, mainly in the high-tech area, have jointly employed an average of 20,267 workers per year between 2001-2007, inclusive.<sup>8</sup> In addition, this same group of MNCs has experienced an average annual employee turnover of 5,878 employees over the same period (Table1). It is important to note the growth in both, the number of employees of these corporations and the number of workers who stopped working for them, during the last years of the period studied (i.e., 2006 and 2007).

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<sup>7</sup> In their study, Monge-González et al (2005) identified a population of 143 Costa Rican companies that produced inputs and services for MNCs established in the country.

<sup>8</sup> According to the records kept by CINDE, this institution has attracted 155 companies since it was created in 1982; however, the records of the CCSS show employment data for the period under study for only 117 of these companies.

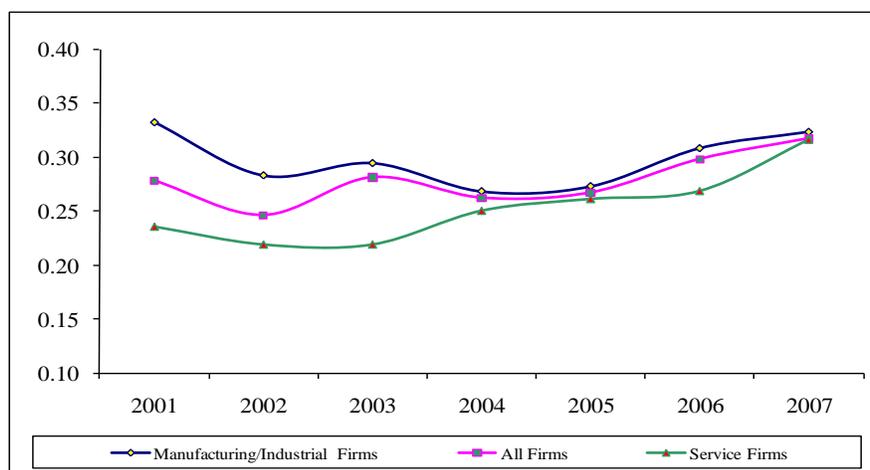
Table 1. Costa Rica: Number of employees and former employees of MNCs under the EPZ regime, 2001-2007

Year	Employees	Ex-employees
2001	13,615	3,381
2002	15,123	4,087
2003	15,412	4,800
2004	18,608	4,976
2005	20,210	5,254
2006	26,404	8,240
2007	32,496	10,411
<b>Average</b>	<b>20,267</b>	<b>5,878</b>

Source: Prepared by the author based on data from the CCSS.

For the purposes of the present study, it is interesting to note the high percentage turnover in employees of MNCs operating under the EPZ regime; as shown in Figure 9, median turnover values vary between 20% in 2002 and 31% in 2007.<sup>9</sup> No major differences are seen when these values are calculated separately for the manufacturing and services sectors.

Figure 9. Costa Rica: Turnover of employees of MNCs under the EPZ regime <sup>1/</sup>



<sup>1/</sup> The turnover index is the ratio between the number of former employees and the average number of employees of an MNC for a given year. The turnover that appears in the chart refers to the median of the yearly turnover indexes for the 117 companies operating under the EPZ regime. The median was used because a high standard deviation was found for index figures between companies within the same year.

Source: Prepared by the author based on data from the CCSS.

<sup>9</sup> If the average is used instead of the median, the percentages are 31% for 2002 and 38% for 2007.

At this point, it is interesting to ask where workers go once they stop working at MNCs. To answer this question appropriately, it is necessary to know how many workers have stopped working for MNCs during the period analyzed, as well as how many times they have changed work once they stopped working at an MNC. The answers to both questions appear in the figures presented in Table 2. Based on this table, it may be concluded that between 2001 and 2007, inclusive, a total of 41,149 employees of MNCs operating under the EPZ regime left their jobs. A great majority of these persons left their jobs only once (88.5%) - once they left the MNCs where they initially worked, they decided to stay in a new job or outside the labor market.<sup>10</sup> This last point is very interesting from the perspective of the possibility of knowledge spillovers, as will be seen in following discussions. On the other hand, the great majority of the remaining former MNC employees (11.1% of the total sample) changed their place of work two or three times after they initially stopped working in an MNC. Lastly, it is important to note that more men than women stopped working in MNCs during the period studied (the ratio between men and women who stopped working at MNCs was 1.26, according to Table 2).

