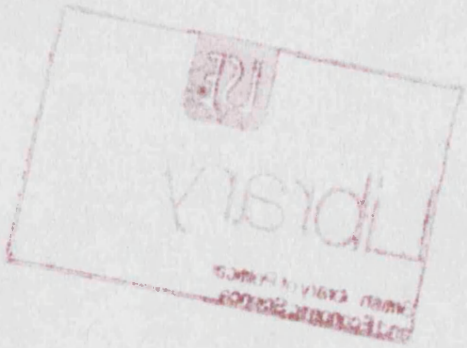

# Institutions, Social Ties and Productive Collaborations: Lessons from the Information and Communication Technologies Cluster in Costa Rica

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# Abstract

Firms located in industrial clusters benefit from economies of agglomeration and collaboration, which help them overcome their resource constraints and acquire new technological capabilities. Developing countries promote industrial clusters expecting them to foster collaborations that will benefit local enterprises. This research analyses the emergence and impact of a variety of productive collaborations that domestic producers established in the Costa Rican Information and Communication Technologies (ICT) cluster with other local firms, investors, universities, multinationals' subsidiaries and actors located outside of the cluster. The findings show that some collaborations promote the capabilities of local firms, while others bring them into technological and transactional dependence.

To explain how developmental and non-developmental collaborations emerge, this work combines the principles of new institutional economics with theories of the social embeddedness of economic action. When deciding whether to collaborate and how to do so, actors evaluate the information available to them and respond to the incentives generated by the institutions that regulate their behaviour. Actors use their social ties to access filtered information, and to circulate and enforce social incentives. Thus, actors operating under the same institutional framework who have different social ties may opt for different, even opposite, collaborative outcomes.

In the Costa Rican ICT cluster the two key obstacles for the formation of developmental collaborations are lack of institutional incentives and information failure, which hampers the coordination of actors' economic actions. Social ties that bridge divided communities, such as MNCs' managers and local entrepreneurs, compensate for information failure, introducing incentives to establish developmental collaborations. Social ties that link actors within closed communities hamper the formation of developmental collaborations, circulating redundant information and diffusing anti-collaborative behavioural norms. The study shows that actors' embeddedness in social networks is a significant factor in understanding the emergence of productive collaborations, which affect the development of local firms.

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# List of acronyms and abbreviations

ALC – Academic institution-local firm collaboration

Camtic – Cámara Costarricense de Tecnología de Información y Comunicación (Costa Rican chamber of information and communication technologies – business association of information and communication technologies' producers)

CBC – Cross-border collaboration

Cinde – Coalición Costarricense de Iniciativas de Desarrollo (Costa Rican investment and development board – agency for foreign direct investment attraction)

FDI – Foreign direct investment

GVC – Global value chains

ICE – Instituto Costarricense de Electricidad (Costa Rican electricity institute – state-owned energy and telecommunication corporation)

ICT – Information and communication technologies

ILC – Investor-local firm collaboration

IMF – International Monetary Fund

IPO – Initial public offering

LLC – Local firm – local firm collaboration

MLC – Multinational-local firm collaboration

MNC – Multinational corporation

Procomer – Promotora del Comercio Exterior de Costa Rica (Costa Rican foreign trade promotion centre – export promotion agency)

UN – United Nations

# 1 Productive collaborations in a MNC-dominated cluster: institutions, social ties and developmental impact

## 1.1 Introduction

Since the 1950s, Latin American policy makers and scholars have pointed out the need for their economies to escape dependency on natural resources and cheap labour. After several decades of costly and creative policies to achieve such change, Latin America is still, by and large, dependent on its natural resource-based and labour-intensive exports (Cardoso and Faletto, 1979; Prebisch, 1967; Sikkink, 1991; Thorp, Cárdenas and Ocampo, 2000; Fitzgerald, 2000).

The fundamental problem is that in Latin America, as in most of the developing world, domestic firms continue to suffer from several market failures that halt their competitiveness, especially in knowledge-intensive sectors (Lall, 1992; 2001). Latin American enterprises tend to be latecomers in markets dominated by first world industry leaders. Although they may have lower labour costs, they do not benefit from proximity to universities, research and development (R&D) centres, headquarters of multinational corporations (MNCs) and financial institutions where most new technologies, organisational techniques and skills are developed.[1] They have to catch-up with their competitors whilst having inferior access to capital, technology, and information (about the difficulties faced by Latin American enterprises, see among others Cimoli, 2000; Chudnovsky, 1999; Teitel, 1992).

The developmental policies adopted by Latin American countries during the years of Import Substitution (ISI) attempted to compensate for these market failures (Gereffi and

[1] Despite globalisation, proximity to such organisations continues to matter because the knowledge they generate, such as new technologies, is partly tacit. Spatial proximity facilitates the transfer of tacit knowledge as it lowers the costs of face-to-face interactions and other forms of socialisation through which actors codify and exchange such knowledge (Antonelli and Quere, 2002; Lundvall, 1992; Nonaka, 1994).

Wyman, 1990).[2] Since the debt crisis of the 1980s, Latin American countries were also pressured to adopt the macroeconomic stabilisation packages advocated by multilateral organisations, which entailed opening their markets to global competition. These policies did not generate accelerated and sustained economic growth for Latin America but they reduced the extent to which state agencies could intervene to compensate for the market failures faced by domestic firms and they also undermined the ideological justification for such interventions (Correa, 2002; Marichal and Topik, 2003).[3]

The failure of both import substitution industrialisation and neo-liberal economic policies to deliver sustainable growth and reduce dependency on primary exports has led Latin American countries to experiment with new policy instruments. Many countries across the region promote strategic sectors, ranging from automobiles to information and communication technologies (ICT), by stimulating the emergence of MNC-dominated clusters (Altenburg and Meyer-Stamen, 1999).

Cluster policies aim to promote the development of local producers. They are based on two observations. Firstly, that MNCs play a key role as sources of capital and technology, especially in the post 1980s context, characterised by accelerated technological change and reduced state capacity (Lall and Narula, 2004). Secondly, that industrial clusters can promote the development of domestic competitive capabilities by stimulating the emergence of collaborative networks of suppliers, R&D institutions, investors, and other actors that compensate for some market failures and improve access to certain resources, such as capital and knowledge (Becattini and Rullani, 1996; Pyke and Sengenberger, 1992; Porter, 1998; Saxenian, 1994).

A substantial body of empirical evidence shows that clusters can help firms overcome their resource constraints by generating external economies, especially economies of

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[2] They generated some technological capabilities, and promoted growth and employment, but they also contributed to the macroeconomic imbalances that culminated with the 1980s' debt crisis (Thorp, Cárdenas and Ocampo, 2000).

[3] The stabilisation packages often included the reduction of tariff barriers, the privatisation of state-owned enterprises, and adherence to the WTO and other multilateral agreements. The need to service both external and internal debt entailed a reduced availability of public resources for policies to support domestic private sectors. In Latin America average growth in GDP per capita stalled during the 1980s, increased during the first half of the 1990s, then declined again after 1997. During the 1980s-2000 period, average levels of inequality and poverty increased (Fanelli, 2007; Ffrench-Davis and Machinea, 2007). Few countries, such as Argentina, experienced a sudden boom in economic growth during their period of market-opening reforms, followed by a decline of the economic growth rate or a crisis (Ciravegna, 2003).

cooperation (Brusco, 1982; Markusen, 1996; Lee, 2000; Knorringa, 1996; Piore and Sabel, 1984; Pyke, Becattini and Sengeberger 1990; Rabellotti, 1995; Porter, 1990). However, there is also evidence of MNC-dominated clusters that have not generated collaborative dynamics, and which have only a marginal developmental impact (Altenburg and Meyer-Stamen, 1999; Giuliani, Pietrobelli and Rabellotti, 2005). Different disciplines, including economic geography, industrial sociology, and new institutional economics, have attempted to solve this puzzle and explain the functioning of clusters. But despite the diffusion of cluster policies in Latin America and other regions, there is still an ongoing debate about what determines whether such policies generate the intended collaborative dynamics, external economies, and related developmental effects.

Several studies point to Costa Rica because of its cluster policies, which successfully promoted its shift from being mainly a primary exporter, to being the first Latin American exporter of Information and Communication Technologies (ICT) in less than ten years (Monge-Gonzalez, Rosales-Tijerino, Arce-Apizar, 2005). The World Bank asserts that "Costa Rica's economy has evolved from production of its 'golden bean' (high quality coffee) to the 'golden chip'" (The World Bank Group, 2006: 15). Rodriguez-Clare describes the effect of Costa Rican cluster policies with the following phrase: "Over the last decade Costa Rica has experienced a tremendous leap forward in the development of a technology and knowledge-driven economy" (Rodriguez-Clare, 2001: 2). Have Costa Rican cluster policies succeeded in generating external economies of collaboration that help its domestic ICT industry overcome its resource constraints? What explains this success? What are the lessons for other countries?

On the basis of extensive empirical evidence from the Costa Rican ICT cluster this study develops a theoretical framework to explain the formation and developmental impact of collaborative arrangements between local firms and other actors in MNC-dominated clusters.[4] It looks at why local firms and other actors decide to collaborate in a specific way, how they establish their collaborations, and how the latter affect firm-level technological and organisational capabilities. Drawing on both new institutional

[4] The reasons for choosing the Costa Rican ICT cluster as a case study and the research design are discussed in chapter 1 (section 1.3 and 1.5). Information sources and data collection methodology are presented in the appendix (section 8.1 and 8.2).

economics and social embeddedness theories, it shows that actors' collaborative choices respond to the incentives generated by the institutions that regulate their behaviour, which are filtered, transmitted, and enforced via their social connections.

Institutions, such as the mandates of MNCs' subsidiaries, create the motives for collaborating: incentives. The social ties of actors determine the range of incentives to which they are exposed, and constitute resources that they can leverage to form collaborations.[5] Social ties that bridge unlinked actors create both opportunities and various means to collaborate in contexts characterised by information failure and asymmetry. Social ties that link the actors that belong to closed communities hamper the establishment of developmental collaborations by circulating redundant information and behavioural customs that can be non-collaborative (Burt, 2001). The influential effect of social ties on institutional incentives explains why actors operating under the same institutional context choose different collaborative outcomes.

This research presents evidence of the diverse set of effects that collaborations can have on firms operating in MNC-dominated clusters, ranging from the acquisition of technological and organisational capabilities, to the loss of transactional and technological independence. Combining new institutional economics with a socially embedded analysis of collaborations allows us to explain how developmental and non-developmental collaborative arrangements emerge, and how cluster policies affect the phenomenon. The next section presents the findings: the productive collaborations found in the Costa Rican ICT cluster.

## 1.2 Collaborations in the Costa Rican ICT cluster

In 1996, Costa Rica successfully lobbied Intel to establish its only Latin American plant there. This was the most visible step of its ICT cluster promotion policy, others being investment in infrastructure and education, and the creation of Export Processing Zones (EPZs).[6] By the year 2005, Intel had invested about 770 million US dollars,

[5] For a discussion of how collaborations have been operationalised in this research, see section 1.3.
[6] Costa Rican governments also promoted other clusters, such as a medical devices cluster, and a tourism cluster.

establishing a production and testing facility that employs about 3000 workers, one hundred of whom are engineers working in a dedicated R&D lab.[7] Largely due to the effect that Intel has had, Costa Rica's exports of electric and electronic goods increased from 3% of total exports in 1985, to 28% in 2003, replacing perishable goods as the first export category (The World Bank Group, 2006).

The presence of Intel attracted investment by other multinationals operating in ICT and possibly helped local firms become more visible in international markets.[8] Local producers grew in number from about thirty in 1995 to about a hundred in 2003 (Nicholson and Sahay, 2005). By the year 2005, in Costa Rica's Central Valley, where most of the population lives, and where the only international airport and national highway were located, an ICT cluster had developed (see Table 1.1). The cluster was composed of the following actors: 25 multinationals, 150 local firms, 1 business association, 2 research universities, and 6 institutional investors.[9]

**Table 1.1 The Costa Rican ICT cluster in the year 2005**

| | Domestic firms | MNCs | Total |
|---|---|---|---|
| Number of firms | 150 | 25 | 175 |
| Sales (US$ million)[10] | 175 | / | / |
| Exports (US$ million) | 70 | 1600 | 1670 |
| Employment (total) | 2560 | 4345 | 6905 |

Source: Author's elaboration based on interviews and information from Camtic

Although the number of companies operating in Costa Rica's export processing zones increased from about sixty in 1990 to over two thousands in 2003 (Monge-Gonzalez, Rosales-Tijerino, Arce-Apizar, 2005), only a few of those MNCs produce ICT goods and

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[7] Interview: Moshen Fazlian, Director of Intel Costa Rica, 29 March 2007

[8] Interviews: A. Mora, Director of Camtic, 28 January 2005, 12 April 2006; Oscar Arias, President of Costa Rica, 22 February 2005. Collective interview: Board of Directors of Camtic, 20 October 2005

[9] For a discussion of how the ICT cluster has been defined and data sources see the appendix. Institutional investors = organisations that invested in local firms, as opposed to individual investors. There are also other actors that are related to many industries and agglomerations, including the ICT cluster. These are the Costa Rican export promotion agency Procomer and the Costa Rican foreign direct investment attraction agency Cinde.

[10] Most MNCs interviewed are subsidiaries that perform offshore assembly operations, or offshore programming, data-storing and other IT operations. These MNC affiliates do not sell in Costa Rica, they "sell" their services and products to their headquarters. The MNCs that also sell in Costa Rica, such as Microsoft, were not willing to disclose information about domestic sales.

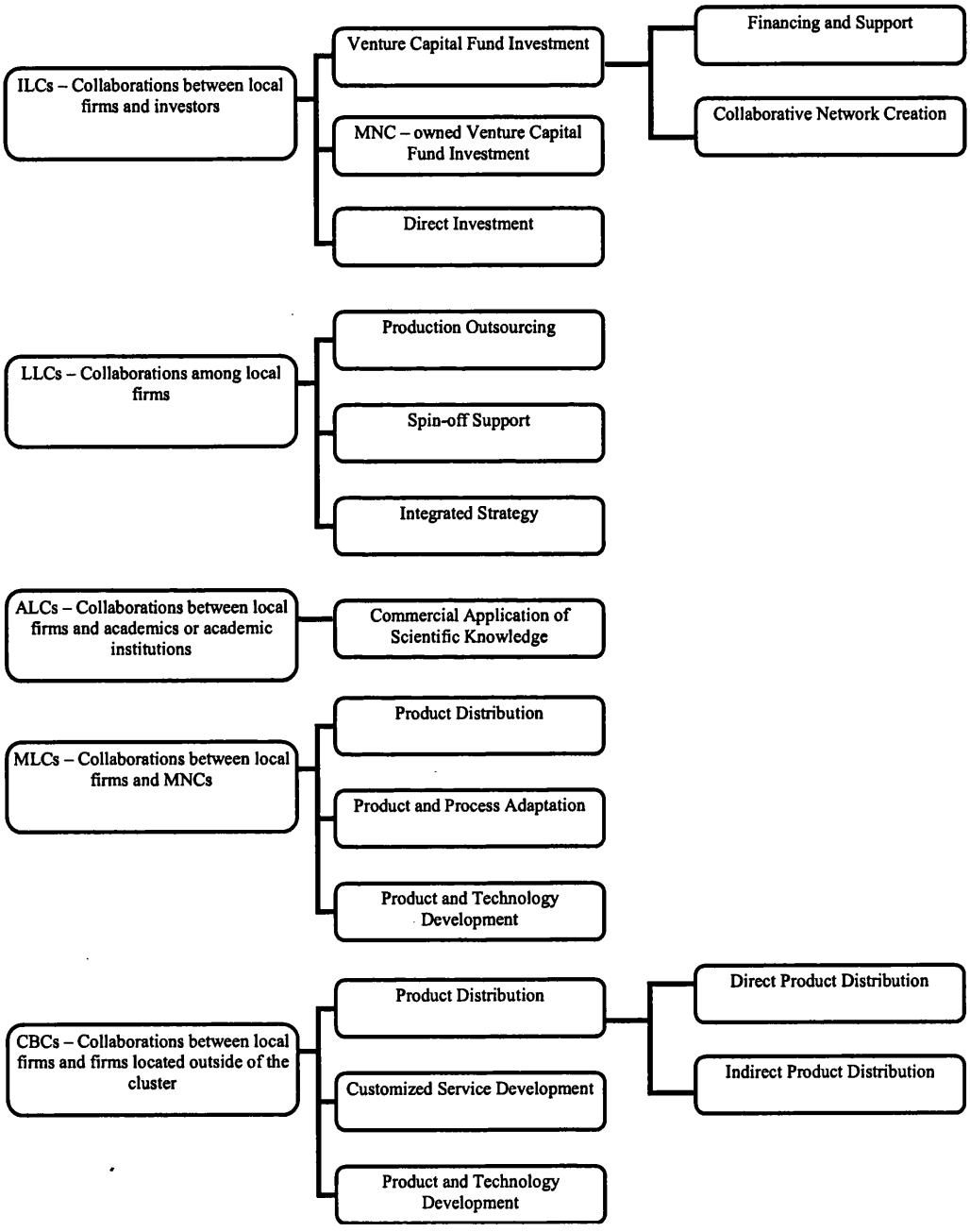
services, and have thus been included in this study. The 25 MNCs are both software developers and hardware manufacturers. Besides Intel, all of the MNC subsidiaries of the cluster have less than 150 employees. Costa Rican producers are small firms (75% of them has less than 20 employees, 5% has more than 100 employees, none has more than 150 employees) specialised in software development and the provision of ICT services that bundle software programs and technical assistance services (Nicholson and Sahay, 2005).

Exploratory fieldwork showed that MNCs, local firms, and other actors are not just co-located. Costa Rican ICT firms are also involved in what this research defines as 'productive collaborations'- cooperative relations with at least one other actor, which serve the purpose of carrying out production-related activities, such as marketing or product development, and which involve joint actions and resource-sharing. There are five different kinds of productive collaborations in the cluster:

- Investors-local firms collaborations (ILCs);
- Local firms-local firms collaborations (LLCs);
- Academia-local firms collaborations (ALCs);
- MNCs-local firms collaborations (MLCs);
- Cross-border collaborations (CBCs).

What impact do these collaborations have on the capabilities, skills, and performance of the Costa Rican firms involved? Do they promote or hamper learning processes? How have they emerged? The fact that four of the five types of collaborations have various subtypes, makes it difficult to provide a simple answer (see Figure 1.1).

**Figure 1.1 Types and subtypes of collaborations**




Source: Author's elaboration based on interviews

Figure 1 represents all of the types and subtypes of collaborations found in the cluster. Different types of collaboration have been singled out to ease the task of discussing how firms from developing countries establish productive collaborations with different actors, such as MNCs and investors. For each type of collaboration different subtypes have been distinguished according to their function and impact. These analytical categories have been designed in order to improve our understanding of the emergence of both collaborations with positive developmental effects and those with negative developmental effects.

In Figure 1, the larger boxes on the left-hand side indicate 'types', which are defined according to the actors local firms collaborate with. The smaller boxes on the right-hand side indicate 'subtypes'. They serve to distinguish between collaborations with different functions, but which are still of the same 'type'. For example, MNCs and local firms collaborate in the distribution of products, but also in order to adjust products to local conditions. Some of the productive collaborations with investors (ILCs) and firms located outside of the cluster (CBCs) have two levels of subtypes. For example, 'Venture Capital Fund Investment ILCs' or ILCs I, can occur in the following forms: ILC Ia – 'Financing and Support', and ILC Ib – 'Collaborative Network Creation'. 'Product Distribution CBCs' can also be CBCs – Ia 'Direct Product Distribution' or CBCs Ib – 'Indirect Product Distribution'. Only collaborations between local firms and academia do not have subtypes.

There is a strong similarity between the productive collaborations that link local firms to global value chains and foreign markets, namely CBCs and MLCs, which are discussed in the second part of the project (chapter 5 and chapter 6). In both CBCs and MLCs there are 'Product Distribution' and 'Product and Technology Development' subtypes, and a mid-level subtype, 'Product and Process Adjustment MLCs' and 'Customised Service Development CBCs' where actors collaborate to adjust products and services to specific conditions.

The developmental impact of collaborations depends on the resources firms can access by collaborating, the capabilities they acquire, and the extent to which they upgrade their products, processes, and functions. Different actors can facilitate access to different resources. But also, different joint activities promote different forms of firm-level learning and capabilities' build-up. Thus, the developmental impact of collaborations changes

according to the actors involved, which define collaboration types, and the activities they perform together, which determine collaboration subtypes. Collaborations do not necessarily have a positive developmental impact. Some of them boost technological and organisational learning, others have very limited effects, and certain subtypes cause the loss of capabilities. The effects of each subtype of collaboration shall be discussed in detail, focusing on the motives and formation processes of both developmental and non-developmental collaborations.

In order to grasp the different aspects of the phenomenon, the emergence of collaborations is looked upon as a three-stage process:

1. Motivation: Why actors collaborate;
2. Formation: How actors establish their collaborations;
3. Developmental impact: How collaborations affect local firms.

One of the key puzzles that emerges from the findings is that actors of the same type, such as managers of MNC subsidiaries, who operate under the same institutional umbrella, choose a variety of collaborative outcomes. This research shall show that variations in response to institutional incentives to collaborate do not undermine the key tenets of new institutional economics – that actors pursue their economic interest, responding to the incentives produced by the institutions that regulate their behaviour. It can be explained by considering collaboration as an economic phenomenon, but acknowledging that it occurs in a socially embedded context.

Although responding to institutional incentives and pursuing their economic interest, actors do not operate in a social void, and do not have symmetric access to information. The way in which they are socially linked to other ICT-related actors affects their collaborative choices. The body of empirical evidence collected shall show that actors use their social ties to transmit and filter information, to circulate and enforce social incentives, and more broadly as resources that can help to achieve certain organisational aims (for example, Costa Rican ICT exporters often use social ties to penetrate new markets, whilst MNC managers may use them to find new suppliers in Costa Rica).

Actors' different patterns of embeddedness in the social networks of the cluster determine the information they have access to, and their exposure to incentives, thus affecting the range of economic actions they can choose to take. Taking these factors into account explains the diversity of collaborative preferences in a context regulated by the same institutions. This socially embedded analysis of collaboration builds on the key behavioural assumptions of new institutional economics to provide a theoretical framework suited to explain the complexity of collaborative relations that occur in industrial clusters. Before discussing how the literature may explain the formation of collaborations, the next section discusses the unit of analysis: local firms' productive collaborations.

## 1.3 Productive collaborations as a unit of analysis

The subject of this study is the network of productive collaborations of Costa Rican ICT producers: how they emerged, and what impact they have. To operationalise the research questions, this section defines the unit of analysis (productive collaborations). The two main characteristics of the relations hereby researched are highlighted in the definition chosen, 'productive collaborations'.[11] The first word, 'productive', defines the relations analysed by stating their objective. 'Productive' is not used to qualify actors' relations according to the economic concept of productivity: having a productive objective entails that actors collaborate in order to achieve some type of goal related to their economic activities - the production of information and communication technology goods. The most basic form of a productive relation is that between a producer of ICT and its client. However, a productive relation can involve many other actors, such as venture capital funds, R&D labs and government agencies.

As far as the ultimate objective is related to ICT production, a collaboration can be structured so as to perform a broad range of activities, such as researching a product, financing a firm, searching for clients, sharing infrastructure, etc. Only relations that have

[11] The term 'collaborations' is used in the text to refer to productive collaborations.

a non-productive objective, such as philanthropic collaborations whereby firms donate equipment to schools, have not been considered to be part of the subject analysed.

The second word that defines the unit of analysis is 'collaborations'. The term has been used to define relations that entail some form of collaboration or cooperation – an instance whereby actors work together. Collaborations are voluntary relations linking a Costa Rican ICT producer and at least one other actor, which comply with the four following criteria: continuity, reciprocity, resource-sharing, and joint action.

'Continuity' means that the scope of such relations is not limited to one-off exchanges, such as 'arm's-length' relations. In 'arm's-length' relations and atomistic economic exchanges, actors have incentives to conceal information - for example, on price. Atomistic economic exchanges follow the logic of the bazaar carpet seller and his occasional tourist client. Sellers have an incentive to show that their costs of production were higher than they actually were, so that their prices are not perceived to be inflating their margins; buyers have an incentive to negotiate lower prices than what they deem fair, so as to obtain discounts. For a punctual exchange to occur, the two parties must reach an agreement, which does not necessarily entail that the buyer has access to information about the costs that the buyer has had to bear.

These relations are characterised by the fact that the opportunity cost of transmitting incorrect information, or of breaching contractual terms, is limited by the probability that such a transaction will be repeated, and by the extent to which the unsatisfied consumer can affect future transactions. As both parties have incentives to not transmit accurate information, transaction costs are high, and the risk of unfair behaviour is also high, as both actors can switch to other partners after the exchange has been closed.[12]

The continuity criterion means that the actors involved have to conceive of a collaboration which involves repeated interactions rather than just one which happens as an exceptional event. When there is a high probability that the exchange or relation will be repeated in the future, actors have incentives to avoid unfair behaviour and to avoid

[12] The literature on automotive assemblers-suppliers' relations (see for example Lincoln, Ahmadjian and Mason, 1998; Fujimoto and Roehl, 2000; Sako, 1990; Womack, 1990) shows that arm's-length relations can allow the stronger contracting part to exert cost pressures on the other part. However, in the long run, they hamper the sort of collaborative relations needed to perform knowledge-intensive activities, such as the joint development of complex products.

concealing information. Long term relations do not necessarily imply collaboration. However, as underlined by the literature on the Japanese automotive industry and on the Italian industrial districts, productive collaborations tend indeed to be based on long term relations (Brusco and Pyke 1990; Becattini, 1998; Sako, 1990; Womack, 1990). For these reasons, only relations characterised by continuity conform to the definition of collaborations adopted in this research.

'Reciprocity' is used here to describe a mutual commitment to the relation in terms of risk and resources. Risk is related to resource commitment: the more resources an actor dedicates to a given relation, the higher the risk, in case of non-compliance or unfair behaviour on the part of the other actor. This characteristic of productive collaborations excludes market transactions where there is little interaction and little commitment between buyer and seller, such as an exchange whereby a firm sells a generic finished good to a final consumer.[13]

The third characteristic of productive collaborations is resource-sharing. For the scope of this research, only relations in which actors share some of their resources can be considered as collaborations.[14] The last criterion to define productive collaborations is that they involve some sort of joint action. 'Joint action' is a broad definition that encompasses activities ranging from undertaking collective marketing campaigns to adopting cross-company integrated strategies. Collaborations can be formal or informal, but actors must actively cooperate. Formal agreements that are signed for their symbolic value, but which do not lead actors to collaborate, have not been considered to be productive collaborations.

To summarise the definition, productive collaborations are relations that firms establish with each other and with other actors in order to pursue objectives related to their economic activities. Productive collaborations are voluntarily undertaken by the actors

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[13] In the latter case, the consumer's risks are related to how transparently information about the transaction is transmitted from producer to consumer. The producer's risks are related to its reputation, however, even if the consumer will repeat her purchase, there is no commitment on either side for it to happen, and no resources dedicated to the relation besides those implicit in the transaction itself. On the contrary, a producer that develops a product specifically for its client, such as a customised software application, risks resources and time, whilst the client risks transmitting information to it. Should the transaction fail, they would both face losses. In this case the relation is characterised by reciprocity, which results in a mutual risk-taking situation.

[14] 'Resources' is hereby conceived to have a broad meaning so as to include human resources, information, technology, infrastructure, brand, contacts, etc. In this case, a repeated exchange between two actors qualifies as a collaboration only if they share some resources, for example, if they share market information.

involved, who conceive them as long term agreements, and accept to be exposed to certain risks, share some of their resources, and pursue joint actions.

This research studies the formation and impact of the five types of productive collaborations established by Costa Rican ICT producers that comply with the criteria outlined above: collaborations among domestic firms; collaborations with investors; collaborations with universities; collaborations with MNC subsidiaries; and collaborations with firms (or firms' affiliates) located outside of the cluster.[15] Having defined the unit of analysis, 'productive collaborations', the next section explores how different streams of literature explain productive collaborations in industrial clusters.

## 1.4 Productive collaborations in the social and economic literature

Several literature streams have analysed clusters and discussed different types and aspects of productive collaborations. MNCs-local firms collaborations have been evaluated by the literature on foreign direct investment (FDI) (Belderbos, Capannelli and Fukao, 2001; Blomstrom and Kokko, 1998; Görg and Ruane, 2000), but also by the literature on global value chains (Gereffi, 1999, Gereffi, Humphrey and Sturgeon, 2005; Humphrey and Schmitz, 2001), which discusses their impact on various forms of upgrading. Collaborations between local firms have been discussed extensively by the literature on the Italian industrial districts (Becattini, 1989, 2004; Piore and Sabel, 1984; Pyke and Sengenberger, 1992) and by studies of agglomerations of small and medium firms (SMEs) in developing countries (Dijk and Rabellotti, 1996; Giuliani, Pietrobelli and Rabellotti, 2005; Knorringa, 1996; Nadvi, 1999; Schmitz, 2000; Zheng and Sheng, 2006). Firms-universities collaborations have been looked at by the literature on the economics of science and innovation (Adams, Chiang and Starkey, 2001; Siegel, Thursby J., Thursby M., and Ziedonis, 2001; Lundvall, 1992).

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[15] Firms and firms' affiliates located outside of the cluster are MNCs that do not have subsidiaries in Costa Rica, MNCs' headquarters, and firms from neighbouring countries. Chapter 1 (section 1.5) explains how the ICT cluster has been defined and how its actors have been identified.

This research discusses cluster policies by looking at how the different productive collaborations discussed by the literature streams mentioned above affect local firms in the Costa Rican ICT agglomeration. Drawing from evolutionary economics, it assumes that firms can acquire skills, resources, and capabilities that determine their actual and potential performance through collaborative interactions with other actors (Antonelli, 2000; Bell and Pavitt, 1993; Edquist, 1997; Freeman and Soete, 1997; Lall, 2001; Dosi, Nelson and Winter, 2000)

Firms have asymmetric access to information and resources. Learning processes, such as technology absorption and capabilities accumulation, are costly, and do not occur automatically (Lall, 1992). When, and if, productive collaborations stimulate such learning processes, they have a positive developmental impact. Learning processes may not have an immediate effect on performance. Therefore, the impact of productive collaborations is hereby evaluated by looking at the skills, resources, and capabilities that firms have acquired by collaborating, and also at whether they are engaged in organisational learning processes.[16] As stated by the literature on knowledge exchange and innovation, microeconomic learning processes often require direct interactions between actors, such as academic researchers and entrepreneurs (Antonelli, 2000; Edquist, 1997; Noteboom, 2000). Collaborations are analysed by combining an observation of the joint activities they involve with actors' accounts of the different learning processes they may have stimulated, such as the transfer or acquisition of knowledge, skills, and technology.

The literature on global value chains (GVC) emphasises that clusters are not self-contained agglomerations. Firms located in clusters in both the developing and developed world compete in the global economy, often not by themselves, but by performing specific roles in the increasingly fragmented and globalised production systems - the global value chains (Arndt and Kierzkowski, 2001; Gereffi and Korzeniewicz; 1994; Scott and Storper, 2003; Sturgeon, 2002; Schmitz and Knorringa, 2000). The GVC literature assesses the developmental impact of a specific type of productive collaborations: those that link local firms to global value chains. One of the key questions it asks is whether penetrating global

[16] The developmental impact of collaborations is discussed in section 1.5: 36-39.

value chains contributes to, or hampers, local firms' development (for a summary of the global value chain framework, see Gereffi, Humphrey and Sturgeon, 2005).

This research borrows the key concepts of the GVC literature: governance and upgrading. However, it adjusts them to the discussion of different types collaborations, not just those that link local actors to global value chains, such as MLCs. Governance allows us to discuss power relations in collaborations and how they affect local firms' learning processes. The upgrading concept helps us to look at different aspects of organisational learning by focusing on changes in firms' activities: the products they make, their production processes, and the functions they have in global value chains.

Using different analytical concepts, and discussing different aspects of the phenomenon, different literature streams converge in underlining that clusters' positive developmental effects are related to collaboration: if firms collaborate with each other and with other actors, they can generate external economies that reduce their resource constraints and accelerate their learning processes.[17] However, there is no agreement on which factors promote different types and subtypes of collaborations.

A great number of variables could be applied to explain productive collaborations in a given cluster. However, there is a fundamental dividing line between two groups of interpretations of productive collaborations. On the one hand, we find theories based on a 'socialised' view of human interactions, which underline either the cultural or social contexts of economic action. On the other hand, there are scholars who take an 'under-socialised' view of human behaviour, which tends to emphasise the rational, utility-maximising nature of humans. (Swedberg and Smelser, 1994: 3-25)

Collaboration is both an economic and sociological phenomenon. Thus, it can be explained as being either the result of rational calculations about its costs and benefits, or as the result of decisions strongly affected by social and cultural variables. These two

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[17] Although they use different definitions of cluster, and different analytical methodologies, Porter and Schmitz, two of the leading scholars of industrial clusters, both emphasise that firms in clusters do not just benefit from agglomeration economies, but also from economies of cooperation (Porter, 1998; Schmitz, 1999a). Economic geographers and the scholars of industrial districts tend to emphasise the same concept: that agglomerations such as those observed in the Third Italy, but also knowledge-intensive clusters such as Silicon Valley, promote local development because firms are embedded in dense networks of collaborative relations (see for example Brusco and Pyke, 1990; Green and McNaughton, 2000; Lawson and Lorenz, 2000; Lee, 2000; Markusen, 1996; Storper, 1997, 1998; Saxenian, 1994)

types of literature start from different behavioural assumptions, and analyse collaboration as part of a broader explanation of social and economic events. Let us discuss how they can be applied to explain the findings of this research.

Authors who take a 'socialised' perspective start from the assumption that economic decisions, such as creating a productive collaboration, are strongly affected by non-economic factors. As stated by Fukuyama: "Economic life is deeply embedded in social life, and it cannot be understood apart from the customs, morals, and habits of the society in which it occurs. In short, it cannot be divorced from culture" (Fukuyama, 1996: 13). Some of Fukuyama's works follow the political culture stream of the 'socialised' literature. Its main propositions are that culture, customs, and social norms generate, or fail to generate, trust amongst economic actors, and that such trust facilitates the formation of productive collaborations (Fukuyama, 1996; Huntington and Harrison, 2000; Putnam, Leonardi and Nanetti, 1993).

Some scholars of political culture treat trust as a manifestation of another culture-determined variable, namely social capital, and argue that the emergence of productive collaborations depends on the amount of social capital, and thus trust, that characterises a given community (Coleman, 1988; Lin, 2001; Putnam, Leonardi and Nanetti, 1993).[18] Fukuyama goes beyond this definition, and considers trust to be the explanatory variable not only of successful clusters, but also of stable democracies and economic development in general (Fukuyama, 1996). The problem with these arguments is that trust is an "elusive notion" (Gambetta, 1988: ix): It is difficult to measure, and difficult to use as a variable that explains why certain locations, industries and clusters are more collaborative than others, or why they generate different patterns of productive collaborations.

Academics who follow a political culture approach conceptualise trust as a diffuse phenomenon that pervades all aspects of society, affecting the behaviour of socio-

[18] There is a vast literature on the nature and economic effects of social capital (see for example Coleman, 1988; Dasgupta and Serageldin, 1999; Field, 2003; Fukuyama, 1996; Knorringa and Staveren, 2007; Putnam, Leonardi and Nanetti, 1993; Putzel, 1997). The theoretical framework of this study takes into account such literature. However, following the suggestions, among others, of Fine (Fine, 2001), it does not use the concept of social capital as an explanatory variable. It does nonetheless discuss how different authors, including scholars of social capital, have used the notion of 'trust' to explain, among other phenomena, collaboration in industrial clusters, and especially in the Italian industrial districts (see for example Putnam, Leonardi and Nanetti, 1993; Dei Ottati, 1994).

economic actors. Trust is related to culture, history, and even to religion. These authors place the question of collaboration in a broader debate on democracy, civil society, and development. They argue that high trust societies are those societies where democracy is more consolidated, where citizens participate more actively in all aspects of political, social, and economic life, which also appear to be the most developed countries. Fukuyama and Putnam refer to trust in a broad way, which includes trust in the institutions that regulate civil life, such as the law, but also trust in other citizens, such as neighbours, and trust among economic subjects, such as firms in industrial clusters. According to these accounts, cooperation is low in certain areas, such as Latin America and Southern Italy, because of low interpersonal trust, or, in other words, low social capital (Putnam, Leonardi and Nanetti, 1993; Fukuyama, 1996; Inglehart, 1990).

Although their theories fuelled a rich debate about collaborations, trust and development, they are not suited to explain the emergence of productive collaborations in industrial clusters. The findings about Costa Rica reveal that within the same cluster there are actors who collaborate, and do so by choosing very different collaborative agreements, and actors who do not collaborate. Labelling the cluster as collaborative or non-collaborative would mean overlooking the research question - why actors establish different types of collaborations, which have different developmental implications.

There are also other theoretical and empirical problems that make the theories of political culture difficult to apply to the study of productive collaborations in industrial clusters. For instance, political culture scholars do not explain why some of the most collaborative industrial clusters, the Italian industrial districts, have originated in Italy and not in other countries (Farrell, 2005). Italy is not one of the countries where, according to Putnam's and Fukuyama's accounts (Putnam, Leonardi and Nanetti, 1993; Fukuyama, 1996), we should expect to find a high trust society, given the comparatively strong influence of the Catholic Church in societal issues, not to mention corruption, political instability and the low credibility of the Italian democratic institutions (Farrell, 2005).

Culture-derived explanations of trust and thus collaboration disregard the fact that culture is not necessarily a static phenomenon. They assume it does not change through time, or fail to explain how it may change; a culture that facilitates the development and diffusion of trust may evolve into a low-trust culture, and vice versa. Finally, cultural

explanations may lead to deterministic accounts and to circular arguments: if less developed countries have low-trust environments because of cultural or historical factors, what space is there for change? Should developing countries just assume their cluster policies will not promote collaborations, and thus avoid them altogether?

Some authors have also pointed out that, contrary to Putnam's and Fukuyama's arguments, trust in the rule of law is not necessarily positively correlated with trust in other actors and with the formation of productive collaborations (Farrell, 2005). The causal relationship 'higher trust in the law = higher interpersonal trust' can also flow in the opposite direction. Lack of trust in the law may drive individuals to rely more on interpersonal trust as a mechanism to protect them from unfair behaviour. For example, it could be that the Costa Rican firms who collaborate in the ICT cluster do so because they trust institutions. Or it could be that Costa Rican ICT producers, like the Bologna food packaging machinery manufacturers analysed by Farrell, collaborate precisely because they do *not* trust formal mechanisms to regulate economic exchanges, and thus rely on collaborative relations based on informal institutions (Farrell, 2005). This contradiction highlights that trust as a culture-derived, diffuse and overarching phenomenon that pervades all aspects of society, is not sufficiently precise as a variable to explain the emergence of different productive collaborations in a cluster.

