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Theme D: Territorial Organization and the New Economy

"New Economies and Innovation for Developing Countries. The Case of Intel in Costa Rica."

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Abstract

The paper presents the specialisation patterns and indexes of the Central American economies based on the CAN database of CEPAL and reports on recent research on these issues and compare this "Intel Island" observation with the "Mobil Valley" case of growth of the electronics sector in the relative less developed region of North Jutland, Denmark. Here the knowledge base, research and education was established prior to investments (with EU subsidies) in assembly factories together with growth in investment in private R&D departments, joint industry-university collaboration, a science park etc., which all in all gives an almost opposite picture of a sustainable development of the new economy.

On this basis, the paper evaluates and discuss how to promote dynamic effects of the new economy in the context of re-exportation-based FDI in developing countries. The industrialisation picture of the trade statistics of the rest of Central America resembles very much the Costa Rican one in recent years in terms of growth in manufacturing exports. The paper also opens a discussion of their conditions for participation in the new economy viz-a-viz the prevailing re-exportaion regimes of the countries. Some general lessons and principles for the new economy as a strategy for development are offered as a conclusion.

Keywords: Specialization patters, International Corporations, New economy, Spatial dimensions, Foreign Direct Investments.

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Introduction

The new economy of ITC is recognizable in development countries. In the Central American region, Costa Rica has in recent years experienced an almost true adventure in the growth of the electronics sector coming from a traditional agricultural products based economy. The export specialization pattern and the technological specialization pattern of the country gives evidence of a truly transformation process into not only industrial manufacturing, but also especially electronics with high value added contents (Lindegaard and Vargas, 1998; Vargas and Miranda, 2001).

The establishment and operation of the INTEL assembly factory in Costa Rica in 1997 explains this development. Intel factory accounts in the last part of nineties for more than three thirds of Costa Rican GDP growth. However, value added and job generations is few compares to aggregated figures in exports and GDP. There have been an important debate on Costa Rican context about the real impact of INTEL in other aspects as for example technological performance and economic and technological linkages with the SME's.

There are at least two important aspects about INTEL effects to Costa Rican industrial performance. First, the generation of economics linkages with the rest of companies and business in Costa Rica. In this aspect, there is some evidence in term of a development process associated to what we have called "island development process". This is very much related to few social, economics and technological linkages with the rest of the economy. Second, the regulatory environment of the company that have been integrated to a model of development based in Free Zones industrial parks, where fiscal incentives are bigger.

However, along the time the company have been operating there are an increasing effort to developed linkages, learning and knowledge trander processes , education and training of the personal, spinn-offs activities in other related business as software development, clustering with some local suppliers. So, there is a real mix picture of island development process during the first years of INTEL operation, but increasing efforts for building bridges to Costa Rican main land industry. Mayor effort of integration requires between others aspects, the development of an industrial policy to increase local firms capabilities and promote technological and economics linkages.

The paper presents the specialisation patterns and indexes of the Central American economies based on the CAN database of CEPAL and reports on recent research on these issues and compare this "Intel Island" observation with the "Mobil Valley" case of growth of the electronics sector in the relative less developed region of North Jutland, Denmark. Here the knowledge base, research and education was established prior to investments (with EU subsidies) in assembly factories together with growth in investment in private R&D departments, joint industry-university collaboration, a

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The export specialization pattern and the technological specialization pattern in Central America

The specialization pattern of the economy is a central aspect of the study of National Systems of Innovation (NSI). The dynamic and the structure of the pattern signify the base from where a particular country can learn and innovate. Somehow, we can consider this pattern as a starting point for the understanding of the particular learning processes along the economic structure.

While the specific data by product is available for all the Central American countries related to the United States' trade relations, the rest of the data for exports to OECD is not available in the same structure. In order to solve this specific data problem, we have used an OECD database that has data available until 1994 and specially managed by software elaborated by Economic Commission for Latin America and the Caribbean, ECLAC.¹

Tables 1 and 2 shows the regression results for Revealed Symmetric Comparative Advantage per country and industry group and includes also the aggregate region. We have considered two middle term periods (1977-1994) and (1979-1992).² Following the Dalum & Williamson analysis, there are three short-term periods taken into account (1979-1984), (1984-1988) and (1988-1992). In the following section of the paper we use the data to test the stability of the Central American specialization patterns during the last 2 decades.