Table 2. Costa Rica: Turnover of former employees of MNCs operating in EPZ regime

Number of times place employment changed	Ex-MNC employees			Ratio Men/Woman	Distribution of ex-employees by turnover
	Male	Female	Total		
1	20,101	16,321	36,422	1.23	88.5%
2	2,370	1,557	3,927	1.52	9.5%
3	399	249	648	1.60	1.6%
4	83	38	121	2.18	0.3%
5	24	4	28	6.00	0.1%
6	1	-	1	-	0.0%
7	2	-	2	-	0.0%
<b>Total</b>	<b>22,980</b>	<b>18,169</b>	<b>41,149</b>	<b>1.26</b>	<b>100.0%</b>

Source: prepared by the author based on data from the CCSS.

Given that a significant number of workers stopped working for MNCs under the EPZ regime (41,149 people, who account for a little less than one-third of the total labor force hired by

<sup>10</sup> This last topic will be analyzed in greater detail later on in this section.

the 117 MNCs under study, between 2001 and 2007), it is worth investigating what percentage of these workers have moved on to the Costa Rican production sector (i.e. private companies, public institutions, NGOs, universities, etc.), during the period analyzed. Table 3 shows the cases of workers who stopped working for MNCs under the EPZ regime during the period 2001-2007.

Table 3. Costa Rica: Destination of employees of MNCs under the EPZ regime, who stopped working for these corporations, between 2001 and 2007, inclusive<sup>1/</sup>

Destination of employees that left work in an MNC attracted by CINDE	Ex-employees of MNCs attracted by CINDE					
	Men		Women		Total	
	Abs.	%	Abs.	%	Abs.	%
<b>Costa Rican Productive sector</b>	<b>11,445</b>	<b>43.1</b>	<b>6,846</b>	<b>33.7</b>	<b>18,291</b>	<b>39.0</b>
<b>Foreign companies in Costa Rica</b>	<b>10,437</b>	<b>39.4</b>	<b>7,016</b>	<b>34.5</b>	<b>17,453</b>	<b>37.2</b>
MNCs attracted by CINDE	6,265	23.7	4,097	20.1	10,362	22.1
Other MNCs in EPZs	1,918	7.2	1,475	7.2	3,393	7.2
Other foreign companies	2,254	8.5	1,444	7.1	3,698	7.9
<b>Left the labor market</b>	<b>4,628</b>	<b>17.5</b>	<b>6,492</b>	<b>31.9</b>	<b>11,120</b>	<b>23.7</b>
<b>Total</b>	<b>26,510</b>	<b>100.0</b>	<b>20,354</b>	<b>100.0</b>	<b>46,864</b>	<b>100.0</b>

1/ The total number of cases that appears in this table (46.864), exceeds the total number of employees in Table 4.2 (41.149), because 4.726 former employees changed jobs more than once during the period studied, after they stopped working for the MNC attracted by CINDE.

Source: Prepared by the author based on data from the CCSS.

The results in Table 3 show that most former MNC employees moved to the Costa Rican production sector (39%; 18,291 employees), which supports the hypotheses that MNCs may be generating knowledge spillovers to the rest of the Costa Rican economy.<sup>11</sup>

Thirty-seven point two per cent of the employees (i.e., 17,453) who stopped working for MNCs moved to other foreign companies operating in Costa Rica. More specifically, 22.1% moved to another corporation of the group of MNCs attracted by CINDE; 7.2% moved to other MNCs established under the EPZ regime; and 7.9% moved to other foreign companies.

It is necessary to emphasize that 23.7% (i.e., 11,120) of former MNC employees stopped working in the Costa Rican labor market. This result is important because within this group are

<sup>11</sup> A valid observation at this point is that although MNC employees may stay in these corporations, it is still possible to find cases in which MNCs allow their employees to teach at universities of the host country, thus generating an improvement in the quality of higher education in the country. This is an important issue that exceeds the scope of the present work.

those Costa Ricans who may belong to any of the following categories: (i) workers who went to work outside the country, even for the same MNC in which they were working in Costa Rica (its main office or a subsidiary)<sup>12</sup>; (ii) workers who decided to set up their own companies in Costa Rica (*spin-off effect*)<sup>13</sup> when they stopped working for the MNC; or (iii) employees who decided to retire.