Another methodological obstacle to the use of trust as an explanatory variable is that it is dynamic, and it is not independent from the dependent variable – productive collaborations (Putzel, 1997). Two actors may trust each other with respect to collaborating, and then eventually their mutual trust may wane as a result of unfair behaviour on either side. Or, two actors may trust each other only with respect to a specific productive collaboration, and whilst working together they may develop trust with respect to other matters. Trust can thus be the cause and also the result of collaboration, or both simultaneously. Do actors in a cluster collaborate because of trust, or do they trust each other because they have been collaborating for a long time?

Schmitz and Nadvi use empirical evidence from the surgical instruments cluster of Sialkpot in Pakistan, and the Sinos Valley cluster of shoe manufacturers in Brazil to show how trust between actors involved in collaborations evolves through time, and is also influenced by such collaborations (Nadvi, 1999; Schmitz, 1999b). Schmitz distinguishes

between two different forms of trust: 'ascribed trust' and 'earned trust'. 'Ascribed trust' is based on some common characteristic of collaborators, such as ethnicity, whilst 'earned trust' stems from the business relationship that two actors have. Both types of trust are dynamic: 'ascribed trust' between two relatives who lead collaborating firms may fade because of unsatisfactory performance, whilst two business partners may develop 'earned trust' through a productive collaboration. 'Ascribed trust' and 'earned trust' are not exclusive categories: Two relatives may establish a productive collaboration based on kinship, and subsequently 'earn' mutual trust that supports such collaboration (Schmitz, 1999b).

Knorringa argues that 'ascribed trust' is a consequence of a particular type of social capital, 'bonding social capital' – the social capital that "emerges from strong social ties, which are based on a social identity, for example family and kinship" (Knorringa and Staveren, 2007: 114). 'Bonding social capital' can facilitate coordination and collective action, but it also has negative implications: it is exclusionary of actors who do not share the same common characteristics, it can facilitate rent-seeking, lock actors in closed groups that limit competition, and reproduce the power asymmetries that exist in a given society, for example the privileges of a given ethnic group (Storper, 2005; Trigilia, 2001). This study does not discuss different types of social capital. However, the last part of this section discusses how different social relations affect the formation of productive collaborations (see section 1.4: 30-32), distinguishing between the social relations that link actors in closed communities, which according to Knorringa generate 'bonding social capital', and the social relations that bridge different actors and groups, which he argues produce 'bridging social capital' (Knorringa and Staveren, 2007).[19]

The accounts of Knorringa, Nadvi and Schmitz underline the difficulty of using trust as an explanation of why and how actors collaborate. Trust can have different origins (it

[19] The discussion on 'bonding' and 'bridging' social capital is related to the old sociological debate about community and society, originated by scholars such as Weber and Durkheim (Durkheim, 1960; Weber, 1968). Several literature streams have discussed whether having tight communities – or a high level of 'bonding social capital' – leads to economically and socially desirable outcomes. This study does not use or discuss different concepts of social capital. The theoretical framework hereby developed borrows from the literature on social structures, ties and networks, which tackles similar questions to those of the literature on 'bonding' and 'bridging' social capital, but under a different angle: it asks how different social ties, such as ties among members of the same group and ties that link different groups, affect economic outcomes. For a discussion of the literature on social ties, see chapter 1: 26-30.

can be 'ascribed' or 'earned'), it can change through time (it can accumulate or wane), and it can also be a dependent or an independent variable (it can be the cause of a productive collaboration or it can develop because of it). An alternative approach to using trust would be to adopt a narrower definition, focusing on very specific aspects of it, in our case trust related to the emergence of productive collaborations. This follows the theoretical propositions of the authors who adopt an 'encapsulated interest' account of trust (Farrell, 2005; Hardin, 2002; Levi, 1996). Instead of thinking about trust as a general characteristic of all interpersonal relations across a given society or cluster, these authors treat trust as the expectation of actor A related to how actor B will behave in relation to matter C. Under these lenses, trust becomes a punctual, rational, behavioural choice, which results from economic actors' calculation of the benefits and opportunity costs of trusting. Two actors trust each other to form a collaboration if they both perceive that the advantages of collaborating overcome its opportunity costs.

Farrell and Knight, who foster this interpretation, argue that, "trust can be analysed as an effect of institutions" (Farrell, 2005: 461). By doing so, they explain trust, a key concept of the 'oversocialised' accounts of collaboration, by using institutions and expectations, analytical categories developed by the 'undersocialised' literature. According to them, formal and informal institutions, conceived as Northonian 'rules of the game' (Farrel and Knight, 2003; Farrell, 2005), act on expectations, providing the behavioural incentives that determine why actors trust each other in the economic relations that occur in clusters. If actors collaborate only when they perceive it as convenient to do so, then they just follow the tenets of classical economics: trust is not a cause of economic choices, but an effect of rational calculations about the costs and benefits of establishing collaborations.

Shifting the causality of collaborations from trust to institutions and incentives entails moving from a socialised, culture-centric perspective, to 'undersocialised' literature streams. Classical economic theory is the foundation of all the 'undersocialised' literature. It explains existing social and economic order as a result of the combination of rational choices of individuals interested in maximising their utility. It is based on some key behavioural assumptions: that man is rational, and responds to external incentives in order

to maximise his utility. It focuses on market exchanges to explain social and economic phenomena.

Williamson, a famous representative of the 'undersocialised' literature, criticises certain 'undersocialised' interpretations of trust. In particular, he disagrees with authors who use the term trust to describe an actor's' calculated expectations about the behaviour of its partner in a given economic exchange – the sort of interpretation of trust adopted by Farrel and Knight. For Williamson, trust based on calculativeness is a "contradiction in terms" (Williamson, 1993: 485-486): if actors trust each other because they calculate that it is convenient, they just behave according to the predictions of classical economic theory – they seek to maximise their utility within the limits of their bounded rationality. This makes it unnecessary to use the "elusive notion of trust" to explain their behaviour.[20] Following Williamson's suggestion, but also in order to avoid the theoretical problems discussed in the previous paragraphs, this research does not use trust as an explanatory variable of why actors engage in productive collaborations. It does nonetheless question why actors take different choices with regards to productive collaboration.

A specific stream of the 'undersocialised' literature explains why self-interested individuals do not only interact via atomistic economic relations, but also organisations and collaborative arrangements: transaction cost economics. Transaction cost economics looks at the costs of transactions, such as the costs of finding the best buyer, exchanging the necessary information to complete a transaction, negotiating an agreement, and making sure the other party complies with it. The main principle is that self-interested actors evaluate whether it is more convenient to carry out atomistic exchanges, such as the arm's-length relation between a carpet seller in a bazaar and his one off client; or to internalise transactions, such as a firm's acquisition of one of its strategic suppliers; or to engage in network-type relations, such as productive collaborations (Coase, 1996; Williamson, 1985).

There is empirical evidence that some transactions, such as those described by the literature on automotive buyer-supplier relations, require actors to collaborate, whilst others can be carried out via arm's-length relations, depending on their complexity, and on

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[20] "The elusive notion of trust" is a phrase coined by Gambetta (Gambetta, 1988: ix). However, the paragraph where it is used discusses Williamson's interpretation of trust. (Williamson, 1993: 480-486)

the difficulty of codifying information (Gereffi, Humphrey and Sturgeon, 2005; Humphrey, 2003; Sako, 1990; Womack, 1990). It could be that actors in the Costa Rican ICT cluster collaborate only when it suits the sort of transactions they are involved in. However, such interpretation overlooks several aspects of the phenomenon analysed. Firstly, certain productive collaborations of the Costa Rican ICT cluster, such as the collaborations between academia and the private sector (ALCs), do not necessarily involve transactions. Secondly, explaining productive collaborations simply by referring to transaction cost economics would mean assuming that all firms involved in a given type of transaction make the same choice with regards to productive collaborations, which oversimplifies the complexity of the findings: for instance, some of the domestic providers of software applications for small businesses collaborate with MNCs that develop technological platforms, others do not.[21] Thirdly, the question is not just why in certain transactions actors collaborate, but how actors establish productive collaborations with different developmental implications.

Williamson, like Farrell and Knight, points out that actors' calculations of how to maximise their utility is not only affected by transaction costs, but also by the rewards and sanctions generated by institutions. This links the literature on transaction costs with the principles of new institutional economics, another important stream of the 'undersocialised literature'. New institutional economics shares the same behavioural assumptions as classical economics. It focuses on incentives: individuals act to maximise their utility, but they do so responding to a set of incentives, which are shaped by rules, norms, and customs. Institutions are over-arching rules that structure incentives by providing rewards, sanctions, and enforcing mechanisms to promote, or hamper, a certain kind of behaviour (North, 1991; Greif, 1994).

This research considers actors to respond rationally to institutional incentives, and it explores the institutions that regulate their behaviour. However, the findings show that institutions and incentives do not explain, per se, the pattern of productive collaborations that can be found in a cluster. Firstly, actors' behaviour may be regulated simultaneously by different institutions that generate conflicting incentives. Secondly, actors that should

[21] For a discussion of collaborations between MNCs and local firms, see chapter 5.

operate under the same institutional umbrella may take very different collaborative choices – for example, not all the domestic producers of the Costa Rican ICT cluster collaborate with each other. Either actors do not respond rationally to incentives, or there must be other explanations for their behaviour.

New institutional economics defines institutions as the rules that structure incentives and sanctions, including both formal regulatory structures, such as laws, and informal norms, such as customs. The behavioural incentives provided by institutions – rewards and sanctions – are not only economic, but also social in nature. This makes new institutional economics bend the assumptions of classic economic theory and consider the possibility that some social phenomena, for example unwritten customs, may have an impact on economic outcomes. Nonetheless, new institutional economics does not discuss the social context in which such informal institutions and social incentives develop, and the social mechanisms through which they affect economic outcomes.

It may be possible, though unrealistic, to imagine that a cluster's actors pursue their self-interest within a given institutional framework without being affected by their social relations. However, when it comes to informal rules, norms, and customs, and to social incentives, this reasoning falls into a paradox: how are customs and unwritten rules transmitted, if not through the relations among individuals, i.e. social relations?

Assuming that institutions work in a socially void context overlooks the mechanisms through which institutions affect the behaviour of individuals. If individuals were operating in a social void, they would not have access to the necessary information about informal institutions, nor would they respond to social incentives. A traveller, for example, would not know the unwritten customary rules of a given location unless they are either reported in some publication, or she is told about them.

Institutions, especially informal, unwritten ones, are transmitted, circulated, and enforced via the set of social relations that tie actors in a given socioeconomic context, such as the Costa Rican ICT cluster. Hence, the way in which actors are connected to their community, but also their linkages to other communities, define their exposure to the incentives generated by customs and other informal institutions. This links new institutional economics to the literature on the social embeddedness of economic action – a literature stream that according to Granovetter, one of its most important contributors,

constitutes a middle ground between the 'oversocialised' and the 'undersocialised' fields (Granovetter, 1985).

"Embeddedness refers to the fact that economic action and outcomes, like all social action and outcomes, are affected by actors' dyadic relations and by the structure of the overall network of relation. (...) Economic actors neither behave as atomised individuals outside a social context, nor adhere slavishly to unchangeable habits or norms" (Grabher, 1993: 5). This literature does not exclude the possibility that individuals act to maximise their utility and respond to incentives, but it emphasises that individuals and organisations are always anchored in networks of social relations, and such relations affect their economic actions (Grandori and Soda, 1995).

Accepting that the social embeddedness of individuals and organisations affects economic outcomes is equivalent to accepting the propositions of those studies of social capital that do not assign to it a predetermined function or value. For example, Knorringa defines social capital as "the intended and unintended economic impacts of social relations on economic outcomes", emphasising that social relations can have both positive and negative economic outcomes (Knorringa and Staveren, 2007: 111).[22] However, it is not sufficient to acknowledge that social relations affect economic phenomena, such as productive collaborations. It is necessary to evaluate how social relations affect specific economic outcomes – in our case, how actors' social ties affect the emergence of the variety of productive collaborations found in the Costa Rican ICT cluster.

Some scholars of industrial districts, such as Becattini and Dei Ottati, and some scholars of social capital, such as Coleman, claim that closed communities, where actors are linked by cultural homogeneity and shared identities – or in other words, 'bonding social capital' – favour the emergence of productive collaborations (Coleman, 1990).

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[22] A great share of the interpretations of social capital are 'functionalist': they assign to it a preconceived function, such as substituting for market failures, promoting democracy etc. They include the studies of political culture scholars, such as Fukuyama and Putnam, but also the studies of mainstream economists such as Dasgupta, used by the World Bank as a theoretical basis for its social capital projects (among others, see: Dasgupta and Serageldin, 1999; Fukuyama, 1996; Paldam, 2000; Putnam, Leonardi and Nanetti, 1993). Other scholars, such as Fine, Knorringa, Putzel, Storper and Trigilia point out that social capital does not necessarily have as good developmental effects as assumed by the 'functionalist' interpretations: social capital of the 'bonding' type can often have negative effects (Fine, 2001; Knorringa and Staveren, 2007; Putzel, 1997; Storper, 2005; Trigilia, 2001). This study discusses some of the effects of 'bonding' and 'bridging' social capital when it looks at how the social relations of actors affect their collaborative choices, distinguishing between social ties within communities and social ties that bridge communities.

Becattini and Dei Ottati argue that the Italian industrial districts benefit from dense networks of collaborative relations because actors operate in closed, identity-based communities. Such communities generate, diffuse and enforce the social rewards and sanctions that promote collaborative behaviour (Dei Ottati, 1994; Becattini, 1989).

Scholars of social networks and structures, such as Granovetter and Burt, point out that tight social relations and community closure do not necessarily lead to the formation of productive collaborations. They circulate and enforce existing customs (Granovetter, 1973; 1985; Burt, 1992; 2001). If such customs lead to developmental collaborations, such as in the Italian industrial districts, social closure reinforces the trend.[23] However, social closure also reproduces and enforces customs when they lead to non-developmental outcomes, such as in the Mafia-ruled villages of Southern Italy (Gambetta, 1988). Social closure can hamper change by limiting the circulation of ideas that are not generated within a given group, and this can reduce innovative economic activities as well as progressive social changes (Trigilia, 2001).

Applying the explanations of Italian industrial districts based on social closure and shared identities to Costa Rica, the ICT producers, which operate in a relatively small and homogenous community, should collaborate amongst themselves, but not with other actors, such as MNCs. However, empirical evidence shows that Costa Rican ICT producers are more likely to be involved in collaborations with MNCs than with their colleagues. The social closure of the community of Costa Rican ICT producers strengthens their non-collaborative customs. This study explores how the social ties of actors; both the social ties of closed communities, and the social ties that bridge actors who belong to different communities; affect the formation of productive collaborations.[24] The assumption is that both of the types of social ties mentioned above can facilitate the emergence of developmental and non-developmental productive collaborations alike. Or they can also have no influence on whether and how actors collaborate.

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[23] Social closure is used to refer to the closure of certain social communities or groups of actors. It characterises communities that do not have many social linkages to external actors. External actors in this case are the actors who are not considered to be members of such community. In the Costa Rican ICT cluster external actors also do not consider themselves to be part of these closed communities.

[24] In this project the term 'actor' is used to refer to both individuals (for example professors) and organisations (for example firms), depending on the context.

Besides circulating and enforcing behavioural norms, social networks also affect access to information. "Much information is subtle, nuanced and difficult to verify, so actors do not believe impersonal sources and instead rely on people they know" (Granovetter, 2005: 33). Actors use their ties to access information that has already been processed. Social ties also allow actors to exchange information that is difficult to codify, such as tacit knowledge. Therefore, the range of social ties that actors have, or, in other words, the way in which they are embedded in different social networks, shape the range of behavioural choices that are available to them. In Uzzi's words: "The structure and quality of social ties among firms shape economic action by creating unique opportunities and access to those opportunities. The type of network in which an organisation is embedded defines the opportunities potentially available; its position in that structure and the types of inter-firm ties it maintains define its access to those opportunities" (Uzzi, 1996: 675).

When actors operate in a closed community, they can easily access the information that circulates in that community. However, by virtue of its diffusion in the community, such information may become redundant, and not give rise to economic opportunities (Granovetter, 1973). On the contrary, actors who have social ties that link them to different communities than their own, can access what Granovetter defines as 'non-redundant information' – information that is different from the information that circulates in a given community, and thus not available to most of the members of said community. Both Granovetter and Burt emphasise the importance of social ties that link actors belonging to different social groups, or, in the terminology of social network analysis, different 'social cliques'. They provide empirical evidence that social ties that bridge divided communities – a similar concept to the 'bridging social capital' mentioned by Knorringa and Storper – affect economic outcomes both by exposing actors to different information, and by functioning as means to achieve certain economic objectives (Burt, 1992, 2004; Granovetter, 1973, 1985; Uzzi, 1996; Wasserman and Faust, 1994).

Social ties thus affect access to information, exposure to social rewards and sanctions, and are also resources that actors can leverage to pursue their aims. But social ties do not explain the origin of the incentives to which actors respond. In order to understand how actors use their ties and why this can lead to the formation of several types of

collaborations, it is also necessary to take into account the sort of incentives such ties deliver, and the institutions they circulate and enforce. This entails looking at the different institutions that regulate actors' behaviour in the cluster, and questioning whether they generate incentives to form productive collaborations. Accepting that social networks and ties affect the circulation of incentives makes it possible to explain why actors operating under the same institutional framework make a variety of different collaborative choices without having to undermine the key behavioural assumptions of new institutional economics – that actors are rational and maximise their utility by responding to incentives. Similar rational, utility-maximising actors who respond to institutional incentives may act differently because they have different social ties, which affect their access to information and their exposure to social institutions.

This research contributes to the debate on productive collaborations by providing a multidisciplinary analysis that combines the principles of new institutional economics with those of social network analysis. By placing the analysis of actors' incentives to collaborate in a socially embedded context, its theoretical framework bridges social and economic literature, incorporating elements of both. The next section illustrates the research design and structure of this study.

## 1.5 Research design and key definitions

This research addresses three core questions: why local firms and other actors try to form different types and subtypes of collaborations; how they form them; and what impact such collaborations have on local firms. In order to answer these questions, it borrows assumptions and analytical categories from different literature streams. Some of the key assumptions of economic theory, namely utility maximisation and rational choice are used to explain the decision-making processes of actors – how they process information and how they react to it. The outcome of such decisional processes – whether or not actors establish a collaboration, and the type or subtype of collaboration they choose to establish – is considered to be the result of the information available to them, and the incentives to which they respond.

This research assumes actors to be affected by 'bounded rationality', or to have imperfect and asymmetrical access to information. Actors acquire information by using a variety of means, including their social ties. Borrowing from the literature on knowledge and innovation, not all information is codifiable. Non-codifiable information, such as certain elements of technology, can be transmitted only via face-to-face interactions, such as the joint activities that occur in productive collaborations.[25]

In order to explain the formation of productive collaboration this study uses two interlinked variables: institutions and social ties. Institutions are conceived as the set of formal and informal rules, norms and customs that regulate actors' behaviour by generating incentives. Institutions regulate the actions of organisations via the incentives they create for the decision makers that lead such organisations. Incentives are rewards and sanctions structured to influence actors' behaviour (North, 1991). They include economic incentives, such as salary increases, and social incentives, such as reputation. Actors explained the reasons of their economic actions during the interviews, pointing out the incentives that affect their decisions and the institutions that generate them. The incentives of decision makers and organisations are discussed without assuming that they correspond or converge. Nonetheless, in most cases they do converge. When they do not, the reasons for such divergence are presented and discussed, highlighting the implications for collaborative outcomes.

This research discusses two complex aspects of institutions, which link new institutional economic theories to more 'socialised' theories of economic action. Firstly, that actors can be simultaneously exposed to the incentives generated by different institutions. Secondly, that certain institutions, such as behavioural norms and customs, deliver their incentives via social interactions.

Social embeddedness is conceptualised as the way in which decision makers (or social actors) are socially linked to other actors and communities. It has been explored by looking at the set of social connections of the decision makers who lead the organisational

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[25] Social interactions allow actors to transmit uncodified information, such as tacit knowledge embedded in practices and routine, via externalisation, a process that occurs through interpersonal communication. (Antonelli, 2002; Edquist, 1997; Nonaka, 1994; Nonaka, Toyama and Nagata, 2000)

actors of the cluster (CEOs and founder of Costa Rican ICT firms, managers of MNC subsidiaries, academics and investors).

Social ties are the social connections that actors have with other decision makers and that they use with relation to the ICT industry. The definition includes ties used to exchange information, or simply to discuss ICT trends, but also ties used to perform joint ICT production activities. It excludes the social ties that actors do not use in their ICT activities – for example, a relative with whom there is no information exchange and no interaction with regards to the ICT business. The use and function of social ties among actors involved in the ICT cluster, such as ICT producers, is discussed in all cases, including when it has no effects on the formation of productive collaborations. The effect of social ties on collaborative outcomes has not been assumed ex ante, but identified through in-depth interviews. The information collected made it possible to distinguish the three functions of social ties discussed in section 1.2:

- Carry and filter information;
- Reproduce social incentives;
- Serve as a means to form collaborations (by substituting organisational reputation with personal reputation, by shortening organisational distance, etc.).

The origin of ties has been explored by asking actors to explain how they and their friends or colleagues have met. Ties that are based on ethnicity or kinship have been distinguished from those based on other factors, such as playing in the same football team. The study discusses how the origin of social ties, whether they are based on a shared identity or developed through joint activities, influences the formation of productive collaborations. It shows that there is no clear relation between the origin of social ties and their functions.

In order to define the direction of the causality 'ties = collaborations', actors were asked to specify when and how a given social tie emerged. This allowed us to identify whether pre-existing ties helped the formation of collaborations, or whether collaborations between organisations lead to the emergence of social ties among their decision makers.

This study distinguishes ties that link actors belonging to the same group (such as those that generate 'bonding social capital') from those that bridge different groups and communities (those that generate 'bridging social capital'), exploring how they affect actors' decisions and their means to implement them. The term community is used to indicate social groups whose members share certain characteristics, tend to be socially linked with each other, and define themselves as part of such groups as opposed to actors who are not part of them.

The developmental impact of collaborations has been evaluated by looking at qualitative evidence of firm-level learning processes, such as the acquisition of new skills, capabilities, or the introduction of new products. The interviewees were asked to identify whether by means of a given collaboration there has been a change in what they currently do – the activities they carry out, the products they make, their relations with buyers and suppliers – and also what they are able to do – the production processes, technologies and functions that they can master. Costa Rican ICT producers were asked to point out whether they feel that their firms have learned something from the collaboration, and to qualify such learning processes, explaining how exactly it took place, for example via joint work between R&D teams, or via training, or codified instructions.

This project uses the analytical concept of capabilities, borrowing from the theoretical and empirical studies of Sanjaya Lall. Lall analyses technological learning in developing countries, pointing out that such process is not very well described by orthodox economic theories, which assume technology to be freely available to all firms, and not to require country-level or firm-level adaptations. He argues that firms do not operate on the same production function and that "Technological knowledge is not shared equally among firms, nor is it easily imitated by or transferred across firms. Transfer necessarily requires learning because technologies are tacit, and their underlying principles are not always clearly understood" (Lall, 1992: 166)

The key insight of the 'technological capabilities' approach is that firms from developing countries improve their performance by learning, which is not a passive process. Absorbing, adapting, and mastering new technologies and organisational techniques is costly and requires targeted efforts. "Capabilities are firm-specific knowledge, made up of individual skills and experience accumulated over time.

Technological change is neither exogenous nor automatic, but rather it is the result of purposeful activities, in other words of 'technological efforts', undertaken by firms" (Pietrobelli, Rabellotti and Morrison, 2006: 5).

Taking into account these definitions, this study conceptualises capabilities as 'the capacity to master specific organisational and technological processes'. It uses capabilities to classify the outcome of the learning processes local firms may have gone through by virtue of collaborating. It assumes that the absorption of both technology and organisational techniques can occur via different means, but that the means which involve face-to-face interactions may be more effective because they also allow for the transmission of non-codifiable knowledge (Noteboom, 2000; Nonaka, 1994; Dyer, 1996).

When firms have acquired new technological or organisational capabilities, they were asked to explain how they use such capabilities.[26] This process allowed us to distinguish the acquisition of capabilities that are circumscribed to a specific use from the acquisition of those technological capabilities that serve to develop new products, processes or technologies that can have multiple applications. A capability circumscribed to a specific use – in Lall's terminology 'adaptive capability' – is the mastering of the technological adaptation of certain products, services, and processes to specific conditions (client requirements, or market conditions). 'Innovative technological capabilities' do not just entail the absorption and adaptation of existing technologies. They entail in-house basic research activities and innovation processes aimed at developing new products, services, and technologies. The acquisition of 'innovative capabilities', which have been hereby defined as 'core technological capabilities', is the most difficult step in the learning process of firms from developing countries (Lall, 1992: 167).[27]

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[26] For example, a Costa Rican ICT firm which acquired the capability to program software in a different programming language was asked to illustrate why it has acquired such capability, and for which commercial purposes it was using it.

[27] Lall also proposes other categories of capabilities: investment, production and linkage capabilities, which have not been used in this research in order to simplify the analysis, and also because they are difficult to apply to non industrial firms, such as software developers. Lall also uses three levels of complexity in capabilities: "simple capabilities" (to perform routine operations), "adaptive" and "innovative". Capabilities to carry out routine operations, for example controlling the quality of products, have not been considered to be technological capabilities. Only adaptive and innovative capabilities, which entail adjusting or creating new technologies, have been included in the definition of technological capabilities. This study distinguishes between the acquisition of organisational capabilities, for example the capability to market and distribute a

The acquisition of adaptive and core technological capabilities is not an objective per se, it is important because it allows firms to improve their products and processes, and potentially the functions they perform in global markets – in other words it allows them to perform the upgrading processes described by the studies of global value chains (GVC). And this links the literature on technological capabilities to the literature concerned with GVC and upgrading. According to GVC scholars, 'upgrading' is divided into product upgrading, process upgrading, and functional upgrading. The first occurs when firms introduce new products, the second when they adopt new production processes, and the last when they acquire new functions along the value chain.

The GVC literature emphasises that the relations between actors in the chain can be governed in different ways. Drawing on transaction cost economics, the authors distinguish five types of governance. They start from market and hierarchy, and elaborate the network concept by distinguishing modular, relational and captive network governance. The productive collaborations analysed in this study are neither hierarchical or regulated solely by the market. It follows that they must fall into one of three network governance categories identified by Gereffi et al (Gereffi, Humphrey and Sturgeon, 2005; Schmitz, 2004).

Modular value chains are characterised by high-capability suppliers, who provide 'turn key', or packaged services. Modularity depends on product architecture. For example, system integrators use different software packages as modular components of integrated services they provide to clients. The transactions involved are complex, and require suppliers to be capable of codifying information without having to interact continuously with their buyers. When continuous feedback and interactions are needed to realise the transaction, governance is relational. This occurs when transactions are complex, involve capable suppliers, and cannot be easily codified. For example, in Customised Service Development CBCs clients define the exact nature of the service they purchase together with their providers. Finally, when transactions are complex but codifiable, and suppliers do not have high capabilities, governance is captive. This type of governance can lead to transactional dependence if lead firms lock their suppliers into

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product, from the acquisition of technological capabilities, such as the capability to use a certain operating system or programming language.

quasi-monopsonistic situations, whereby their costs of switching to other clients are too high. Lead firms may limit the activities of their suppliers to narrow tasks, and keep them dependent on them not only as key buyers, but also for the provision of technology, training, and other selected benefits. Through their market power and these benefits, lead firms control their captive suppliers (Humphrey and Schmitz, 2001; Gereffi, 1999).

Governance categories are used to discuss how different collaborations are governed, disregarding whether such collaborations link local firms to global value chains, such as in MLCs, or whether they do not, such as in LLCs. Governance has been observed by analysing actors' accounts of how their collaborations function, and the extent to which they limit or shape their strategic decisions. This process allowed for the identification of power imbalances between collaborations partners, and of collaborations that generated transactional or technological dependence.

Learning processes (capabilities acquisition and upgrading) and governance have been observed in order to determine the developmental impact of collaborations. The causal relationship between collaborations and learning were discussed with all of the partners involved in each collaboration. Actors were asked to explain how - via which channels or mechanisms - the collaboration has facilitated or hampered certain learning processes. Their discourse has been analysed to grasp different aspects of collaborations, and to qualify whether the upgrading of products, processes and functions occurred because of a collaboration, or whether there is no causal link between them.

All of the collaborations found in the cluster affected the Costa Rican ICT firms involved in some way. Some led to the acquisition of new capabilities and to upgrading, others to transactional dependence and downgrading. In a few cases, collaborations evolved through time, so that their developmental impact changed. All of these cases of collaborations' change are discussed in detail throughout the study.

The Costa Rican ICT cluster has been chosen for various reasons.[28] Firstly, there is very little empirical evidence on the working of clusters in Central America, and especially on whether they constitute an effective instrument of industrial and development policy. Secondly, this project focuses on an ICT cluster because there are

[28] For information on data sources and how the actors of the ICT cluster have been identified, see the appendix, section 8.1.

several empirical studies of ICT clusters that analyse the role of social structures and networks, offering an important benchmark for our analysis (Breznitz, 2005a; Commander, 2005; Görg and Ruane, 2000; Lee, 2000; 2005; Saxenian, 1994, 2002). Thirdly, the Costa Rican ICT cluster is small and spatially concentrated, which eased the task of tracing social structures and networks, and also the task of interviewing a statistically relevant sample of actors with resource-limited fieldwork. However, there are also other reasons for focusing on the Costa Rican ICT cluster, related to cluster policy and its effectiveness as a tool for fostering structural change and promoting industrial development.

Costa Rica is often cited as a successful case of economic policy (Rodriguez-Clare, 2001; Monge-Gonzalez, Rosales-Tijerino, Arce-Apizar, 2005; The World Bank Group, 2006). It managed to become the first Latin American per capita producer of ICT whilst advancing with its economic reform agenda. It attracted massive inflows of FDI, mostly in greenfield manufacturing plants, which allowed it to switch from being a primary exporter to an exporter of knowledge-intensive goods. It constitutes a counter-example to more protectionist ICT promotion policies, such as those adopted by Brazil (Beherens, 2005). Yet, the existent literature does not provide sufficient evidence to understand whether its ICT cluster generates 'collective efficiency', and leverages the capabilities of domestic producers. This research aims to provide fresh empirical evidence about the functioning of this often-mentioned cluster by looking at the collaborations that link local firms to different actors. Assessing how developmental collaborations emerge, and how they promote local firms' capabilities, will shed light on the strengths and shortcomings of the cluster policies adopted by Costa Rica, contributing to the debate about industrial policies in post-Washington Consensus Latin America.

In the following chapters, the project outlines the dynamics of collaborations that domestic firms establish as part of their strategies. The first three chapters analyse collaborations that link actors who operate at the local level, such as investors, domestic firms and universities. The last two chapters analyse the external linkages of the cluster, namely the productive collaborations that link Costa Rican firms to external markets and sources of knowledge: collaborations with multinationals located in the cluster and collaborations with firms located abroad.

Chapter 2 discusses the emergence of collaborations between local firms and investors, which include both venture capitalists and direct investors. They provide local firms with access not only to capital, but also to expert advice on markets and technologies. However, only in a few cases they directly fostered the acquisition of additional capabilities. Their main developmental impact was indirect; they generated or supported other types of collaborations, which did promote upgrading and capability acquisition. ILCs have been analysed first because of their role in backing other collaborations.

Chapter 2 contributes to the debate about investors in ICT clusters by providing evidence of the emergence of ILCs in contexts that do not benefit from the same institutional conditions as the often-quoted cases of Silicon Valley and Israel. It shows that in developing countries, local entrepreneurs may share a custom of not having external investors.[29] Costa Rican ICT producers with no social ties to external actors follow this norm, preferring self-financing in order not to lose control of their firms. However, the diffusion of anti-investors bias in the closed Costa Rican producers' community is not the key obstacle for the emergence of ILCs. Only a few of the firms that are willing to have external investors have managed to find them; and some of the MNCs operating in the cluster could be potential investors, but they lack access to the necessary information to do so. Information failure is the main obstacle to the diffusion of ILCs: information about the benefits of ILCs, and information that allows actors to coordinate their actions and establish ILCs. Social ties that link investors and producers overcome information failure, facilitating the emergence of ILCs.

Chapter 3 discusses collaborations among local firms (LLCs). LCCs have a varied range of impacts: Some LLCs are an ICT version of the 'putting-out system' organised by Benetton in its industrial district: a large firm subcontracts production to smaller collaborators, supporting them with access to capital, advice, and technology (Harrison, 1994: 53-75). This sort of LLCs does not have relevant developmental impacts. Other LLCs, such as those supporting spin-offs and collaborative networks, have a strong

[29] The term "entrepreneur" is used hereby to indicate the founders of Costa Rican ICT firms. Given that usually firms' founders are also the CEOs, the term "entrepreneur" is used to refer generally to the individuals who lead Costa Rican ICT firms, or decision makers – although in certain cases these individuals are not the firms' founders, and may not be entrepreneurs.

developmental impact. They increase firm-level access to resources, allow the structuring of complementary strategies, and boost the acquisition of capabilities.

Chapter 3 shows that the formation of LLCs is strongly affected by the social closure of the local producers' community. Social closure facilitates the diffusion of certain customs, and their enforcement via mutual monitoring and social incentives, such as reputational rewards and sanctions. In the case of Costa Rican ICT producers, these institutions do not lead to collaboration. They create incentives for domestic firms to sell in the domestic market, and to compete for the same clients. This increases mutual rivalry, and fear of losing clients or strategic information via collaborations.

Exporters are less affected by these concerns and some of them do establish LLCs, driven by the observation of successful collaborations in other clusters, and by the will to access collective resources to compete with foreign firms. Chapter 3 discusses the findings in light of the literature on collaboration in the Italian industrial districts, showing that social closure affects collaborative outcomes in both positive and negative ways. Costa Rican producers who have external linkages – social ties to actors operating outside of the cluster – are less affected by the anti-collaborative incentives that circulate in their own community.

Chapter 4 discusses collaborations between local firms and academic institutions (ALCs), one of the types of collaboration with the strongest observable developmental impact, yet also the least common in the cluster. Costa Rican universities are an essential element of the cluster. They formed the workforce that founded most domestic ICT firms, and that MNCs identify as one of the main reasons for investing in Costa Rica (see chapter 5). However, universities have maintained a historical bias against collaborations with the private sector, which they inherited from the period when the state was the most important player in the economy. Academics who collaborate with private firms are marginalised in their own community and subjected to social sanctions.

Professors and local producers operate in closed communities, and thus have little access to information about their respective activities: academics are not familiar with the businesses of Costa Rican ICT firms, and Costa Rican ICT entrepreneurs are not aware of the research activities of their domestic universities. Lack of communication hampers the possibility of coordinating research activities and organising ALCs. As a result,

universities tend to focus on basic research, and on research niches that are not complementary with the needs of the local ICT industry.

Community closure and lack of contacts between entrepreneurs and academics constitute a key barrier for the emergence of ALCs. However, in this case there is also another hampering factor: despite the fact that most R&D activities in Costa Rica are carried out by universities and private firms, both the private and academic sector expect the state to finance ALCs and also to organise them. The retreat of state agencies and state-owned corporations from their historical functions in the national innovation system has left a void that neither local firms nor universities are willing to fill. As a result, most research occurs in an insulated way, which reduces the scope for systemic innovation and poses some questions about the policy instruments adopted by Costa Rica to promote its cluster.

Chapters 5 and 6 discuss the external linkages of the cluster: MLCs and CBCs. MLCs link Costa Rican producers to MNC subsidiaries located in the cluster. CBCs link Costa Rican firms to foreign firms, not all of which are MNCs. MLCs and CBCs have similar subtypes: some of them are collaborations to distribute products, others to adjust products and services to specific conditions and others to develop new products and technologies. The developmental effects of both MLCs and CBCs strongly depending on their subtypes. The CBCs and MLCs that serve to adjust or develop products or services have the strongest developmental effects: they provide local firms with access to the R&D personnel, infrastructure, and technologies of global players, accelerating their firm-level learning processes.

The key difference between MLCs and CBCs is that Product Distribution MLCs have negative developmental effects on Costa Rican firms, whilst there are no cases of CBCs with negative effects. Product Distribution MLCs often lead Costa Rican firms into technological dependence, causing process and also functional downgrading. They are the only form of productive collaboration analysed that reduces the capabilities of Costa Rican firms to manage certain processes and perform certain operations. On the contrary, Product Distribution CBCs help Costa Rican firms penetrate new markets, and in some cases they also promote product upgrading and other learning processes.

The formation of both MLCs and CBCs follows different dynamics than those described in the other chapters. It is also affected by social closure and by the social embeddedness of the actors involved, but with different results. In the case of MLCs, social closure leads to collaborative outcomes, namely the formation of Product Distribution MLCs. Local producers who have no external ties have little access to information about the dangers of technological lock-in. Attracted by the discounts and selected benefits of MNCs; they fall into captive, non-developmental collaborations. Local producers with external ties perceive the threat of technological lock-in, invest in different technological platforms, and attempt to use collaborations with MNCs as a learning mechanism. Following the examples of foreign colleagues, they pursue the formation of Product Adjustment and Product and Technology Development MLCs, which yield a high potential for acquiring technological and organisational capabilities.

CBCs concern mainly exporters, who are most interested in strengthening their links to actors located abroad. Chapter 6 analyses CBCs, questioning whether, and how, exporters rely on their social ties to establish CBCs. It illustrates that Costa Rican producers use their social ties to acquire information, to compensate for insufficient organisational reputation to convince potential collaborators, and to facilitate the exchange of tacit knowledge about products and technologies.

Chapter 6 contributes to the literature on transnational ethnic ties in the ICT industry by showing that Costa Rican producers do leverage their existing ties to form CBCs, but that such ties tend not to be based on ethnicity or kinship. Social ties are a key resource for ICT producers in developing countries, especially when they attempt to penetrate new markets. But pre-existing social ties are not a pre-requisite for establishing collaborations with economic actors located in different countries and clusters. The chapter provides evidence that Costa Rican producers actively pursue the construction of social ties that can be used to form CBCs.

Qualitative evidence about the different functions of ties, ranging from the filtering of information filtering, to the enforcing of social sanctions, comply with Granovetter's theoretical arguments that economic action is affected by social embeddedness (Granovetter, 1985). They also comply with Burt's arguments about information transmission in closed and open communities (Burt, 1992; 2001). In Costa Rica,

community closure contributes to the information and coordination failures that affect the cluster, often leading to non-developmental collaborative outcomes. Ties that bridge actors from different communities of the ICT cluster, but also ties that bridge local producers to actors operating in other locations, compensate for information failure. They expose actors to incentives to form developmental collaborations, and provide the means for them to do so. Having discussed the literature and presented the overview of this project, the following chapter analyses the emergence and impact of productive collaborations between Costa Rican ICT producers and investors.

# 2 Financing the cluster: Investors-local firms collaborations (ILCs)

## 2.1 Introduction

This chapter analyses ILCs: collaborations to finance firms operating in the Costa Rican ICT cluster. Their main function is to facilitate the growth of new ICT firms, filling the gap where banks and financial markets do not provide adequate financing mechanisms. In some cases they also constitute a means to support other productive collaborations. For this reason, ILCs are the first type of productive collaboration to be discussed in this project.