The data presented in table 1 and 2 show the statistical test of stability of the national export specialization pattern regression models by country in the short-term: 1979-1984, 1984-1988, 1988-1992 and in the medium-term: 1977-1994, 1979-1992. The tables show the values of beta, R and beta over R estimated in the different periods.

¹ The software "Competitive Analysis of Nation" (CAN) uses a simple average of three years trade as a reference for each year in order to normalize the data. We have constructed different categories; these categories have defined the groups of products based on technical characteristics of the production processes. We show the figures for 1977 and 1994 in order to have a middle-term perspective of the trade pattern.

² We have being using 238 sectors according to the CUCI Revision 2.

Table 1: Country-wise stability and development of OECD export specialization patterns in the short-term periods (1979-1984, 1984-1988, and 1988-1992).

RSCA	1979-1984		1984-1988		1988-1992	
Country	β	R	β	R	β	R
Guatemala	0,89	0,82	0,91	0,82	0,91	0,91
Honduras	0,93	0,86	0,93	0,94	0,90	0,88
El Salvador	0,75	0,78	0,78	0,74	0,89	0,76
Nicaragua	0,76	0,81	0,72	0,75	0,88	0,73
Costa Rica	0,95	0,80	0,86	0,88	0,99	0,90
Panamá	0,82	0,81	0,73	0,86	0,94	0,84
Central America	0,95	0,90	0,90	0,92	0,99	0,93

Source: Own elaboration based on CAN21 and SPSS. Note: All Beta coefficients are significant at 99 percent.

Table 2: Country-wise stability and development of OECD export specialization patterns in the periods (1979-1992, 1977-1994).

RSCA	1979-1992			1977-1994		
Country	β	R	β/R	β	R	β/R
Guatemala	0,81	0,68	1,20	0,77	0,61	1,25
Honduras	0,77	0,65	1,18	0,79	0,68	1,15
El Salvador	0,66	0,56	1,18	0,50	0,50	1,00
Nicaragua	0,73	0,71	1,04	0,75	0,69	1,09
Costa Rica	0,86	0,64	1,34	0,80	0,64	1,25
Panamá	0,77	0,72	1,06	0,72	0,66	1,09
Central América	0,87	0,79	1,10	0,81	0,74	1,10

Source: Own elaboration based on CAN21 and SPSS. Note: All Beta coefficients are significant at 99 percent.

In the medium-term periods (1977-1994, 1979-1992) the results show a general increase in the dispersion of exports specialization, implying a trend towards an increase in specialization. The increase of dispersion is important and can also be seen in the unweighted mean for beta over R that is 1,10. This tendency is particularly important for Costa Rica where beta over R is 1,34 if we consider the first period 1977-1994 and 1.25 in the second period 1979-1992.

The decomposition of the dispersion in a regression effect (1-beta) and a mobility effect (1-R), reveals that the beta-values are significantly different from zero and significantly below unity at one percent level for all the 5 countries. As Dalum & Willumsen (1996) explain, trade patterns do not change overnight and do not change fundamentally even over two decades. This result points to a general tendency to increase in industries where they have been highly specialized. The beta specialization, which measure the capability of previous specialization patterns to determine those of the future, is strong, as indicated by the unweighted beta value of 0.87.

Concerning the short-term of 1979-1984, 1984-1988 and 1988-1992, it should be noted that the relation beta over R estimated (1.05, 0.98 and 1.07) are indicating a process of sigma de-specialization effect. Only Nicaragua and El Salvador show a lower specialization process that is closely related to the war periods in these countries during the seventies and eighties.

We need to be careful with the analysis of the data especially for Nicaragua and El Salvador, because the war periods are in-between the periods analyzed. Also, we must consider that OECD trade excludes around 25 percent of the trade pattern, which is intratrade and trade with other countries out of the OECD.