This group of former employees who stopped working in the Costa Rican labor market is particularly important for several reasons. In the first case, workers who went to work outside the country would represent an important Costa Rican Diaspora which could benefit the country if its members were contacted. In the second case, if knowledge spillovers existed, the companies newly established by former MNC employees would be an important positive externality for Costa Rica, in addition to the positive externality of the mobility of other employees to the Costa Rican production sector. In the third and last case, the knowledge acquired by retirees while they worked at an MNC could well be used to develop skills in public institutions, such as municipal governments, through volunteer or remunerated work by a significant portion of these Costa Ricans.

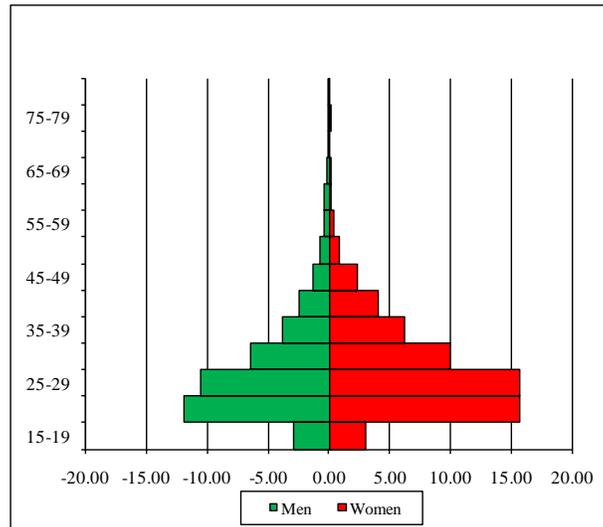
The results in Figure 10 show that former MNC employees who left the Costa Rican labor market are mainly between 20 and 35 years old, which strengthens the hypothesis that these persons either went to work outside the country, or decided to set up their own companies. Some members of this group were more than 55 years old (possibly retirees). The distribution of these ex-employees by age is very similar for both sexes.

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<sup>12</sup> This group does not include those employees who were sent to another country by a MNC and who then quit working with that corporation and came back to their native country to set up their own company or work independently for other local firms. It would be interesting to carry out further research with this group, with regard to the creation of *spin-offs*.

<sup>13</sup> This category should also include employees of MNCs operating under the EPZ regime who may have moved to the Costa Rican production sector or to foreign companies established in the country, and then left the labor market to set up their own companies, between 2002 and 2007, inclusive.

Figure 10. Costa Rica: Distribution of employees of MNCs under the EPZ regime who left the Costa Rican labor market, by age and sex



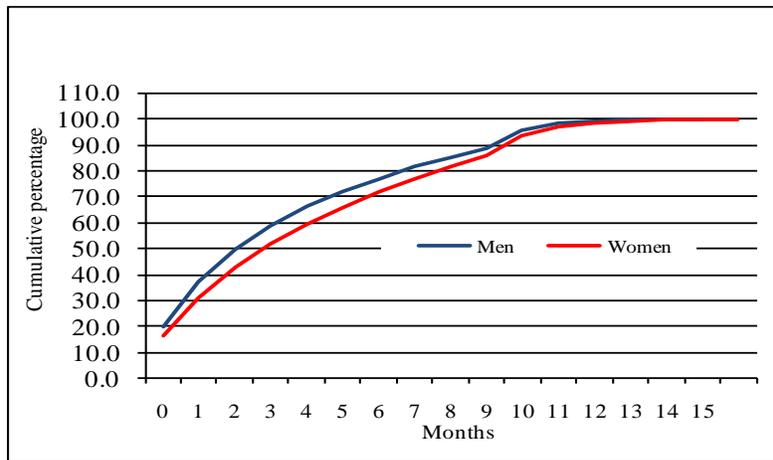
Source: Prepared by the author based on data from the CCSS.

As was mentioned previously, better information about the location of former MNCs employees who stopped working in the Costa Rican labor market is especially important for the promotion of initiatives that will make it possible to take advantage of the knowledge they acquired, for the benefit of Costa Rican economic and social development, but the gathering of such information would go beyond the objectives of the present study.