Different types of ILCs, such as investments in ICT firms by venture capitalists or direct investors, have been singled out by the literature as a key feature of successful ICT clusters (Kenney and Florida, 2000: 101). Inspired by these accounts, industry consultants and multilateral organisations often promote the establishment of ILCs subsidised by donors in the ICT clusters of developing countries, such as Costa Rica.[1] The problem is that most of the current understanding of ILCs stems from studies of advanced ICT clusters, such as Silicon Valley. In the developing world, the conditions that have promoted ILCs in those clusters, such as sophisticated financial markets, (see for example Kenney and Florida, 2000; Saxenian, 1994), tend not to exist. Instead of discussing which 'Silicon Valley conditions' apply or are missing in Costa Rica, this chapter provides evidence of how ILCs emerge in a specific developing country context.

In the Costa Rican cluster, some of the investors are venture capitalists and some are MNCs. They established different types of ILCs, all of which provide local firms with access to capital. Some ILCs also have other developmental impacts, such as supporting, or leading to, other productive collaborations. This chapter analyses how ILCs emerged in Costa Rica, discussing producers' and investors' incentives for establishing ILCs. The

[1] For example, since the year 2004 the Inter-American Development Bank and Camtic have been discussing the possibility of establishing an ICT-specific venture capital fund to support firms in the Costa Rican ICT cluster.

most important finding is that beyond the missing 'Silicon Valley conditions', there are other obstacles that hamper the formation of ILCs. Firstly, information failure may hamper investors' and producers' efforts to coordinate their actions in order to create ILCs. Secondly, ICT producers in developing countries may not be willing to have external investors.

Information failure leads actors to rely on their social ties as mechanisms for filtering information. Thus, their social ties affect the range of incentives for setting up ILCs to which they are exposed and also opportunities for finding an appropriate ILC partner. Because they operate in a closed community, local ICT producers have limited access to information regarding the benefits of ILCs and limited contacts to potential investors.[2] As a result, many of them do not wish to become involved in ILCs, or do not find compatible ILC partners. Domestic investors have little information on Costa Rican ICT producers, and few social contacts with them. Thus, they tend to target other sectors. Most managers of the subsidiaries of MNCs operate in a socially disembedded context: they not only have little information regarding the cluster in which they operate, but also few links to Costa Rican society.[3]

Social ties that link actors to their own community, for example ties among the managers of MNCs, affected the outcome because they reproduced information that either does not facilitate, or actively discourages, the formation of ILCs. Ties that bridge potential ILCs' partners, such as venture capitalists and local producers, compensated for information failure, introducing both incentives and the means to create ILCs. This chapter shows that in order to understand how ILCs emerge in a developing country's cluster, it is necessary to look not only at institutions and regulatory frameworks, but also at the social context in which they occur. The chapter is structured as follows. In the first section it presents the findings, in the second it discusses the literature on ILCs, in the third, fourth and fifth it looks at incentives and institutions, in the sixth it questions the role of social ties, and in the last it considers the impact of ILCs.

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[2] Chapter 3 discusses how the closed community of Costa Rican ICT producers affects incentives and means to establish productive collaborations in the cluster.

[3] The social embeddedness of the managers of MNC subsidiaries is discussed in detail in chapter 5.

## 2.2 ILCs in the Costa Rican ICT cluster

ILCs are productive collaborations between investors and ICT firms. Their aim is to finance ICT operations. The most common forms of finance collaboration in the IT sector are venture capital funds and direct investments by other firms. Venture capital funds are independent companies established specifically to finance other firms. They are led by professional managers, often people with previous experience in ICT (Avinimelech and Teubal, 2004). Direct investments occur when an ICT company decides to purchase or to become the majority owner of another firm that is not listed in the stock market.

Collaborations aimed at financing ICT firms, especially venture capital funds, are believed to be a key feature of successful ICT clusters. As Zhang recalls when explaining the development of the ICT cluster in Silicon Valley: "Since the 1960s, venture capitalists have been involved in every major successful company" (Zhang, 2003: 31). This is because new ICT firms often lack any form of collateral for investors against the risk of failure, as most of their potential value lies in their ideas and technology solutions (Avinimelech and Teubal, 2004). Banks may be unwilling to lend to ICT start-ups, because risks are too high, but also because they may lack the expertise to evaluate the ideas and technology that constitute the core potential value of ICT firms (Kenney and Florida, 2000: 100).

Productive collaborations focused on financing ICT firms aim to meet ICT firms' demand for investments where conventional banking and finance fail to do so, such as for firms that are not listed on the stock market and do not have enough revenues and collateral to obtain loans. That is the case of ICT firms in their early development phases, before they launch their products and thus before they begin to generate revenues. Given that it takes some time before a new firm can generate surpluses for reinvestment, unless an ICT start-up is created by entrepreneurs endowed with sufficient resources to finance its growth, it is critical for it to find external sources of capital.

On average, most firms financed by external investors in Silicon Valley are either in the start-up phase or in the product development phase, when they are in the most need of capital, but also when it would be very difficult to obtain financing from conventional sources (Kenney and Florida, 2000: 101). In other words, in Silicon Valley ILCs often

finance firms that are not yet fully operational – firms that do not generate dividends, but also that often do not produce enough revenues to cover their costs. Some of the firms that went through this type of uncertain early phase, and that developed thanks to the capital provided by ILCs, such as Cisco, Intel, Yahoo, EBay, Sun Microsystems and Google, became today's ICT global leaders. The importance of ILCs as mechanisms that support the growth of the ICT industry in Israel and Silicon Valley has inspired academics and policy makers alike, providing hopes that promoting ILCs will have similar effects in other contexts. The question is, why and how do investors finance ICT companies and establish ILCs?

Although there may be different reasons for a venture capital fund or a company to invest in a given ICT firm, the most basic motive is to realise high returns on capital. Risks are similar, and the broad objective is the same: to provide such a company with financing instruments that the banking sector does not offer. When a venture capital fund or a company becomes the majority stakeholder in an ICT firm, it does so without short term exit options (Bygrave and Timmons, 1992). The exit options, which all occur after a period long enough for the firm to develop, are the following:

- The company which was financed fails, and all of the capital invested is lost;
- The company is purchased by other firms, either producing gains or losses for investors;
- The company is listed on the stock market, which can also generate either capital gains or losses;
- Entrepreneurs purchase back investor's shares of the company, generating either capital gains or losses.

Given the lack of short run exit options and the lack of certain mechanisms to evaluate the future value of the firms which were financed, investing in ICT is a very risky business. Investors do so when they foresee that the value of the firm will increase enough to offset both unrealised revenues and the risk of losing all of the capital invested. Clearly, expected revenues have to be very high for investors to undertake such risks. However, because of the risks involved, investors do not just finance firms; they often actively

collaborate with them, demanding seats on the directors' boards, providing clients, advice and other forms of assistance (Banatao and Fong, 2000: 301 -305). For this reason, ILCs have been considered here as a specific type of productive collaboration.

In the Costa Rican ICT cluster there are three subtypes of ILCs, determined by the nature of the six investors involved: Venture Capital Fund Investment (ILCs I), MNC-owned Venture Capital Fund Investment (ILCs II) and Direct Investment (ILCs III). Venture capitalists finance two different ILCs: Financing and Support ILCs (ILCs Ia) and Collaborative Network Creation ILCs (ILCs Ib).

**Table 2.1 ILCs in Costa Rica**

| Investor | Subtype of ILCs | Year | Firms Financed | Investment US$ million |
|---|---|---|---|---|
| Aureos | ILC Ia: Venture Capital Fund Investment – Financing and Support | 1996 | 1 | 3 |
| Darby | ILC Ia: Venture Capital Fund Investment – Financing and Support | 2003 | 1 | 1-3 |
| Worldcap – PGI | ILC Ia: Venture Capital Fund Investment – Financing and Support | 1999-2000 | 2 | 6 |
| Mora and Beck | ILC Ib: Venture Capital Fund Investment – Collaborative Network Creation | 2002 | 4 | 12 |
| Intel Capital | ILCs II: MNC-owned Venture Capital Fund Investment | 2003 | 2 | Not revealed |
| Microsoft | ILC III: Direct Investment | 2001 | 1 | Not revealed |

Source: Author's elaboration based on interviews

The first column on the left-hand side of Table 2.1 reports the name of the investor, the second the subtype of the ILCs, the third the year of investment, the fourth the number of firms financed and the fifth the amount invested. A total of eight firms have been financed by ILCs, some of which by more than one investor. Table 2.2 summarises the developmental impact of ILCs.

**Table 2.2 The developmental impact of ILCs**

| Subtype | Access to resources |
|---|---|
| ILCs I | Ia Capital, professional advice<br>Ib Capital, professional advice, shared clients and distribution network, other types of collaborations |
| ILCs II | Capital, professional advice, use of the MNC brands, other types of collaborations |
| ILCs III | Capital, professional advice, use of the MNC brand, clients and distribution network, support to other collaborations |

Source: Author's elaboration based on interviews

The first column of Table 2.2 shows the subtypes of ILCs and the second how ILCs affected access to resources. In none of the ILCs found has it been possible to observe a causal link with product, process, or functional upgrading. However, all ILCs provided firms with access to professional advice. Most ILCs, save for ILCs Ia, also fostered firms' acquisition of organisational capabilities. ILCs Ib, ILCs II and ILCs III either led to, or provided support for, other types of productive collaborations. ILCs Ib also provided firms with access to shared clients and a common distribution network. The ILCs where MNCs acted as investors, namely ILCs II and ILCs III, allowed Costa Rican firms to use the MNC brand, which helped them acquire reputation in international markets. As part of ILCs III, the Costa Rican firm involved also acquired access to the client network and some of the marketing infrastructure of MNCs. The next section discusses the literature on ILCs, questioning whether it can account for the findings shown in Table 2.1 and 2.2

## 2.3 ILCs and the promotion of ICT clusters

The literature on ILCs draws on both new institutional economics and political economy. Most of it starts from empirical studies of Silicon Valley and Israel, and it discusses the factors that have promoted the emergence of ILCs in those clusters (Khavul, 2005: 164-168). Some authors focus on the rules and regulatory structures that either promote or hamper the formation of ILCs (Zhang, 2003: 40). Their key message is that ILCs emerge when financial markets provide an efficient exit mechanism for investors. That occurs when financial markets are regulated in a clear and transparent way, are open

to competition, are not affected by costly red tape or cumbersome taxation and when the macroeconomic environment is stable (Kenney and Florida, 2000: 101-110). All of the above elements reduce the costs of investing, and thus increase the probability that investors will establish ILCs.[4]

In 2006 Costa Rica is still in the process of financial market liberalisation and deregulation which began in 1991, when private and foreign banks were not allowed to run full banking operations. State-owned banks, which until 1984 were the only type of banks in the country, are still large players in the market, and they benefit from some laws of preferential treatment. Foreign banks have only recently begun acquiring Costa Rican subsidiaries. The stock market remains dominated by the listing of national monopolies, such as ICE, the public electricity and telecom company, INS, the public insurance company and a few large private corporations operating in the protected sectors, such as Florida, a beer and beverages company. In 2004, credit to private companies as a percentage of GDP was about 19% in Costa Rica, as compared to 40% for El Salvador, despite the fact that Costa Rica enjoys much higher rankings in almost all development-related indicators, from GDP per capita, FDI inflows per head, to education, or the aggregate indicators of the Human Development Index (IMF, 2006; IMF, 2005). Although the financial system is in the process of being restructured, it is still affected by cumbersome regulations, at least according to the industry representatives interviewed by the Global Competitiveness Index (Lopez-Carlos, 2006).

Discussing credit available to small and medium enterprises in Central America, the World Bank reports that "Having an unmet demand for formal credit or being credit constrained is more common in Costa Rica than in comparator countries" (The World Bank, 2007: 37). In a similar vein, the IMF mentions that Costa Rica has a "low level of financial literacy" (Carvajal, 2006: 21). Low credit availability means companies and entrepreneurs had, and still have, to find other ways to finance their operations. The literature that focuses on institutions and regulations states that the conditions that prevail

[4] Some authors (for example Kenney and Florida, 2000: 120) find a correlation between the number of public offerings in the stock market (POs), which is related to the size of the host economy but also to the functioning of the financial system, and the number of ILCs. The causality of this argument is not very clear: it could also be that there are many POs of ICT firms precisely because there have been many ILCs, which have ended by listing firms on the stock market.

in Costa Rica, which are not dissimilar to those of most developing countries, halt the emergence of ILCs. However, such literature provides little insight into how actors create ILCs under such conditions, which is the puzzle discussed in this chapter.

Another stream of economic literature that has dealt with ILCs is that of political economy. Some of its arguments, such as the role of government in generating a stable macroeconomic environment for investors, propose, although from a different perspective, similar ideas to those discussed by institutional economics. Other arguments, such as those proposed by Leslie (Leslie, 2000: 49-60), focus on other aspects of public policy. He argues that the US government had an important role in fuelling the growth of venture capital in Silicon Valley not only because it relaxed regulations on investment and maintained a stable macroeconomic framework, but also through its creation of the Small Business Investment Corporation. The Small Business Investment Corporation was a publicly managed fund to match private investments in small enterprises. According to Hellman, although the ILCs that emerged through the Small Business Investment Corporation were not particularly successful, they were important in fuelling the development of ILCs because "they provided a learning experience and training ground for the first generation of successful independent venture capitalists" (Hellman, 2000: 289).

Avinimelech and Teubal underline that the Israeli government played a key role in boosting the emergence of ICT-focused venture capital funds and other ILCs by creating the Yoma, a large public fund for financing ICT start-ups (Avinimelech and Teubal, 2004). These public funds did not create ILCs out of the blue. They increased the initial mass of funds to be invested and signalled to industry leaders and investors that the government actively encouraged ICT-focused ILCs.

Defence contracts also fostered ILCs. Both in Israel and in the US, early investments in electronics were stimulated by demand from defence companies or from the military itself (Khavul, 2005: 161; Leslie, 2000: 50). If strong demand by the defence industry was a prerequisite for the emergence of ILCs, a country with low defence budgets, or one with no army altogether, such as Costa Rica, would be condemned to not having any ILCs. The most important lesson that can be drawn from the political economy literature is that the public sector can play an active role in promoting ILCs through several mechanisms, not

just by providing an adequate regulation for financial markets. However, this literature does not explain how ILCs may emerge in contexts where the government does not support ILCs as the US and Israeli governments have done.

Most of the studies of ILCs focus on institutions and government policies, not considering the social context where ILCs occur. Nonetheless, some authors, such as Castilla et al (Castilla, Hokyu and Granovetter, 2000: 218-220), explain ILCs by looking at social networks involving venture capitalists and entrepreneurs. They argue that ILCs in Silicon Valley are based on tight social networks of entrepreneurs, bankers, lawyers and accountants that operate in interlinked investment funds and companies. Banatao and Fong underline that ILCs emerged mainly because there was a pool of entrepreneurs who turned into investors and constituted the first venture capital funds together with adventurous capitalists and experienced investment bankers (Banatao and Fong, 2000). The subsequent boom of ILCs in Silicon Valley can be explained by the initial success and the returns obtained by the first venture capital funds, but also by the high growth rate of ICT firms in the cluster, which provided a large pool of potential recipients for investment.

These studies illustrate how social ties and networks affect the formation of ILCs. The problem with this approach, however, is that it applies well to the illustration of how ILCs developed in Silicon Valley, but it fails to suggest how ILCs may emerge in newer ICT clusters. The social networks that lay behind ILCs in Silicon Valley have emerged around the historical founders of the ICT industry in California, which date back to the 1950s and 1960s (Kenney and Florida, 2000: 105-110). Such networks consolidated as the number of funds and firms financed increased as the cluster grew through time, and as the individuals involved accumulated experience. The Costa Rican ICT cluster began developing in the 1990s, some thirty to forty years after Silicon Valley. Being younger, and with an overall smaller size, it may take some time before there will be a pool of experienced entrepreneurs willing to move on, create venture capital funds, and generate the intertwined social networks of funds and companies that Saxenian observed in Silicon Valley.

The social networks that boosted the growth of ILCs in Silicon Valley may not have developed yet in the Costa Rican cluster. However, the empirical studies of social networks of investors and capitalists in Silicon Valley and Israel suggest that it is

important to analyse ILCs by taking into account the social context in which they occur – not just institutional frameworks and government policies. This chapter aims to contribute to the literature by analysing ILCs in the Costa Rican ICT cluster through a theoretical framework that looks at both institutions and social ties. The next sections provide evidence of how ILCs emerge in developing countries and discuss the motivations for actors to create them.

## 2.4 Is it convenient to set up an ILC?

Investors and the firms which were financed by them were asked to clarify their reasons for establishing an ILC. Table 2.3 reports and summarises their most common answers.

**Table 2.3 Why forming an ILC? Most common answers**

| Investors | | Financed firms | |
|---|---|---|---|
| The company looked like a good investment | 5/5 | We (I) needed capital to expand | 6/7 |
| There were strategic reasons for investing (other than the prospect of high returns to capital) | 2/5 | The partnership with investors could improve our image and credibility | 3/7 |
| The company was based on a promising idea | 1/5 | Our investors could help us access new clients and markets | 4/7 |
| We (I) believed ICT would boom in Costa Rica | 2/5 | The ILC could provide access to technology | 2/7 |

Source: Author's elaboration based on interviews

Table 2.3 shows on the left-hand side investors' reasons for forming ILCs, and on the right-hand side firms' reasons for having external investors. Table 2.3 illustrates that actors claim to be involved in ILCs for reasons related to the maximisation of the utility of the organisations they lead. The same question was asked to actors who have not established ILCs, namely all of the domestic firms that do not have external investors, and a selected group of investors that has not financed ICT firms. Their most common answers have been listed in Table 2.4 (see next page), distinguishing the answers of investors, shown in the left-hand column, and those of firms, shown in the right-hand column.

**Table 2.4 Reasons for not forming an ILC**

| Investors not involved in ILCs | | Firms without external investors (CEOs/entrepreneurs, or founders/entrepreneurs) | |
|---|---|---|---|
| We (I) were not interested in ICT | 2/3 | We (I) wanted external investors but did not find any | 15/100 |
| ICT is too risky, there are no guarantees | 3/3 | We (I) have not looked for investors yet because we think we would not qualify | 12/100 |
| We (I) do not know enough about ICT to make good investments | 1/3 | We (I) did not know about the possibility of obtaining external financing | 8/100 |
| We (I) could not find suitable companies | 0/3 | External investors create problems, complicate decision making, dilute control | 32/100 |
| | | External investors are unnecessary | 21/100 |
| | | Other | 12/100 |

Source: Author's elaboration based on interviews

Some of the findings reported in Tables 2.3 and 2.4 can be explained by referring to the literature. Some of the firms not involved in ILCs wanted to have external investors but they could not find them, either because they lacked access to the necessary contacts, or because they did not qualify with investors' requirements. Other companies are not aware of the existence of ILCs. These factors reflect unsophisticated financial markets, which do not supply the credit instruments required by companies. They are also related to the fact that the cluster is relatively young, and not yet endowed with many companies able to satisfy investors' expectations. After all, the links between venture capitalists and entrepreneurs in Silicon Valley developed as the cluster became more complex, integrated and populated by more companies (McKenna, 2000: 370-379).

However, some of the findings go against the conventional wisdom regarding ILCs in ICT. Most firms that do not have external investors actually did not want to have them, either because they think they are not necessary, or because they see them as a possible source of problems. And those investors who did not finance ICT firms claim that it is because they do not want to invest in ICT, not because they did not find suitable companies to finance. Both the actors who are involved in ILCs and those who are not explain their decisions by mentioning factors that make them the most convenient choice for the organisations they lead or represent. None of the actors interviewed mentioned cultural or sociological reasons for deciding either to form or not to form an ILC. This raises a key question: why do similar actors have different and even opposite views on

whether it is convenient for them to be involved in ILCs? In order to understand the results found, the next section discusses the behavioural incentives of investors and entrepreneurs with regards to the creation of ILCs.

## 2.5 Incentives to establish ILCs[5]

### 2.5.1 Investors' incentives

There are three types of investors found in the Costa Rican ICT cluster: venture capital funds, the venture capital branch of an ICT multinational and a direct investor, also an ICT multinational. They have different objectives, reflected in different corporate missions and in the subtypes of ILCs they tend to establish. The literature predicts that they operate by following slightly different incentives (Hellmann, 2000: 284-286). Venture capitalists invest in order to realise high returns, which can occur only when the firm is sold. They form an ILC to acquire shares of a given firm, ideally increase its value through time, and sell it at a price that, besides covering their costs, provides them with high returns to investment. Only the incentive of high returns compensates for the high risks of venture capital investment in ICT.

When discussing the incentives that motivated their choice to establish a venture capital fund and finance ICT firms in Costa Rica, one of the founders of a local ICT-focused venture capital fund pointed out that exposure to the returns realised by ICT funds in other clusters provided the first incentive. He thought that venture capital would boom in Costa Rica together with the ICT sector, and wanted to gain first-mover advantage. His incentives came from knowledge of the US venture capital industry and its linkage with ICT firms.[6]

The MNC investors – Intel Capital and Microsoft – established ILCs for slightly different reasons. Intel Capital is a venture capital fund that finances ICT firms, but which also performs a corporate function for Intel by establishing alliances and partnerships with

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[5] Firms and investors were asked to identify the factors that made them evaluate it as being convenient or inconvenient to establish ILCs. In the case of actors involved in ILCs, the process through which the ILCs were established has been reconstructed through multiple open interviews with all of the actors who participated. The results are discussed in this section.

[6] Interview: Carlos Mora de la Orden, Founder of M&B 14 July 2005.

new firms. The ex Director of Intel Capital's Costa Rican office explained that Intel's investment criteria have not only been to realise good returns. Intel Capital's establishment of ILCs in the Costa Rican ICT cluster was driven by the incentive to realise returns, but also by strategic incentives. He stated: "Given that we had already invested here (in Costa Rica), it was part of Intel's strategy to find local partners and form other linkages with Costa Rica"

Intel Capital's strategic incentives were to improve Intel's image as an investor with links to the local economy in Costa Rica, and to expand its global network of allied firms in Central America.[7] Microsoft's investment in an ILC III was driven primarily by strategic considerations on the quality of the product and the technology it was developing, and the will to support an existing cross-border collaboration.[8]

**Table 2.5 Investors' priorities**

| Type of investor | Prospect of high returns | Strategic motives for investing |
|---|---|---|
| Venture capital funds (ILCs I) | 1 | 2 |
| MNC-owned venture capital fund (ILCs II) | 1 | 1 |
| MNC acting as direct investor (ILCs III) | 2 | 1 |

Source: Author's elaboration based on interviews

Table 2.5 summarises how investors ranked their own incentives for becoming involved in ILCs. It shows how they change according to the type of investor. Strategic motives for investing are incentives to invest disregarding the potential for realising high returns by selling the firm purchased. Investors' priorities, or incentives to invest, are ranked with 1 representing the most important and 2 the least important. Table 2.5 shows that venture capitalists pursue mainly high returns, and only as a secondary motive they may they have strategic reasons to invest, for example forming a holding of allied firms under the same ownership structure.

Intel Capital has equal interest in realising returns and pursuing its strategic aims. Finally, Microsoft, which in this case acted as a direct investor, followed primarily

[7] Interview: Diego May, Ex Director of Intel Capital, 7 February 2006, 20 January 2007.
[8] For more information on Microsoft's ILC, see section 2.7.

strategic incentives when it decided to set up an ILC in the cluster. The results found comply with what the literature on ILCs predicts: high returns drove venture capitalists to create ILCs, whilst a combination of returns and strategic incentives lead ICT multinationals to invest.

In order to understand the incentives that led actors to form ILCs, it has been necessary to also consider the behavioural dynamics of investors who are not involved in ILCs. They stated that there are incentives to invest elsewhere, that returns in ICT are too low and that they have more expertise in other sectors. Investors who decided not to establish ILCs in the ICT sector could perhaps find suitable firms to invest in, but they did not look for them. Their discourse emphasises that they, contrary to the investors that did form ILCs in the cluster, have no incentives to invest in ICT. Did the same institutions generate contrary incentives for similar investors? Or did investors respond to the incentives generated by different institutions? Before answering these questions, it is necessary to verify whether local entrepreneurs also responded asymmetrically to the institutional structures that regulate the cluster. The next section analyses their incentives for finding external investors.

### 2.5.2 Entrepreneurs' incentives

Most of the literature assumes that ICT entrepreneurs have incentives to become involved in ILCs because conventional banks do not offer adequate financing arrangements for the ICT sector and because in the early phases ICT start-ups do not generate revenues or returns (Dean, 2000: 315). This complies with the description of the incentives to form ILCs provided by the Costa Rican producers who have been financed either through venture capital or by direct investment. As stated by the founder of one of the firms financed by an ILC:

> "I wanted to sell in the US, but first I needed to improve security and quality. (...) The capital from M&B (a venture capital fund) was

immediately used to upgrade the technological infrastructure, which allowed us to start doing business in the US"[9]

There were other incentives for entrepreneurs to form ILCs with investors in the Costa Rican ICT cluster. The first was credibility; having external investors shows that others apart from the firm's founders believe that it has good growth prospects. Artinsoft's founder and CEO underlined that having Microsoft and Intel as investors conferred a credibility boost to its company, associating it to some of the most known ICT brands. Entrepreneurs' incentives to gain access to capital, credibility and technology conforms with the literature's explanations of why ILCs emerge in ICT clusters. In the Costa Rican ICT cluster as well as in Silicon Valley, banks do not provide financial solutions suited to ICT firms, so that entrepreneurs have incentives to establish ILCs.

Although the literature on ILCs is largely focused on ICT in Silicon Valley and Israel, it could be argued that there are 'industry-wide' institutions that regulate the ICT industry at a global level, providing ICT entrepreneurs with incentives to access capital and technology via ILCs. Some entrepreneurs perceived such incentives and acted accordingly, but they did not find willing investors, as shown in Table 2.4. However, in the Costa Rican cluster not all entrepreneurs responded to these incentives. Some, contrary to what is predicted by the literature, responded to incentives *not* to have external investors.

The entrepreneurs who could have obtained financing and chose not to do so argue that in order to manage an ICT business, it is better to not have external influences. Their incentives to not look for external investors are that they do not want to lose control of their company and do not want to show that they need external help. The following quotes from founders of ICT companies who did not want external investors highlight some of their key motivations: the desire to keep strong control over their firm, the fear that having investors is a sign of financial weakness and the desire to emulate others.

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[9] Interview, Roy Vargas, Founder of Isthmus and Lidersoft, 9 February 2006. Note shown in parenthesis added by the author.

"Yes, capital is always needed. But having external investors means that they control the firm: if you have too many people taking decisions, it doesn't work"[10]

"If we start having investors from outside, people start thinking the firm is weak"[11]

The points highlighted in the quotations have been made and repeated in different forms by most ICT producers, who share a negative perception of ILCs. For them, having external investors is something threatening, contrary to customs, and its benefits are not clear. They feel that it may confer a negative reputational effect in the context in which they operate. They perceive that it is not respectable to have external investors, and that it is rewarded to "do it alone". The founders and CEOs of newer firms tend to look to the founders of older local firms as models to imitate. As one of them mentioned:

"If you get investors it shows that you cannot do it by yourself. It's your firm; you know...if other guys make it by themselves, I can do it too"[12]

When asked to clarify why they perceive that having external investors confers a bad reputation, entrepreneurs responded that it shows that the firm is not producing enough returns to finance itself, and that the entrepreneur himself cannot manage his firm by himself.

Among older local firms, only three (Codisa, Exactus and Artinsoft) are involved in ILCs. And only Exactus began to have external investors in 1996, whilst all other ILCs were signed from 1999 onwards. Most Costa Rican ICT firms had to grow through the late 1980s and 1990s without external financing because there was no investor available – it was not a choice. Some of them, such as Exactus, tried to contact investors as soon as the

[10] Interview: Marcelo Azua, Founder of Infoweb, 3 August 2005.
[11] Interview: CEO of domestic firm, Name Withheld, 9 August 2005.
[12] Interview: Franklin Lizano, Founder of Sicoe, 24 August 2005.

possibility emerged. Yet, for a number of firms created after the year 2001, the fact that the biggest and most successful domestic firms have grown without ILCs until the year 2000 has become a sort of benchmark. In their view, the genesis of the Costa Rican ICT industry has occurred without external investors not because there were no investors, but because local producers were able to survive without "lowering themselves to compromise" with external actors in order to finance their operations.

The CEOs of older local firms that hold a hostile view of external investors contribute to the diffusion of such a model and confer credibility to it. As a result, for many Costa Rican ICT entrepreneurs, not having external investors became an unwritten behavioural norm, which many entrepreneurs seem to follow. The existence of reputational rewards and sanctions suggest that the behavioural norm of not having investors seems to have become, at least for a large number of actors, part of the institutions that regulate the local cluster.

The two groups of actors, entrepreneurs and investors respond asymmetrically to incentives. Entrepreneurs and investors seek to maximise their career or the performance of their organisation by choosing different, even opposite, economic actions. The next section questions the origin of the behavioural determinants that lead similar actors to act differently, discussing whether the same institutions generate different responses, or whether actors respond to different institutions.

## 2.6 The origin of incentives to form ILCs

During the interviews, it has been possible to identify not only actors' incentives, but also the institutions that generate such incentives. Table 2.6 summarises the incentives to which actors responded when deciding whether or not to enter into an ILC.

**Table 2.6 Incentives and their origin**

| Type of actor | Incentives to form ILCs | | Incentives not to form ILCs | |
|---|---|---|---|---|
| Investors | High returns in ICT investments in other clusters | I | High returns in other sectors in Costa Rica | L |
| | ICT growth worldwide | I | Regulations make it costly to exit the investment | L |
| | Strategic reasons for investing in a Costa Rican ICT firm | N | Knowledge of other industries in Costa Rica | L |
| ICT producers | Access to capital for expansion | I | Loss of control | N |
| | Access to experts' advice | I | Loss of reputation at the local level | L |
| | Access to clients | I | Wish to emulate firms that have grown without ILCs | L |
| | Access to technology | I | No need | L |
| | Gain in international credibility | I | | |

Source: Author's elaboration based on interviews

Table 2.6 shows in the first column from the left-hand the type of actor (investors or ICT producers), in the second column the incentives to form ILCs, in the third column the incentives not to form ILCs. The rows show the incentives of investors and ICT producers.

derives from customary rules that prevail among domestic entrepreneurs. However, it could also be the result of conditions that apply in other locations, such as small firms' preference for self financing. Thus, it is a behavioural incentive that does not stem specifically from one of the two categories of institutions identified ('industry-wide' and 'local').

Table 2.6 shows that venture capitalists' incentive to realise returns stems from the rules that lay behind the establishment of a venture capital fund, which include no short-term exit and no guarantee of success. Venture capitalists have incentives to invest in the Costa Rican ICT cluster, but also incentives to not do so if no firms complied with their criteria. ICT multinationals have an incentive to form ILCs if there are firms in the cluster that may have strategic value for them, such as technology suppliers. The incentives that have driven investors to set up ILCs in the cluster are those predicted by most of the literature. They are not specific to the Costa Rican cluster.

On the contrary, incentives for not forming ILCs seem to have stemmed from more 'local' institutions. For example, small capitalisation of the Costa Rican stock market and cumbersome regulations generate a counter incentive for investors to arrange ILCs because they increase the cost of exit. The most important incentive mentioned by investors as a reason for not financing ICT firms is the prospect of high returns in other sectors of the Costa Rican economy which benefit from market protection and other forms of distortion. This is an incentive created by the regulatory structures of the Costa Rican market, which may or may not apply in other contexts.

Reputational sanctions against having external investors are generated by the customs and behavioural rules that regulate the relations between ICT entrepreneurs in Costa Rica, but which may not apply elsewhere. They also do not conform with what is described by the literature. The question is why some investors and entrepreneurs responded to the incentives stemming from 'industry-wide' institutions, whilst others responded to the incentives generated by more 'local' institutions (Table 2.6).

Through ethnographic research, it has been possible to verify that different perceptions and responses to incentives are related to the background and experience of investors and entrepreneurs: foreigners and Costa Ricans with international exposure seem to have better access to information on ILCs in other clusters and to be less affected by the

observation of specific features of the local economy, such as high returns in protected sectors. International exposure has been analysed by taking into account the actors' nationality and whether they have studied or worked abroad.

**Table 2.7 Actors who have worked abroad**

| Actors' preferences | Type of actor | Foreigners | Costa Ricans |
|---|---|---|---|
| Are involved or want to be involved in ILCs | Investors | 3/5 | 2/5 |
| | Entrepreneurs | 5/35 | 21/35 |
| Do not want to be involved in ILCs | Investors | 0/3 | 0/3 |
| | Entrepreneurs | 3/53 | 7/53 |

Source: Author's elaboration based on interviews

Table 2.7 reports the data collected. It shows the perception of ILCs by actors who have worked outside of Costa Rica, distinguishing foreigners from Costa Ricans. The first column from the left-hand side of Table 2.7 shows the preferences of actors, the second column the type of actor, the third and fourth how many foreigners and Costa Ricans

who have
nces seem
ponsive to

ILC but have not been able to do it yet have been considered together with those already succeeded. Table 2.7 shows that actors with more international experie to be less affected by the institutions that operate at the local level but more res

generated by global and domestic investment markets. What determines the extent to which they respond to local and global incentives, or the combination of incentives to which they respond? In order to answer the question, the next section discusses how social embeddedness may affect the response to institutional incentives that lead actors to form ILCs.

## 2.7 Social ties and the emergence of ILCs

In order to discuss the economic actions of investors and entrepreneurs in a socially embedded context, actors were asked to identify the ten people they talk to most often when asking for advice on their business (investments or ICT). Actors with higher international exposure have more social ties to other clusters, and are more likely to use them to obtain information and advice. Entrepreneurs and investors who have no social ties to actors outside of the cluster tended to respond only to the incentives produced by the institutions that regulate their own community, which do not lead to ILCs.

Social ties affected behavioural incentives in several ways. The most evident effect that they had was to either transmit and enforce the social sanctions created by informal institutions or to make them ineffective. Social embeddedness affects the way in which actors perceive the behavioural incentives produced by the set of customs and norms that regulate social and economic action. One of the entrepreneurs who seemed unaffected by social incentives to not have external investors stated that for him these customs are irrelevant:

> "It does not matter to me whether they (other local entrepreneurs) think that I cannot manage my firm alone, or that the firm has no money. In other places, having investors signifies that the firm is credible"[13]

He has social ties outside of the Costa Rican ICT cluster, which reduced the effect of social sanctions against having external investors, and introduced different incentives to

[13] Interview: Roy Vargas, CEO of Isthmus, 9 February 2006. Note in parentesis added by the author.

form an ILC. On the contrary, the ICT producers who are the most affected by social sanctions against having external investors are those who are more socially embedded in the Costa Rican cluster and rely on their local colleagues to obtain filtered information and advice. Although most of them seem to be aware of the incentives prevailing in other clusters, they respond to the incentives that prevail in their own community. They consider local behavioural norms as real incentives, whilst they perceive 'industry-wide' incentives as distant and for them irrelevant, as if they operated in a self-contained social and economic reality. When discussing the importance of guarding local reputation, one CEO mentioned:

> "I know that investors can be a good thing, yes, I know about venture capital in Silicon Valley and all that. (...) But, I live here, this is not Silicon Valley. And it is important for me to keep a good reputation here"[14]

Social ties provide actors with access to filtered information, which is promptly transformed into behavioural incentives. The investors not involved in ILCs did have access to information regarding the opportunities to invest in ICT but, having few social ties outside of Costa Rica, they are more exposed to incentives to invest in sectors that are profitable locally, than to incentives to invest in sectors that have been profitable elsewhere. Investors who are socially tied to communities where financing ICT is considered to be profitable tend to internalise such external incentives. When explaining why they have invested in ICT, they continuously refer to Silicon Valley, India and Israel. They have been inspired by the experiences of their acquaintances both in choosing to form ILCs and in continuing to support the firms they invested in by providing them with advice and business contacts.

The case of direct investment by Microsoft into the Costa Rican company Artinsoft provides evidence of both of the mechanisms through which social ties affect incentives to form ILCs-enacting or diluting social incentives, and transforming information into

[14] Interview: Eduardo Castillo, CEO of Teico, 2 August 2005.

incentives. One of Artinsoft's board directors has worked in Silicon Valley and still has social ties with some of Microsoft's managers in the US. By working in both communities, the Costa Rican ICT cluster and Silicon Valley, this particular manager was simultaneously exposed to the incentives generated by the institutions that regulate them. The CEO of Artinsoft also has many social ties outside of the Costa Rican ICT cluster. Hence, he was more responsive to global incentives to form an ILC with Microsoft than to the social sanctions to not have external investors that affect Costa Rican ICT entrepreneurs.

Microsoft had incentives to invest in ICT firms with promising technologies. However, its managers had never heard of Costa Rican firms and had no incentives to look for a partner in that specific cluster; especially given the number of firms they could search for in Silicon Valley. They had no information on the firms that operate in the Costa Rican cluster and no incentives to invest resources into acquiring such information. Moreover, there was a bias against investing in firms from ICT clusters located in developing countries, unless Microsoft already had partnerships there, as it did in India. Microsoft could have had access to information concerning Artinsoft's product without social ties. However, it would not have looked actively for such information. Furthermore, it is possible that it would have discarded such information together with most of the information it receives, which, according to its officers, is unprocessed, and often unreliable.[15]

Microsoft's manager and Artinsoft's board member with whom he had a social link acted as a bridge between the two communities, compensating for information failure. They informed Microsoft regarding the technology and products developed by Artinsoft, offsetting the incentive for not dealing with firms from developing countries and reducing the costs of searching for suitable firms to invest in. After the contact was made, it developed into a cross-border collaboration and a supporting ILC because the MNC had strategic interests in the Costa Rican product.

The social tie that linked the two firms helped Artinsoft to make itself visible, so that Microsoft began having it as a supplier, and eventually formed an ILC with it, which

[15] Interviews: Rodrigo Ayala, General Manager of Microsoft Costa Rica, 9 June 2005; Carlos Araya, Founder of Artinsoft, 26 January 2005.

supports a cross-border collaboration between them, discussed in chapter 6. Microsoft became a client of Artinsoft and formed an ILC with it because, through social ties, it became exposed to its technology. Social ties helped Microsoft and Artinsoft overcome information asymmetries and coordinate their actions. They delivered strategic information to Microsoft, transforming existing accessible information into partly processed information, which acted as an incentive to form an ILC.

Most MNCs not operating in Costa Rica have little or no information on the Costa Rican ICT cluster. But also many of the MNCs that do have subsidiaries in Costa Rica have little access to information regarding domestic producers. Some of the American managers of MNC subsidiaries operating in the Costa Rican ICT cluster have no contact with, and no information about, domestic ICT producers. They work in Costa Rica, but they are socially disembedded. Their only ties are to expatriates and to communities abroad. Thus, they are exposed mainly to the social customs that prevail among expatriates. Unless they have a mandate to look for local partners, expatriate managers of ICT multinationals do not have incentives to acquire information on the activities of domestic firms. This limits the formation of both ILCs and MLCs, which are discussed in chapter 5.