Concluding, we have found a process of specialization in the region during the period analyzed, that has been stronger in countries like Costa Rica, which did not suffer war and strong political problems. Even in countries that have suffered from a war period in-between, stability of the patterns and recently a specialization process has been detected.

The analysis of relative export specialization patterns does not provide explanation of any causal relations or of the initial specialization structure. Neither is it clear so far, whether the small Central American countries are displaying a similar relative export specialization over time as the less-developed OECD countries or if they are closer to the development path of the small (rich) OECD countries sharing similar natural resource bases.

The tension between convergent/divergent trade specialization processes on the one side and divergent technological specialization processes on the other and the unclear relation between the processes taken together are all seen as the "core of the dynamics of national systems of innovation analysis" (Dalum & Willumsen, 1996, p. 1). The processes point to the interplay between processes of international imitation and diffusion of technologies as a mechanism of convergence and institutional (contextual and historical) mechanisms of national divergence.

Stickiness is, on the other hand, a necessary component in all learning trajectories and new industrial policies will, if based on a broader innovation strategy of "learning from doing", seek competitive advantage created by bifurcations of new products, production processes, organizations and markets from the existing structure. Institutional change can here enhance interactive learning as well as the knowledge infrastructure of existing competence, know-how and experiences.

Following the same argument, we have constructed an index of technological specialization for the Central American Region, following (Alcorta and Pérez (1996)). This work has been done in a previous work of SUDESCA project by (Vargas and Miranda, 2001).³

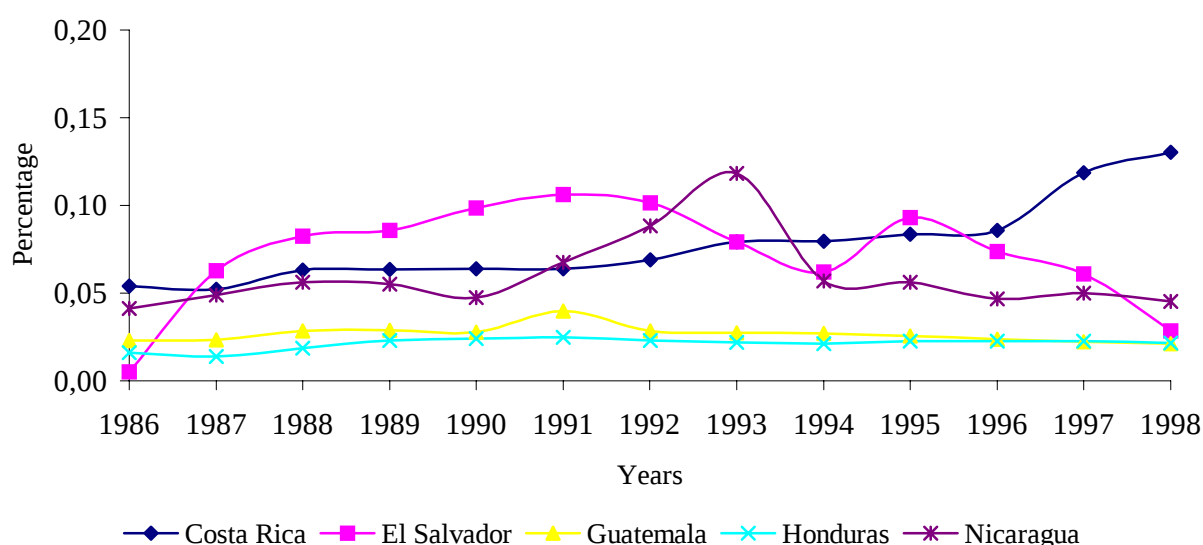
The figure 1 shows at least two important results. First, Central American technological specialization patterns is quite low and did not have change under the last decade. The effort for attracting Foreign Direct Investment could contribute to reduce the demand constraints for Science and Technology in production processes, if they really could develop internal linkages with local economy. Indeed, the relative prices changes have not resulted in major changes in technological

³The index is a rate that compares the share of non-technological specialized exports with respect to the ones that have technological specialization. The selections between them are associated to OECD index of Research and Development investment by products. Because the small index results we have considered high and medium research and development product and compared to the ones that have few. More details could be found in (Vargas and Miranda, 2001).

development. Exports have growth but not necessarily modify the technological contents of production processes as have been shown in figure 1.