#### ***Labor mobility from MNCs to the Costa Rican production sector***

Of the 18,291 job positions occupied by former MNC employees in the Costa Rican production sector, almost two-thirds were occupied by men (62.5%) and one-third by women (37.5%). MNC employees who moved to the Costa Rican production sector did not have to wait too long to find a new job; as shown in Figure 11, a little over half of these workers found a new job in less than three months (58.8% in the case of men, and 51.6% in the case of women). Almost three-quarters of the men and women (77.1% and 71.4%, respectively) who stopped working for MNCs under the EPZ regime achieved found new employment within six months of leaving their previous employment.

Figure 11. Costa Rica: Distribution of the time it took former employees of MNCs under the EPZ regime to find a new job in the Costa Rican production sector  
 - Figures in percentages and by sex -



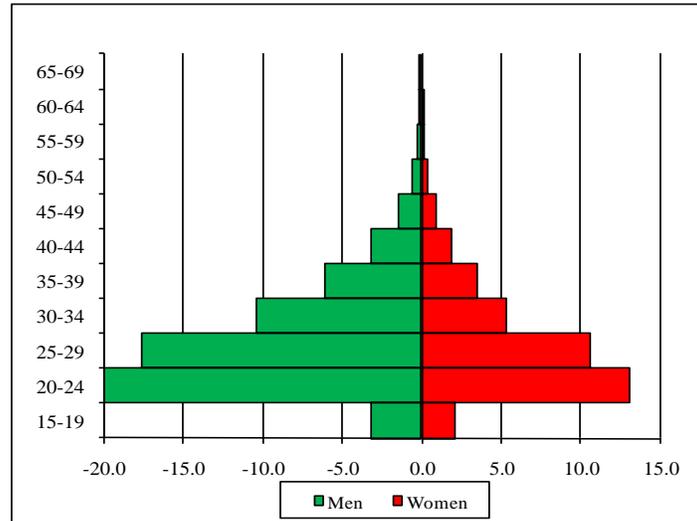
Source: Prepared by the author based on data from the CCSS.

Another interesting finding is the relative youth of former MNC employees who found a job in the Costa Rican production sector. In fact, as shown in Figure 12, the great majority of this population (81.7% of men and 82.5% of women) is under 35 years old. This means that the employees who stopped working for MNCs operating under the EPZ regime did so at ages that are often considered to be the most productive. The age distribution of these persons does not vary greatly between the sexes.

It is important to study the distribution of former MNC employees who went to work in the Costa Rican production sector with respect to the type of business or organization to which they moved. Table 4 presents information relevant to this issue, and several interesting conclusions can be drawn from the data. In the first place, MNC employees moved to 5,747 companies or organizations operating in Costa Rica, most of which produce goods and services (91.5%). Secondly, most employees who left MNCs moved to private companies (83.6%). In other words, 15,139 workers stopped working in MNCs operating under the EPZ regime to go to work in Costa Rican private companies. The rest of the workers who moved to the country's production sector did so by moving to governmental institutions (7%), non-governmental

organizations or NGOs (5.3%), educational centers (2.1%), financial intermediaries (1.5%), and electricity and telecommunications companies (1.2%).

Figure 12. Costa Rica: Distribution of former employees of MNC under the EPZ regime, who found a new job in the Costa Rican production sector, by age and sex



Source: Prepared by the author based on data from the CCSS.

Table 4. Costa Rica: Distribution of employees of MNCs under the EPZ regime, who moved to the Costa Rican production sector, between 2001 and 2007, inclusive<sup>1/</sup>

Destination of ex-employees of MNCs attracted by CINDE	Costa Rican productive sector		Employees	
	Abs.	%	Abs.	%
Private businesses	5,261	91.5	15,139	82.8
NGOs	261	4.5	977	5.3
Academy	93	1.6	389	2.1
Government and public institutions	86	1.5	1,279	7.0
Financial intermediaries	36	0.6	270	1.5
International organizations	8	0.1	12	0.1
Energy and telecommunications	2	0.0	225	1.2
<b>Total</b>	<b>5,747</b>	<b>100</b>	<b>18,291</b>	<b>100</b>

<sup>1/</sup> The total of employees was divided by seven categories: private businesses (producers of goods and services); NGOs (trade unions, professional associations, other associations and non-profit foundations); financial intermediaries (public and private banks, Banco Central de Costa Rica, financial agencies and other credit institutions); energy and telecommunications (ICE, JASEC and other electricity suppliers); government and public institutions (Congress, CCSS, ministries and other public institutions); the academy (public and private universities, university colleges, INA, CATIE and other educational centers); and international organizations (those that operate in Costa Rica and the embassies).