The following conversation was recorded during an interview with the Director of the subsidiary of an American MNC that provides offshore ICT services to its headquarter (HQ). The corporation he works for has an explicit strategy to look for small ICT firms to invest in. However, most of its ILCs are with firms operating in ICT clusters in the US. He was asked whether its company had invested in any Costa Rican firms:

> Author: Did you invest in any local firms?
> Director: What local firms?
> Author: There are 150 Costa Rican ICT firms, mostly software developers...
> Director: What? 150 ICT firms? Here? I had no idea about that.
> Author: You did not hear that there is an ICT cluster?
> Director: Yes I did...I know about multinational corporations that work here...You see, we don't really do much with local firms...We have our

global partners, and partners are managed from the HQ...But that's good information though, maybe there are some good firms next door and we just have no idea. Do you know where I could find a list?"[16]

The Director of the MNC subsidiary, who had been working in Costa Rica for three years, confessed to have had very little interaction with Costa Ricans, or, as he defined them, "the locals". He has few incentives to gather information or establish linkages with domestic firms, because the subsidiary he manages performs offshore operations for the HQ, but does not have a specific mandate to find firms to invest in. In the case where a subsidiary manager finds firms that look like good allies, he informs the HQ, where other managers evaluate the technology and products and eventually establish an ILC. The fact that he did not find any firm suitable for ILCs stemmed also from a lack of access to information regarding the pool of local firms operating in the cluster, some of which are located at less than 200 metres from his office. The Director admitted that he had heard about Costa Rican firms producing software, but that this information had never transformed into an incentive, because it remained unprocessed. After discussing the theme he remembered having heard about the local ICT cluster and affirmed:

"Yes, I have to say that I know about Camtic (the Costa Rican ICT business association). But you know, I get a lot of magazines, publications, newsletters... if I read them all, I would never work. Now that you tell me, I will get some info about this"[17]

Not having any social ties to people who have more specific knowledge on Costa Rican ICT firms, he had dismissed the information, and followed the incentives provided by the institutions that regulate ICT in the US. These institutions do not push MNC managers to search for Costa Rican firms to invest in, but rather to keep the MNCs' Costa Rican facilities as units where HQs offshore some operations in order to reduce costs.

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[16] Interview: Ian Thorpe, Director of Fiserve Costa Rica, 24 February 2006.
[17] Interview: Ian Thorpe, Director of Fiserve Costa Rica, 24 February 2006. Note in parentesis added by the author.

Thus, the information asymmetries that hamper the emergence of ILCs in the cluster persist, only occasionally overcome by bridging social ties.

## 2.8 Effects of ILCs in the Costa Rican ICT cluster

It is difficult to assess the impact of ILCs on performance because performance depends on many other factors, such as global industry trends, other collaborations, strategy, etc. Moreover, there is a 'chicken and egg' dilemma: is it that a firm obtained an ILC because it was successful, or is it that being involved in an ILC explains its current success? In the Costa Rican cluster, some of the largest (in terms of sales and employment) domestic ICT producers are involved in ILCs. However, there are also firms not involved in ILCs that maintain similar employment levels and realise similar or higher sales. On the basis of the information available, there is no clear correlation between ILCs and firm performance. More time may be necessary to evaluate the impact of ILCs. However, on discussing it with CEOs, it emerged that although there may be no detectable impact on performance, ILCs contributed more than just capital to the firms which were financed.

As shown in Table 2.2, most firms also received professional advice, especially in the areas of marketing and internationalisation. The most traditional type of ILCs, ILCs Ia, generated the least developmental effects, for the involvement of investors was lower. ILCs Ib, which occurred in only one case, entailed a higher involvement of investors because they also had some strategic aims: to create a network of collaborating local firms. It was thus in their interest to provide advice more consistently, and to ensure the success of all the firms they financed. As a result of investors' advice and support, in all of the ILCs except for ILCs Ia, Costa Rican firms claim that they have improved their organisational capabilities. They illustrate that through ILCs they have learned how to better manage their finances and organise their expenditures.

The firms financed by Intel Capital and Microsoft underlined the fact that their contact with MNCs allowed them to gather information and to benefit from using the MNCs' brands. In both cases, MNC investors also entered into other collaborations, facilitated or strengthened by the ILCs, which they emphasised as being the most

important aspect of their ILCs. Both firms eventually gained access to some of the MNCs' technology, but that occurred through, and because of, other collaborations they established with them, which are discussed in chapters 5 and 6.[18]

The ILC Ib also led to other productive collaborations. It stimulated and it currently supports the creation of a network of allied domestic firms (a LLC III) which also includes a collaboration with a university (an ALC). The firms it financed became integrated and began operating as a small group, specialising in different client and product niches. They operate under a modular governance system whereby they generate independent product modules that clients can choose to combine. The characteristics of their collaborative network, the most articulated in the cluster, are discussed more in-depth in chapter 3, which analyses collaborations amongst local producers.

The most important impact of ILCs is that they facilitated the formation of other types of collaborations, both amongst local firms and with the MNC investors. This complies with the description of Silicon Valley as a networked economy (Zhang, 2003: 40), where collaborations cross each other and lead to other types of alliances and inter-firm linkages. However, by 2005 the number of ILCs was still limited in Costa Rica, and most firms relied on self-financing, which perhaps limited the diffusion of other types of productive collaborations, too.

## 2.9 Conclusion

The study of ILCs in the Costa Rican cluster shed some light on how this type of productive collaborations emerge in a context where the conditions that have promoted them in other locations do not exist. It brought to light the fact that the absence of "Silicon Valley conditions" and supportive government policies is not the only obstacle for the development of ILCs. Information failure, enhanced by a lack of social ties between potential investors and producers, is the key obstacle in the Costa Rican ICT cluster.

The analysis of how actors established ILCs in the Costa Rican cluster illustrates that despite the lack of Silicon Valley conditions, there are some investors willing to invest in

[18] Interviews: Carlos Araya, Founder of Artinsoft, 26 January 2005; Claudio Pinto, Founder of Exactus, 18 January 2006.

the cluster, including some MNCs. However, in many cases information failure causes coordination failures: investors do not find suitable companies, and companies may not find willing investors. Domestic investors do not know the ICT sector very well, and have incentives to focus on more traditional sectors. Similarly, a number of local firms are led by entrepreneurs who are not aware of the possibility of financing their operations via ILCs. Notably, MNCs, which according to Lall and Narula should be the most important source of capital and technology for developing countries, tend to operate in the cluster without having information on other actors, and especially on domestic ICT producers (Lall and Narula, 2004).

Most managers of the subsidiaries of MNCs are socially disembedded. They have no social ties to Costa Rican actors. Thus, they have limited access to information about local firms. Institutions do not generate incentives for them to obtain such information; most of them do not have a specific mandate to invest locally. Moreover, the lack of information reduces their incentives to ask for a mandate, limiting the operation of MNCs' subsidiaries to their designated functions: manufacturing and providing outsourced services to the HQs. MNCs' limited role in promoting ILCs is a manifestation of the gap that divides MNCs from the local economic and social structures of the Costa Rican ICT cluster, which will be further discussed in the chapter on MLCs (chapter 5). It is also a consequence of public policies aimed explicitly at attracting FDI, but not at fostering linkages between the local and foreign actors of the cluster.

The only two MNCs involved in ILCs are Intel and Microsoft. The ILCs they generated had a positive developmental impact, both supporting and leading to other types of productive collaborations. Intel had a specific mandate to find local partners through its venture capital branch, Intel Capital. The case of Microsoft, on the other hand, illustrates that social ties can bridge the communities of potential ILC partners, such as MNC managers and ICT entrepreneurs (Burt, 2001), compensating for information failure.

In the Costa Rican ICT cluster low availability of adequate credit instruments from the national banking system contributed to the diffusion of self-financing among domestic companies. For many of them, this evolved into a bias against having external sources of finance, so that even if capital is available, the majority of local firms do not attempt to find investors. Such bias is based on a lack of access to information on the benefits of

ILCs, and also information about potential investors. The custom to not have external investors affects the community of Costa Rican ICT entrepreneurs in an asymmetric way, creating three distinct groups.

The first group is that of founders of old, established local firms, who have no international exposure, sell mainly in the domestic market and who are very embedded in the local ICT community. They are vocal in opposing the idea of ILCs. Perhaps because of rivalry with colleagues who received external financing, they circulate negative perceptions of ILCs, and provide an example of how it is possible to succeed without ILCs.

The second group is that of young and small firms founded by actors with no international exposure, also very embedded in the local ICT community. They follow the example of the first group, and respond to an apparently established behavioural norm of not having external investors and punishing those who do via negative reputation.

The third group is that of producers with international exposure, which includes older, more successful firms and younger, smaller firms. Those who lead the most established firms are indeed involved in ILCs. They ignore local sanctions, export a high share of their output and are socially embedded in more communities simultaneously, some of which are outside of the cluster. Most of those who lead smaller companies are not involved yet in ILCs, but are trying to do so, following the example of both foreign and domestic ICT enterprises who have been supported by investors.

The actors who benefit from having a number of external social ties are less affected by local institutions, such as the behavioural norm not to be involved in ILCs. Social ties transmit and enforce incentives, in this case social sanctions, determining how actors respond to behavioural norms. Costa Rican ICT producers without social ties to actors located in other clusters process the information circulated in their community and follow local customary rules. This prevented them from looking for investors, but also from looking for other collaborative outcomes. The impact of social closure on local producers' incentives to collaborate is discussed at length in the next chapter.

The state has not stimulated the formation of ILCs, as it has generated institutions that, directly or indirectly, make it more difficult to form ILCs. A more competitive banking system could create further incentives for investors to finance ICT firms and

make more credit available for local firms. Most importantly, though, the public sector has not contributed to solving the information asymmetries that affect the cluster impeding coordination between local producers and other actors, including investors. The only Costa Rican ICT business association, Camtic, has considered the lack of ILCs as a weakness of the local ICT sector, and, together with the Inter-American Development Bank, in 2006 it started creating an ICT-dedicated venture capital fund.[19] Perhaps such a venture capital fund will play a similar role as the Yoma fund in Israel, stimulating the emergence of private ICT-specific funds. However, evidence on the development of ILCs in Costa Rica suggests that if information failure is not addressed, higher capital availability will not automatically generate more ILCs.

[19] Federico Cartin Arteaga, Ex Director of Camtic, 15 March 2005; A. Mora, Director of Camtic, 28 January 2005, 12 April 2006; Betsy Murray, Head of the IADB Office in San José, Costa Rica, 8 August 2006.

# 3 Productive collaborations in a closed community: collaborations amongst Costa Rican ICT companies

## 3.1 Introduction

The most notable feature of industrial districts is that rival firms not only compete, but also collaborate.[1] It is through external economies and productive collaborations that many industrial clusters in both the developed and developing world achieved collective efficiency and became global leaders in their respective fields (Schmitz, 1995; 2000). The literature converges on praising the developmental effects of productive collaborations, but it provides contrasting explanations of how collaborations emerge. This chapter analyses productive collaborations between Costa Rican ICT producers, discussing different theoretical explanations of collaboration.

In the Costa Rican ICT cluster, there are three subtypes of productive collaborations between local firms (LLCs), which have been structured by four large exporters.[2] Their developmental impact depends on their functions and how they are governed. The first subtype of LLCs (LLCs I) links the four exporters to subcontractors that provide them with additional capacity – an ICT sector remake of the hierarchical 'putting out system' practiced by some firms in the Italian industrial districts during the 1990s (Harrison, 1994: 75-106). Although enacting a flexible production system, these LLCs do not have

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[1] The term 'industrial district' is used in this chapter to refer to clusters characterised by a high density of productive collaborations, such as the Italian industrial districts. 'Cluster' is used to indicate industrial agglomerations without specifying their level of collaboration. This follows Schmitz's use of the terminology. He points out that "the terms 'industrial district' and 'cluster' are sometimes interchangeable, but it is worth recalling that while an industrial district is always a cluster, the reverse is not always the case...using the term 'industrial district' implies that a deep inter-firm division of labour has developed; in most contemporary analysis it also implies the existence of co-operation" Schmitz, 1995: 536)

[2] This chapter analyses all productive collaborations that have occurred amongst local firms up to the year 2005, including some collaborations that had ceased to exist at the time of fieldwork. The four "Large exporters" are firms that rank among the top ten domestic ICT exporters in terms of declared average exports per year.

significant developmental implications. LLCs II, the second subtype of LLCs, are collaborations which support spin-offs: they accelerate collaborating firms' acquisition of capabilities and contribute to upgrading. The third subtype of LLCs (LLCs III) links several firms that operate in a collaborative network. By sharing not only resources, but also an integrated group strategy, the firms involved in a LLC III acquire new capabilities and upgraded their products and functions. How and why did the four large exporters organise the three subtypes of LLCs?

Collaborations amongst similar firms in industrial clusters have often been related to the existence of closed communities, which facilitate the circulation and enforcement of collaborative customs (Becattini, 1989; Dei Ottati, 1994). Most Costa Rican ICT producers are entrepreneurs with similar ethnic and professional backgrounds, who operate in a spatially concentrated community. As anticipated in chapter 2, they share some common behavioural norms, and identify themselves with their community. However, most of them are openly hostile to the idea of collaborating.

This chapter shows that one of the features of social closure – the fact that it facilitates the circulation of information and behavioural norms – can halt rather than promote the emergence of productive collaborations. In the Costa Rican ICT cluster, social closure limits actors' access to non-redundant information, such as information about export markets.[3] As a result, most domestic firms compete for a limited number of clients and develop similar products. This reduces the scope for buyer-supplier collaborations (vertical collaborations), and it also enhances commercial and interpersonal rivalries.

Social ties to external actors compensate for the information failure caused by community closure, exposing local producers to incentives to target foreign clients. Exporters are more prone to get involved in collaborations with other domestic firms, because their key rivals are not other Costa Rican producers. Most of them use social ties to external actors to obtain information, and support their exporting ventures via cross-border collaborations, a feature discussed in chapter 6. The chapter is structured as follows. In the first section, it presents the results, in the second it discusses how the

[3] Drawing on Burt (Burt, 2004), the term 'non-redundant information' is used to indicate information that is not available in a given social context, such as in a closed community.

literature may explain them, in the third it looks at incentives and institutions, in the fourth it questions the role of community and social ties and in the last it provides in-depth qualitative evidence on the formation and impact of the three subtypes of LLCs found in the cluster.

## 3.2 Productive collaborations amongst local firms in the Costa Rican ICT cluster

Costa Rican ICT producers generated only one organisation that represents them: the ICT chamber Camtic. This was founded by a group of older domestic firms in order to lobby the government and foreign donors. The organisation, originally called Caprosoft, has been financed for four years by the Inter-American Development Bank in order to promote ICT production. From the year 2000 until 2004, Caprosoft provided funding for quality certifications and for specialised training to a selected number of its members. However, limited funds constrained its capacity to extend benefits to all members, especially as membership increased to the point where it included more than 90% of the domestic firms. In 2004, it was transformed into a self-funding business association open to all ICT producers, including MNCs, and was renamed as Camtic.

Since 2004, Camtic has been organising collective actions to promote the "marca país" – Costa Rica's image as a location for ICT investment and production. These activities involve public agencies and multilateral organisations, especially the Inter-American Development Bank. However, the ICT chamber has never promoted or facilitated any productive collaboration. Despite the fact that Camtic originated as an organisation of local producers, Camtic's Board of Directors never considered fostering or helping to coordinate productive collaborations among its members.[4] Productive collaborations between Costa Rican producers have been structured independently of Camtic by four exporting firms and their partners.[5]

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[4] Interview: A. Mora, Director of Camtic, 28 January 2005, 12 April 2006; Collective interview: Board of Directors of Camtic, 20 October 2005. The impact of Camtic's role on the emergence of productive collaborations among local firms is discussed throughout the chapter

[5] In the year 2005 Camtic's role was redefined, and its entire staff replaced. Promoting collaborations with investors and MNCs are part of the objectives of the board for their post-2005 agenda. Collaborations

In the Costa Rican ICT cluster, there are three types of LLCs: Production Outsourcing (LLCs I), Spin-off Support (LLCs II) and Integrated Strategy (LLCs III). As shown in Table 3.1, LLCs II and LLCs III have very strong developmental effects for the firms involved, leading to the acquisition of organisational and technological capabilities, and also to different types of upgrading. LLCs I provide access to resources but do not contribute to the build-up of capabilities or to upgrading.

**Table 3.1 The impact of LLCs**

| Subtype | Governance | Access to resources | Capabilities | Upgrading |
|---|---|---|---|---|
| LLCs I | Captive | Additional capacity<br>Brand<br>Clients and distribution network | No change observed | No upgrading observed |
| LLCs II | Relational | Brand<br>Clients and distribution network<br>Infrastructure<br>Capital<br>Professional advice<br>R&D personnel | Organisational skills<br>Product-specific technological capabilities | Product<br>Process |
| LLCs III | Modular | Brand<br>Infrastructure<br>Professional advice<br>Other collaborations | Organisational skills<br>capabilities | Process |

Author's elaboration based on interviews

Source:

3.1 outlines the effects of LLCs. It shows in the first column from the left-hand e of LLCs, in the second column the governance structures, and in the following ifferent aspects of developmental impact: access to resources, change in s, and upgrading.

can be either vertical, between buyers and suppliers, or horizontal, between l rival firms (Schmitz, 1995: 540). They can have relational, modular, or captive e structures, depending on the nature of their joint activities.[6] As for other types

Table
the subtyp
columns
capabilitie

LLCs
similar an
governanc

l producers were not mentioned as being part of the actions that Camtic plans to undertake in

ssion of the governance concept, see chapter 1, section 1.5: 38-39

between loc
the future.

[6] For a discu

of collaborations (see, for example, chapter 5 on MNCs and local firms), captive LLCs have less positive effects than relational or modular collaborations.

LLCs can also be bilateral or multilateral. The features of bilateral and multilateral collaborations resemble those of trade agreements. In bilateral collaborations, two parties maintain an exclusive collaborative relation, which is not superimposed or interlinked to the relations they have with other firms, disregarding whether they are collaborative or not. As for trade agreements, a firm may have a high number of bilateral collaborations, none of which are linked to each other. This is the case in LLCs I: networks of subcontractors that supply larger Costa Rican ICT producers with specific services. Each subcontractor is linked to its buyer/collaborator, but not to other subcontractors. In multilateral collaborations, (LLCs III), all firms are linked, information flows across the network, resource-sharing and joint actions involve many or all of the actors simultaneously.

All of the LLCs found in the cluster have been organised by four of the top fifteen Costa Rican producers: Syme, Soin, Cenisa and Lidersoft (Table3.2).

also not related to age: among the four leaders of collaborations, there is one of the oldest top fifteen Costa Rican producers, Soin, and one of the youngest, Lidersoft.

This chapter questions why the four LLCs' leaders and their partners have established three subtypes of LLCs, providing more details about their impact on firm-level capabilities. An equally notable finding is that the vast majority of local entrepreneurs do not collaborate and are vehemently opposed to the idea of collaborating with their peers. Such a finding is surprising given that, as anticipated in the first chapter, the Costa Rican ICT cluster has many of the features that scholars list as typical of collaborative clusters: it is spatially concentrated, populated by many domestic small firms, entrepreneurs share a common identity, culture and values, entries of foreigners are limited, and most actors are socially tied to each other (Becattini, 2004: 20; Dei Ottati, 1994: 530, 533. Rabellotti, 1995: 30). The next section discusses the literature concerned with collaboration among local firms in industrial clusters, questioning how different interpretations can be applied to explain the outcome.

## 3.3 Collaborations, trust, community and institutions

A great share of the literature on clusters and collaborations has been inspired by the success in the 1980s of the so-called 'Third Italy', regions where industrial districts – agglomerations of small and medium firms (SMEs) – became global leaders in sectors ranging from shoes to ceramic tiles, furniture and food packaging machinery. Scholars of industrial districts observed that in these agglomerations SMEs engage in competition and collaboration simultaneously (see among others Becattini, 1989, 1998, 2004; Brusco, 1982; Piore and Sabel, 1984; Pyke, Becattini and Sengenberger, 1990). Through collaboration, firms compensate for their resource constraints, and achieve superior levels of flexibility than vertically integrated corporations (Piore and Sabel, 1984). Scholars of clusters in developing countries corroborated this view, showing that firms that collaborate perform better and respond better to crises (Schmitz, 2000). But how, when and why do these productive collaborations emerge?

A variety of disciplines, including economics, sociology and geography, provide different accounts of why firms operating in industrial districts collaborate and compete

instead of competing only. There is a fundamental dividing line between the theories concerned with the determinants of collaboration. On the one side, there are the studies that emphasise the role of cultural homogeneity and common values in industrial districts, which are related to their history and culture; and on the other, those that focus on incentives, institutions and the nature of transactions.

Some of the most distinguished industrial district scholars, such as Brusco (Brusco, 1982), Becattini (Becattini, 1989; 1998; 2000), and Piore and Sabel (Piore and Sabel, 1984), belong to the first group. They argue that firms operating in a district collaborate because actors are not just spatially and sectorally concentrated, but also share the same culture and values. Talking about communities and actors' social linkages in industrial districts, Becattini states that "The most important trait of the community of people is its relatively homogeneous system of values and views, which is an expression of an ethic of work and activity, of the family, of reciprocity, and change" (Becattini, 2004: 20).

Collaborative behavioural customs circulate easily in the Italian industrial districts, benefiting from community closure and low mobility of labour. They do not only spread through the district, they also reproduce themselves through time (Brusco, 1982; Becattini, 2004; Dei Ottati, 1994). Scholars such as Becattini and Dei Ottati construct theories of collaboration observing the Italian industrial districts. The key factors that they identify to explain the phenomenon are a collaborative culture and a spatially concentrated, closed community. Community closure facilitates the circulation of collaborative customs, which lead actors to trust each other, and thus eventually to establish productive collaborations. These theories may explain collaboration in the Italian industrial districts, however, they do not explain the variety of collaborative outcomes found in the Costa Rican ICT cluster. They also do not explain why a high number of Costa Rican ICT producers, who operate in a spatially concentrated and closed community, is strongly opposed to the idea of collaborating.

The theories of industrial districts also mention a collaborative culture. It could thus be that Costa Rican ICT producers are simply not collaborative. However, as discussed in chapter 1, culturalist explanations of collaboration can lead to circular arguments and ex post accounts: where there is a history of collaboration, actors collaborate, where there isn't, they do not (Trigilia, 2001). The problem is that many scholars of the Italian

industrial districts do not discuss whether collaborative culture can be reproduced in new clusters. If the traditions and culture of Italian industrial districts cannot be replicated, how can we account for the emergence of productive collaborations in new sectors, such as ICT, and locations other than the Third Italy, such as developing countries? Moreover, how do we account for the variation of collaborative outcomes that are likely to develop in a cluster? Why do similar actors, such as Costa Rican ICT producers, take very different collaborative choices, ranging from not collaborating to forming integrated strategic networks (LLCs III)?

Scholars such as Schmitz and Nadvi, who focus on clusters in the developing world, argue that actors collaborate because they trust each other, as stated by Dei Ottati (Dei Ottati, 1994). However, they also point out that such trust is based on customs and on reciprocity. It is maintained through time because of the advantages conferred by trust-based transactions, and the sanctions imposed on defectors (Schmitz and Nadvi, 1999; Schmitz, 1995). When actors repeat certain patterns of collaborative behaviour, they lead to the development of specific customs, or institutions, that regulate collaboration. But how do collaborative and non collaborative customs circulate?

Becattini, Dei Ottati, and Piore and Sabel emphasise that community closure and shared identity are necessary to diffuse and enforce collaborative customs. They argue that the build-up of trust and the construction of norms that facilitate cooperation is possible in industrial districts because of cultural homogeneity and community closure (Brusco, 1982; Becattini, 2004; Dei Ottati, 1994; Piore and Sabel, 1984). Face-to-face contact and personal knowledge facilitate the transmission of information and the monitoring and enforcement of social sanctions. This conforms to Coleman's arguments that common identity and community closure have positive developmental effects, such as fuelling productive collaborations (Coleman, 1988). Such explanation is contrary to what found in the Costa Rican ICT cluster: many local firms are not willing to establish developmental collaborations with each other despite operating in a closed community.

As Lazerson and Lorenzoni point out, "Explanations of inter-firm cooperation based on the cultural homogeneity of the district fail to make the distinction and fall into the trap of the oversocialised economic actor, which Granovetter (Granovetter, 1985) criticised for mistakenly assuming that by identifying a set of dominant social values one can predict

the behaviour of economic actors" (Lazerson and Lorenzoni, 1999: 259). The behavioural choices of Costa Rican ICT producers show that social closure may lead to collaborations with negative developmental implications, or even halt collaborations altogether. This chapter explains the outcome by exploring how social ties may affect both incentives to collaborate and the process of establishing collaborations. It contributes to the debate on collaborations in industrial clusters by providing new evidence of how actors who consider themselves to be similar and operate in a closed community make use of their social ties to either collaborate or achieve other objectives.

## 3.4 Protected markets and incentives to collaborate

The first characteristic of the ICT cluster that limits collaborations is that it is a MNC-dominated cluster (Altenburg and Meyer-Stamen, 1999) where MNCs do not organise collaborative production processes. Schmitz notes that in clusters, collaborations occur most frequently at the vertical level, between buyer and supplier, because that allows actors to coordinate their actions instead of competing directly (Schmitz, 1999a). In the Taiwanese and Irish ICT clusters, MNCs articulated vertical collaborations that greatly benefited their local suppliers (Görg and Ruane, 2000; Lall, 2001; 1999; 1994; Kishimoto, 2003).

MNCs are the largest firms and most sophisticated firms of the cluster. They could structure their value chains in order to promote vertical collaborations, not only between them and local firms, but also amongst local firms engaged in the same production processes. Yet, they have not promoted systemic patterns of vertical collaborations, partly because their involvement with local firms remains very limited. They are not an important source of demand for local ICT producers, and, for reasons discussed in chapter 5, they have little information about them. Most domestic companies have responded to the lack of demand by MNCs for highly specialised products by developing an array of diverse, non-specialised software applications to be sold mostly to national and regional (Central American) clients.

Local firms have not managed to structure the sort of fragmented production system that favours vertical collaboration. The majority of firms produce general business

applications, such as accounting software, and have a diversified product range. Only a few firms, the biggest exporters, have developed highly specialised products that can be bundled with other products, and thus offer the possibility of collaborating with distributors and clients outside of the cluster (for a discussion of collaborations between Costa Rican ICT producers and actors located outside of the cluster, see chapter 6). The lack of specialisation of domestic producers reduces incentives to collaborate. Costa Rican ICT companies tend to be, in the words of Camtic's Director, "not compatible but rather rival on several levels"[9] What explains the pattern of specialisation of Costa Rica's ICT producers?

All Central American markets, including Costa Rica, are small but relatively protected from international competition. The complex regulatory structures that characterise Central American countries create barriers to entry. For general business applications like accounting or pension software, the overall size of such markets does not justify the necessary investment to adjust technologies to local laws. [10] As discussed in chapter 5, MNCs tend to either form collaborations with local firms to adapt their products, or to let local firms exploit domestic markets. This context of limited competition from abroad creates incentives for Costa Rican firms to sell in their home market and export in Central America, rather than focusing on the US. An estimated 60% of Costa Rican ICT sales target the domestic market, whilst about 50% of the exports go to other Central American countries. This diverges strongly from the behaviour of Israeli and Indian firms, which, despite operating in far larger markets than Costa Rica, have a much higher export orientation (Athreye, 2005; Teubal, 2002).

Central American markets, although regulated by different laws, share some of the characteristics of the Costa Rican market, such as being dominated by few business conglomerates that offer remunerative contracts for ICT business applications.[11] The vast majority of Central American software firms are Costa Rican[12]. As a result, Costa Rican

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[9] Interview: A. Mora, Director of Camtic, 28 January 2005.
[10] Interview: MNC subsidiary Director, 15 February 2005. Name withheld.
[11] Interview: CEO of a local firm, 8 August 2005. Name withheld.
[12] The definition of Central America used in this study is that provided by the EU, which excludes Mexico and Belize. It includes Costa Rica, Honduras, Nicaragua, Guatemala, El Salvador and Panama.

software developers compete for a relatively small number of large clients both at home and in their main export markets.

Inward orientation in small, non-sophisticated ICT markets means that most firms develop similar products, competing not only for the same clients, but also in the same product areas. Their low specialisation also limits the potential for vertical collaborations, and it makes most of their products unsuitable for exports to sophisticated markets, such as the US. These factors entail that there is a strong inter-firm rivalry between Costa Rican ICT producers, who, wary of losing strategic information to their competitors, prefer to avoid LLCs. Collaborating with other domestic firms is seen as dangerous because it can facilitate the theft of information about clients, products and technology. Summarising the discussion, the institutions that characterise and regulate Central American ICT markets generate incentives for Costa Rican firms to avoid collaborating with each other. Costa Rican government policies also seem to influence incentives to collaborate.

The Costa Rican government actively supports the domestic ICT sector by providing demand for software. Costa Rican ICT producers sell more than a quarter of their total sales to clients in the public sector, ranging from state agencies, such as municipalities and ministries, to state-owned firms, such as the National Insurance Institute, also one of the largest companies in Central America. The problem is that the number of large, remunerative contracts is limited. Competition to gain such contracts is high, and is generally limited to local firms because of information failure and a non-explicit preference of government bodies for Costa Rican providers. This factor contributes to increasing domestic rivalries.

There are also signs of irregularities and corrupt practices. Several entrepreneurs complain that, in certain cases, the same firm always wins a contract with a given public agency, or that information about contracts often is not disclosed appropriately. Some entrepreneurs provided anecdotal accounts of public agencies publishing or changing information about contracts one day before the deadline, which often results in only one firm being able to compete. One entrepreneur stated that some of his colleagues know in advance whether there will be rival firms in a bid for a public sector contract, which determines the nature of their offer. If there are rivals, they offer a competitive price for their services. If they are the only competitor, they offer a non-competitive price, or

include clauses in the contract which tie the contractor to further service purchases.[13] The entrepreneurs who told these stories referred to specific cases of domestic firms that won public contracts by being the only competitor, and that obtained particularly advantageous contractual conditions.

The accounts provided may not be sufficient to claim that there are corrupt contractual practices. Nonetheless, they suggest that there is a certain degree of information asymmetry regarding public contracts. Most producers agree that information on public contracts can be difficult to access, and can be affected by bureaucratic distortions, such as last minute changes or hidden clauses. The different accounts of sales to the Costa Rican public sector provided by exporters and non-exporters corroborate the argument.

Two of the top 15 Costa Rican ICT producers, which currently export 100% of their sales, most of them outside of Central America, claim that they stopped bidding for public contracts in Costa Rica because it was more costly than competing in the US. Both of them attempted to win contracts with state agencies for several years. Changes in product specifications, appeals against them by competitors and bureaucratic inefficiencies caused them monetary losses, creating an incentive to stop competing in the domestic market.

A contrary account is provided by other two of the top 15 firms, which sell mainly in Costa Rica. Some of their larger clients are public. Their average yearly sales are very similar to those of the two exporters. The only complaint they have about the public sector is that it does not offer explicit privileges for domestic producers. From their perspective, public agencies are honest, remunerative clients and should provide more contracts. Given that they sell most of their software to public sector clients, it was expected that these firms would not voice complaints about the transparency and regularity of contracts.

The Costa Rican market appears to be distorted by information asymmetries and possibly by unfair practices in the remunerative public contracts, which absorb about half of the domestic sales. How do local firms access information about these contracts? And how does operating in a closed community affect their behaviour? The next section

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[13] Interview: CEO of a local firm, 26 January 2007. Name withheld.

discusses how social ties and community structure affect information circulation and incentives to collaborate in the Costa Rican ICT cluster.

## 3.5 Social closure, information and incentives

The cases of collaboration analysed in other chapters, such as investors-local firms collaborations (ILCs), involved the interaction of actors belonging to different, often divided communities. In the case of ILCs, lack of social linkages between the investors and local producers' communities have created obstacles in the circulation of information and the coordination of actions necessary to form productive collaborations (for a detailed discussion, see chapter 2). This chapter looks at collaborations that involve actors belonging to the same community. The CEOs and founders of Costa Rican ICT firms are what social network analysis defines as 'homophili actors' – actors with similar characteristics (Wasserman and Faust, 1994). They belong to the same, self-identified community. Most of them know each other and interact often. Nonetheless, they are hostile to collaborations. Let us discuss why.

**Table 3.3 The CEOs and founders of Costa Rican ICT companies**

| Profile | Number of CEOs |
|---|---|
| Male | 97/100 |
| Costa Rican | 99/100 |
| Studied electronic engineering or informatics in Costa Rica | 85/100 |

Source: Author's elaboration based on interviews

As shown in Table 3.3, most Costa Rican ICT firms are lead by actors with similar ethnographic characteristics: Costa Rican males who studied engineering or informatics in one of the local universities. Most immigrants work for MNCs. Few work in middle management positions in local ICT firms, and only one immigrant has founded an ICT firm in Costa Rica. Women tend to work in lower organisational levels, such as in administrative and clerical jobs. Only one firm was founded by a woman, and only six women have been interviewed as part of the leading management personnel of local ICT firms.

Not only do actors share similar characteristics; they also feel that they are part of the same community. They often refer to themselves as "us", when talking about ICT producers. When asked about the actions or strategies of their firms, they often answer in the plural, as if talking about the whole community. For instance, promoting Costa Rica as an ICT-producing location is perceived not only as a means to benefit their businesses, but also as a factor of which to be proud of. Paraphrasing a concept that emerged in several conversations, ICT producers are proud of being the protagonists in what they perceive as their country's change from a rural to a knowledge intensive society. In 2005, about 90% of the producers were members of the same business association (Camtic), which is the key actor in promoting Costa Rica's ICT-related image abroad.

The local ICT producers' community is closed in Coleman's terms; most of the entrepreneurs who founded a firm before the year 2001 know each other and are engaged in frequent social interactions (Coleman, 1988; 1990). The representatives of the twenty oldest firms even claim to be able to name all of the firms operating in the cluster, save for those founded in the last two years. They meet and socialise during the events organised by Camtic and in other instances, too. When asked to indicate the people whom they would call if they wanted to ask for technical or business advice, the majority of the interviewees pointed out colleagues and rivals from within the cluster. How do these features affect incentives to collaborate?

Costa Rican producers rely on their social ties to acquire filtered information. However, many of them also make a different use of ties. They invest in social ties that can help them gain remunerative public contracts by providing them with information which is not available to their rivals, which happen to be other Costa Rican ICT producers. As Gambetta argued in his study of trust and the mafia (Gambetta, 1988: 213-237, 154-175), the value of this type of social tie is that they are 'exclusive'. If they become public, if every firm gains access to the same information, the investment made in these ties becomes worthless. Several producers pointed out that information about public and also some private contracts in regional markets is not readily available. It emerged clearly that in many instances, "knowing the right people" was more of a determining factor in winning a contract than having a better or cheaper product.

In a closed community where everyone knows each other, information travels fast, and thus the risk of losing control over 'exclusive ties' and the information they carry is high. Costa Rican producers do not collaborate so that they minimise the probability of suffering from information leakage, whether intentional or unintentional.

The CEOs meet and talk, but make sure that they keep their organisations distant enough to protect their 'exclusive ties' and the competitive advantage that they may confer to them. The rules of the game in the local market, namely large public contracts, information failure and limited competition, generate incentives to acquire and use social ties with informants and potential clients in ways that not only diffuse uncompetitive practices, but also halt the emergence of productive collaborations.

Unlike strategic information about contracts, general information about markets circulates fast within the closed community. Despite a high level of rivalry, most firms consider the domestic market more remunerative than foreign markets. Smaller firms follow the example of larger domestic firms, which, by selling to the public sector, have generated high profits for their owners. Community closure and a dense network of social ties facilitate the diffusion of information that generates incentives to develop products for domestic markets and to target the same clients. Thus, in the Costa Rican ICT cluster, community closure hinders the diffusion of productive collaborations.

Only a very few local firms, exporters, hold different views, and maintain that the views of most local entrepreneurs are affected by a lack of knowledge about foreign markets. They export because they have social ties to actors operating in other clusters, who provide them with information about export markets. This information translates into incentives for targeting foreign clients, and reduces incentives for not collaborating with other local firms. This finding complies with Granovetter's explanation of how information circulates in closed communities (Granovetter, 1973). Redundant information circulates fast. But non-redundant information, such as information about opportunities to export, often does not reach the closed community, unless introduced via social ties to external actors.

The entrepreneurs who export do so because they have seen and heard of practical opportunities to do so. Non-exporters do not sell abroad because they have heard that it is difficult to do so, and also that it is remunerative to sell in the home market. None of them

seemed to act on the basis of what they have read in Forbes, The Economist, the MIT Technology Review, or other public sources of information. The study of local producers in the Costa Rican ICT cluster illustrates that information transmitted via social ties is promptly transformed by its recipients into behavioural incentives, even if it is redundant. Information that is accessed via non-socialised means does not directly generate incentives, as it is considered to be unfiltered, and thus likely to be irrelevant and to entail high costs of processing and selecting before becoming applicable.

Social closure generates counter incentives to collaborate, not only by limiting access to non-redundant information. The fact that most entrepreneurs know each other, and operate in a small, closed social circle, also transforms commercial into interpersonal rivalry. The vast majority of Costa Rican ICT entrepreneurs consider their companies to be their own life projects, not just business ventures. They measure social status by looking at the success of their enterprise in comparison to the firms of their competitors. During fieldwork, interviewees frequently provided negative comments about their colleagues, which shows that in a closed community, inter-firm rivalry often evolves into, and is reinforced by, inter-personal rivalry.[14]

The business association Camtic does not provide direct incentives for firms to collaborate. Most of the managers who were interviewed hold a positive attitude towards Camtic's work, but feel no pressure to contribute more than the annual quota. Rivalry and disagreement among some of the most influential and successful domestic firms have also affected Camtic. When Camtic changed its policy and opened membership to MNCs, some members left the board of directors, and adopted an inimical stance towards Camtic, diffusing negative accounts about it. They lead firms that do not export, and identify themselves with Camtic's initial agenda, focused on lobbying the domestic government for protection and contracts. The new agenda of Camtic is geared to market its image abroad and also promote linkages with MNCs, whilst reducing the distortions that affect public contracts in the domestic market.[15]

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[14] For example - Interviews: CEO of a local firm, 2 August 2006; Founder of a local firm, 10 October 2005; CEO of a local firm 23 January 2006. Names withheld.
[15] Interview: A. Mora, Director of Camtic, 28 January 2005

Given its limited resources, Camtic has financed training and certifications for a small number of firms, igniting jealous reactions from others who have not so far received any direct benefit. Limited resources also imply that there are limited incentives for members to support Camtic and promote their own collaborations through it. The majority of firms claim that, although they recognise the utility of Camtic's work, they are not willing to dedicate resources to collective action. Others do not want to participate because of their rivalry with some of the board members. Camtic's Directors, CEOs of large domestic firms, affirm that they support the business association because it is their moral duty to promote the national ICT industry. They claim that directing Camtic has not provided them with any benefits, but that it has a high cost in terms of the time it subtracts from their managerial roles.[16] All of the Directors meet regularly and take part in joint discussions. However, there is no collaboration between their firms beyond the encompassing collective actions organised by Camtic, such as technology fairs. This suggests that Camtic has not promoted or institutionalised collaborations between its members. Yet, four exporters have created several LLCs, structured into three different subtypes. Let us discuss their motivations for doing so, and the functioning and impact of their LLCs.