The second aspect in the figure is that Costa Rican exports have had a very stable patterns until middle of the nineties where a shift in the pattern appear, INTEL investment in microprocessor facility is explaining this boom on technological exports specialization process. In next section of the paper it will be presented the details of this particular investment as well as some results.

Figure 1
Central America: Technological exports specialization index



Source: Own elaboration with CAN2000

Other important conclusion about the figure is that the major results of the opening-up process in last two decades have been a diversification of the products and particularly, mayor manufacturing exports. However, those products continue showing a very few research and development index, so the technological specialization patter is sticky and do not change with the relative change of the prices.

INTEL experience in Costa Rica: ¿Is it an island development or not?

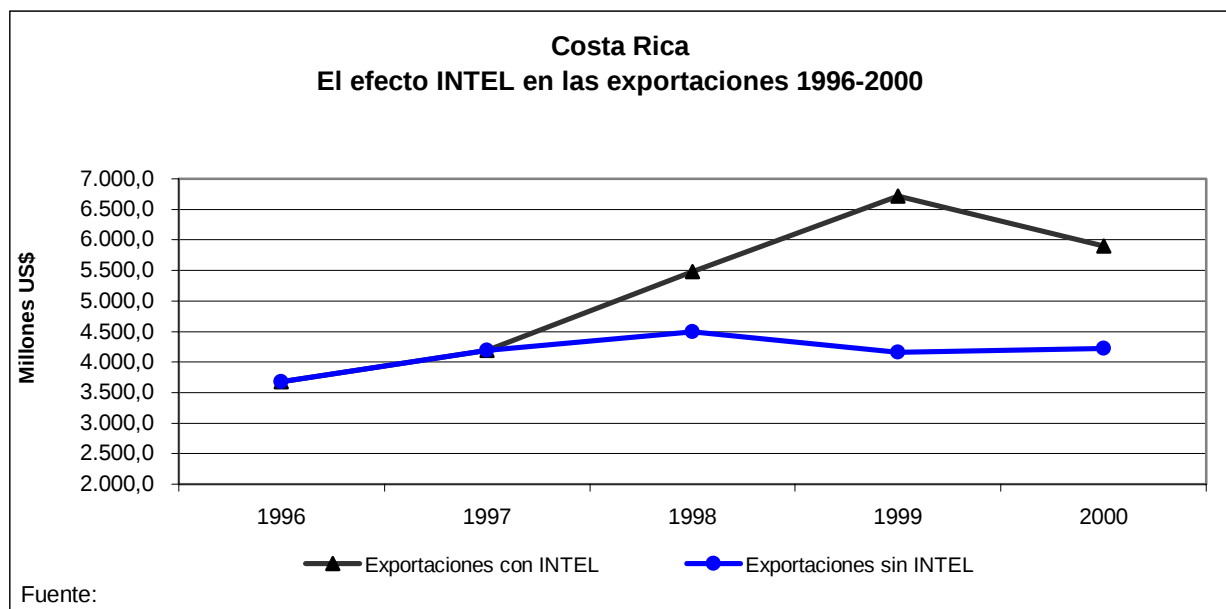
In the previews section of this paper we have shown an important movement of Costa Rican trade and technological specialization patterns during the 90's. Those results have been possible because the growth in FDI and particularly Free Zones industrial activities. Between the major investment on this activities, INTEL industrial facility have been the clearest example.

Costa Rican economy is relatively small. The country is of about four million people and the exporter performance has been mainly related to a traditional natural resource-based exporter. Since the beginning of 1997, once INTEL main semi-conductor US firm have announced the installation of an important facility in Costa Rica, the country macroeconomic figures and particularly external ones have dramatically changed. In 1998 the economy growths on GDP and exports was so high that national accounts need to be redefined with and without INTEL figures. Closed to a billion exports were the results on first year INTEL operation. Some people have conclude on this development talking about the emerging of a high technology cluster development in Costa Rica (Hershberg and Monge, 2001).