Source: Prepared by the author based on data from the CCSS.

An analysis of the types of company in which most former MNC employees later worked revealed that 79.8% of them are MSMEs (micro-, small- and medium-sized businesses) (Table 5). These companies also absorbed 49.1% of the total number of former MNC employees who moved to private companies between 2001 and 2007, inclusive. If the existence of knowledge spillovers is confirmed, the above results would be a clear evidence of an important positive externality of the FDI attracted by CINDE to this group of businesses. On the other hand, the percentage of former MNC employees who were absorbed by large corporations is also significant (46.6%), all of which indicates that the potential for knowledge spillover associated with the labor mobility of 15,139 MNC employees, is associated with all sizes of Costa Rican private companies.

Table 5. Costa Rica: Costa Rican private companies that hired former employees of MNCs operating under the EPZ regime, between 2001 and 2007, inclusive, by size

Company size	Companies		Employees	
	Abs.	%	Abs.	%
Micro	1,085	20.6	1,508	10.0
Small	1,996	37.9	3,081	20.4
Medium	1,115	21.2	2,840	18.8
Large	679	12.9	7,060	46.6
NI	386	7.3	650	4.3
<b>Total</b>	<b>5,261</b>	<b>100</b>	<b>15,139</b>	<b>100</b>

NI = could not be classified because of lack of information.

Source: Prepared by the author based on data from the CCSS.

According to the literature on knowledge spillovers, if the knowledge acquired by MNC employees is specific to the industry in which they work, then their movement to local companies will generate a positive externality through increasing productivity in these local companies, with a greater probability of such increased productivity if the local companies belong to the same industry as the MNCs (Görg and Strobl, 2002). Assuming that the knowledge acquired by a worker in an MNC is specific to the industry in which he/she works, Spearman's rank order correlation coefficients were estimated for the 2001 – 2007 period, inclusive, between the industries to which the MNCs under the EPZ regime (in which former employees originally

worked) belong, and the industries of the companies in which these individuals later worked.<sup>14</sup>

The results of this exercise are presented in Table 6.

Table 6. Costa Rica: Spearman's rank order correlation coefficients between the industries to which MNCs under the EPZ regime belong, and Costa Rican companies where former MNCs employees went to work MNCs1/

Year in which new employment began	N of valid cases = i	Rank order correlation coefficient	Probability $rs >  r_0 $ for $H_0: rs=0/ N=i$
2001	546	0.148	0.001
2002	1030	0.201	0.000
2003	1493	0.295	0.000
2004	1531	0.342	0.000
2005	1894	0.332	0.000
2006	2419	0.304	0.000
2007	3447	0.312	0.000

<sup>1/</sup> These coefficients were estimated with a total sample of 13,749 former MNC employees. Even though 15,139 former employees are mentioned in Table 4.5, it was only possible to identify the type of industry for Costa Rican firms that received these former MNCs employees for 13,749 of them.

Source: Prepared by the author based on data from the CCSS.

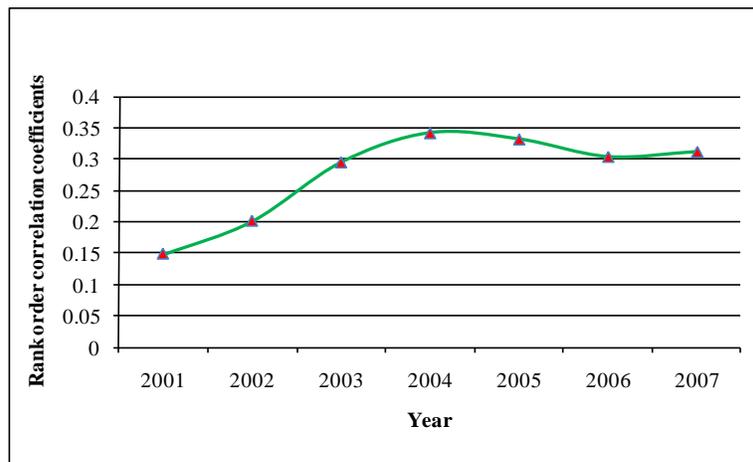
Based on the values in the third column of the Table 6, it may be said that in a little less than one-third of the cases, employees who stopped working at an MNC attracted by CINDE later went to work in companies of the same industry to which the MNC where they previously worked belonged. In addition, this correlation tended to increase over time, as shown in Figure 13. Based on these results, it seems that a significant number of MNCs established in Costa Rica are very possibly generating important knowledge spillovers to Costa Rican private companies, in agreement with the hypothesis proposed by Görg and Strobl. However, it is clear that this hypothesis needs to be further studied in the future.