## 3.6 Four exporters, three subtypes of LLCs

In the Costa Rican ICT cluster, there have been 30 productive collaborations involving local firms, some of which have ceased to exist. All of them have been structured by four large exporters. They will be discussed by focusing on the networks of LLCs created by each of the four large firms, questioning why they have established different subtypes of LLCs. The developmental effects of LLCs will be discussed by looking at how the collaborations affect firm-level capabilities for both of the parties involved: the large exporting firms and their smaller collaborators.

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[16] Interview: A. Mora, Director of Camtic, 28 January 2005, 12 April 2006; Collective interview: Board of Directors of Camtic, 20 October 2005.

### 3.6.1 Syme

The first case of collaboration found revolves around Syme, a firm founded in 1991 by a Nicaraguan entrepreneur. The firm has established a network of bilateral productive collaborations with ten smaller enterprises to which it subcontracts specific services, including the development of new technologies – LLCs I. In this subtype of LLCs the leading firm uses its smaller partners to increase its capacity in times of high demand. The smaller firms are dependent on their leader for growth, because it absorbs most of their sales. They benefit from using Syme's brand, from access to some of Syme's clients and from the income that Syme generates for them. Syme also provides them with free technology and market advice. Their dependence on Syme is related to their capacity to find different clients and grow independently of it. According to its CEO, Syme's aim is to develop not only a network of firms to which it can outsource services when demand rises, but also with whom it can share clients and technologies. However, the captive governance structure of LLCs I entails that Syme's partners are free to find other clients as far as Syme is willing to let them do so. Because of its market power over its suppliers, Syme can determine their fortunes and shape their strategic decisions. Should Syme cancel some of its contracts at short notice, some of its subcontractors could go bankrupt. This underlines that LLCs I, like all collaborations with a captive governance structure, may have more beneficial effects for leaders than for smaller partners.

Syme has also created one LLC II – a bilateral collaboration with a spin-off founded by one of Syme's employees. They share infrastructure, carry out joint R&D, and Syme lets its employee work in both firms simultaneously. Syme offered an advanced purchase guarantee, so that the spin-off did not have to dedicate resources to finding clients, or to become indebted until the product was ready. In exchange, the spin-off offered to share the technology it developed with Syme exclusively, acting de facto as an external provider of R&D. As a result, the spin-off, which is a firm with only two employees (who are also the owners and founders), can compensate for its resource constraints. Thanks to its productive collaboration with Syme, the spin-off can accelerate its product development and save on initial costs, including infrastructure and marketing.

Through its LLC II, Syme has benefited from gaining access to the knowledge developed by an independent source of R&D. In this case, too, there is an element of transactional dependence, as the spin-off has committed to selling its technology exclusively to Syme as the first client, as part of its collaborative agreement. However, unlike in LLCs I, Syme has incentives to limit the extent to which its spin-off is transactionally dependent. If it develops a successful product, Syme stated to have an interest in purchasing part of its spin-off. The idea is to make it an independent, partially owned, provider of ICT products that complement Syme's product range.

Why did Syme's founder establish the above-mentioned collaborations? Why wasn't he affected by the incentives to avoid collaborating, which stem from the Costa Rican ICT cluster? Is this outcome related to the fact that Syme's founder is a foreigner? The founder and CEO of Syme is not 'homophilus' with the rest of the entrepreneurs in the community (Wasserman and Faust, 1994). He is an immigrant who worked and lived in several other locations and did not study ICT in Costa Rica. He identifies himself as being part of the community of Costa Rican ICT producers. Nonetheless, because of his international experience, he is endowed with different social ties, including several ties to actors who operate in other countries and sectors.

His social ties have affected the incentives to which he is exposed, determining his decisions regarding productive collaborations. Firstly, through his social ties, he had a better exposure to foreign markets. Such exposure created incentives to export rather than to target the Costa Rican market. Secondly, he did not have the type of 'exclusive social ties' with government officials or large domestic businesses which could have ensured remunerative domestic contracts (for a further discussion of 'exclusive social ties', see Gambetta, 1988: 213-238). In his words, he felt that he did not know the "right people" to gain big contracts in Costa Rica. Instead of building such relations, he decided to target foreign markets from the start. Thus, he invested in different ties, ties with actors located abroad.

He recalled that since the beginning of his career, he had searched for information about potential clients by investing in his international ties – contacts with classmates and work colleagues, sometimes maintained only through a phone call for Christmas. These contacts provided him with access to market information not available in the community

of Costa Rican ICT producers. The information that he acquired through his contacts generated incentives to export. The first sale of his firm was to a foreign client, and signed a path of accelerated internationalisation that led Syme to reach over fifteen countries and become the local producer with the most geographically diversified client portfolio. Not having invested in 'exclusive social ties' in the domestic market, he is not concerned that the domestic entrepreneurs with whom he is collaborating will attempt to "steal" his contacts.

This case illustrates how social ties, communities and actors' social embeddedness affect the formation of collaborations. For Syme's CEO, who operates in a closed community, having external ties provided incentives and resources to export, not directly to form collaborations. However, targeting foreign clients reduced the two major incentives to avoid collaborations that prevail in the cluster: social rivalry and the fear of information leakage.

In order to make sure that the LLCs would work, Syme structured appropriate incentives for its suppliers. Its CEO explains that he 'trusts' his partners simply because it is convenient for them to continue to collaborate, given the advantages that he embodied in the collaboration agreements. If they were to sell their services without collaborating with Syme, they would have to compete with larger firms, establish a brand name and would not have access to Syme's technology and market advice. He emphasised that he has put no constraints on them having other clients, and is actively helping them to diversify. Most importantly, they compete in the domestic market, whilst his firm is mainly an exporter. Thus, they are not direct rivals. The 'trust' he mentions is a calculated trust, a la Farrell and Knight (Farrell, 2005; Farrell and Knight, 2003), based on expectations about how actors respond to incentives, not on culture or values.

The same incentive-based thinking applies to Syme's spin-off. The bilateral collaboration was created when one of Syme's employees had an idea about a new technology and matured the interest to create his own firm. Syme's CEO had an incentive to appropriate the technology that the employee was about to develop. But the employee had no incentives to develop it *for* Syme. His ambition was to be an entrepreneur rather than an employee. Social status, reputation and personal ambitions play an important role in explaining the employee's behavioural incentives. Syme's CEO established the LLC to

find a compromise between his incentives – to appropriate the technology that was being developed by the employee – and those of the employee – to found his own company. Syme's CEO created incentives for the employee to remain in his position and to form his own enterprise as a collaborator of Syme. The founder of the spin-off did not have to abandon his job, so that in case the spin-off project failed, he would not lose his main source of income.

Syme saved on R&D costs and kept exclusive access over the work of one of its employees who would otherwise have left the firm. Syme's CEO 'trusted' his employee to develop a valuable technology without breaching his collaboration agreements because under their agreements it would have not been convenient for him to do so. Similarly, the employee 'trusted' Syme not to appropriate illicitly its technology, because it was Syme that structured the agreement and invested the most resources in it, and because it was more convenient for Syme to have a long term joint R&D collaboration.

The employee also has access to Syme's technology, thus the risk of intellectual theft goes in both directions. Their mutual 'trust' is based on the set of incentives that their agreement contains. But also on knowledge of each other's capabilities and on the reputation earned working together, on which they base their expectations of what the other party may do. Community closure, culture and values do not seem to have affected the outcome, especially given the fact that Syme's CEO is a foreigner and his employee is a Costa Rican. Both of them emphasised the convenience of their agreement, rather than the ethical values that their collaboration may contain.

Syme's CEO has taken part in collective actions organised by Camtic, the Chamber of ICT producers. However, despite his involvement, he is still perceived as being an outsider by other local entrepreneurs, both because he is foreign and because he has followed different strategies. Thus, although part of the community, he is not considered to be a direct rival, socially or commercially. A Costa Rican entrepreneur described him as a "tipo especial" – someone who participates in common activities and talks to everyone else, but has his own different agenda and operates in other contexts. Syme's CEO indirectly confirmed this description during an informal conversation about Camtic and the local ICT community. He underlined that often the issues at stake in the community are related to the domestic market, and too affected by interpersonal rivalries to interest

him. He is socially embedded in the local ICT producers' community, but also linked to other communities. His social ties to actors operating under different institutional frameworks expose him to different incentives than those that regulate the behaviour of most entrepreneurs in the ICT cluster. The way in which he is linked to different communities determines how he accesses information, and thus his choice to export, and to establish LLCs.

### 3.6.2 Soin

Soin is one of the oldest Costa Rican ICT producers, founded in 1984, and also the only one to have a foreign subsidiary. Soin sells over half of its output through its subsidiary in Mexico. Soin established a network of 8 LLCs I with smaller local firms. It shared with them its brand and its client range. They did not share technology or infrastructure. They carried out only joint marketing. The collaboration started because Soin wanted to increase its capacity in a flexible way, in order to improve its ability to adjust to demand fluctuations. Instead of hiring more programmers, Soin chose to establish a network of allied subcontractors.

Soin managers illustrate that forming LLCs I could provide the firm with some additional capacity in the domestic market whilst it was focusing its investments in the Mexican market. The firms they were collaborating with benefited from being associated with Soin's brand, and from obtaining new clients. However, Soin and its allies did not establish any clear rules for such collaborative agreements. They relied on an implicit understanding that the subcontractors would comply with their contracts. Partly because of this lack of clear incentives, the LLCs I did not work.

The collaborating firms did not satisfy clients, and did not comply with quality requirements. Hence, they threatened Soin's own reputation, because they were acting under a co-branding agreement. Soin had not foreseen this possibility, and thus had not established clear sanctions against it. There were no additional benefits, other than obtaining clients and benefiting from Soin's brand, for subcontracting firms to maintain their alliance. In order to avoid further damages to its reputation, Soin stopped the LLCs after their initial phase. Although Soin planned to carry out more joint actions, such as

R&D, and transform its LLCs I into more developmental LLCs, its collaborators' failure to deliver the expected results stopped the process. The next paragraphs discuss how social ties affected Soin's collaborative choices.

Soin's founders are Costa Rican ICT engineers who have studied abroad. Soin initially focused on the domestic market, targeting a few large private and public sector clients. During the late 1990s, one of the founders obtained information about the possibility of bidding for a contract with the Venezuelan subsidiary of a Mexican MNC through a social tie to a foreigner he had met during his school years. Soin participated and won the contract. The value of such a contract at that time was much smaller than Soin's average domestic sale. However, it opened up access to information about other opportunities and launched Soin onto its path towards internationalisation.

Soin built up its reputation with the Mexican MNC, which assigned contracts to it for more of its subsidiaries and eventually hired it to develop a software application for its headquarters. Finally, it also introduced Soin to other clients, facilitating its expansion in the Mexican market. Because it was focusing on penetrating foreign markets, Soin had incentives to form LLCs I to maintain or expand its domestic market share whilst not diverging resources from exports. Had Soin not exported, it would not have had incentives to collaborate with other domestic firms.

The founders chose their LLC I collaborators from amongst a group of friends and colleagues. However, the initial trust they had in their partners, based on pre-existing social ties, was easily broken when their expectations were not fulfilled. As a result, Soin's management calculated that the potential losses for collaborating were higher than the benefits and terminated the collaborative network. Soin's case shows that what Schmitz calls 'inherited trust' – trust not accumulated via joint work but related to kinship, friendship or other social relations – disappears easily if one of the partners does not fulfil the other's expectations (Schmitz, 1999b). In other words, if collaboration ceases to be mutually convenient and the expected behaviour does not materialise, actors exit their agreements. This outcome, which is not dissimilar from the findings of Nadvi and Schmitz, underlines the rational nature of collaborations (Nadvi, 1999; Schmitz, 1999b).

Adopting Schmitz's terminology, it could be argued that LLCs I are sustained by 'earned trust' – gradually accumulated reputation that lets partners expect specific

behavioural outcomes and reciprocity (Schmitz, 1999b). Soin's collaborators did not manage to build up and maintain a good reputation, thus Soin's CEO, despite having pre-existing social links and inherited trust, lost incentives to collaborate. On the contrary, Soin proved to be a reliable partner for the Mexican MNC, so that the latter transformed their relation from an arm's-length buyer-supplier contract to a cross-border productive collaboration with positive developmental effects, discussed in chapter 6.

Soin's founders were amongst the most active members of the local ICT entrepreneurs' community when it obtained funding by the Inter-American Development Bank to create Caprosoft, later renamed Camtic. However, Soin left Caprosoft before it became Camtic, due to personal incompatibility between its management and some of the founders of the chamber. Commercial rivalry exacerbated personal disagreements over the agenda that Caprosoft should follow, which impeded the deepening of collective initiatives. As a result, Soin withdrew its membership and interrupted communication with most of Camtic's members, cultivating instead its relations with foreign collaborators.

In 2005 it was the only domestic firm which made sales worth more than US$ 20,000 that was not a member of Camtic. The chamber's management has changed since the disagreement, and the members with whom Soin had the strongest disagreements have left the board. As a result, Soin is considering re-establishing contacts with Camtic.

### 3.6.3 Lidersoft

Lidersoft is a firm embedded in a multilateral network of collaborations (a LLC III) with three firms that have similar sales and are also among the top twenty domestic ICT producers. Three of the firms were founded between 1998 and 2002, one was older but was purchased to become part of the LLC III in 2003. One of them was created as an ALC, a university-private sector collaboration, the subject of chapter 4. Two of the fastest growing Costa Rican ICT producers are amongst the four firms of the network.[17]

The firms are embedded in several intertwined collaborations, managed in a modular way at a group level. A group of managers share different positions in the board of

[17] Two firms of the LLC III network entered the top-ten domestic ICT exporters' ranking after only three years of their foundation.

directors of all of the firms, directing them collectively. This ensures that the firms do not compete for the same clients, markets or product niches, but rather pursue coordinated actions. The group benefits from internal collaborations of different types. For example, two of the firms in the network share the same technology and infrastructure. One targets Central American clients, the other North American clients. They have different brands, and are separate legal and organisational entities. But they provide essentially the same ICT service, the only differences being the language used and the higher data protection standards for North American clients.

This coordinated strategy yields several benefits. The two firms share infrastructure (they are in the same building), technology and the personnel dedicated to R&D. But they also have different brands and market their products in different ways in the two regions. A third firm acts as a supplier for all of the LLC III members, developing specific solutions with them. In exchange they promote it with their own clients and occasionally act as distributors for its services. The last firm, created in 2002, sells its product both independently and bundled with the services of one of its network collaborators. It also uses the distribution and client networks of the other firms. The managers of the four firms meet frequently to discuss how to improve their production processes and maintain complementary technological trajectories.

Operating in a LLC III has allowed the firms to upgrade their products and processes at lower costs, as R&D costs are shared, and specific organisational or technological innovations are quickly diffused. Most importantly, the LLC III has lead to functional upgrading, as each firm acquired a specific modular role. All of the firms have become more specialised and capable of providing a packaged service or product that can be easily combined with those of the collaborating partners. As all of the firms have been successful, the leading firm around which the network was created has lost its role. Strategic decisions are taken at a group level, not from the leading firm.

Behind the formation of this network, there is the leadership of two managers with a finance background – one who founded two of the companies, and the other who leads a venture capital fund that finances the network. The first is a Costa Rican with some international experience, who studied both ICT and finance. The second is a Venezuelan who worked in several venture capital funds and then created one in Costa Rica together

with a local capitalist and other investors. They both worked in the financial sector for a long period before becoming involved in ICT. Thus, their social ties that predate the creation of the network are mainly to actors outside of the ICT producers' community.

At the beginning of their ICT career, both of the founders of the LLC III were socially disembedded with respect to the local ICT community. This strongly influenced their behavioural incentives. Because they came from a different work environment, the "thing to do" – what their social contacts communicated to them as the common successful practice – was different to what local ICT producers would have suggested. Whilst the objective of most Costa Rican ICT entrepreneurs is to transform a technical idea into a commercial enterprise, the initial intent of the LLC III partners was to develop a network of firms that integrate strategies and share clients. They entered the ICT business with a strategy and a set of markets they wanted to exploit, not with a specific technology in mind.

Because of their non-ICT background, the founders of this LLC III have a different sense of "ownership" than most local ICT entrepreneurs. Rather than focusing on firms as showcases of their technical prowess, they consider the whole network of firms as a project. When promoting their firms, they insist on sales and commercial viability of the whole group rather than on the specific technology of one or another of the firms involved in the LLC III.

The Costa Rican entrepreneur, who took a more active role in the LLC III and created three of the member firms, is not concerned about sharing ownership and managerial decisions with his collaborators. This contrasts strongly with the attitude of most entrepreneurs, who tend to be very concerned about maintaining a tight control over their firms, to the point that many do not welcome external investors, as discussed in chapter 2.

The network seems to be managed collectively, without apparent signs of rivalry or jealousy. All of the actors involved have a different profile than the Costa Rican ICT entrepreneurs: one is a foreign venture capitalist, two of them are ex bankers and one is a professor. All of them have a strong international experience. Their incentives came from observation of collaboration in other countries and sectors, which they mention when clarifying why they are involved in a LLC III. They operate in different communities, and

thus introduce into the LLC III information coming from different sources, ranging from scientific information brought by the firm linked to academia, to financial information provided by the venture capitalist.

### 3.6.4 Cenisa

Cenisa, a Costa Rican ICT company established in 1989, is one of the top 15 firms in the cluster in terms of sales, about half of which are exported. Cenisa has established some LLCs II with two firms that 'spun off' from it. Cenisa shares its infrastructure and a few engineers from its workforce with its spin-offs. Cenisa helps its spin-offs to market their products, introducing them to clients and procuring contracts with them. In exchange, they specialise in market niches in which Cenisa does not compete. One of them committed to share the technology it is developing in a property-sharing agreement with Cenisa. The spin-offs benefit from access to resources, including strategic advice. Cenisa promotes relational governance of its LLCs II, letting the spin-offs decide their technological trajectory freely, but making sure there are collaborative R&D efforts, from which it benefits. The LLCs II thus have a developmental impact for both Cenisa and the spin-off firms, fostering product and process upgrading, and the acquisition of new technological and organisational capabilities.

Cenisa is in the process of creating a LLC III network with newly founded, fully-owned firms. They do not qualify as spin-offs because they are so far fully-owned by Cenisa. They have been founded or co-founded by Cenisa's CEO, whilst the two spin-offs have been founded independently by some of Cenisa's employees. The network is so far based, financed and managed from Cenisa. Member firms share clients, brand, infrastructure, management, core technologies and finances. The most important feature is that Cenisa and its four partners structure their strategies in an integrated modular form. As is the case with Lidersoft's LLC III, the products Cenisa's LLC III partners develop, the clients they target and the technologies they adopt are chosen as part of an overall network strategy. This organisational setting allows them to specialise in one niche product that can be combined with those developed by partners so as to obtain varied combinations of products and services. The LLCs III greatly improve access to resources

for all of the firms. The LLC III network is gradually leading the companies involved to upgrade their functions, acquiring direct responsibility for supplying a modular product.

There are a few differences between this LLC III network and Lidersoft's LLC III network. Cenisa's network has been founded as an emanation of Cenisa, the leading firm. Lidersoft's network has been developed without a clear hierarchy between the firms involved. Cenisa's network is still in a developmental phase, as all its partner firms are still start-ups, whilst all of the firms in Lidersoft's network are fully operational. Cenisa's network is more centralised. Although the intended governance structure is modular, in practice the LLCs III still have a captive governance, for Cenisa owns and allocates all of the network's resources.

The potential benefit of Cenisa's multilateral network lies in the high specialisation that each firm is aiming to achieve, which is meant to foster patterns of mutual, vertical and horizontal collaborations, and coordinate their actions in a complementary way. Until all of the firms involved become independent from Cenisa in terms of ownership and management, it will be premature to evaluate the impact of such a collaboration. Nonetheless, it is necessary to question why Cenisa has supported two spin-offs and formed a network of multilateral collaborating firms.

Cenisa's founder and CEO is a Costa Rican ICT engineer, who has studied in Costa Rica and worked in the US. The incentives of Cenisa's founder were to emulate a business model observed in other countries. He explicitly mentioned that he wishes to support the creation of highly specialised firms that could integrate their services and technologies with Cenisa and act as a group of independent collaborating enterprises, as he has seen on several occasions in Silicon Valley. His decision was affected by personal contact with actors who work in networked firms.

Cenisa's CEO is not affected by rivalry or by fear of information theft from the sister companies because he perceives them to be part of his own project. This contrasts with the case of Lidersoft. The founder of Lidersoft also played an important role in creating LLCs III around his firm, but he considers ownership of the project, technologies and strategies to be diffused across the network and among several people. In Cenisa's case collaboration amongst the firms of the LLC III is based on unified ownership.

Cenisa's multilateral network is managed mainly by Cenisa's CEO, and the companies are entirely dependent on Cenisa for all of their resources, ranging from their workforce to their infrastructure and technology. However, there are clear plans for all firms to become self-sustainable independent companies. Cenisa's CEO believes that the modular network's benefits for member firms will escalate through time, as their strategies become more integrated, and their specialisation more defined. This will ensure that the managers of Cenisa's allied firms will continue collaborating once ownership and control become less centralised.

Cenisa's productive collaborations with the two spin-off firms follow a slightly different logic. Cenisa's CEO does not control or own them. He does not fear unfair behaviour, such as intellectual theft, for similar reasons as those observed in the case of Syme's spin-offs: he structured appropriate incentives to ensure that the collaborations would work. For example, two of the founders of the spin-off companies have been allowed to keep their jobs at Cenisa in order to have an income source before their own firms start selling. Cenisa is providing them with free infrastructure, such as offices, and client contacts. Thus, Cenisa's founder 'trusts', or expects, the founders of the spin-off companies to keep collaborating and to behave fairly. Clearly, if the spin-offs fail to be viable enterprises, the collaborations will not work. Cenisa is also providing technology and market advice, in order to ensure that its smaller allies have a smooth start-up process.

In this case, ties to external actors and personal experience in a different working context served as a mechanism to give Cenisa's CEO access to non-redundant information about foreign markets and collaborations. This information led him to create LLCs III as a network of firms specialised in compatible product niches. He adopted several measures to control for unfair behaviour in the LLCs he established. He is combining centralised decision-making, ownership and control over resources with the provision of targeted incentives to make sure that the actors involved sustain the collaborations initiated.

## 3.7 Conclusion

Collaboration between similar actors is considered to be one of the key features of the industrial clusters that have become highly competitive both in the developed and

developing world (see for example Becattini, 1989 and Trigilia, 1985 on the Italian industrial districts; Saxenian, 1994 on Silicon Valley; Schmitz, 2000 on Latin American and South Asian clusters; Visser, 1999 on Peru). In the Costa Rican ICT cluster, the firms that generate the most sales and employment, MNCs, have not structured the sort of highly specialised local production systems that favour the emergence of productive collaborations (for a discussion of MNCs and their relations to local firms, see chapter 5). This aspect is the first obstacle to the emergence of LLCs in the cluster. Besides the strategies of MNCs, there are other factors that have so far limited the extent to which local firms collaborate. Most Costa Rican ICT producers are explicitly hostile to collaborating with their local rivals because community closure circulates information and incentives that make it more profitable for them not to collaborate.

Costa Rican ICT producers are a homogenous community, dominated by white Costa Rican males who have studied ICT in local universities, know each other and interact frequently but have little social linkages to other communities in the cluster or to external actors. They obtain information from talking to one another. The information that circulates in their community suggests to them that it is more convenient to target the same range of Costa Rican clients than to export. As a result, the majority of ICT producers compete in the same domestic market, Costa Rica, and in the same export market, Central America.

Central American markets are partially protected from global competition by their small size, high regulation and fragmentation. They are dominated by a few large clients to which all firms want to sell, and an array of small clients who do not provide very attractive contracts. Information failure affects the functioning of these markets, especially with regards to public sector contracts, such as those of the Costa Rican state agencies, which account for a large share of the sales of domestic producers.

As a result of these aspects of local and regional markets, most Costa Rican ICT companies compete for a limited number of remunerative, occasionally non-transparent, contracts. They develop similar rather than complementary products, which reduces the potential for coordinating their actions and structuring collaborative strategies. Often, they do not specialise in products suited for exports, but in a range of diversified general

business applications for local clients. These factors explain why Costa Rican producers have few incentives to collaborate with each other.

In markets affected by information failure, such as those of Central America, having the right contacts may determine whether a firm wins a remunerative contract. Thus, Costa Rican producers invest in social ties with potential clients that they can leverage to gain advantage over their domestic rivals. Such ties maintain their value only to the extent that they are kept secret and provide access to information not available to competitors. However, Costa Rican ICT producers operate in a closed community where information travels fast. Thus, they try to limit the circumstances in which they could lose 'exclusive' access to the sort of social contacts that they use to win contracts. The CEOs do interact with each other, but prefer to avoid productive collaborations with other local firms, in order to reduce the probabilities that their employees may leak information or defect to competitors. This provides another explanation for the anti-collaboration bias of Costa Rican ICT producers, and illustrates the different uses of social ties that entrepreneurs make to support their firms. The social ties of local producers also affect the formation of LLCs through other mechanisms.

Entrepreneurs who are socially embedded in other communities as well as that of domestic ICT producers are more likely to export. Not competing for the same clients, they are less affected by commercial and inter-personal rivalry, and also less threatened by the theft of information on local contracts – the major incentives against forming collaborations. On the contrary, since they operate in larger markets, they have incentives to specialise and collaborate at the local level in order to compete with foreign rivals, which are often larger and endowed with more resources.

The entrepreneurs' explanations of why they have formed a specific collaboration or why they do not want to collaborate reveal that their choices are determined by a calculated pursuit of self-interest. The entrepreneurs' decisions are a response to the incentives that institutions and social ties deliver to them. When they 'trust' others to collaborate, they do so because they calculate that there are sufficient incentives for them to do so. When they do not want to collaborate, it is because they consider it more remunerative to preserve the ties and information that give them access to large contracts in the domestic market.

The Costa Rican case illustrates that a community of similar actors linked by dense social ties does not necessarily lead to collaboration. On the contrary, it shows that, as argued by Burt and Granovetter (Burt, 2004; Granovetter, 1973), community closure limits access to non-redundant information, leading actors to compete for the same contracts and to avoid mutual collaboration. The producers that collaborate are exporters. They sell to different clients than most other Costa Rican firms, which reduces their commercial and inter-personal rivalry with them. They differ from other firms because they are endowed with ties to actors operating in different communities, outside of the cluster, which provide them with access to non-redundant information about export markets and collaborative strategies. As a result, not only do they target different markets, but they also try to form LLCs in order to compete with more resourceful foreign producers.

Another outcome that emerges from the analysis of domestic firms in the Costa Rican ICT cluster is that, whilst collaboration in general may help small firms reduce their resource constraints, different collaborative agreements have different implications for development. For example, in LLCs I smaller partners are transactionally dependent on their LLC I leader, and benefit only from marginal access to additional resources, such as client networks and use of brand. LLCs I have a very limited impact on firm-level capabilities and do not promote any form of upgrading.

On the other hand, collaborations between firms and their spin-offs (LLCs II), and also network collaborations (LLCs III), have a positive developmental impact on all of the actors involved. These collaborations entail the sharing of several key resources, from infrastructure to part of the R&D personnel and some technologies. Spin-off firms can, thanks to their LLCs II, cut their initial costs and reduce the amount of time necessary to launch their products. Supporting firms can access the knowledge and technologies generated by their spin-offs. However, it is LLCs III that have the highest potential for fostering firm-level capabilities: they involve the continuous exchange of information, the sharing of key resources, such as managerial boards and R&D personnel, and joint strategic efforts. One of the two cases of LLCs III also involved an ALC, a private sector-academia collaboration, which is discussed in detail in the next chapter.

# 4 The knowledge of a knowledge-intensive cluster: academia-private sector collaborations

## 4.1 Introduction

Notorious ICT clusters emerged and developed around large, capable technical universities, such as Stanford University and Jerusalem University, which took leading roles in fostering R&D activities and generating new knowledge. ALCs – collaborations involving academic and private sector actors – facilitate the diffusion of academic knowledge and its application to commercial purposes, producing highly competitive innovation systems (Saxenian, 1994; Lee, 2000).

Costa Rica has two large public universities. They educate the workforce that has contributed to attracting investment by MNCs since the 1990s.[1] Costa Rican universities account for a far larger share of R&D expenditure than the Latin American average (Table 4.1). Yet, there are only three ALCs in the ICT cluster, only one of which has been established by an academic institution. All of them helped the firms involved to upgrade their products and improve their capabilities to manage certain technological processes. This chapter explains how the three ALCs emerged, illustrating their developmental effects. It then discusses why universities and firms have not founded more ALCs in the cluster by looking at institutions and at actors' embeddedness in social networks and communities.

In the Costa Rican ICT cluster professors, entrepreneurs and the directors of MNCs belong to divided communities. They do not respond to cluster-level incentives, but to the incentives generated by the institutions that regulate their respective communities, such as the customary rules of local academics, which do not lead them to establish ALCs. Lack of communication between the two communities causes coordination failures: the research

[1] For MNCs, the quality of Costa Rican engineers and workforce was one of the key the reasons for investing in the country (see chapter 5).

activities of academia and the private sector are carried out independently, and in a non-compatible manner. Actors who have been exposed to the advantages of ALCs in other locations are willing to emulate the experience in Costa Rica. However, social sanctions punish actors who follow this path, such as the professor who created a spin-off near his university expecting it to develop into an ALC.

This chapter provides evidence of the information and coordination failures that halt the formation of ALCs in the Costa Rican ICT cluster, which are enhanced by community divisions and the non-collaborative customs of universities. It also suggests that the retreat of the state from its roles in technology policy has left a void that neither firms nor universities are willing to fill. Because of the lack of appropriate institutional incentives and clear rules for ALCs, all of the actors involved in research activities operate independently, failing to constitute an innovation system that supports the cluster and complements Costa Rican development policies.

The chapter is structured as follows. In the first section it presents the results. In the second section it briefly outlines the literature on ALCs. In the third section it describes the formation and impact of the three ALCs found in the cluster. In the subsequent sections it questions the behavioural determinants of local entrepreneurs, professors and managers of MNCs, highlighting the interplay between institutions and social ties in generating incentives to establish ALCs.

## 4.2 Universities and the private sector in the Costa Rican innovation system

Costa Rica benefits from some of the highest educational standards in Latin America.[2] It has three large universities with ICT faculties: the University of Costa Rica (UCR), the Cartago Technology Institute (TEC) and the Latina University (ULatina). The first two are public, the third is private. They are located in the three main cities of the Central Valley, which are also the key axes of the ICT cluster: San José, Cartago and

[2] According to the UNDP Human Development Report of 2006, among Latin American countries, only Argentina, Chile and Uruguay rank higher than Costa Rica on the Education Index, which combines literacy rates and the gross enrolment ratio for primary, secondary and tertiary schools. http://hdr.undp.org/hdr2006/statistics/indicators/

Heredia.[3] Only the Universidad Central de Costa Rica (UCR) and the Instituto Tecnológico de Cartago (TEC), the two public universities, have research facilities. ULatina and other private universities and ICT centres offer degrees and professional courses, but do not perform research activities.

Costa Rica increased its investments in R&D between the year 1999 and the year 2004. However, R&D expenditure, both per capita and as a percentage of GDP, is still below the Latin American average, and lower than in countries with a similar income per capita, such as Argentina, Brazil, Chile and Mexico (Micit, 2006). According to the World Bank, Costa Rica's efforts in R&D may be lower than those of its neighbours, but their output is satisfactory. The World Bank Costa Rica Economic Memorandum of 2006 benchmarks the number of patents registered at the US Patent and Trademark Office with GDP levels and values of exports to the US, concluding that: "Given Costa Rica's economic size, there is no clear evidence that it is underperforming in terms of patents registered in the United States" (The World Bank, 2006a: 133). The most notable feature of R&D activities in Costa Rica is that, contrary to what happens in most Latin American countries, a very high percentage of R&D is carried out by universities, whilst the government invests very little in R&D (see Table 4.1).

**Table 4.1 Costa Rica's expenditure in R&D**

Given that they contribute to the highest share of R&D expenditure of Costa Rica, it would be plausible to expect that universities play a leading role in local innovation systems, for example by structuring collaborative relations with the private sector, as observed in other clusters. However, this is not the case. In Costa Rica, universities do not lead ALCs (see Table 4.2), and in certain cases they actively discourage them. Local producers also fail to approach local universities to form ALCs. Both the academic and private sectors blame the government for the scarcity of ALCs, despite the fact that the public sector accounted for only 17% of R&D expenditure in 2004.

**Table 4.2 Actors involved in R&D and ALCs**

| Organisation | Number |
|---|---|
| Research universities | 2 |
| Local firms | 151 |
| MNCs | 25 |
| Occasional hiring of academic experts | 6 |
| ALCs: Spin-outs supported by academic institution | 1 |
| ALCs: Spin-outs not supported by academic institution | 2 |

Source: Author' elaboration

Table 4.2 shows that in the Costa Rican ICT cluster there are three ALCs and six cases in which private firms hired academic experts.[5] The three ALCs are spin-outs, one of which has been supported by the Technological Institute of Cartago, and two that occurred without being promoted by any academic institution.[6] The next section discusses how the different streams of literature on innovation and technology could explain why universities

[5] ALCs are productive collaborations between local firms and either academics or academic institutions that are conceived as long-running partnerships, as opposed to the occasional hiring of academic experts to solve a specific problem.

[6] University-private sector linkages include collaborations where firms finance universities for philanthropic reasons, to improve their social corporate responsibility score, or to ensure that they prepare an adequate workforce for their needs. In these types of collaborations, the private sector gains by improving their image in society, not by accessing the research carried out by universities. Universities gain resources, but they do not share resources with firms, nor do they carry out joint actions with them. The aim of these collaborations is not to generate commercially applicable technologies. As such, they are not ALCs, and do not comply with the definition of productive collaboration outlined in chapter 1.

and most firms are not involved in ALCs in the Costa Rican cluster, and also account for the emergence of the ALCs found in such a context.

## 4.3 Universities and the promotion of ICT clusters

There is a vast body of literature that discusses how commercial and non-commercial research activities contribute to innovation, technological learning, and, as a consequence, economic performance. Until the 1980s, the so-called 'linear view of technological learning' prevailed (Arrow, 1962). In this view, knowledge was conceived to be clearly divided between basic scientific knowledge, generated by academic institutions, and applied knowledge, generated by the private sector through the absorption of the first type. For this literature, innovation was a linear process, where the scientific knowledge developed in academic institutions was passed onto the private sector almost automatically, leading to technological progress. The implication of this paradigm is that if the academic sector invests more in R&D, the knowledge generated will eventually foster innovation and technological change in the private sector.

The 'linear view of technological learning' has been challenged by scholars of innovation and knowledge, who point out that the transformation of scientific knowledge into technological innovation tends to occur through cross-feedbacks between different actors (See for example, Lundvall, 2006; Nonaka, 1994; Antonelli, 2002). Adapting the research carried out by universities to commercial uses is not an easy process. As Lee and Gartner note: "Even where academic research is conducted with applications in mind it still represents the very early stage of technological innovation, requiring many years of focused applied research and large sums of R&D" (Lee and Gaertner, 1997: 111). Cross-organisational interactions between academic and private sector actors facilitate the diffusion and adaptation of knowledge to commercial purposes.

Empirical evidence about Silicon Valley, the Israeli ICT cluster and other knowledge-intensive agglomerations corroborates the idea that innovation has systemic features, and it does not occur through automatic linear processes (Görg and Ruane, 2000; Lall, 2001, 1999; Contractor and Kundu, 2004; Pack, 2001; Kishimoto, 2003; Wade, 2004). Therefore, in order to study innovation in a given industry or cluster, it is necessary

to look beyond data on R&D expenditures and to verify to what extent the actors involved in innovative activities collaborate; in other words, to analyse whether there are ALCs, how they emerge, and how they affect the development of firm-level capabilities of the local private sector.

ALCs are productive collaborations that favour the flow of knowledge across the organisational barriers of firms and academic institutions. The most common ALCs are firms that spin out from university departments, founded by professors, students and researchers. Some universities actively promote spin-outs; others do not take part in the phenomenon. There can be many other forms of ALCs, such as joint university-private sector research projects, or the hiring of academic experts by commercial enterprises.

ALCs promote the exchange of different types of knowledge, including tacit knowledge, through face-to-face interactions between researchers from both firms and universities. They involve resource-sharing and joint actions, and thus are analysed in this study as one of the types of productive collaborations that actors create in industrial clusters. The main actors involved in ALCs – academic and private sector organisations – are regulated by different institutions. Hence, they respond to different incentives (Bercovitz and Feldman, 2003). The universities' mission is to generate scientific knowledge and to diffuse it, both in order to serve a societal purpose and to gain reputation (Lundvall, 1992). Firms deliberately limit the diffusion of their organisational knowledge, so that they can avoid appropriation by their rivals. By doing so, they seek to recover their R&D costs through monopolistic rents. Both private sector and academic organisations carry out R&D activities. However, they follow opposing aims: the private sector aims to restrict access to the knowledge it develops, whilst academia aims to maximise access to it.

The literature points out that the divergence of their missions, reflected in the institutions that regulate them, can lead universities and firms to not collaborate (Adams, Chiang and Starkey, 2001; Bercovitz and Feldman, 2003; Siegel, Thursby J., Thursby M., and Ziedonis, 2001). However, there are also incentives to form ALCs. Universities have incentives to obtain funding and to share the applied knowledge of corporations. Firms have incentives to access scientific knowledge and the expertise of academic researchers. When and if actors manage to define a set of rules regulating the joint research activities

they will carry out, universities, firms and the overall business environment where they operate benefit from ALCs, as demonstrated by the case of Stanford University (Castilla, Hokyu and Granovetter, 2000: 229)

From a new institutional economics perspective, ALCs occur when clear rules – institutions – define rewards for research collaborations and sanctions for intellectual theft. For example, several authors point out that intellectual property rights regimes are determinants of university-industry collaborations because they set the rules of the ALCs game (Adams, Chiang and Starkey, 2001; Siegel, Thursby J., Thursby M., and Ziedonis, 2001). It could be that in Costa Rica, the majority of firms do not wish to collaborate with the academic sector because they perceive the intellectual property rights (IPRs) protection to be unsatisfactory. Firms and universities were asked to comment on IPRs. As discussed at length in the next sections of this chapter, both pointed out that IPRs are just one of the many factors that halt the emergence of ALCs in the Costa Rican ICT cluster.