Following this argument we could describe the expectation of Costa Rican politicians as follow: “A country whose path to peaceful development could be attributed to the century-long predominance of small farm-based coffee production would thus renew its ticket to prosperity in a new era: by producing engineering and technical expertise for the global market in semi-conductors, software and related high value-added products” (Hershberg and Monge, 2001; page 2).

However, the dynamic of the High-Tech industries moved to slow down process under the crisis that many developed economies suffer at the end of 1999 and beginning of new millennium. Those results have imply that the figures of exports of Costa Rican electronics cluster and particular INTEL have been reduced and indeed, economic growth returned to a very small figure for the following years. A figure with GDP Growth and exports growth for Costa Rican economy is presented just to show the effects of the INTEL changes and performance on Costa Rican macroeconomics and particularly trade figures.

Figure 2: INTEL effects on exports in Costa Rica.



Source: PROCOMER, Costa Rica.

After this results, a mayor question appear to be important to ask, Is INTEL development activity in Costa Rica much more than a classical maquila island export process. Which are the major linkages of INTEL industry facility with the rest of the economy in Costa Rica. Is there a chance for

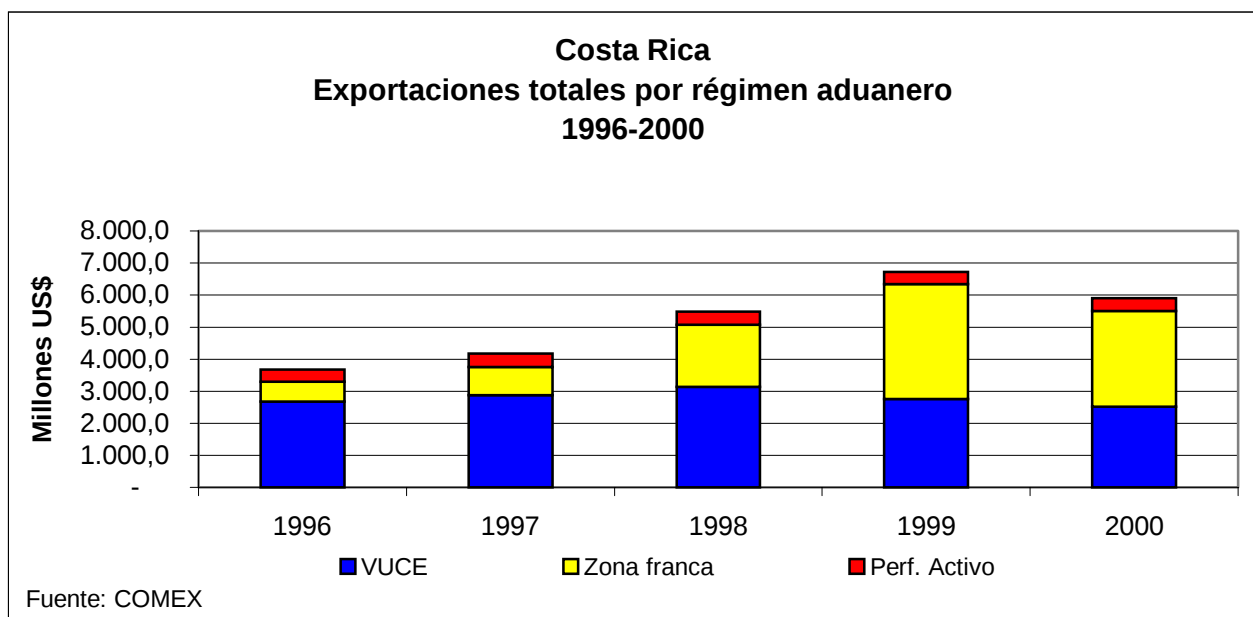
promoting a clustering industrial policy program, what would be the objectives, tools and advantages of this policy program?

We could say that the answer of this question is ambiguous. First of all, the real technological and industrial effects of INTEL operation require years to be cashed for. Human resource updated and technological spillover will require time, something that only could be smelled on five years INTEL operation process. By the other hand, evaluating INTEL island hypothesis only measuring economics benefits would be a mistake, that means to forget about majors impact of technological externalities, agglomeration effects and indeed, human resource updating that the industry could have.