At this point, it may be asked whether the knowledge acquired by a MNC employee is really specific to the industry in which he/she works. With respect to this point, Monge-González and González (2007) state that the knowledge acquired by Costa Rican employees in corporations such as Intel, Cisco and Microsoft, does not seem to be specific to the industries in which these

<sup>14</sup> To make this estimation, Costa Rican companies where former MNCs employees went to work, and the MNCs themselves, were classified according to the International Standard Industrial Classification of all economic activities (CIIU version 3, 2 digits).

corporations operate. In fact, the authors found that the training received by employees of these corporations is a *lifelong learning process*, which includes training courses not only on topics that are specific to the position they will occupy within the MNC, or to new positions that they will occupy within the same corporation (*job training plan and specific training*), but also in other areas defined by the employees themselves (*individual development plans*) as a mechanism that will allow them to reach their objectives, as the employees perceive them to be within the company, in the medium term.

Figure 13. Costa Rica: Spearman’s rank order correlation coefficients between industries to which the MNCs operating under the EPZ belong, and Costa Rican companies where former MNCs employees went to work



Source: Prepared by the author based on data from the CCSS.

The type of training described above includes language studies such as English or Portuguese, e-commerce, business planning, etc. Moreover, in an interview conducted with 13 former Intel employees regarding the importance of the knowledge they acquired in this company for their future performance in other Costa Rican companies, these former employees reported that the training received in Intel allowed them to improve their performance in their new jobs, and to improve their salary levels as well. Two of these workers even indicated that after having worked for Intel in Costa Rica they created their own company, using part of what they learned in Intel to do so.

Although the results of these interviews cannot be regarded as more than anecdotes, it is worth considering the hypothesis that labor mobility from MNCs established in Costa Rica to private companies in the country may be generating some type of positive externality, even in the cases when MNCs workers move to local private companies that belong to different industries, because the knowledge acquired by Costa Rican employees in MNCs does not seem to be only specific to the industry in which the MNCs operate. There is currently no empirical evidence for the existence of such positive externalities in Costa Rican, but in a recent study carried out in Brazil, Poole (2008) found knowledge spillovers among workers who moved from an MNC to a local company, each of which operate in a different industrial sector. In fact, the author states that “the positive knowledge spillovers are not specific to the services sector where most investment flows have come from (in Brazil) since 1996” (Op. cit. p. 25).

Poole also found that the most highly qualified employees who stop working for a MNC are the most apt to transfer technology from the MNC to local companies, and that the most qualified employees of local firms are the most apt to absorb technology from MNCs thanks to the labor mobility of former MNC employees. This result indicates that educational levels and the absorption capacity of local firms play an important role in their capacity to absorb knowledge from MNCs through labor mobility.

Beyond the ideas discussed in the above paragraphs, it would be worthwhile to ask whether former MNC employees who moved to the Costa Rican production sector did so because of possibilities of a higher-level position in the local business (for instance, going from being a head of a department in a MNC, to being a manager in a SME); if so, they might be generating knowledge spillovers. Although information is not available to evaluate this hypothesis in Costa Rica, once again, the results obtained by Poole are important and support this hypothesis in a developing country (Brazil). In fact, Poole found that the greatest knowledge spillovers occur when the skill set of employees of local companies is much lower than that of MNCs employees,

suggesting that employees in the area of production in local businesses learn from co-workers who used to hold managerial and technical positions in MNCs.

In summary, it may be said that the evidence presented in this section supports the hypothesis of the existence of possible positive externalities associated with labor mobility from MNCs operating under the EPZ regime to Costa Rican private companies, and even to other institutions in the country's production sector. Nonetheless, the identification and measurement of the relative importance of these externalities is still pending, and it is necessary to collect and process information relevant to this subject. If empirical evidence is found to more strongly support the proposed hypothesis, it could be said with more confidence that FDI covered by the EPZ regime is generating an important impact on Costa Rica's economic development, due to labor mobility of ex-MNC employees to the rest of the country's economy. It could also then be argued that this type of FDI has been a source of such knowledge spillovers, a subject that assumes great importance when strengthening strategies to attract foreign investment to Costa Rica.