Scholars of new industrial policy and innovation systems stress that the public sector directly influences the R&D not only of universities, but also of local and multinational firms (see for example Cimoli, 2000; Edquist, 1997; Freeman, 1995; Lall, 2001; Lundvall, 1992; 2006; Katz, 2004; Nelson, 2004; Wade and Kang, 1995). These authors underline that the state can play different roles. It can stimulate demand for research by providing defence contracts to ICT firms, a 'demand-pull' function. Or, it can directly finance universities and R&D projects, a 'science-push' function. The state can also promote the formation of ALCs by providing specific incentives to collaborate for firms, universities and other actors, and by coordinating their R&D activities. Evidence from the Asian Tigers, for example the growth of the Taiwanese ICT cluster, shows that ALCs supported or coordinated by the state accelerated the build-up of local technological capabilities and the competitiveness of domestic producers (Lee and Tunzelmann, 2005; Wade, 2004).

During the import substitution industrialisation period (ISI), the Costa Rican state articulated ALCs through its state-owned enterprises, which collaborated with universities. The public sector still has a key role in the economy, as it keeps control of the electricity and telecommunication markets through a fully-owned monopoly – ICE. However, after the development model switched from ISI to an FDI-driven strategy, the state has retreated from some of its functions, such as that of coordinating ALCs. Universities have become

the key actors involved in research activities. This chapter will discuss how the change in public policies may have affected universities' and firms' attitude towards ALCs.

Most of the literature on ALCs focuses on policies, such as technology and science policies, and institutions, such as IPR regimes. These theoretical frameworks illustrate the broad evolution of innovation systems, and within them also that of ALCs. But they often fail to look at the role played by individual actors. ALCs, such as spin-out firms founded by academics, involve the interaction of social actors-scientists and researchers on the one hand, and businessmen and public sector officers on the other. These actors do not operate in a social void. They are embedded in different social networks and communities, which, as shown by the findings, affect their behavioural choices with regards to ALCs. It is thus necessary to analyse not only institutions and policies, but also the social context in which ALCs occur.

Some of the scholars of ICT clusters have emphasised the role of individuals and their social ties in promoting the formation not only of ALCs, but also of other forms of collaboration. For example, Gillmor highlights the importance of Fred Terman, head of Stanford's engineering department, in creating the first and one of the most famous ALCs. In 1939 he founded HP, a spin-out company, to provide employment and contracts for both the students and faculty. The group of engineers who worked simultaneously at Stanford and at HP constituted a precedent, established a new custom and diffused incentives to be engaged in ALCs. The informal institutions of the university evolved so that the custom is currently recognised to be that of creating private corporations from university labs, and for actors to move frequently across the academic-private sector organisational borders (Gillmor, 2004).

Breznitz tells a similar story about the diffusion in Israel of collaborations involving MNCs, local firms and universities, which he traces back to the decision of Dov Frohman, a senior Intel researcher, to accept an academic position in the Hebrew University of Jerusalem. Not willing to lose its researcher, Intel created a small ad hoc R&D lab in Israel, and it let Dov Frohman work simultaneously at the university and at the corporate lab (Breznitz, 2003). Frohman's actions created a precedent, stimulating a change in both the customary rules of universities and MNCs' decision to invest in R&D in Israel. The story illustrates that in order to fully understand ALCs, it is useful to look not only at the

big picture, such as policies and country-level institutions, but also at the incentives that determine actors' behaviour, and the way in which they are diffused and filtered by their social ties.

In the Israeli case, the institutions of universities did not create obstacles for academics in working with the private sector. In the case of Silicon Valley, they adapted to the circumstances and began promoting ALCs. Presumably, there were clear rules to protect Intel's intellectual property rights. And it is well known that in Israel there are specific policies and institutional frameworks to promote productive collaborations involving state agencies, universities and private companies (Teubal, 2002; Khavul, 2005). However, had Frohman not moved back to Israel as an academic, perhaps the MNCs' investments in R&D facilities linked with universities would have occurred later, or would have encountered more obstacles.

Sturgeon (Sturgeon, 2000: 20) underlines that the very foundation of Silicon Valley is related to several key companies created by the university, and also to the movements of a group of ICT professionals across firms, venture capital funds, academic departments and consultancies. Gibbons (Gibbons, 2000: 201) emphasises that the social links of engineers often determine how and why they move from organisation to organisation, creating communities that cross the borders of firms and faculties. This chapter aims to combine the analysis of the institutional frameworks that regulate the actions of universities and firms with that of social ties and communities to explain the pattern of ALCs found in the Costa Rican ICT cluster.

The next section of the chapter discusses the formation of the three spin-outs found in the Costa Rican cluster, questioning the behavioural incentives of the actors involved, their social embeddedness in local communities and the impact of such ALCs on the firms involved. The hiring of academic experts is discussed throughout the document, as it is part of a broader argument about how academic institutions and the private sector interact.

## 4.4 Three ALCs in a developing country's ICT cluster

The first case of an ALC involves Sicoe, a firm that span out of CEI-TEC (Centro de Incubación de Empresas del Instituto Tecnológico de Costa Rica), the incubator of the

Technological Institute of Cartago (TEC).[7] Sicoe was created by an ICT engineer and a secondary school teacher. Sicoe develops educational software for national public schools at the primary and secondary levels, such as programs that record and compute students' grades. Sicoe won a public bid to obtain start-up support by CEI-TEC. The latter, a sister organisation of the university, hosts about twenty start-ups at any one time, to which it provides targeted benefits and collective goods. The firms that it supports are selected through an open competition, and do not have to be formed by TEC students or personnel.

Sicoe's founders launched their product and obtained their first sale in 2005. Because of their first-hand knowledge of the market needs of the Costa Rican educational sector, they are confident that their sales will grow exponentially in the following years. Being incubated by TEC, they had access to the following benefits: training in business plans and software quality, free use of office space, discounted utilities' fees and occasional free advice sessions. The founders admit that without their interaction with TEC, they may not have been able to start the firm. Not only would they have lacked the necessary funds to cover all of their expenses, but they also may have had trouble in fine-tuning their product and adjusting it to the quality standards that the market requires.

This collaboration with TEC's incubator had a positive impact on Sicoe's product and process upgrading. It shortened the time Sicoe needed to develop its first software application and improve the quality of its program before launching it. Sicoe's accumulation of organisational capabilities benefited from access to targeted training and expert advice in areas such as quality control. However, there is no inter-organisational relation between Sicoe and the ICT faculties of TEC. Sicoe only interacts with TEC's incubator, a different organisation from TEC, located miles away from the university and its research facilities.

TEC's incubator was not designed specifically for ICT firms. As such, it does not host a pool of ICT experts in loco. The advice offered to Sicoe by the incubator was mostly in general areas, such as marketing, which do not entail ICT expertise. In some occasions the incubator called consultants from the ICT faculty of TEC and provided

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[7] Information about Sicoe was collected during interviews with the following people: Franklin Lizano and Ana Maria Monge, founders of Sicoe, 24 August 2005; and Juan Carlos Leiva Bonilla, Director of the CEI-TEC (Centro de Incubación de Empresas del Instituto Tecnologico de Costa Rica), 24 August 2005.

Sicoe with ad hoc support sessions. This sort of free technical help was particularly useful for Sicoe, but it did not occur frequently or consistently. Moreover, the sessions were designed as problem-solving support in the use of technologies. They did not entail joint work to develop products, processes or technologies.

Sicoe's access to academic knowledge has been limited both in frequency and scope, because of the rules that specify the sort of support that TEC's incubator is supposed to provide to its firms, and the kind of collaboration it can receive from TEC's faculties and research personnel. Once Sicoe exits the incubator, its contacts with TEC will be interrupted, pre-empting the potential for knowledge exchange with the ICT faculty, unless other collaborative agreements emerge.

Sicoe's founders claim that they would like to have more interactions with TEC professors, and be more exposed to TEC's research activities, especially when they exit the incubator. They state that occasional interaction with academics was essential to finding solutions to the problems they encountered whilst developing their new product. But they also point out that if there were a consistent collaboration with at least one academic expert, they could perform joint work to develop new products and technologies, not just to solve specific problems. The incubator's director lamented the situation, affirming that steps are being taken to create more linkages between the incubated firms and related academic departments.

Sicoe has benefited from its relation with TEC's incubator. However, its core technology and its products have been developed with only temporary and occasional support from TEC. The case highlights that interactions with the academic sector can be an efficient means to support start-ups. It also underlines that the absence of structured long term interactions between research departments and incubated firms limits the extent to which incubation promotes the capabilities of local firms because it circumscribes access to academic knowledge to problem-solving instances. The case is very different from that of Predisoft, a firm founded in 2002 jointly by an academic professor and an ICT.[8]

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[8] Information about Predisoft was collected during the following interviews: Roy Vargas, CEO of Lidersoft, co-founder of Predisoft, 22 March 2005; Oldemar Rodriguez Rojas co-founder of Predisoft, 5 April 2005.

Predisoft applies a mathematical code developed through academic research to different commercial uses. The founders of Predisoft adapted the code for commercial purposes, generating a new process to design credit card security software. All of the products that Predisoft currently offers are software applications based on mathematical codes and models. Predisoft is the only Costa Rican ICT firm that dedicates half of its workforce exclusively to R&D, and that has an explicit image of a science-based enterprise. Despite the fact that its founders define the firm as being strongly anchored in academic research, Predisoft has no formalised inter-organisational agreements with universities; it is not involved in productive collaborations with academia.

The story of Predisoft leaves several questions unanswered. Firstly, given institutional counter incentives, and the suspicion that separates their communities, why and how did the academic and the entrepreneur collaborate in creating such a firm? Secondly, why did the firm, despite its success, not generate formalised research collaboration with the academic sector? Thirdly, has the ALC contributed in any way to making Predisoft different from other firms that do not have any links with academia? Looking at how Predisoft was created provides answers to some of these questions.

In 2001 Roy Vargas, a Costa Rican ICT entrepreneur, read in the newspaper about Oldemar Rodriguez Rojas, a professor who won the national technology prize for inventing a mathematical model. He recalled having a high school friend with the same name as the professor, and considered that perhaps the model could be useful for some sort of software application. Although he hadn't seen his friend for over twenty years, he decided to contact him to verify whether it was the same person. The two met, remembered their times at school, and revived a social tie that had almost ceased to exist. The entrepreneur told to the professor that in 1998 he left his banking job to create a software firm, and by then had already founded a second firm, networked to the first, and obtained financing from a venture capital fund. He also talked to the professor about his invention, and how the latter could be transformed into a commercial software application. The academic found the proposition fascinating, and agreed to co-found a firm dedicated to the development and commercialisation of products based on the model he invented.

The entrepreneur contributed to the commercialisation of the mathematical model through several mechanisms. Having work experience in the banking sector and in

directing two software firms, he was aware of the sort of application that potential clients may need, an essential feature in transforming scientific knowledge and discoveries into commercially viable products. He was also already familiar with the process of creating and directing a software firm, whilst the academic had no business experience. His banking sector and software connections helped Predisoft find its first contracts. Lastly, the entrepreneur helped to obtain external investors for Predisoft, and linked it to the network of collaborating firms he was structuring. These two actions broadened the range of strategies that the firm could adopt by providing it with access to financial resources and to the expertise and client networks of its allies.

Predisoft illustrates how social ties that bridge actors from different communities can overcome social sanctions and transmit incentives, in this case incentives to form ALCs. The entrepreneur contacted his old classmate despite the gap that divides academics and private sector operators because, having studied abroad and worked in sectors other than ICT for a long time, unlike most of his colleagues, he actively seeks collaborations for his firm. In the US he was exposed to the role of collaborations in ICT clusters, not only ALCs, but also other types of collaborations. He is also one of the founders of Lidersoft's LLC III, a network of collaborating Costa Rican ICT producers that includes Predisoft, which is discussed in chapter 3 (see section 3.6.3: 99).

Another factor that facilitated the creation of this ALC was that the businessman did not create contacts with academia via formal organisational means, but through one of his social ties. It was not a case of an entrepreneur approaching a professor, but of two old friends meeting after a long time and sharing ideas and interests. This allowed them to overcome the mutual distrust that affects the Costa Rican academia and private sectors, which will be discussed further in the next sections. The entrepreneur proposed an idea to his friend: collaborating outside of the existing organisational contexts – outside of the firm he manages and of the faculty in which the friend works – by creating a new dedicated firm.

This ensured that the professor knew he was to have ownership of the project, without affecting the key idea – that of a firm based on the transformation of academic knowledge into a technology to generate commercially viable products.

The professor, who is dean of the Sciences Faculty at UCR, the biggest national university, has pursued a research-focused career due to personal interests. He obtained a PhD in France, where he observed how the state actively promotes the formation of ALCs, and where universities are often engaged in relations with the private sector.

When he returned to Costa Rica he became an academic, and thought of the possibility of emulating the French model at home but had no information about the local ICT industry, and found no institutional mechanism or incentive to promote ALCs. Through the social tie based on an old friendship, he bridged the gap that divides the community of ICT producers from the community of professors, compensating for both information and coordination failure.

It is important to note that Predisoft did not evolve into a formalised collaboration with the university. Not pushing for a formal ALC, the professor minimised his interference with the customary rules prevailing in the Costa Rican academic world. The exchange of academic and business knowledge occurs through his person, not through institutional arrangements that promote collaboration between the university and a private sector actor. His participation in Predisoft does not affect the working practices or organisational borders of the university. Given his status as an inventor, he is seen by other professors as an exception, as a person with particularly brilliant intelligence, which justifies his deviance from the common rules, but does not constitute a precedent for establishing a custom of private sector-university collaboration, such as the custom generated by Hewlett Packard, a spin-out of Stanford University.

The ALC had an important impact on the firm it gave rise to – Predisoft. In 2006, four years after its foundation, Predisoft has already developed and launched six different products, software applications based on mathematical and statistical prediction models developed by its founder. It has diversified the commercial applications of its core technology so as to include not only products to protect electronic transactions, but also, for example, software programs to predict and optimise the usage of automatic telling machines. Partly because of its ALC root, Predisoft went through an accelerated accumulation of organisational and technological capabilities, and launched several products in a short period of time.

When Predisoft's management opted for an export-oriented strategy, it revealed both its inclination toward collaborations, and its academic root. In order to adjust their products for international markets, the academic and the professor hired a consultant from MIT. They claim that accessing the expertise of the MIT academic was very useful in developing the core technologies of Predisoft in a way that would facilitate the production of software applications aimed at export markets. By 2006, Predisoft became one of the most dynamic Costa Rican ICT exporters; after only three years of full operations, over 70% of its sales were to foreign clients.

Predisoft was also the fastest growing Costa Rican ICT firm between 2003 and 2006. In three years of full operations, it moved from being in the bottom 20% of domestic firms in terms of sales, to being in the top ten, although it still employs less than twenty people. Roy Vargas, the entrepreneur who co-founded the company, considers Predisoft to be the "diamond edge" of the network of four allied firms he has structured and helps to manage. According to him, its success can be attributed primarily to the professor's genius. However, he also explains that what really distinguishes the firm from other Costa Rican ICT enterprises is the ability to combine knowledge from different sources in order to produce commercially viable inventions. He illustrates how the firm makes use of his business expertise, the scientific knowledge of the professor and also knowledge from external sources, such as the MIT consultant.

The last incidence of an ALC in the Costa Rican ICT cluster that we have yet to discuss is that of Dinamica, a firm established in 1989 by a junior professor of the Technological Institute of Cartago, the largest and most famous technical university in the country.[9] The professor spent several years studying in Mexico, where he observed the attempts by his Engineering school to establish linkages with MNCs and the domestic private sector, not only to obtain funding, but also to co-develop research projects. The public sector's explicit support for ALCs, but also academics' open attitude towards the private sector, commanded the professor's attention.

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[9] Information about Dinamica was collected during the interview with Roberto Calvo, CEO and founder of Dinamica, 6 July 2005.

His undergraduate studies, carried out in Costa Rica, led him to consider ICT as a divided world, whereby academic research and commercial research are different paths with few possibilities of convergence. When he left the country, he had not yet decided whether he wanted to pursue an academic career or to enter into the private sector. Influenced by his Costa Rican professors, he believed that working in the private sector did not entail real research and meant giving up academic thinking for practical business-oriented work. Being exposed to the activities carried out by Mexican universities with the private sector, such as in spin-out firms, changed his perspective. He decided to go back to Costa Rica, pursue an academic career, orient his research to projects with potential commercial applications, and establish a firm dedicated to the commercialisation of such projects.

He became a professor at the Technological Institute of Cartago, and founded Dinamica with three of his students. He developed the basic technology that he later used for Dinamica's products during his academic research activities. Dinamica was able to launch its first product shortly after it was founded precisely because part of the necessary R&D had already been performed in the university labs. Accessing researchers' knowledge also allowed Dinamica to enter the ICT market with original software solutions, rather than with cheaper copies of existing applications. Thanks to these factors, Dinamica grew and became a relatively large player in the domestic market.

The firm was intended to be a spin-out from the university. It works in a similar way to the spin-out firms of Silicon Valley: its workforce is largely academic, and draws from academic research to develop commercial software applications (Lee et al, 2000: 1 -14). However, unlike the case of Stanford University with its spin-outs, the Costa Rican university does not support or promote Dinamica. Dinamica is an unwanted spin-out. Dinamica's founder hoped to gradually formalise research collaborations with the university. To maximise the potential for collaboration, he even established Dinamica in a building located less than fifty meters from of the main entrance of the university. He stated that proximity to the university should facilitate knowledge spillovers and promote innovation, showing that he was aware of the arguments in the literature on knowledge exchange (see for example Antonelli, 2002 and Nonaka, 1994).

Despite the professor's/CEO's intentions, and his understanding of the literature on innovation, seventeen years later Dinamica is still an unofficial spin-out of the university, with no collaboration agreements linking the two organisations. The founder is still both a professor, and the CEO of Dinamica. 73 out of 80 of the employees of Dinamica are engineers from the university, five of which have postgraduate degrees. Only employees with clerical duties have not been hired from TEC.

Working at the university provides the CEO with direct contact to students, which facilitates the hiring process, and the structuring of internship programs. Dinamica is the only firm that formally organises internships, whereby university work and applied work for the firm are mixed. The founder personally takes care of internships and of selecting candidates from amongst his students. However, not only interns, but all of his students take part in some of Dinamica's projects, so that on the one hand they acquire work experience, and on the other hand they expose the firm's employees to fresh academic knowledge and methodologies.

The source of Dinamica's core technology also has an academic origin, as it was developed by the professor and founder through his research at the ICT faculty. Dinamica, just like Predisoft, works as an ALC not because of agreements between academic and private sector organisations, but because its founder moves across organisational borders. He functions as the bridge that facilitates cross-fertilisation between academic and business knowledge, despite the divisions that separate the social communities of entrepreneurs and professors. The only difference is that in Dinamica one person crosses organisational borders and directs the firm, whilst in Predisoft the balance between the academic and business sides of the firm is maintained through joint decision making involving both of its founders.

Dinamica is one of the twenty largest Costa Rican ICT producers in terms of sales and employment. However, unlike Predisoft, it achieved its position over a longer period of time. It is also less atypical than Predisoft in that most of its sales are oriented to the domestic market. Dinamica's growth stalled from 2002 onwards, when the domestic market for ICT suffered from a decrease in demand, and the number of ICT firms surged. Unlike Predisoft, Dinamica is self-funded, and has no direct collaboration with other Costa Rican ICT producers. Like many other local firms, its only productive collaboration

linking it to global markets is a product distribution collaboration (a MLC I) with a MNC (see chapter 5).

Dinamica's CEO's exposure to a foreign academic system pushed him to form an ALC in Costa Rica. But his lack of business contacts and work experience outside of academia meant he followed the main trend of domestic ICT producers: he targeted the public sector, and a small number of domestic corporations. He expected that focusing on the domestic market and on public clients would facilitate collaborations with the university. He admits that he was too risk-averse to push his firm to international markets, and that, being specialised in technical and non-commercial knowledge, his strategic choices followed the evolutionary trends of the domestic ICT industry. Because of the failed experience in establishing a productive collaboration with the university, Dinamica's founder is disillusioned about collaborations, and not willing to dedicate any energy to looking for MNCs, local firms, or investors as partners.

This contrasts with Predisoft, which attracted investors and formed alliances with other local firms. Its other collaborations – an ILC and a LLC III – allowed it to expand without the constraints of self-funding, to access client networks and to share resources with allied firms (for a discussion of the impact of ILCs, see chapter 2, for LLCs, see chapter 3). Predisoft also adopted an export-oriented strategy, targeted non public sector clients, and thus achieved high growth even when the domestic market stalled. Predisoft's strategies, opposite to those of Dinamica, can be attributed to the influence of its business co-founder. His non-ICT background, and his social embeddedness in different communities at once explain why he convinced the professor to launch Predisoft as a company that differs from most local producers in terms of export-orientation and propensity to collaborate.

The absence of institutional arrangements to promote interactions with the university limit Dinamica's and Predisoft's benefits from being a spin-out to the activities their founders carry out. In the case of Dinamica the university involved seems to be more hostile to the ALC, perhaps because, unlike Predisoft, it was created with the explicit aim of initiating a formal ALC. Although located at the doorstep of the largest domestic ICT faculty, Dinamica has access to academic knowledge only via his founder and his

students. Should he decide to leave the university, Dinamica would cease to have access to interactions with academia.

Being based on academic research has allowed Dinamica to accumulate technological capabilities relatively easily, and to upgrade its products faster than if it had to carry out all R&D internally. The professor/CEO admits that he could not foresee that Dinamica would never become a formal ALC with the university. When he created Dinamica, he thought that the number of projects that the firm would develop with the university would grow exponentially, especially after observing the success of the first academic-based product it sold. Contrary to his expectations, Dinamica is seen with suspicion by the university.

Since he operates in the private sector, the academic career of Dinamica's founder has become more difficult. Other professors are intellectually opposed to the idea of applied research, and even more so to the idea of commercialising research. Operating in a closed social community, other professors easily learned about Dinamica. As a result, they created several obstacles for him, which made it difficult to further his academic career, and marginalised him within the faculty. In other words, the colleagues of Dinamica's founder circulated and enforced social sanctions generated by the behavioural norms of the local academic community, which in this case entail not collaborating with the private sector. In order to understand whether Dinamica is an exception or the rule, the next section discusses the position of academia regarding ALCs.

## 4.5 The academic sector and ALCs

Most studies of the Costa Rican contemporary economy (for example Rodriguez-Clare, 2001; Paus, 2005) emphasise the importance of local universities for the genesis of the ICT cluster. As early as the 1980s, in the midst of structural adjustment, they trained engineers capable of founding a domestic software industry in a low-income primary products exporter with little or no historical expertise in electronics, and no government program to promote ICT, such as, for example, that of Brazil (Commander, 2005). During the 1990s, the pool of engineers trained by national universities became a key pillar of Costa Rica's FDI attraction policies (see chapter 5). Costa Rican universities contributed

the most important element in an ICT industry: a skilled workforce. They also account for a larger percentage of the national R&D expenditure than the average in Latin America (Table 4.1). Yet, Costa Rican universities have not so far been involved in joint research activities with the private sector.

The Director of Computing and Engineering at the TEC explains that universities have limited qualified personnel to carry out research, especially at a postgraduate level, and this limits the capacity to engage in ALCs.[10] His claim is supported by data: the number of researchers per thousand workers has decreased in Costa Rica since 1996 from 1.53 to 0.61 in 2004, falling below the Latin American average of 1.43 (Micit, 2006). Since the 1990s, high demand for ICT technicians[11] and new engineering graduates by MNCs provoked a rise in wages, whilst the wages of academic researchers have not changed. As a result, a postgraduate engineering researcher at the university earns approximately the same, and often less, than an ICT technician or a call centre worker.[12] Hence, the incentives for Costa Ricans to pursue a full electronic engineering career have decreased because of MNCs. However, incentives to pursue postgraduate degrees, research positions, and an academic career in ICT faculties have decreased even more dramatically.

The Director of the Postgraduate Informatics Program at the UCR argues that as long as the wage gap between the private sector and academia persists, there will be no incentives for students to become involved in research, and it will become more difficult to find new professors. Being a professor has lost part of the reputation it used to confer in society, especially in ICT-related subjects, precisely because it is not a well paid profession. This creates incentives for professors to leave their job and found their own firms, and for students to avoid an academic career. The professors who had ambitions to carry out applied research have already moved to better paid private sector jobs. Those

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[10] Interview: Cesar Garita, Director of Instituto Tecnologico de Costa Rica, Cartago; 7 August 2006.

[11] In this study the term technician refers to people who have completed one or two year technical courses in ICT, which are not university degrees in engineering or programming. Technicians specialise in the use of certain technologies and machinery, and are not trained to carry out R&D activities. Engineers are trained to carry out activities related to the use of technologies and those related to the creation of new technologies, such as R&D.

[12] Francisco Mata, Professor at the Postgraduate School of Computing and Informatics, 10 June 2006

who remained in academia are likely to be more inclined to have interests in non-applied research, which further limits the scope for ALCs to emerge.[13]

According to the Vice Director of the Informatics and Computing School of UCR, there are no ALCs because, besides the scarcity of R&D personnel, there is no coordination of the research activities carried out by MNCs, private firms and universities. Universities focus on basic rather than applied research, and do not choose their research interests according to what the private sector demands. There are no career incentives for professors to establish ALCs because there are strict laws on their remuneration from external sources. According to the current legislation, if they do additional projects, such as ALCs, they do not have the right to be remunerated more even if the financing comes from external sources. This regulation creates incentives for professors to exit academia and work for the private sector if they are interested in applied research, or else to focus on research that has little commercial applicability.[14]

There is also little communication between universities and the private sector, especially with domestic ICT producers. Universities do not have information about the activities of private firms, or about research projects that could be performed jointly.[15] Hence, there are few incentives, but also insufficient information, for universities to coordinate their actions with the private sector. Lack of information and coordination is enhanced by the social closure of both the professors' and the ICT entrepreneurs' communities, corroborated by a long-standing custom of universities to have tight relations with the public sector but not with firms. Some senior professors insist that research should be funded mainly by the state, and that universities should focus on basic rather than applied research. The idea that seems to prevail in academic circles is that universities are better off if they carry out their research independently, if they do not "sell out to the private sector", or in the case of ALCs with MNCs, "sell out to the gringos".[16]

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[13] Interview: Gabriela Marin, Director of Postgraduate Program in Computing and Informatics, UCT. 18 July 2006.
[14] Interview: Marcelo Jenkins, Vice Director of the School of Computing and Informatics, UCT. 18 July 2006.
[15] Interview: Marcelo Jenkins, Vice Director of the School of Computing and Informatics, UCT. 18 July 2006.
[16] Interview: Senior academic, TEC. Name withheld. 3 February 2006.

Disregarding the economic liberalisation reforms that Costa Rica has been implementing since the 1990s, professors seem to expect the state to regain its previous role in the economy and in society, and to provide incentives and coordination for the R&D activities that both they and private actors carry out. Universities complain that Costa Rican governments consider them mainly as a source of trained labour to attract investment, and have no interest in their research activities. They point out that a law to co-finance ALCs has been promoted, but it hasn't been approved by the Legislative Assembly, stalling current efforts to introduce ALCs.[17]

Costa Rican ICT policies focus mainly on FDI attraction by the dedicated agency Cinde. The main wave of FDI in ICT, driven by Intel, and facilitated by Cinde's actions, occurred between 1997 and the year 2000. Cinde and Procomer, the export promotion agency, coordinated the first collaboration between a MNC and local universities. The collaboration involved Intel's experts, who worked together with professors to update technical schools and universities' curricula and their use of ICT equipment. Costa Rica's will to adapt its educational system to MNCs' needs contributed to Intel's decision to invest in the country, signalling its pro-investors attitude. However, the agreements with Intel involved no collaboration on research activities.

Since the year 2000, Procomer began supporting Caprosoft, a project financed by the Inter-American Development Bank that gave birth to the sectoral chamber Camtic. The four-year project, renewed in 2004, demonstrated the government's willingness to adopt more complex policies than just FDI attraction to promote the ICT cluster. However, the Caprosoft project did not contain any measure to coordinate different actors involved in R&D so that they would structure a coherent innovation system to support the cluster. This corroborates professors' claims that public agencies have neglected universities as a source of knowledge, prioritising instead their educational role. Camtic, the only organisation that articulates the interests of ICT producers in Costa Rica, seems to have

[17] Interview: Gabriela Marin, Director of Postgraduate Program in Computing and Informatics, UCT. 18 July 2006. Interview: Marcelo Jenkins, Vice Director of the School of Computing and Informatics, UCT. 18 July 2006.

taken a similar position to that of the government: pressuring universities to increase the number of skilled workers they train per year whilst ignoring their R&D activities.[18]

The Costa Rican case contrasts with Silicon Valley, where the government stimulated ALCs since the inception of the cluster through different mechanisms. The public sector has been and still is a source of demand for specific joint university-private sector research projects, especially in the defence and aerospace sectors of Silicon Valley. It is also a provider of funds for applied research, patenting and incubation for start-ups (Saxenian, 1994; Lee, 2000; Kenney and Florida, 2000). In the ICT clusters of Taiwan, Israel and Ireland FDI policies in ICT have been linked to incentives for MNCs to conduct research locally, collaborate with domestic universities and establish different types of ALCs (Görg and Ruane, 2000; Lall, 2001, 1999; Contractor and Kundu, 2004; Pack, 2001; Kishimoto, 2003; Wade, 2004).

In Costa Rica, a few professors do work with the private sector, or rather, *for* the private sector. They offer consulting services as independent professionals. Six firms have claimed to have purchased advice services on software applications, solutions and maintenance from university professors. Although the firms did not provide details about the identity of such professors and the type of work they are involved in, they stated that they are Costa Ricans, younger than 40, and that they have been offering private consulting services to ICT firms over the last five years. The phenomenon is not very common, and it has not been possible to investigate it further. However, it entails that some professors are willing to cross the organisational barriers of academia and get involved in private sector activities. The veil of secrecy surrounding professors who work as ICT consultants may result from a will to avoid social sanctions from fellow academics who have a negative opinion of ALCs.

Besides the few professors who work as consultants, there are very limited social contacts between ICT faculties and ICT private sector representatives in Costa Rica. Academics do not have social ties to managers and founders of ICT firms. They perceive themselves as belonging to a community that is insulated from the rest of the ICT cluster. They tend to picture academic knowledge as inherently superior to the sort of applied

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[18] Interview: Marcelo Jenkins, Vice Director of the School of Computing and Informatics, UCT. 18 July 2006.

knowledge ICT entrepreneurs have and accumulate, because it is insulated from commercial influences. Partly as a consequence, some professors disapprove of colleagues who have left academia to found their own firm.[19]

Many professors seem to respond to, but also to circulate and enforce, social sanctions against collaborating with the private sector, which is considered to alter the traditions and ideological orientation of universities. Students are not interested in research activities. They tend to pursue a degree in ICT to work in the private sector.[20]

Most ICT academics are Costa Ricans and operate in a closely tight community where everyone knows each other. Social closure helps to circulate and to enforce norms of behaviour, such as the custom of seeking public positions. But it also facilitates mutual monitoring of behaviour and the enforcement of social sanctions against actors who defect from the norm, such as the professor who founded Dinamica. Operating in a closed community, most actors within academia follow the incentive system structured by formal and informal institutions, or exit the community altogether. Having discussed the incentives of academics, it is necessary to look at the incentives of the other social actors involved: MNC managers and local entrepreneurs.

## 4.6 MNC subsidiaries and ALCs

Several academics pointed out that they prefer to approach MNCs if they have to choose partners for ALCs. MNCs are endowed with more resources, and often they are involved in ALCs in their home countries, thus have previous experience in how to manage joint research projects with universities. Costa Rican academic institutions consider collaborating with local firms to be a less attractive option for several reasons. They perceive them to be less advanced, to have fewer resources and to have little

[19] Interview: Francisco Mata, Professor at the Postgraduate School of Computing and Informatics, 10 June 2006

[20] Interview: Silvia Centeno, Walter Salas, Jose Morales, Anita Mora, Carlos Torres, Lorena Sanchez; students in Informatics interviewed at the UCR campus, 8 February 2006.

experience in working together with academics.[21] However, the nature of multinationals' investments in Costa Rica implies that it is unlikely for MNCs to establish ALCs.

The 25 MNCs that operate in the cluster invested in Costa Rica for efficiency-seeking reasons (See chapter 5): to produce in locations where costs are lower than in their home base. They perform mainly high-tech assembly operations and little R&D, which conforms with what the literature on FDI and development predicts (For example, Dunning, 1993; Lall, 2001; Altenburg and Meyer-Stamen, 1999). Hence, most MNCs' subsidiaries in Costa Rica do not have the personnel, the labs, the mandates and the financial resources to perform R&D jointly with local universities.

The exception is Costa Rica's Intel plant. Like the majority of Intel plants, the latter has an R&D department that employs about 300 electronic engineers (out of a workforce of over 3000). Intel's Costa Rican R&D facilities perform testing and fine-tuning operations. They also co-designed the Penryn, the first 45 nanometre processor in the world. Although most products are invented at US research departments, and although their function is to test and fine-tune existing technologies, Intel's Costa Rican labs have the capabilities to carry out advanced research activities. However, Intel Costa Rica does not have a mandate, and may not have incentives, to perform R&D jointly with local universities.[22]

MNC subsidiaries consider collaborating with local actors to be risky, because of the threat of information leakage. This entails that, when MNCs do perform research activities, they do so in a very secretive, insulated way, which leaves little leeway for collaborations with universities. A graphic display of the how MNCs carry out R&D activities in the cluster is Intel's plant, probably the most heavily-guarded and difficult-to-access site in the whole country.[23]

Assuming MNCs had or obtained the mandate to establish ALCs with universities, there is still no coordination between the kind of research that subsidiaries would be interested in carrying out in Costa Rica and the research activities of Costa Rican

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[21] Interview: Gabriela Marin, Director of Postgraduate Program in Computing and Informatics, UCT. 18 July 2006. Interview: Marcelo Jenkins, Vice Director of the School of Computing and Informatics, UCT. 18 July 2006.

[22] Interview: Mohsen Fazlian, Director of Intel Costa Rica, 29 March 2007

[23] Costa Rica does not have an army, thus it does not have military zones.

universities. Universities admit that they may not be able to provide the research expertise that MNCs may need. Firstly, they are too focused on basic research. Secondly, they do not have sufficient information about the exact needs of industry. Thirdly, the needs of MNCs are often too specific to be supplied unless there has been a long term effort to coordinate their research activities with those of universities.

Universities' R&D efforts do not complement Costa Rica's development policy, focusing on the same sectors and niches promoted by the government, such as ICT. They cover a broad range of research areas but with a relatively low number of researchers and resources. Thus, in each area, such as electronic engineering, there are many research niches where they may not have the necessary expertise, and many others where they do have expertise, but which are not complementary with the activities of private firms.[24]

The managers of MNCs' subsidiaries, mostly expatriates, tend to have few social ties to local communities, which limits access to information about the activities of domestic actors in the ICT cluster. As a result, they have very few contacts with the researchers of local universities. The MNCs' managers who are more socially embedded, either because they are Costa Ricans, or because they are socially tied to local actors, are more interested in establishing collaborations to perform some R&D functions. However, in these instances they tried to collaborate with local enterprises rather than universities (See chapter 5).

As anticipated in the first section of this chapter, MNCs do have relations with universities. However, they are not productive collaborations, and are not aimed at developing technology. The most important collaboration occurred when Intel helped local universities and technical schools to update their curricula (Nicholson and Sahay, 2005). To quote from Intel's website:

> "Intel engineers work directly with the university faculty to provide counsel on future skill requirements needed by industry that should be incorporated into technical curricula"[25]

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[24] Interview: Francisco Mata, Professor at the Postgraduate School of Computing and Informatics, 10 June 2006

[25] http://www.intel.com/community/costarica/education.htm

Notably, most of the effort was directed towards establishing specific one-year and two-years training courses to prepare the pool of technical workers whom Intel needed to operate its plant, not to update the electronic engineering curricula, or to adjust universities' research agendas. This is a consequence of the fact that most of Intel's employees are not engineers, but technicians, which reflects the operations that the firm carries out in Costa Rica – sophisticated assembly operations.

The main obstacle to the emergence of ALCs between MNCs and local universities is that there are insufficient institutional incentives. MNCs have no incentives to establish ALCs with local universities, and local universities do not focus on the type of research that MNCs may need. Community division does not cause the current lack of coordination that halts the emergence of ALCs, but it contributes to it by limiting the exchange of information between academics and the managers of MNCs and by circulating academia's anti-private sector bias. The next section discusses the behavioural incentives of local ICT entrepreneurs, who do not respond to the regulatory structures of MNC subsidiary-HQ relations.

## 4.7 Local firms and ALCs

Unlike the managers of MNC subsidiaries, most of the CEOs of local firms have been trained in domestic universities, which should increase the probability of them having social ties to Costa Rican academics. However, there are only three cases of ALCs, and few cases of the hiring of academics by domestic producers. Local firms respond to incentives to not collaborate with universities. Some of these incentives emerge from the characteristics of the Costa Rican ICT industry, others from the institutions that regulate universities. Other incentives to not collaborate also stem from the social embeddedness of academics and ICT producers in different networks and communities.

The first obstacle blocking the emergence of ALCs with universities stem from industry structure. Costa Rican ICT producers are small. The vast majority of them have less than twenty employees and generate less than US$ one million of sales per year. They do not have formal R&D departments, or dedicated R&D personnel. Their employees

carry out on-the-job R&D whilst they perform other functions. Only the 15 biggest firms have any designated employees to perform R&D functions. Universities clearly expressed their preference for collaborating with firms that have permanent R&D staff. Entrepreneurs mentioned that they feel they cannot afford to dedicate any of their employees exclusively to R&D because they need the entire workforce to be flexible in their assignments in order to manage demand fluctuations.

Local managers are aware that universities also suffer from resource constraints. As one entrepreneur mentioned, "this makes them bad companions". Many local firms claim that if the government or a multilateral agency financed a research project they would consider it, but they do not want to fund ALCs with their own resources. This underlines that not only universities, but also local firms consider the government to hold the responsibility for financing research and structuring collaborations. However, size and resource constraints do not provide a satisfactory explanation per se; the biggest firms, that have the resources and dedicated personnel to perform R&D functions, also do not seek any research collaboration with universities. The most important reasons quoted by ICT producers to explain why they are not interested in establishing ALCs with local universities are related to coordination and information failures: universities focus on basic research, are not aware of the needs of industry, and there is little exchange of information between academia and the private sector. They are the same factors mentioned by universities and MNCs, which have been discussed in the other sections of this chapter.

Although all of the founders of local ICT firms have been trained in local universities and they operate in a small, highly concentrated cluster, most of them have no social ties with local academics. Communication seems to occur mainly amongst similar actors, academics with academics and entrepreneurs with entrepreneurs, as predicted by social network theories. (Burt, 1992, 2001; Granovetter, 1973) Lack of communication helps to explain diverging research agendas, which impede the formation of collaborations. It also affects mutual perceptions in a negative way. The conversations held brought to the surface a certain hostility between the two communities. Professors perceive entrepreneurs as being too money driven. In the entrepreneurs' opinion, academics do not understand the industry and maintain an intellectual superiority complex that makes interaction difficult.