Once productions processes became more des-centralized geographically and economic activities globalize more and more, competitive advantage depend more and more on specialization and indeed sophistication of those specialized activities. Learning and innovation became crucial aspects for multi-national companies and for local factories as well. This globalization process implies that major portion of value added in products and services depend much more on upgrading human resource capabilities and indeed technological infrastructure. For countries that follow behind on trade and technological specialization as Costa Rica, major effort to moved will significantly depend on local industrial policy and FDI.

According to major reports on INTEL and other Free Zones electronics companies interviews, major advantage of Costa Rican economy in attracting Electronics firms have been the un-expensive and well-educated human resource base. Once INTEL is in Costa Rica, major effects on agglomeration benefits could also be part of advantages for collateral firms, considering the division of labor between specialized companies, the closed related suppliers and need for cooperate on upgrading human resources, etc. So we could say that INTEL developed a centrifugal force to attach other related industries to the country.

Figure 3: Exports by different regimes in Costa Rica economy.



Source: COMEX, Costa Rica.

In order to present some framework for describing INTEL linkages with local economy, a basic figure could help. The figure 3 is presenting three major sources of linkages; one is related to global suppliers that come to Costa Rica to follow INTEL globalization strategy. Second, the linkages of local firms and the degree of sophistication of those linkages in term of product chain activities.

Some of the previews work that have been done on INTEL effects on local interactions and industrial development shows that the first process of INTEL production was not as sophisticated as it was expected, so even that the investment was for around 500 millions of US dollars, the mayor investment of a single company in Costa Rica, the effects on technological linkages were very reduced. With the reorganization of the plant after 1999, the process attracts some other suppliers of and local interactions, particularly in software industry. The following picture is showing INTEL links and the degree of sophistication on the links. National companies are located far bellow global ex-ante INTEL suppliers.

Figure 4: INTEL related International Firms in Costa Rica



The effect of spiral attraction of INTEL supplier was important in term of some technological services and ex-ante INTEL suppliers in other part of the world. However, there are new firms, particularly national ones, that starts top growth in their role in providing some facilities to INTEL as can be seen in the next figure.

Figure 5: INTEL local firms relations



According to the documentation on INTEL local relations, mayor services are based in low-tech value added activities, except to some recent contract and acquisition of software. However, the company is redefining their activities in Costa Rica and could generate mayor technological impact. A promising effects founded is the increasing demand for engineers and software expert. Local Universities have been very much interested and involved in human resources training, updating universities programs and also, some technological knowledge transfer. Of course, those have been ongoing activities and it is still very difficult to evaluate.

Considering what it is clear until now, we have founded at least three important aspects for the coming years process in Costa Rica. The first one is related to the need for implementing local strategies to improved technological links with local organizations of Local System of Innovation. Second, the process of upgrading local human resources and the possibilities of transferring vis a vis human mobility technological capabilities to local firms, not only in hardware product but and particularly on software activities. Finally, the need of consider local institutional development in term of facilitating the increase amount of others firms agglomeration strategy.

The North of Jut land development in Electronics industry?

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Some lessons for small developing countries under the New Economy

INTEL is a recent and very important experience for a small developing economy as Costa Rica. The particular economic and social development of Costa Rica have explain the most important reasons that explain the decision of INTEL to locate engineering facilities in the country. However, the particular evolution of the new economy has created important trade off of that decision for INTEL directors as well as Costa Rican decision-makers.

The linkages of INTEL with local economy have been mainly articulated to low tech and low value added activities, except to the contracting of local human resources so far. Mayor impact on exports and GDP growth have been the result of first years operation activities and very much articulated to the evolution of market conditions. Internal linkages have bee few and concentrated on very local context.

Long-term linkages could be associated to a higher education demands and the development of local interaction with local firms and suppliers. We have found interesting cases or examples of succeeding relations between local firms and Free zones companies as INTEL, but the process has concentrated in low value added activities of the global chain value added of INTEL.

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