#### **b. Knowledge spillovers through vertical integration**

As mentioned at the beginning of this section, one channel by which knowledge acquisition by local companies is possible is through commercial agreements between multinational corporations and their local suppliers (*knowledge transfer*). In general terms, this relationship has been referred to as *backward vertical linkages*.

The fact that this is not a positive externality should be kept in mind, because it is difficult to distinguish between a *knowledge spillover* and a *knowledge transfer*; in the later the MNC may be receiving compensation for the knowledge transferred to the local company.

Among the examples of knowledge transfer that may be generated as a result of the relationship of MNCs with their local suppliers, Monge-González et al (2009) found the exchange of best practices, the acquisition of specialized equipment to which local companies would not have had access unless they had a relationship with an MNC, acquisition of technology and *know-how*, acquisition of information processing systems, access to specialized databases to which

other companies do not have access, acquisition of specialized production processes, exchange of lessons learned with other subsidiary companies in other parts of the world, quality certifications (e.g., ISO), specialized audits, and access to capital markets.

Monge-González *et al.* (2005) were the first to document knowledge transfer between MNCs (most of which are operating under the EPZ regime) and their local suppliers in Costa Rica. The authors found that:

- MNCs have become a new market for local suppliers, who most commonly (55%) do not export directly, thus allowing these companies to become indirect exporters.
- The relationship between local suppliers and MNCs has had an important impact on the exporting performance of the further.
- The great majority of local suppliers (89.7%) were operating in the country much before they established a commercial relationship with MNCs, and only 10.3% of these companies sell their products or services to less than two MNCs.
- For a great majority of local suppliers (70.7%), being a supplier of MNCs has had a positive impact on their sales, and for more than half of this type of company (58%) the relationship brought about an important improvement in the quality of their products.
- Only 27.5% of local suppliers report having received training from MNCs. However, all local suppliers use the new knowledge acquired from MNCs to produce goods and services that are later sold to other Costa Rican companies.

Given these results, it is obvious that knowledge transfer to Costa Rican private companies through productive linkages is still incipient in Costa Rica, notwithstanding its importance for the country's development. In fact, it should be mentioned that Monge-González *et al.* (2005) were able to identify only 143 companies that supplied active MNCs in the country during 2004. In addition, a study carried out by Paus (2005) that compares the experiences of Costa Rica in the

area of FDI with that of Ireland found that the effect on the productive linkage between MNCs and local companies in Costa Rica is still much lower than that observed in the green tiger (Ireland).

Cordero and Paus (2008) note the small amount of knowledge transfer that occurs in Costa Rica through vertical linkages between these types of companies, stating that the relative relevance of local purchases compared to the total of purchases made by MNCs continues to be very small. In fact, the authors found that local purchases accounted for only 12% of imports, and 10% of the exports made by MNCs established in Costa Rica during 2005. These figures have not significantly changed since 1997.

According to PROCOMER (2008), local purchases by EPZ firms in Costa Rica has grown in recent years, from US\$63 million in 1997 to US\$591 million in 2007.<sup>15</sup> Agribusiness, services and machinery are among the sectors showing higher local purchases (Table 7).

Table 7. Costa Rica: Local purchases from EPZs firms grouped by sector (US\$ Million)

	1997	2002	2007
TOTAL	62.9	235.7	591.1
Agribusiness	5.1	103.9	242.1
Services	8.9	28.9	127.6
Electrical Machinery and Materials	14.5	35.7	50.0
Metal Manufacturing	1.0	1.1	49.5
Precision Instruments and Medical Equipment	1.7	8.6	44.4
Plastics	1.0	15.4	30.9
Textiles and Apparel	19.9	19.2	18.5
Chemical and Pharmaceuticals	6.1	7.1	15.2
Other	4.7	15.8	12.9

Source: Monge-González et al (2009)

It must be noted that total local purchases are important, but it is not necessarily possible in all cases to generate technological and knowledge spillovers from MNCs to local companies.