Lastly, local entrepreneurs, just like MNC managers, respond to incentives not to collaborate with universities because they are worried about protecting their intellectual property rights. They explained that before a given idea is brought to the market, it's very easy to copy it, and they do not fully trust universities or other external actors to respect intellectual property rights. The vast majority of firms carry out R&D internally, with no interaction with external actors. The Director of TEC corroborated the account of producers, arguing that the existing regulatory framework for research collaborations does not offer sufficient protection of IPRs, and creates obstacles to the emergence of ALCs. He mentioned that the red tape involved in research projects financed by firms create incentives for both professors and managers to avoid collaborating. In his view, a more flexible, but also clearer and less bureaucratic set of rules for university-private sector collaborations are a necessary condition to promote ALCs.[26]

## 4.8 Conclusion

ALCs are considered by the literature to be an important means of promoting innovation because they facilitate interactions between the academic and private sectors. Together with collaborations between MNCs and local firms, they can be a key means for clusters in the developing world to acquire technological capabilities and compete in the global market. In the Costa Rican cluster, several factors hinder their formation: the institutions that regulate the decisions of MNCs and academia, and community divisions between local entrepreneurs and professors, which enhances information and coordination failure. The retreat of the state from the roles it previously played exacerbated such obstacles to coordinating ALCs. Nonetheless, there are three cases of spin-outs.

The three spin-out firms seem to have benefited from being ALCs. In the first case, a spin-out of TEC's incubator, the Costa Rican producer managed to cut its start-up time by accessing credit, the use of infrastructure and market advice through the ALC. In the second case, the interaction of the two founders combined academic and business knowledge, generating an enterprise that has a strong scientific basis but that also adopts

[26] Interview: Marcelo Jenkins, Vice Director of School of Computing and Informatics, UCT. 18 July 2006.

innovative business strategies. In the last case, a professor created a spin-out firm with some students, and established it near the ICT faculty. This provided the firm with access to the research that he and his students carried out in TEC. This shortened R&D times, letting the firm focus on technology adaptation to commercial means rather than on technology development. It also allowed it to compete with an original product rather than to opt to enter the market with a software application copied from competitors. However, in all of the three cases, the ALCs have not given rise to formal collaborative agreements with universities.

In the first case, the university's incubator provides to the firms it incubates occasional access to academic experts, but with no contact to the research activities of the university. In the second firm, the ALC entails the transformation of academic knowledge into commercial applications and the interaction between academic researchers and businessmen. However, the productive collaboration occurs because of the relationship that links its two founders, not because of inter-organisational linkages. The last firm, despite proximity and repeated attempts to formalise an ALC, has failed to become an officially supported spin-out of TEC. The founder also suffered from social sanctions enacted by colleagues to punish him for having attempted to create an ALC.

Academia's intellectual aversion to commercially applicable research, a feature observed by local entrepreneurs, but also confirmed by academics themselves, effectively reduces the chances of collaboration with the private sector. Even if there were more incentives for academic institutions to engage private firms in ALCs, they would first have to change their research focus and make it complementary to the needs of the private sector. This would require incentives for both universities and private sector actors to exchange information and coordinate their research activities, something that neither academics nor producers seem to be willing to do.

Although universities and private firms account for most R&D expenditure in Costa Rica, both academics and local producers blame the state for the lack of ALCs. After the economic reforms began in the late 1980s, the Costa Rican public sector ceased to organise and direct the formation of ALCs. Both universities and ICT producers perceive the Costa Rican legal framework to be ineffective at protecting intellectual property rights and creating incentives for universities and firms to establish ALCs. As a result, the actors

involved in research activities in Costa Rica act independently rather than being part of an integrated innovation system that supports domestic industry. Research activities are not articulated so that they contribute to the broader developmental agenda of the state: they do not support technological development in the ICT cluster.

Universities and local ICT producers seem to be unwilling to take up the roles historically performed by the state, partly because of resource constraints, partly because of lack of incentives to do so. MNC managers, domestic ICT entrepreneurs and academics operate in divided communities. The state has perpetrated such a division by failing to generate institutional incentives to collaborate through a post-ISI developmental vision (Paus, 2005) where the mission of universities becomes more focused on the production of knowledge rather than just on education, and where the private sector takes up part of the role from which public agencies have retreated.

Lack of social linkages between academics and ICT managers and entrepreneurs contributes to the creation of obstacles that halt the emergence of ALCs. The actors who could form ALCs are linked to their colleagues, but do not have social ties that bridge across communities. Such a division between communities stops information flows, further reducing the potential for actors to coordinate their actions, as observed in the case of other productive collaborations (See, for example, chapter 2 and 5). Social ties also influence the emergence of ALCs through different mechanisms. For example, the social closure of the academic community makes its norms of behaviour effective, by facilitating monitoring and also the imposition of sanctions on defectors, such as that applied to the founder of Dinamica. The next two chapters analyse other cases of productive collaborations that involve actors belonging to different, in some cases also spatially distant, communities: collaborations that link local firms to MNC subsidiaries and firms located outside of the cluster.

# 5 FDI-attraction and cluster development: MNCs-local firms collaborations in a MNC-dominated cluster

## 5.1 Introduction

In order to promote an ICT cluster, Costa Rica adopted specific policies to attract investment by multinationals. As a result, the Costa Rican ICT cluster, like a large number of knowledge-intensive clusters in the developing world, is dominated by MNCs (Altenburg and Meyer-Stamen, 1999). MNCs are the biggest investors in the cluster, and they employ most of the Costa Rican ICT workers. Multinationals have pushed Costa Rica from being essentially a natural-resource-based goods exporter to being an exporter of ICT in less than ten years.[1]

MNCs are also the key global actors of the Costa Rican ICT cluster. They constitute the most evident external linkage of the cluster – the means through which local firms can enter into global value chains, access new markets, technology and other forms of knowledge (for a discussion of clusters' external linkages, see: Nadvi and Halder, 2005; Belderbos, Capannelli and Fukao, 2001; Lall, 1999; Dunning and Narula, 1995; Mytelka and Barclay, 2004). Whether MNCs will work as an external source of dynamism for Costa Rican ICT firms, fostering a cluster development process similar to that observed in Taiwan and Ireland, falls within one of the most discussed topics in development economics – the impact of MNCs on the economies where they invest (Breznitz, 2005a; Görg and Ruane, 2000; Hewitt-Dundas et al, 2005; Kishimoto, 2003; White, 2004). This chapter addresses the question by discussing the emergence, nature and impact of MLCs – productive collaborations that MNCs have established with Costa Rican ICT producers.

In the Costa Rican ICT cluster, MNCs and local firms are engaged in three subtypes of MLCs, which have very different functions and developmental implications. Most

[1] ICT manufactured goods, such as integrated circuits and electronic components, have displaced coffee and bananas as the most valuable exports from Costa Rica since 1999 (The World Bank Group, 2006).

collaborations are MLCs I, collaborations between MNCs and their local distributors, which often have negative developmental effects on Costa Rican firms. However, there are also some cases of MLCs II – collaborations between MNCs and local firms to adapt products and processes – and MLCs III – collaborations between MNCs and local firms to develop new products and technologies. Unlike MLCs I, MLCs II and MLCs III contributed to the accumulation of Costa Rican producers' organisational and technological capabilities, helping them to upgrade their products, processes and functions. This chapter discusses why MNCs and local firms formed MLCs with both positive and negative developmental effects, by looking at how institutions and social ties shaped actors' behavioural incentives.

The chapter shows that the emergence of MLCs with positive developmental effects is hampered by two factors. Firstly, Costa Rican FDI-attraction policies did not create incentives for MNCs to collaborate with domestic partners. As a result, most MNCs do not have the mandates to establish MLCs, or have mandates to only establish MLCs I. Secondly; information failure impedes the coordination of collaborative actions in the cluster. Even when they do have a mandate to collaborate, MNCs may not have access to reliable information about local producers. Social ties help to explain information failure, and are also one of the means that actors use to compensate for such failure.

The managers of MNC subsidiaries and local producers rely on their social ties to gain access to information that they consider as being ready-filtered. However, most MNC managers are expatriates who operate in a socially disembedded community. Not having social ties to Costa Rican actors, they do not have access to the necessary information to establish MLCs II and MLCs III. MNC managers who have social ties with Costa Rican ICT producers are more exposed to incentives to collaborate, and use such ties to coordinate MLCs. In the Costa Rican ICT cluster, social ties that bridge the divided communities of MNC managers and entrepreneurs compensated for information and coordination failures, fostering the emergence of MLCs with developmental effects.

The chapter discusses institutions and social ties as determinants and a means through which actors collaborate. It is structured as follows: the first section presents the research findings, the second discusses how the literature could explain them and the third evaluates how the determinants of MNC investment affect collaborations. The following

sections analyse the emergence and impact of the three subtypes of MNC – local firms productive collaborations found in the Costa Rican ICT cluster: Product Distribution (section 5.5), Product and Process Adaptation (section 5.6) and Product and Technology Development (section 5.7).

## 5.2 MNCs-local firms productive collaborations in the Costa Rican ICT cluster

In order to attract MNCs, Costa Rica created export processing zones (EPZs) – special areas where MNCs benefit from selected incentives. In EPZs, multinationals benefit from 100% exemption from import duties, profit taxes (for the first eight years, then 50% exemption for the following four years), excise taxes, sales taxes, profit repatriation taxes and municipal and capital taxes. MNCs have no limitations with regards to profit repatriation, and can sell up to 40% of their products in Costa Rica without paying sales tax. They also benefit from on-site customs clearance. Additionally, some of them, such as Intel, also benefit from lower electricity charges (Monge-Gonzalez, Rosales-Tijerino, Arce-Apizar, 2005: 19; The World Bank Group, 2006: 8; Rosales and Arroyo, 2001).

By 2003, MNCs located in EPZs had a strong macroeconomic impact: they accounted for more than 50% of Costa Rica's exports and 8% of its GDP.[2] Nonetheless, according to local procurement indexes (which are commonly used to assess the linkages between MNCs and host economies), MNCs' purchases from local firms are very limited (Ciravegna and Giuliani, 2006; Paus, 2005). But estimating the value of transactions between MNCs and local actors may not be sufficient to discern the developmental impact of FDI, and especially to identify the nature of MNC – local firms' relations. A multinational corporation could, for instance, actively collaborate with local partners to develop an experimental technology, thus stimulating their technological learning, whilst

[2] This includes all MNCs, not only the 25 MNCs that are ICT producers. However, ICT producers are the most important investors and exporters in EPZs, largely because of Intel (The World Bank Group, 2006; Ciarli and Giuliani, 2005).

purchasing little from them. Or it could purchase vast amounts of low-tech inputs from local suppliers without generating significant developmental effects.

Intel, the largest MNC in the ICT cluster, purchases on average US$ million 50 to 150 of products and services per year from local firms, which is equivalent to 1-2% of the value of its annual production (The World Bank Group, 2006: 16). In 2004 and 2005, Costa Rican firms produced about US$ million 170 of ICT goods and services (Camtic, 2005), which makes the value of Intel's local purchases look very high. However, the vast majority of what Intel buys in Costa Rica are low-tech inputs, such as security services and packaging materials, not ICT services. Thus, although Intel local purchases may appear high, they have very little effect on the development of an ICT cluster, and especially on Costa Rican ICT enterprises.

Following the evolutionary economics tradition (see for example Blomstrom and Kokko, 1998; Dunning and Narula, 2004; Lall, 1999; Humphrey and Schmitz 2001; Schmitz and Knorringa, 2000), the impact of MNCs on the economy of developing countries depends on the extent to which they facilitate local firms' learning processes, such as the acquisition of new skills and capabilities, and the upgrading of products, processes, and functions. The sort of MNCs-local firms relations that promote these learning effects fall under the definition of productive collaborations discussed in chapter 1; they entail joint actions and shared resources that can (although they do not have to) improve the capabilities and competitiveness of local firms. This chapter focuses on discussing the emergence and impact of these productive collaborations between MNCs and local firms (MLCs). MNCs-local firms relations that do not entail collaboration, such as arm's-length transactions, as well as collaborations that do not have a productive purpose, are not MLCs and thus have not been analysed.

In the Costa Rican ICT cluster there are three different subtypes of MLCs. They have been categorised in ascending order according to the complexity of their function, which affected their developmental impact on Costa Rican producers.[3] Product Distribution collaborations (MLCs I) had a less positive developmental impact than Product and Process Adaptation collaborations (MLCs II), which had a less positive developmental

[3] The different categories of MLCs have been designed ex post, in order to suit the qualitative evidence collected about the function and impact of MNC-local firms productive collaborations.

impact than Product and Technology Development collaborations (MLCs III). Table 5.1 provides a more detailed outline of the impact of MLCs on the Costa Rican firms involved.

**Table 5.1 The impact of MLCs**

| Subtype | Access to resources | Capabilities | Upgrading |
|---|---|---|---|
| MLCs I | Brand<br>Training courses and discounted services<br>Professional advice (4/35) | Organisational skills (8/35) | Process downgrading (29/35)<br>Functional downgrading (2/35) |
| MLCs II | Clients and distribution network (2/3)<br>Infrastructure<br>Professional advice<br>R&D personnel | Organisational skills<br>Product or location-specific technological capabilities | Product<br>Process |
| MLCs III | Brand<br>Clients and distribution network<br>Capital (via ILCs)<br>Infrastructure<br>Professional advice<br>R&D personnel<br>Other collaborations | Organisational skills<br>Core technological capabilities | Product<br>Functional |

Source: Author's elaboration based on interviews

In Table 5.1 the first column from the left-hand side shows the MLCs' subtype, the second column lists the resources that Costa Rican producers could access through their MLCs, the third column the capabilities that they acquired because of MLCs and the last column reports whether there has been product, process or functional upgrading.[4]

Table 5.1 shows that MLCs I tend to have negative developmental implications: 29 of the firms involved went through a downgrading of their processes, two of these also went through functional downgrading. Only 4 of the 35 local producers involved in MLCs I received professional advice from their MNC partners, and only 8 acquired some new organisational skills. The main contribution of MLCs I was to provide firms with access to the use of the MNC brand and to discounted services and training courses.

[4] The numbers in brackets indicate how many of the local firms involved in a given subtype of MLCs have been affected by the impact described in a particular cell. The number is reported when only some of the firms involved in a subtype of MLC have accessed a certain resource, acquired a certain capability or carried out a certain upgrading process. The absence of such numbers indicates that all the firms that took part in a specific subtype of MLCs were affected in a symmetrical fashion.

On the other hand, MLCs II had a positive developmental impact in all cases. All MLCs II led to product and process upgrading, the acquisition of organisational skills and of product or location-specific technological capabilities. The only MLC III is also the only case in which a Costa Rican ICT firm acquired core technological capabilities and upgraded its functions through a productive collaboration with a MNC. Additionally, the MLC III provided access to resources that were also available through MLCs II, such as professional advice and the use of R&D personnel. Table 5.2 summarises the findings.

**Table 5.2 Productive collaborations between MNCs and Costa Rican firms**[5]

| Subtype | Number of MLCs | Number of MNCs | Number of local firms | Function [6] |
|---|---|---|---|---|
| MLCs I Product Distribution | 40 | 2 | 35 | Collaboration between a MNC and Costa Rican ICT firms that distribute its products |
| MLCs II Product and Process Adaptation | 4 | 3 | 4 | R&D collaboration to adapt a MNC product or process to local conditions |
| MLCs III Product and Technology Development | 1 | 1 | 1 | R&D collaboration to develop a new technologies |

Source: Author's elaboration based on interviews

In Table 5.2, the first column from the left-hand side shows MLCs' subtypes and functions, and the second column reports how many MLCs per subtype have been found in the cluster. The third and fourth columns indicate how many local and multinational firms are involved in each subtype, and the last column provides a short description of the functions of the MLCs' subtypes.

Table 5.2 illustrates that in the Costa Rican ICT cluster there are several MLCs I, few MLCs II and only one MLC III. The first unexpected result is that there are several MLCs. Although MNCs may not buy a high share of their inputs from local suppliers, a quarter of the MNCs that are ICT producers, and more than 1/3 of Costa Rican firms, are involved in MLCs. The findings also highlight that the outcome of investment by MNCs in a given developing country's cluster can be very heterogeneous: some MNCs collaborate, others

[5] MLCs are non-exclusive: one MNC may have more than one subtype of collaboration with the same firm, or many collaborations with different local firms. Similarly, a local firm may have more than one MLC with the same MNC. This explains why 35 local firms are involved in 45 MLCs.
[6] The function they play as described by the actors involved.

do not, and those that collaborate do so through three different typologies of MLCs. The results presented in Table 5.1 and 5.2 raise several questions:

- Why have MNCs and local firms operating in the same EPZs, and thus under the same institutional regulatory framework, formed three different kinds of MLCs, some of which have conflicting developmental impacts?
- Why are there many MLCs I, few MLCs II and only one MLC III?
- How do different subtypes of MLCs emerge?
- How do MLCs function and generate their effects on Costa Rican firms?

This chapter addresses such questions by illustrating the formation process of the different subtypes of MLCs and the mechanisms through which MNCs affected the firm-level capabilities of Costa Rican ICT producers. Before analysing the three subtypes of MLCs, the next section discusses the literature that has dealt with MNCs-local firms relations.

## 5.3 FDI, collaborations and impact on host economies

MNCs-local firms collaborations are a transversal phenomenon, analysed by a vast number of scholars and several literature streams. This section provides a brief discussion of the main approaches that could be adopted to explain the formation and impact of MLCs. It links the economics and political science literature concerned with FDI, MNCs and spillovers with the literature on the social embeddedness of investors. The discussion outlines how this chapter aims to contribute to the understanding of MNCs-local firms relations in developing countries.

Governments in the developing world compete to attract investment by MNCs because MNCs provide a source of employment, growth and exports, but also because investment by MNCs can compensate for a lack of capital and technological capabilities for developing endogenously knowledge-intensive industries such as ICT (Belderbos, Capannelli and Fukao, 2001; Lall, 1999; Dunning and Narula, 1995; Mytelka and Barclay, 2004; Wade, 2004). Productive linkages between MNCs and local firms can generate

knowledge flows that foster the improvement of quality standards and the upgrading of products and processes (Belderbos, Capannelli and Fukao, 2001, Blomstrom and Kokko, 1998; Görg and Ruane, 2000). MNCs can link the firms operating in developing countries' clusters to the global economy, providing them with opportunities to acquire new knowledge and accelerate their accumulation of technological capabilities (Bell and Albu, 1999; Gereffi, 1999; Nadvi and Halder, 2005; Schmitz and Nadvi, 1999). In countries such as Ireland and Taiwan, MNCs-local firms relations have stimulated the development of the technological capabilities of host country enterprises, contributing to their industrial development (Breznitz, 2005a; Görg and Ruane, 2000; Hewitt-Dundas et al, 2005; Kishimoto, 2003; White, 2004).

However, as discussed in chapter 1, MNCs do not always have a positive developmental effect on local producers. Altenburg and Meyer-Stamen pointed out that MNC-dominated ICT clusters can develop into "high-tech maquiladoras", such as the Guadalajara ICT cluster in Mexico, where MNCs carry out sophisticated assembly operations that have few effects on the development of local producers' capabilities (Altenburg and Meyer-Stamen, 1999). Drawing on the global value chains and technological capabilities literatures (Gereffi, 1999, Gereffi, Humphrey and Sturgeon, 2005; Humphrey and Schmitz, 2001; Lall, 2001, 2004), this chapter assumes that the impact of FDI on cluster development depends on the sort of relations that MNCs and local firms establish, and in particular on those relations that promote technology transfers, knowledge spillovers and other learning effects, namely MNCs-local firms productive collaborations, or MLCs.[7] The key issue it tackles is how different MLCs emerge.

Among scholars of MNCs, Dunning explains the relation between MNCs and local firms by analysing the determinants of FDI (Dunning, 1993). He argues that the sort of linkages that emerge between a MNC and the host economy, and thus its developmental impact, depend on the reasons that drove the MNC to invest in the first place. If MNCs

[7] The literature does not use 'productive collaborations' as an analytical concept. However, several authors (see for example Lall, 2001; Wade; 2004) relate the developmental impact of MNCs to aspects that are captured by the concept of productive collaborations, such as the extent to which MNCs share resources and carry out joint activities that promote knowledge transfers to local firms. Productive collaborations allow us to focus on the MNC-local firms relations that entail such aspects, excluding relations that are not collaborative – for example, arm's-length relations.

invested to jump tariff barriers and exploit local markets, they may have no reasons to collaborate with local firms. However, if a MNC invests in a cluster or country because it seeks to benefit from its pool of specialised suppliers, then it is within its objectives to form productive collaborations with local firms. Dunning's explanation suggests that in order to understand productive linkages and collaborations, it is necessary to question the causes of FDI by MNCs. Section 5.4 of this chapter draws on Dunning's work and discusses how the FDI determinants of MNCs in the Costa Rican ICT cluster relate to the formation of MLCs.

The analysis of FDI determinants may provide an important first step in understanding the behaviour of MNCs, but it may not be sufficient to explain the occurrence of MLCs in the Costa Rican cluster. Firstly, MNCs may have different reasons for investing and collaborating. For example, they could invest for efficiency-seeking reasons, and subsequently, after having invested, attempt to find local partners to distribute their products in the local market. Secondly, MNC managers and local entrepreneurs operate in a socially embedded context, which affects their decisions (Evans, 1979, 1995). Thus, FDI determinants may be the same across several MNCs, but MNC managers may respond to different behavioural incentives, affected by the way in which they are socially connected to other MNC managers and to the local society. For this reason, the chapter integrates the discussion of FDI determinants into a broader analytical framework that discusses the behavioural incentives of both MNCs and local firms by looking at institutions and social ties.

Other authors, such as Lall and Wade, discuss the impact of FDI by looking at the success of the East Asian Tigers in using FDI to promote the technological development of their domestic industries. They illustrate that in certain East Asian countries, industrial policies served to overcome specific market failures and generate the conditions necessary for MNCs to establish productive collaborations with local firms that fostered both firm-level and country-level technological capabilities (Lall, 1992, 1997, 2004; Wade, 2004). Their work provides a broad framework for assessing the links between FDI policies and the effects of MNCs on host economies. However, it does not explain why a single set of FDI policies, such as those that regulate the Costa Rican EPZs, can generate the diverse range of MNCs-local firms relations that are shown in Table 5.1 and 5.2.

Paus adopts a similar perspective to Lall and Wade in her comparison of linkages between MNCs and local firms in Costa Rica and Ireland (Paus, 2005). She argues that in Costa Rica, the policies to promote the formation of linkages have been less successful than in Ireland because the overall resource commitment was lower and because there hasn't been a stable social and political coalition supporting such policies. She argues that Costa Rica offers tax breaks and other incentives for MNCs to locate there, but it does not provide similar incentives for increasing linkages with the local economy. Most MNCs operate in free trade zones, where they can import all of their inputs tax-free. Thus, they have no incentives to engage Costa Rican firms in the sort of knowledge-intensive joint activities that in Ireland contributed greatly to the development of domestic technological capabilities in ICT (Görg and Ruane, 2000).

Paus' arguments about industrial policy are consistent with the main tenets of new institutional economics; by creating specific rules (or institutions), government policies generate the incentives that shape the relations of MNCs with local firms. According to Paus, the institutional framework that regulates MNCs in Costa Rica (that of EPZs) does not provide sufficient incentives for MNCs to form collaborations with local actors (Paus, 2005). However, the findings presented in section 5.2 illustrate that there are several productive collaborations between MNCs and local firms, and that they have different developmental impacts. It is thus necessary to complement Paus' analysis with a more in-depth discussion of the MLCs that have emerged in the Costa Rican cluster, questioning in particular:

- How different MLCs have emerged;
- How they affected the firm-level capabilities of Costa Rican firms.

This chapter addresses the first question by looking at how institutions and social ties influenced the decisions of MNCs and local firms regarding whether to collaborate or not and which subtype of MLCs to establish. The theoretical framework it adopts, discussed in chapter 1, borrows from the literature on the social embeddedness of economic action (Granovetter, 1985) and from the sociological analyses of FDI and development. It follows the propositions of Evans, who suggested that the social embeddedness of local

and foreign capitalists might help to explain the strategic choices of MNCs and local firms alike (Evans, 1979: 36-37).

The second question, concerning the impact of MLCs, is discussed by referring to the analytical concepts devised by the scholars of technological capabilities and global value chains, following the theoretical framework discussed in chapter 1 (for example, Bell and Pavitt, 1993; Gereffi, 1999; Humphrey and Schmitz, 2001; Lall, 1992, 1999, 2001; Schmitz and Knorringa, 2000; Schmitz, 2004). These authors argue that technology, information and organisational techniques are not freely available. Even when they can be freely purchased on the market, they need to be absorbed and integrated into production processes through learning-by-using or learning-by-doing. Asymmetrical access to technology and other forms of knowledge is a market failure that puts firms from developing countries in a disadvantageous position: not only do they tend to have less resources to purchase technology than their first world rivals, but they may also have difficulties in accessing and absorbing the necessary knowledge to catch up and compete in global markets.

Productive collaborations with MNCs can facilitate the learning processes of local firms from developing countries, helping them to upgrade their products, improve their processes and acquire new capabilities. Such learning occurs especially when MNCs actively help their partners, for example by providing them with training, advice and technical assistance services. It also occurs when MNCs do not actively help but instead allow local firms to share their work practices, use their infrastructure and acquire information about their technology, products, clients, strategies and organisational structures.

This chapter discusses the impact of MLCs by looking at whether the practices mentioned above occur in different MLCs. It assesses the governance structure of MLCs, and questions whether MLCs affect Costa Rican ICT firms' access to resources, capabilities and upgrading processes.[8] The chapter contributes to the literature by providing extensive empirical evidence about the formation of different MLCs and their impact within the same cluster. On a theoretical level, it introduces the debate on the

[8] For a discussion of the governance and upgrading concept, see the appendix, section 1.5: 36-39.

developmental impact of MNCs in a socially embedded context, whereby not only governance, policies and incentives, but also social connections, contribute to explaining the outcome. The next section introduces the discussion on the formation of MLCs by questioning whether the FDI determinants of MNCs explain whether and how they collaborate with local firms.

## 5.4 FDI determinants and collaborations

In order to understand the logic that drove MNCs to form MLCs, MNC representatives were asked to identify the most important reasons for collaborating or not collaborating with local firms. Their answers are listed in Table 5.3.

**Table 5.3 Determinants of collaboration**

| MNCs that collaborate | | MNCs that do not collaborate | |
|---|---|---|---|
| 1. Expertise of local firms in the Central American market | 4/4 | 1. Not necessary, have their own suppliers and partners already | 21/25 |
| 2. Pool of existing business clients | 3/4 | 2. No mandate from the HQ | 21/25 |

MNCs seem to be divided into two groups that have opposing evaluations about whether it is convenient or even possible to have MLCs in the Costa Rican ICT cluster. The easiest explanation could be that they have invested in Costa Rica for different reasons. It could be that the MNCs that invested in order to capture the local market or find partners have formed collaborations, and those that invested in order to exploit lower costs have not done so. In order to assess this possibility, MNCs' executives were asked to explain the reasons for choosing Costa Rica as a location for FDI.

Their answers have been analysed following the theoretical framework suggested by Dunning (Dunning, 1993), who identifies four FDI determinants: 'market-seeking', 'efficiency-seeking', 'natural resources-seeking' and 'strategic assets-seeking'. The framework has been adapted so as to include several aspects of efficiency-seeking FDI, ranging from labour costs to fiscal incentives, other locational advantages, such as climate and physical proximity to the HQ. The following table lists the FDI determinants mentioned most frequently by MNC managers.

**Table 5.4 FDI determinants**

| Type of FDI | Reason for investing in Costa Rica | Non-collaborating MNCs | Collaborating MNCs |
|---|---|---|---|
| Efficiency-seeking | Location (Proximity to the US, good climate, low criminality, stable democracy) | 21/21 | 4/4 |
| | Cost of Labour | 14/21 | 2/4 |
| | Fiscal incentives | 7/21 | 2/4 |
| Natural resource-seeking | Natural resources of Costa Rica | 0 | 0 |
| Market-seeking | Clients in Central America or Costa Rica | 0 | 0 |
| Strategic assets-seeking | Presence of local suppliers in Costa Rica | 0 | 0 |
| | R&D institutions in Costa Rica | 0 | 0 |

Source: author's elaboration

In the first column from the left-hand side, Table 5.4 shows the FDI determinants mentioned by Dunning, in the second column the FDI determinants adapted from Dunning's framework, and in the third and fourth columns the number of answers provided by the MNCs. Table 5.4 illustrates that MNCs have invested in Costa Rica in

order to have operations in a location that allows to produce more efficiently. None of the MNCs mentioned the presence of local suppliers or local R&D institutions among their FDI determinants. Forming productive collaborations with local partners has not been the driving force behind the MNCs' investment, even for those MNCs that do collaborate. MNCs that collaborate with local firms and those that do not mention similar FDI determinants: location, fiscal incentives and labour costs.

There could be other reasons why some MNCs collaborate and others do not. Some MNCs may not have found any Costa Rican firms with the necessary technological complementarities needed to collaborate. Or the firms that operate in complementary areas may not have sufficient technological capabilities to work with MNCs (Cantwell and Colombo, 2000). It could also be that the social embeddedness of the directors of MNC affiliates determines whether or not they are willing to establish MLCs, and the sort of MLCs they are likely to promote.

In order to explain why some MNCs do collaborate, and why there are three subtypes of productive collaborations, it has been necessary to analyse how each MLC was formed, extrapolating from the narrative of the decision makers the factors that affected their choices, focusing on institutions and social ties. The following sections explore what lies behind the emergence of different MLCs, analysing the incentives that led actors to establish them, and the impact of such MLCs on local firms.

## 5.5 MLCs I: Product Distribution

MLCs I occur when MNCs collaborate with local firms that act as indirect distributors for them. In MLCs I, local firms sell the MNC product packaged with each unit of their own products. The MNCs that formed such collaborations in Costa Rica are providers of architectural software, databases and operating systems – technological platforms on which smaller firms base their own software products and services. Few MNCs, such as Microsoft, define the technology standards that are used by producers of software (business applications developers, custom software developers and system integrators), and ICT service providers (for example software programming houses and information storage providers) all over the globe. These MNCs, two of which operate in

the Costa Rican ICT cluster, sell their products not only directly to software developers, but also indirectly to the customers of software developers who act as distributors. For this reason, in Costa Rica as in other markets, such MNCs have incentives to form collaborations with their direct clients, in this case Costa Rican software providers, in order to maximise the diffusion of their products via indirect sales.

There are two MNC producers of systems and databases that invested in the Costa Rican ICT cluster. They have established MLCs I in order to create a number of partners that exclusively or preferentially use their technology. Costa Rican software developers sell mainly business applications (such as accounting software) to Central American firms. When clients adopt a given software application, for example to manage their balance sheets, they acquire and internalise certain operating routines and standards, which makes it costly for them to switch to products based on a different MNC technology. By creating this type of MLCs, the MNCs that produce technological platforms generate a pool of direct and indirect clients tied to their standards. This allows MNCs to extract revenues not only from sales, but also from the long-term servicing and updating of their programs and systems. For this reason, these MNCs have strong incentives to lock their distributors (MLCs I collaborators) and their clients into exclusive dependence on their technological standards.

MNCs lure local firms into MLCs I and into technological lock-in by offering several selected benefits. These include the right to use the MNC brand under certain conditions, free training sessions on how to develop products based on the MNC technological platforms and discounts on the MNC products. Eight firms stated that through the training provided by MNCs, they acquired new skills, for example a better management of the MNC technological platform. Four of the eight stated that in addition to the training courses, they occasionally received advice from the MNC managers on how to improve the way they market their products. However, the majority of local firms explained that their main benefits were discounts on the MNC products and the MNC certificate of

quality that they could show to clients.[9] Local firms enter into MLCs I attracted by the incentives provided by MNCs.

MNCs look for MLCs I partners that have well established distribution networks and a pool of local business clients. The more local clients a given Costa Rican software developer has, the more it can serve in distributing the MNC technological platform packaged with its own product. These MNCs have an institutional incentive – a mandate from the HQ – to find local partners, increase sales and generate technological dependence. The directors of MNC affiliates in Costa Rica established MLCs I responding to the incentives generated by the institutions that regulate the MNCs they work for, which are related to the institutions that regulate the ICT industry at the global level. Was the outcome affected by the way in which the MNC managers are socially embedded in the communities that characterise the Costa Rican cluster?

The two MNC managers that established networks of 10 and 30 local partners respectively have a different social and ethnographic profile. One is a Costa Rican who returned to Costa Rica, sent from the MNC's HQ to create a local subsidiary. The other is a foreigner, sent from another subsidiary to Costa Rica in the year 2000. The first is socially embedded in Costa Rica, and is linked to people from the local ICT world, with whom he studied or worked before emigrating. The second is a socially disembedded actor: he has no social ties with Costa Ricans, and is not sure whether the Costa Rican subsidiary will be his last transfer among the global network of the MNC's offices, which reduces his incentives to invest in local social networks. Although both managers operate under the incentives generated by the internal career-building mechanisms of the MNCs they work for, their different social ties affected their access to information, exposure to other incentives, and thus their behavioural choices.

The Costa Rican MNC manager revealed to us that he had an ambition to create the largest Latin American subsidiary of the corporation for which he works in Costa Rica.

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[9] The two MNCs involved in MLCs I provide three to four levels of quality certifications, which are related to how many units of their own product the local partner sells per year. This creates incentives for local firms to perform and to move up the certifications ladder. Local firms use certifications as a marketing tool, to improve their organisational credibility. As more firms obtain these certifications, their market value decreases. The firms that do not manage to keep increasing sales are left with a quality certificate that progressively loses significance.

This explains why he pushed for the formation not only of MLCs I, but also of other productive collaborations, such as MLCs II. He responds to the incentives of his MNC employer, but also to other incentives. His long term objective is to advance his career, but also to make sure that he lives in his country and to increase the role of the Costa Rican subsidiary in the MNC global network, because by doing so he can improve his social reputation at home. In order to do this, he looked for local firms capable not only of distributing the MNC product, but also of forming MLCs that encompass other functions and that can potentially attract more of the MNC's activities to Costa Rica. To implement this strategy, he had to ask for a special mandate from the HQ and had to risk his own career by taking direct responsibility for his actions.

The social ties of the MNC manager to Costa Rican actors created some of the incentives that made him ask for a mandate change and look for MLCs that were different from MLCs I. However, his local social ties also provided the means to compensate for information failure. Through his social ties to local producers, he gained access to the information necessary for finding suitable firms for MLCs II, overcoming the problems mentioned by other MNC managers regarding the reliability of available information on local firms. When choosing partners, he relied on the personal reputation of the founders of ICT firms in order to substitute for their companies' lack of organisational reputation.

He did not have a mandate to look for MLCs II. However, he realised that some of the product adaptations that the MNC office which he directs was performing in-house could be outsourced, thereby allowing to cut production costs. Having a good understanding of the capabilities of the distributors involved in MLCs I, he hired two of them to co-develop Central American versions of the business applications that the MNC sells directly to its customers. By doing so, he changed the governance structure, the content and the developmental impact of two of the MLCs I, which evolved into MLCs II. The next section discusses the characteristics of MLCs II in more detail.

These are the only two cases out of the forty Product Distribution MLCs that transformed into different collaborations that have a positive developmental impact on local firms. In both cases, the incentives generated by institutions, such as the career mechanisms of the MNC, were affected by the social embeddedness of the MNC manager. Being socially linked to local actors, he responded to incentives to stay in Costa Rica and

to attract more functions to the country. Additionally, his social ties to local entrepreneurs provided him with access to filtered information, which he used to establish MLCs II.

The foreign manager who works for the second MNC producer of technological platforms present in the Costa Rican ICT cluster also created a network of MLCs I with Costa Rican software developers. However, in the absence of a clear mandate from the HQ, he did not have any incentives to establish other forms of MLCs. Neither did he have access to the necessary information to do so. Thus, he perceived entering into more complex productive collaborations with local firms as an unnecessary and risky move.

The findings show how social embeddedness affects economic choices. As underlined by Evans (Evans, 1979), an actor who is disembedded from the society in which she operates responds to different incentives than an actor who is socially embedded. The foreign disembedded MNC manager was relatively indifferent to the idea of shifting to another location, but more cautious about risking his career to collaborate with local firms. The manager who is socially embedded in Costa Rica chose riskier strategies because of two reasons: firstly, additional incentives to make the local subsidiary successful (driven by the desire to build up his reputation not only globally but also in his local context); secondly, better access to information on the local economy, acquired via social ties.

The way in which actors are socially linked to their own and to other communities has also affected the behavioural incentives of the local firms involved in MLCs I. In particular, firms directed or founded by actors who gather information through social ties with actors located abroad seem to respond to different incentives. Out of the thirty-five Costa Rican firms involved in MLCs I, only six are directed by managers who, having studied or worked abroad, are also socially tied to other communities than that of Costa Rican ICT entrepreneurs.

**Table 5.5 Awareness of technology lock-in (firms involved in MLCs I)**

| Social ties | Aware of the risk of technology lock-in | Trying to establish MLCs II or III | Involved in MLCs II or III |
|---|---|---|---|
| Do not have social ties to foreign ICT actors | 0/29 | 0/29 | 0/29 |
| Use their social ties to foreign ICT actors to acquire information | 6/6 | 6/6 | 2/6 |
| Total | 6/35 | 6/35 | 2/35 |

Source: Author's elaboration

Table 5.5 summarises how local producers involved in MLCs I perceive the threat of technological lock-in and incentives to enter into MLCs II and MLCs III. The first column from the left-hand side distinguishes those producers who do not have social ties to foreign actors from those who claim to use their social ties to actors who are external to the cluster in order to acquire information. The second column from the left-hand side shows the number of firms that are aware of technological lock-in, the third column those that are attempting to enter into MLCs other than MLCs I with MNCs and the last column those that are already engaged in MLCs II or MLCs III.

Table 5.5 underlines that only the firms that use their ties to actors who do not belong to the local ICT producers' community respond to incentives to avoid technological lock-in and pursue collaborations with MNCs that yield a higher potential for technological and organisational learning, such as MLCs II and MLCs III. These ICT producers with international experience are currently investing in order to diversify their technological base. They have higher operating costs because they keep a diversified technological base; they develop products on different technological platforms and need their workforce to manage a broader range of skills. However, maintaining the ability to develop products based on different technological standards protects them from market fluctuations. Not committing themselves to one technology standard, they can also negotiate better deals with their MNC distribution partner, which is aware of the fact that they can switch to a rival MNC. In economic terms, they avoid monopsonistic behaviour from MNCs.

Most Costa Rican software developers involved in a MLC I have voluntarily focused on one technology only in order to cut their costs and respond to the demands of the MNCs they collaborate with. By doing so, they have lost the capability to perform certain

functions, such as managing servers, or have ceased to manage certain production processes, such as developing open source software, focusing only on developing products based on the technological standard of their MNC partner. This highlights that the MNCs succeeded in locking these firms into technological dependence. Before entering into the MLCs I, the Costa Rican firms were mastering the production processes and functions necessary to develop a range of products based on different technological standards. Becoming exclusive partners in MLCs I, they lost such capabilities, thus going through process and functional downgrading.