Rodriguez-Clare (1997) argues that the most relevant issue is related to the increase of the linkage

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<sup>15</sup> These local purchases includes all local sourcing of goods and services, namely, raw materials and inputs (related and not related to the production process), outsourcing and professional services contracting, and other services (marketing, customs, transportation), among others.

coefficient (the value of *specialized* inputs sourced locally per worker hired locally) between international and local firms. Alfaro and Rodríguez-Clare (2005) indicate that some of the general notions found in the literature may be due to using linkage measures that are not properly derived from theory. It is likely that although MNCs do source a lower percentage of their inputs domestically, they also use more inputs with respect to the workers they hire. As a result, MNCs do not necessarily generate weaker linkages with domestic firms.

Following the same lines of reasoning, Monge-González *et al.* (2009) made a preliminary estimation of linkage coefficients for EPZ MNC in Costa Rica, whose results are presented in Table 8. Due to limitations on the data available, they could not identify specialized inputs<sup>16</sup>, but their results still indicate that sectors like chemicals and pharmaceuticals, metal manufacturing and plastics purchase more goods and services locally, relative to the people they employ.

**Table 8. Local Purchases from EPZs Firms (US\$ per Worker)**

	<b>1997</b>	<b>2002</b>	<b>2007</b>
TOTAL	3,771.7	6,724.1	11,838.6
Agribusiness	11,233.5	15,921.9	35,800.0
Services	2,435.7	7,368.7	7,626.1
Electrical Machinery and Materials	5,523.8	3,924.8	5,238.9
Metal Manufacturing	45,454.5	2,864.6	41,842.8
Precision Instruments and Medical Equipment	12,592.6	2,448.7	6,845.5
Plastics	15,384.6	15,762.5	14,365.4
Textiles and Apparel	2,398.7	1,604.9	2,325.3
Chemicals and Pharmaceuticals	59,803.9	75,531.9	434,285.7
Other	3,549.8	7,577.9	7,321.2

Source: Monge-González et al (2009).

According to Cordero and Paus (2008), the potential for backward linkages in Costa Rica is reduced by insufficient domestic absorptive capacity for linkages, and secondarily by the limited potential for generating spillovers from established FDI. There are areas where scale

<sup>16</sup> It is clear that a more precise approach would involve identifying the specialized inputs purchased directly from MNCs locally and incorporated in final products, which requires significant time and resources. This analysis goes beyond the scope of the present study.

requirements may constitute a problem for backward linkages, but even in areas where they do not represent an obstacle, the generation of such spillovers in Costa Rica is insufficient. According to the authors, some domestic firms have become successful suppliers to high-tech MNCs, producing moldings and metal and plastic moldings and parts; however, such companies are still the exception rather than representative examples of the state of national linkage capability and capacity.

In summary, although FDI attracted by Costa Rica is an important source of knowledge transfer to local firms through vertical production linkages with MNCs, it seems that this country has not yet been able to take advantage of this important source of economic growth. In a study with implications for this topic, based on the results of a survey conducted with MNCs and local suppliers carried out by Beltran and Gutierrez (2007) in Costa Rica, Monge-Naranjo (2008) show that the weak vertical integration observed between these companies seems to be related to the business culture and the administrative capacities of local companies – aspects that are not easy to transfer from MNCs. Moreover, the author argues that in spite of the efforts by representatives of the Costa Rica Provee<sup>17</sup> program, the results of such linkages are not satisfactory, as they are in other countries such as Ireland.

## **5. Concluding remarks**

The present work has showed evidence to support the hypothesis that there exist MNC *knowledge spillovers* through labor mobility in the Costa Rican economy. It is recommended that this subject be further investigated to determine the presence or absence of *knowledge spillovers*, the type of knowledge that is spilling over to local companies (micro-, small -, medium- and large-sized businesses) and the relative importance of this type of externality in improving the productivity of Costa Rican firms, and the economy as a whole. This type of effort would make it possible to define

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<sup>17</sup> A program to promote vertical linkages between MNCs and local firms in Costa Rica; it started in the year 2000 with support from the Inter American Development Bank, and was later on absorbed by Procomer.

public policies regarding issues related to the educational, foreign direct investment, production linkages and business startup areas, all important for the future development of Costa Rica.

In the area of *backward linkages*, the present study showed evidence for the existence of knowledge that has been transferred from MNCs to their local suppliers, as well as the positive impact of these linkages on the productivity of the latter firms. However, it was not possible to determine if such a transfer of knowledge is in fact a *knowledge spillover* as discussed previously, an issue which assumes particular importance when trying to establish the presence or absence of a positive externality in the Costa Rican economy as the result of such a relationship. This task is still pending.

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