The firms that preferred to maintain a diversified technological base are the only six out of thirty-five Costa Rican ICT producers involved in MLCs I that did not go through process or functional downgrading. They maintained the same functions and diversified the process capabilities that they had before entering into MLCs I. Through this strategy, they faced higher costs but achieved collaborations governed by less captive structures and did not reduce their firm-level capabilities.

The entrepreneurs with external social connections clarified that having contacts abroad has been particularly important for convincing them to avoid falling into the trap of technological lock-in. They have a strong interest in using their MLCs I as a basis for establishing MLCs II and III. However, only two out of six of these producers managed to transform their MLCs I. The four Costa Ricans with international experience that did not manage to transform their MLCs I into a MLC II or III claim to be in the process of discussing and negotiating this possibility with their MNC partners. They have demonstrated that they are strongly committed to obtaining such change, which contrasts starkly with the attitude of most firms involved in MLCs I.

Most Costa Rican producers involved in MLCs I do not seem to be preoccupied about being technologically dependent on one MNC standard, or to be unsatisfied about the limited impact that MLCs I have on the capabilities of their firms. They argue that distributing the MNC's product provides them with access to several benefits and that they do not seek other subtypes of MLCs. Many stated that there is no need to diversify because the MNC they work with controls most markets in the region. This widespread belief was expressed clearly during one of the interviews:

"You mention other technologies, but in Latin America there is only Microsoft... There is no reason to work with other enterprises"[10]

In contrast, entrepreneurs with external social ties are concerned about being able to work on different technological platforms, and thus are willing to invest a considerable share of their R&D expenditure into technological diversification. Local entrepreneurs with no international experience gather their information through their social ties with colleagues, who share similar opinions, constructed upon the diffusion and repetition of the same pieces of information. Some of them quote colleagues' opinions to strengthen their own. For example, one entrepreneur stated:

"Ask anyone else working in the industry. Most of them will tell you that here, other technologies (than that of the firm's MNC partner) do not matter, that they are just a waste of time"[11]

This outcome corroborates the findings of other chapters: that social ties among actors who operate in the same community circulate redundant information, cementing existing views and opinions (Burt, 2004). In Costa Rica, relatively closed and tight relations within the ICT entrepreneurial community have promoted the diffusion of incentives that downplay the risk of technological lock-in and reduce the attractiveness of forming MLCs II and III. Diffusion and repetition make such information appear more credible to the actors involved.

The lack of social contacts to external actors means that most Costa Rican ICT producers access information either via social ties to their local colleagues, who are equally affected by information failure, or via non-socialised sources, such as publications. The problem is that, as observed in other chapters, local producers (but also other actors) perceive information acquired via non-socialised sources as being unreliable and often irrelevant. They complain about the over-availability of information, stating that it is too

[10] Interview: CEO of a Costa Rican firm involved in a MLC I, Name Withheld, 4 July 2005.
[11] Interview: CEO of a Costa Rican firm involved in a MLC I, Name Withheld, 2 March 2006. Note in parentheses added by the author.

expensive to distinguish relevant from irrelevant pieces of information. Hence, they use social ties as a mechanism to access information that has already been filtered, or that they perceive to have been filtered.

Secondly, the information contained in publications usually does not refer to Costa Rica or Central America, so that local producers may not consider it applicable to their economic reality. The information transmitted by social ties is always more contextualised, which facilitates the process through which actors transform it into behavioural incentives. Several Costa Rican producers explained that in their opinion it is different if a colleague suggests that technological lock-in presents a risk for them than if they read it in a global ICT publication, which they consider to be overly focused on other economic contexts, such as the US. Local entrepreneurs are not sure about whether or not and how the information they access is applicable to the context in which they operate. As a result, they rely on information circulated through social ties. In this case, social ties compensate not for lack of information as such, but for over-availability of unfiltered, non-contextualised information.

As a result of the relative closeness of their community, the majority of Costa Rican entrepreneurs involved in MLCs I are not informed about the risks of technological lock-in. They respond to incentives to collaborate with MNCs only to gain discounts and free training services, not in order to acquire new skills and capabilities. Partly because of this information failure, MLCs I tend to have a negative effect on the technological and organisational learning of Costa Rican ICT firms. Only the firms that managed to change their MLCs I into MLCs II obtained additional benefits, which are described in the following section.

## 5.6 MLCs II: Product and Process Adaptation

All the MNC subsidiaries that operate in Costa Rica invested for efficiency-seeking reasons. Their main objective was not to find local partners. Nonetheless, some of them, such as the two MNC producers of technological platforms that organised MLCs I, have mandates to penetrate local markets and establish productive collaborations with their

distributors. Another two MNCs have mandates to source certain services of product adaptation locally via MLCs II (their case is discussed further on in this section).

Whether MNC subsidiaries in Costa Rica have mandates to collaborate with local firms or not depends strongly on their specialisation and on the nature of their operations in Costa Rica. As explained in section 5.5, MNCs that produce technological platforms have mandates to find partners for MLCs I. MNCs that run large operations in Costa Rica and Central America may need to adapt some of their production processes to local conditions and regulations. For example, they may need to adjust their supply chain management software in order to coordinate their logistics with the local trade authorities. MNCs can either perform these process adaptations themselves, or source them to local collaborators. The latter option may be more cost-efficient, because local suppliers may have a better knowledge of local conditions and may offer services that are cheaper than adaptations performed in-house. However, it is also more risky, because it requires finding local partners that have the necessary capabilities to collaborate in a cluster affected by information failure.

Most MNCs that operate in Costa Rica have opted to minimise the adaptations needed to operate in local markets and perform them in-house, or to purchase them from their global suppliers. There are two MNCs, a hardware manufacturer and a service provider, which have mandates to source adaptation services from local firms. In both cases, the Costa Rican affiliates play an important strategic role for the MNCs' HQs, which explains the MNCs' willingness to invest in MLCs II. These MNCs want to be associated with well-known local ICT producers and show their commitment to contributing to local development, in order to maintain a positive corporate image. None of the other MNCs for whom Costa Rica and Central America play a similar strategic role are willing to undertake the costs and risks of finding suitable partners for MLCs II in the cluster.

The two MNC officers that had mandates to establish MLCs II did so because they responded to the institutional incentives that regulate the corporations they work for. In order to advance their careers, they complied with their mandates and searched for firms to involve in MLCs II in the Costa Rican ICT cluster. However, because of information failure, they structured fewer MLCs II than they had intended to. Both of the MNC

officers pointed out that they do not have access to the necessary reliable information on local firms to find more MLCs II partners.

The third case of MLC II differs from the previous two; in this case, the MNC subsidiary did not have the mandate to find local partners. As anticipated in section 5.6, a Costa Rican MNC manager convinced the HQ to change the mandate in order to transform some MLCs I into MLCs II, and to source certain adaptation services locally. The manager's knowledge of local firms, acquired through his social ties to Costa Rican producers, was the pre-requisite for him to have incentives to ask for the mandate change, but also the factor that convinced the MNC's HQ to modify its strategy and engage local firms in MLCs II. Having discussed the different determinants that led three MNCs to look for MLC II partners, let us question the incentives of local firms.

Costa Rican ICT producers involved in MLCs II claim that they collaborate with MNCs in order to learn about their organisational practices and technologies. Such claims contrast with the opinions of the firms involved in MLCs I, the majority of which are not interested in working together with MNCs as a means to acquire information and new skills. The way in which local producers acquire information explains such divergent perceptions of the effects that MLCs II and III can have on firm-level capabilities.

The local producers who rely mainly on information acquired from social ties to other Costa Rican ICT entrepreneurs tend to discard the potential developmental effects of working with MNCs. Those who have external social ties openly state that their incentives to work more closely with MNCs have been affected by their observation of the benefits that it conferred on firms involved in MLCs II and MLCs III in other clusters, and provide anecdotal evidence to support their arguments. Their social ties link them to contexts where collaborating with MNCs is not considered to be a daunting, useless or non-remunerative exercise. The information they accessed via external social ties led them to question the authority of the information that circulates in their own community, and generated incentives to act differently from most of their colleagues – to get involved in MLCs II and III.

In all cases of MLCs II, the MNCs and their local partners performed some joint R&D to adjust production processes to local conditions. In two of the four MLCs, the MNCs sent a team to work on-site at the Costa Rican firm's office. In the other two cases,

the MNCs invited the engineers of the Costa Rican firms to their subsidiary. Working together exposed Costa Rican producers not only to state of the art technology, but also to advanced working routines and practices, which they are in the process of transferring to their own firms.

Unlike MLCs I, MLCs II involve the exchange of complex, not fully codifiable information, which explains why the engineers of MNCs and Costa Rican firms have worked together on product adjustment projects. According to the GVC literature, "when product specifications cannot be codified, transactions are complex, and supplier capabilities are high, relational governance can be expected" (Gereffi, Humphrey and Sturgeon, 2005: 86). The descriptions of their mutual relations provided by both the MNCs and their local partners corroborate the predictions of the GVC literature, suggesting that in MLCs II, governance is relational.[12]

MLCs II have had a developmental impact on Costa Rican firms. Working with the MNCs has pushed local enterprises to upgrade some of their processes, such as quality control standards in the software testing procedures. The objective of a MLC II is to develop a new process or product adaptation service for a MNC. This entails that at the end of MLCs II, Costa Rican firms upgraded their products – developed a new product or service – whilst MNCs upgraded their products or processes so that they suit local conditions. In two cases, MNCs have also provided Costa Rican firms with access to clients and to international fairs.

The positive developmental effects of MLCs II are linked to their relational governance structures and the frequent interactions and joint activities that they entail. Through these joint activities, local firms have acquired new capabilities, especially in the fields where they admit to having perceived a clear knowledge gap with their MNC

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[12] MLCs II can also entail some elements of transactional dependence if the MNC becomes responsible for most of its local partner's sales. This feature is not a function of the type of collaboration, but of the value of the sales it implies as compared to the overall sales of the local firm. Such transactional dependence has been observed in only one case, and did not seem to constrain firm-level learning. The Costa Rican producer that sells over 50% of his products to a MNC because of his MLC II explained that when the collaborative project ends, his firm will go back to a situation whereby the MNC partner does not absorb more than 20% of total sales. He claimed to be unwilling to depend on one client in the long run, and to have accepted the dependence implied by the MLC II because it is temporary and because of the learning effects that the collaboration has on his firm.

counterpart, such as strategic planning and corporate organisation. The perception of such a gap has created the incentive for accelerating organisational learning and catching up, which the MNCs seem to have supported. Had local firms not been interested in this form of collaboration, they may not have perceived their own organisational deficiencies, or they may not have had any incentive to solve them.

MLCs II have contributed to the upgrading and capabilities accumulation of local firms. However, it is worth noting that the technological and organisational learning that MLCs II have facilitated is limited to adapting products and processes to local conditions. When MNCs exposed their MLCs II partners to international markets, they targeted mainly Latin America, rather than more sophisticated markets.[13] MLCs II did not provide Costa Rican firms with access to the sort of R&D activities necessary to develop core technologies and products for global markets. MNCs have no incentives to carry out such activities jointly and share their most strategic assets with Costa Rican partners. Moreover, most of the core R&D activities of MNCs are not carried out in their Costa Rican subsidiaries but in other locations.

MLCs II accelerate the organisational and technological learning of the local firms involved, but also keep them focused on their regional markets. Local firms involved in MLCs II go through a learning process. However, such learning is circumscribed to the ability to compete in their regional markets, where conditions are different from the markets of the developed world on many levels; quality standards tend to be lower, product lifecycles are longer and information about products and firms may be less transparent. As such, MLCs II stimulate a specific kind of accumulation of technological capabilities, similar to that observed in Latin American manufacturing industries during the 1960-1970s' import substitution industrialisation (see, for example, Katz, 1978; Katz and Kosacoff, 2000; Fitzgerald, 2000; Teitel, 1992; Thorp, 1998).[14]

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[13] One entrepreneur who sells to both the US and Central America explained the difference using the following words: "We sell a similar service...but they are two different worlds (the US and Central America); for the US market we have much higher quality standards, a better client support and safer data protection systems... even the office has more sophisticated security, so that when clients visit us it looks similar to American providers... all of that is not necessary for our Central American clients". Interview: Roy Vargas, CEO of Lidersoft, 22 March 2005.

[14] Unlike most industries under ISI, software and ICT are not protected by local content or tariffs. But local market fragmentation, regulations and language seem to provide a certain extent of protection to local firms.

MNCs do not actively limit the learning processes of their MLCs II partners. Nonetheless, they provide explicit support only for locally-focused learning, which may strongly affect the technological and strategic trajectories that their partners choose. As a result, MLCs II were not a means to acquire the necessary capabilities to compete in global markets for Costa Rican producers. In one case, a MLC II also had an indirect positive effect: it facilitated the formation of a MLC III, which is discussed in the next section.

## 5.7 MLCs III: Product and Technology Development

MLCs III are productive collaborations in which a MNC and a local partner jointly develop a new product or process that is to be used at a global level. The only MLC III found in the Costa Rican ICT cluster emerged from a MLC II. Unlike what happens in MLCs II, in the MLC III the MNC does collaborate because of the expertise in local markets and conditions of its Costa Rican partner. It collaborates because of the capability of the Costa Rican producer to offer a global service that is more competitive than those offered by the MNC's global suppliers (none of which is from Latin America). The local firm involved in the MLC III acquired the same status as the suppliers and partner firms that work together with the MNC at its HQ.

The incentives for MNCs to form this subtype of MLC in developing country clusters are low. MNCs operating in Costa Rica are located in EPZs. They thus follow global sourcing practices, whereby the HQs choose the suppliers, but also the allies and partners that work with the MNCs in all of its locations. MNC subsidiaries may choose local partners only to source products and services not related to the core business, such as security services, and in certain cases, also to perform tasks related to local markets, such as Product Distribution (MLCs I) and Product or Process Adaptation (MLCs II). The internal institutions that regulate MNCs, such as mandates, but also those of the host economy, such as the regulations of Export Processing Zones, do not generate incentives for MNC officers to form MLCs III with local firms.

MNC subsidiaries in the Costa Rican cluster do not have the mandate to establish MLCs III. The directors of MNC subsidiaries have to ask for special permission in order

to foster such collaborations, which decreases their personal incentives to do so. Collaborating with a local firm in a MLC III may entail displacing established partners or suppliers, which the HQ may not be willing to do. On the contrary, all of the Costa Rican firms already involved in MLCs II would be more than willing to be partners in MLCs III, as their determinant for collaborating is to acquire knowledge and skills from MNCs. However, by 2006, only one firm had managed to transform its MLC II into a MLC III. The profile of its founder is similar to that of the other firms involved in MLCs II: he has worked abroad and is endowed with several social ties to external actors. He actively pursues many contacts to actors operating in different clusters and sectors in order to diversify his sources of information. Like other Costa Rican ICT producers that have attempted to engage MNCs in MLCs II and III, he is aware of the developmental effects that productive collaborations, not only those with MNCs, can have. What is different about his case is not his behavioural incentives, but the role that his social ties played as a means to facilitate the formation of the MLC III.

At an international ICT fair, the Costa Rican producer met a foreign MNC officer with whom he engaged in several conversations about ICT trends. He had the opportunity to show the MNC manager the latest product his firm was working on. After the fair they maintained contact by exchanging occasional emails where they discussed trends in the ICT industry. The foreign manager was subsequently appointed to the MNC subsidiary located in Costa Rica, with a mandate to find local partners for MLCs II. The newly appointed manager had little information on Costa Rican ICT producers, save for the firm of the Costa Rican colleague he met at the international fair. He had already tested its products and formulated a positive opinion about the firm's founder. The MNC director used the information acquired through his social tie to establish his first MLC II.

During the four year duration of the MLC II, organisational and personal distance gradually shortened. The MNC manager, very satisfied with the outcome of the collaboration, began to see his Costa Rican counterpart more frequently, and to share ideas with him. Impressed with the technical capability of the local firm and with the personal qualities of its CEO, he decided to accept the proposition of his partner: to hire the Costa Rican company not only to provide a process adaptation software for the Central American subsidiary, but also to develop a new application to serve the HQ and all other

affiliates. The MNC manager asked the HQ for a mandate change in order to be able to transform the MLC II into a MLC III, and obtained it. As a result, in 2006, the Costa Rican firm began to develop a new software together with the MNC, and is in the process of displacing an established American supplier for one of the applications that the MNC uses at a global level.

The MNC manager explained that it was important to know the CEO of the Costa Rican firm, and to have discussed the technicalities of the product through socialised rather than impersonal, non-socialised communication means. Some of the details that convinced him that the Costa Rican firm had the necessary organisational and technological capabilities to become a global supplier would have been difficult to convey without discussing them extensively during face-to-face conversations. The social tie linking the two actors allowed the exchange of what the literature defines as tacit information – information that is difficult to codify and that is generally transmitted via socialisation (Nonaka, 1994) – which was necessary for the MLC III to work.

The director of the MNC subsidiary illustrated that there may be many firms in the cluster that offer similar services to its MLC III partner, namely that are technologically compatible with the needs of the MNC, but that it is very difficult to know whether such firms have the necessary organisational and technological capabilities. He underlined that information on local producers is often unreliable and must be corroborated with direct knowledge of the firms and their CEOs. This highlights two factors. Firstly, in MNCs' perception, not many local firms have the necessary capabilities to be involved in MLCs III. Secondly, MNC managers tend to have limited access to information on local firms, thus they may simply not know whether there are suitable collaborators for MLCs III in the Costa Rican ICT cluster.

The social tie that linked the two managers functioned as the 'structural holes' described by Burt (Burt, 2004): it bridged two otherwise divided communities (local entrepreneurs and MNC managers), and shortened the organisational distance between the MNC and the Costa Rican company. By doing so, it exposed both actors to different incentives than those provided by the internal regulatory structure of the MNC, the market and the Costa Rican ICT community. Their social connection helps to explain the collaboration they tried to form and the mechanisms through which they eventually

formed it. It is in another case where the collaborative outcome was determined by the combination of incentives generated by institutions and social ties.

Co-developing a new product with the MNC, the Costa Rican firm went through a process of accelerated learning. The founder visited the R&D labs located near the MNC's HQ several times, exchanging information with the MNC's R&D team assigned to the project. Subsequently, some consultants from the MNC were transferred from the HQ to the Costa Rican subsidiary in order to continue to work with the R&D team of the Costa Rican MLC III partner. Carrying out joint R&D allowed the Costa Rican firm to access the MNC's most advanced infrastructure and technological knowledge. Its engineers worked together with some of the most qualified personnel of the MNC, exchanging not only explicit, but also tacit knowledge, embedded in work routines and practices.

Through these mechanisms, the local firm is acquiring the necessary capabilities to be a global supplier. Shifting from a MLC II to a MLC III implies that the local firm is upgrading its product and functions. The software services it supplies are evolving from applications aimed at Central American markets to more sophisticated, flexible and valuable applications for the global market. The MNC manager asserts that the software development processes of the local firm were already up to global standards during the MLC II, which entails that there has been no process upgrading. It also entails that the firm was already endowed with advanced capabilities, which partly explains why it managed to get involved in a MLC III in the first place.

By becoming a global supplier, the local firm is acquiring new functions and a different form of insertion into global value chains. The Costa Rican firm will become the provider of a software application for all of the MNC's subsidiaries, coordinating the activities necessary to adjust the MNC's operations to local needs in different locations. It will acquire responsibility for the global functioning of its particular software application, and work directly with the HQ.

The MLC is characterised by relational governance precisely because the tasks that are carried out jointly are highly specific, non-codifiable and technologically complex (Gereffi, Humphrey, and Sturgeon, 2005; Humphrey and Schmitz, 2001). However, once the two partners have developed the application and fine-tuned it for global use, the local firm's relation with the MNC will acquire many of the traits of modular governance. The

Costa Rican firm will supply a self-contained package, capable of being integrated in different ways in the operating systems of the MNC. The product itself will become more complex, but also more standardised, as it will not be a specific application for Central American markets. Part of the objective of the MLC III is to codify the tacit information needed to co-develop the new modular product, defining, for example, the way in which global software applications and local adaptations are integrated in the MNC production processes.

## 5.8 Conclusion

Costa Rican ICT producers are engaged in two forms of productive collaborations that link them to external sources of demand, knowledge and technology: collaborations with MNC subsidiaries located in the cluster – MLCs – and collaborations with firms located outside of the cluster – CBCs – which are discussed in the next chapter. The literature on MNCs-local firms relations compares FDI determinants and the effects of investment by MNCs in different locations (Lall and Narula, 2004). The three subtypes of MLCs found in the Costa Rican ICT cluster illustrate that MNCs-local firms relations can be very heterogeneous, even within a single industry, a spatially-concentrated industrial agglomeration and a homogenous institutional framework. MLCs' subtypes differ in governance structures, the sort of joint activities they entail, the MNCs' resources to which they provide access and their effects on the capabilities of local firms.

Most MLCs are MLCs I, collaborations established by MNCs with indirect distributors. MLCs I provide local firms with training courses and discounts and, in a few cases, also with access to professional advice. These MLCs may improve the organisational capabilities of Costa Rican producers, especially in the field of marketing and developing products based on the specific technological platform of their MNC partner. However, MLCs I also lead to process and occasionally functional downgrading. MLCs I create incentives for local firms to specialise in one technology only and lose their capacity to work on different platforms simultaneously. The firms that became MLC I partners exclusively with one MNC entered into captive governance relations, became technologically dependent and lost their mastering of certain processes and functions. The

findings underline that, as argued by the literature on global value chains, MNCs-local firms relations can also have negative effects on clusters in the developing world.

MLCs I led Costa Rican producers to downgrade their processes, but MLCs II and MLCs III, of which there are few cases in the cluster, helped Costa Rican firms acquire new capabilities and improve their products, processes and functions. MLCs II and the only case of a MLC III functioned as an external linkage with positive effects for the cluster: they exposed Costa Rican firms to new clients, and especially to new knowledge. These MLCs did not generate technological lock-in. Through joint R&D work they facilitated product upgrading, promoted knowledge-sharing and the transfer of technology and organisational practices from MNCs to their partners.

MLCs II also pushed local firms to upgrade their processes in order to comply with the MNCs' requirements. The only case of a MLC III did not entail process upgrading, as the MNC claimed it was not necessary. However, it drove the local firm to upgrade its functions and acquire the capabilities to be a global supplier, moving from a relational to a modular governance structure. Both MLCs II and the MLC III stimulated technological learning. But MLCs II promoted upgrading and the acquisition of capabilities circumscribed to technological adaptation processes: R&D to generate products and processes that suit local conditions. The MLC III entailed joint R&D activities to develop new products, not just to adapt existing products and processes to local conditions. Thus, the MLC III exposed the Costa Rican company involved to the most advanced technologies of its MNC partner and provided it with the chance to expand as a global rather than a regional ICT player.

One of the puzzles that emerged analysing the impact of MLCs is that there are only a few collaborations with positive developmental effects, as opposed to many MLCs that have negative effects. The incentives generated for MNCs by Costa Rican development policies, such as those of EPZs, do not lead to the formation of MLCs II and III. MNCs' investment in Costa Rica is efficiency-seeking; it is not driven by the will to find local collaborators, and, given the EPZs' regulations, does not have to entail special relations with domestic firms. Thus, the HQs of the MNCs that operate in the cluster do not generate incentives for their subsidiaries to form MLCs II and MLCs III: only two MNCs have a mandate to create MLCs II. The third case of MLC II and the only case of MLC III

occurred because the director of the Costa Rican MNC subsidiaries asked for a change in mandate. However, mandates and the incentives generated by EPZs are not the only explanation for the low number of MLCs II and MLCs III in the cluster. Whether MNC managers look for local partners and the subtypes of collaboration they try to form do not depend only on the institutions that regulate MNCs in the Costa Rican ICT cluster, but also on their social connections to local actors.

Most MNC managers are socially disembedded. They have few social links with local actors and are unwilling to undertake personal career risks in order to ask for a mandate change. Even when they have a mandate to form MLCs II, they do not have access to the necessary information to identify suitable local partners and cannot rely on their social ties to compensate for such information failure. In contrast, a Costa Rican MNC director decided to change two MLCs I into MLCs II precisely because of his social embeddedness in local communities. His social ties exposed him to incentives to gain reputation by increasing the scale of the MNC operations in Costa Rica and engaging local firms in productive collaborations. His social ties also worked as a means for MLCs II to emerge, providing him with information on Costa Rican firms that have the capabilities to be partners in MLCs II.

The only case of MLC III is also related to the existence of a social tie that compensated for information failure and linked actors belonging to divided communities. The MLC III took place because the director of a MNC subsidiary asked for a mandate change to transform an existing MLC II. He did so because he was convinced that the Costa Rican firm was capable of providing a very valuable service to the MNC. However, the Costa Rican firm became a MLC II partner because his CEO and the MNC director met at an international fair, where they established their first social contact and exchanged information about the Costa Rican product. Such a meeting compensated for information failure when the MNC director began looking for local partners. The social tie linking the two actors also had another role: it facilitated the exchange of tacit information necessary for the functioning of the MLC III.

Although MLCs are one of the external linkages of the cluster, their formation process has some similar features to that of productive collaborations that involve only local actors. Both internal collaborations and collaborations between local firms and

global actors, such as MNCs, are halted by the existence of information failures, especially information regarding Costa Rican firms. When potential collaborators are not aware of their mutual activities and capabilities, they may not have incentives to collaborate and may find it difficult to coordinate collaborative actions. The fact that potential collaborators are organisations led by actors who operate in divided communities, such as the expatriates who work in MNCs, enhances information failures. In the case of MLCs as in the case of collaborations with investors (ILCs), social ties that bridge divided communities compensated for information failure and led to the formation of developmental productive collaborations, such as MLCs II and MLCs III.

Information failure is the result not only of divided communities, but also of the absence of targeted government policies to coordinate actors' actions. Since the 1990s, Costa Rican governments have attracted investment by MNCs, including the 500 million Intel plant, in order to promote the development of an ICT cluster. However, FDI attraction policies have not targeted MNCs according to their compatibility with the pool of existing local ICT producers, or for their intentions to form collaborations with Costa Rican firms. FDI attraction policies were also not complemented with an effort to provide MNCs with incentives to work with local firms and with the necessary information to do so. In the year 2005, almost ten years after the arrival of Intel, the Costa Rican government had still not collected information about domestic ICT firms, their products and their clients.[15]As a result of these market failures, and the of lack of appropriate policies to solve them, the MNCs that dominate the cluster do not function as its developmental external linkage; for most local firms they are not a key source of demand and knowledge.

The impact of MNCs on cluster development was in most cases irrelevant, as only a few MNCs have interactions with local firms. In some cases, those of MLCs I, it was negative. And only in a very few cases did it have any positive effects. The next chapter discusses the other external linkage of the cluster: productive collaborations between Costa Rican producers and firms that are located abroad.

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[15] Some general efforts to compile a database of local suppliers for all sectors have been carried out by the Inter-American Development Agency and Camtic. However, information collected during fieldwork showed that in 2005, existing data about local producers was still at best inaccurate, at worst fragmented and outdated.

# 6 Export-orientation and transnational social ties: the cross-border collaborations of Costa Rican ICT producers

## 6.1 Introduction

Productive collaborations do not just occur between actors located in a spatially concentrated agglomeration. Thanks to the globalisation of production, firms also collaborate across the borders of the clusters and the countries in which they are located. Several studies show that the external linkages of clusters, such as cross-border collaborations (CBCs), can be a key source of dynamism because they provide firms with access to new markets and especially to knowledge that may not otherwise be available to them (see for example Bair and Gereffi, 2003; Nadvi and Halder, 2005; Giuliani, Rabellotti et al, 2005). But how do collaborations emerge between firms that are located in different places?

There are two main streams of literature that explain CBCs: the literature that focuses on transactions and the literature that looks at cross-border social ties. The first stream argues that in certain sectors and product niches, buyers and suppliers collaborate, even when not co-located, because it is difficult to codify the information necessary to complete their transactions. According to this theoretical framework, the capabilities and technological compatibility of Costa Rican producers and their potential partners determine whether or not they establish CBCs and what subtype of CBCs they establish. The second stream of literature relates the emergence of CBCs to the existence of cross-border ethnic ties linking firms from a cluster to emigrant communities operating in other clusters. This chapter analyses the CBCs found in the Costa Rican ICT cluster, providing an explanation that combines the insights of both the literature on transactions and that on cross-border social ties. It explores how different types of CBCs emerge, function and

impact the enterprises involved by looking at transactions, the institutions that regulate markets and also at the role played by the social ties of Costa Rican entrepreneurs.

In the Costa Rican ICT cluster, producers endowed with ties (either ethnic or of other types) to actors who operate in foreign ICT clusters have facilitated access to the information necessary to form CBCs. This corroborates the arguments of the literature on cross-border social ties. However, the chapter shows that when actors respond to incentives to form CBCs but do not have the necessary ties to do so, they try to build such ties. Several Costa Rican producers pursued social ties with the representatives of foreign firms precisely to facilitate the formation of CBCs. Their tie-building strategy compensated for their lack of ethnic contacts in the markets they targeted. The findings show that having pre-existing social ties, such as ethnic ties, is not a necessary precondition for establishing CBCs.

Social ties allowed Costa Rican ICT producers to overcome information failure and organisational distance, coordinating long distance productive collaborations with foreign firms. However, as is the case of other productive collaborations, social ties also affected incentives to collaborate. Costa Rican producers who have cross-border social ties are exposed to incentives to specialise in export-oriented services. Because they target foreign markets, these firms try to form cross border collaborations to distribute or adjust their services. The domestic producers who do not have external social ties rely on information provided by other local firms, which leads them to focus on the domestic market. Not being export-oriented, these producers are less interested in having foreign collaborators.

This chapter provides evidence of the double role that social ties play in explaining the formation of productive collaborations within and across a cluster's borders; on the one hand, they transmit the information that drives entrepreneurs to attempt to collaborate, and on the other hand they are one of the key resources used by actors to establish collaborations. The chapter is organised as follows: the first section presents the findings, the second section discusses the literature on CBCs; the third, forth and fifth section analyse the formation and impact of each subtype of CBCs; the last section before the conclusion questions the incentives that lead Costa Rican firms to collaborate with firms located abroad.

## 6.2 The cross-border collaborations of Costa Rican ICT producers

CBCs are productive collaborations between two or more enterprises located in different places. Together with MLCs, they are part of the external linkages that tie developing countries' clusters to global markets. CBCs can be a source of demand dynamism and a means for local firms to access external sources of knowledge – knowledge about technologies, organisational practices, clients, etc. Quoting Nadvi and Halder: "the long term success of a cluster is tied to the ability of clustered firms to build channels to external partners providing complementary and new knowledge" (Nadvi and Halder, 2005: 341)

Both CBCs and MLCs link the Costa Rican ICT cluster to external actors and can potentially function as the channels to external knowledge sources described by Nadvi and Halder. However, CBCs are different from all the other types of productive collaborations analysed in this study. Unlike MLCs, which involve MNC subsidiaries located in Costa Rica and domestic firms, CBCs are productive collaborations that do not occur within the cluster's border. They are collaborations between spatially distant economic actors, who operate in contexts regulated by different institutional frameworks.

The decision makers of the organisations involved in CBCs are embedded in different societies, where information about potential partners for CBCs is likely to be scarce. Most Costa Rican firms do not know which company in Silicon Valley could be a good partner to collaborate with. Given the information failures that affect the Costa Rican ICT cluster, a feature discussed throughout this study, it is likely that Silicon Valley firms will not be aware of the activities of Costa Rican ICT producers. In order to form a CBC, actors have to overcome the difficulties of accessing information and coordinating economic action between organisations that are spatially, and often culturally, distant.

CBCs, like LLCs (collaborations among local firms) and MLCs (collaborations between local firms and MNCs), are productive collaborations between firms. They involve private sector actors who, in order to pursue a common objective related to their activity, share some of their resources, carry out some joint actions, or both. For example, they can co-develop a product by sharing some of their engineers and using the R&D lab of one of the two partners. CBCs differ from LLCs because they link Costa Rican

producers to external actors, which may include MNCs. However, they also differ from MLCs because they may link Costa Rican producers to firms that are not MNCs, such as buyers and suppliers from neighbouring countries.

CBCs allow their members to collaborate without having to co-locate. Using communication technologies, firms can exchange information and coordinate joint actions from distant locations. CBCs are managed by combining virtual communication with different degrees and forms of socialised communication between the decision makers involved. For example, some CBCs also involve sending selected personnel to work on-site with partner firms, whilst the organisations keep collaborating over a long distance. This allows CBCs' partners to benefit from some of the advantages of close-distance collaborations, such as the exchange of tacit knowledge via face-to-face interactions among employees, without facing the costs of co-location.

CBCs can acquire very different characteristics. They differ in scope, or the function for which they have been created. As with MLCs, the function of CBCs in turn determines what actors do together in CBCs, what resources they share, and thus the sort of effects that the CBCs can have on firm-level capabilities. A CBC between a Costa Rican ICT producer and its distributor in a given market may improve knowledge about that market, its clients and distribution techniques. It is unlikely to promote the Costa Rican firm's capability to develop new core technologies because collaboration is circumscribed to distribution. CBCs can also have different governance structures, depending on the power relations between their members and on the activities that they involve. If they entail exchanging complex, difficult-to-codify information, for example, the information necessary to co-develop a product, CBCs are likely to have relational governance structures (Gereffi, Humphrey, and Sturgeon, 2005).

In Costa Rica, it has been possible to identify three different subtypes of CBCs, which have been distinguished according to their function: CBCs I – Product Distribution, CBCs II – Customised Service Development and CBCs III – Product and Technology Development. CBCs I occur in two forms: CBCs Ia, collaborations with direct distributors and CBCs Ib, collaborations with indirect distributors.

CBCs I are collaborations between an exporting firm and at least one partner located in a foreign market, who acts as distributor. They resemble MLCs I, collaborations

between MNC subsidiaries and their Costa Rican distributors, save for the fact that in this case, it is the Costa Rican ICT producers who rely on distributors to penetrate other markets. CBCs I also differ from MLCs I because there are two forms of CBCs I, which have different developmental implications and different characteristics. CBCs II are collaborations between Costa Rican service providers and their foreign clients. They are similar to MLCs II in that their function is to adjust a product to specific circumstances. The main difference is that MLCs II serve to adjust a product or process to local conditions in Costa Rica or Central America, whereas the function of CBCs II is to adapt the service of a Costa Rican provider to the needs of clients located in other markets.

CBCs III occur when two distant firms collaborate to develop a technology that will be incorporated into different products or services. This type of CBC is similar to MLCs III. They both entail joint R&D efforts and the sharing of some of the most strategic resources of the firms involved, such as their core technologies and R&D personnel. The key difference is that in a MLC III, a Costa Rican producer collaborates with a MNC subsidiary in Costa Rica, whereas in the only case of CBC III, a Costa Rican firm collaborates with the HQ of a MNC. Given the propensity of MNCs to concentrate decision-making and their core R&D activities near their HQs, a CBC III may offer a higher potential for acquiring technological and organisational knowledge than a MLC III.

The developmental effects of CBCs – like those of other productive collaborations – are related to the type of joint activities and shared resources that they entail, to the extent to which they foster the accumulation of technological and organisational capabilities, and to the upgrading processes that they promote. Table 6.1 summarises the developmental impact of CBCs.

**Table 6.1 The impact of CBCs**

| Subtype | Access to resources | Capabilities | Upgrading |
|---|---|---|---|
| CBCs Ia | Brand<br>Clients and distribution network | Organisational skills | No upgrading observed |
| CBCs Ib | Brand<br>Clients and distribution network<br>Professional advice | Organisational skills<br>Product or location-specific technological capabilities | Product |
| CBCs II | Clients and distribution network<br>Infrastructure<br>Professional advice<br>R&D personnel | Organisational skills<br>Product or location-specific technological capabilities | Product<br>Process |
| CBCs III | Brand<br>Clients and distribution network<br>Capital (via ILCs)<br>Infrastructure<br>Professional advice<br>R&D personnel<br>Other collaborations | Organisational skills<br>Core technological capabilities | Product |

Source: Author's elaboration based on interviews

Table 6.1 shows in the first column from the left-hand the subtype of CBCs, in the second the resources they provide access to, in the third the capabilities they help to accumulate, and in the fourth the forms of upgrading that they promote. As shown in Table 6.1, CBCs I have a lower developmental impact on the firm-level capabilities of Costa Rican firms than CBCs II, which in turn have a lower impact than CBCs III. Table

information and coordination failures affect the Costa Rican ICT cluster, halting the formation of productive collaborations even amongst actors that are located within a short distance of each other. How could productive collaborations emerge between actors that are spatially distant? What role do institutions and social ties play in explaining why and how actors established different subtypes of CBCs? How do different subtypes of CBCs promote the firm-level capabilities of Costa Rican ICT producers? The following section discusses how the literature streams that have dealt with CBCs address such questions, outlining how analysing CBCs through the theoretical framework developed in this study can contribute to the understanding of cross-border collaborative relations.

## 6.3 The globalisation of production, transnational ethnic ties and the emergence of cross-border productive collaborations

Several authors have illustrated that the fragmentation of production processes and the advent of new communication technologies have contributed to creating international networks of firms that interact and collaborate from far away locations, ranging from different clusters to different countries (see among others Arndt and Kierzkowski, 2001; Ernst and Kim, 2002; Harrison, 1994; Humphrey, 2003; Sturgeon, 2001). Although spatial proximity may facilitate collaboration, it is not a necessary precondition for the emergence of productive collaborations (Green and McNaughton, 2000; Saxenian, 2006). The globalisation of production is the most clear in the case of multinationals like Intel, that have production facilities, R&D labs and offices across several continents. However, cross-border interactions do not only occur amongst units of the same organisation, but also amongst different firms (Sturgeon, 2002).[1]

The literature on the globalisation of production draws its inspiration from Williamson (Williamson, 1985). It starts from the observation that in certain sectors, there are inter-firm organisational arrangements that elude the market vs. hierarchy dichotomy,

[1] This chapter focuses only on cross-border productive collaborations between different firms.The definition of CBCs used in this chapter does not include collaborations between different units of the same corporation, such as HQ-subsidiary relations.

and adds that such network-type arrangements increasingly cross national borders. It explains the existence of collaborative networks by looking at the nature of transactions. For example, in highly customised services, it can be more efficient for both the buyer and supplier to adopt collaborative relations because they facilitate the exchange of the information necessary to complete such transactions (Arndt and Kierzkowski, 2001; Borrus and Zysman, 1997; Gereffi and Korzeniewicz, 1994; Humphrey, 2003; Lall, Albadalejo et al, 2004; Sturgeon, 2001, 2002).

Technological change means that firms can choose to establish collaborative relations no matter what their location. A Costa Rican producer can, for example, co-develop a software application with a client in the US whilst collaborating with a Chilean firm in order to integrate their software products into a packaged service that bundles them together. An important contribution of the literature on the fragmentation of production is that it points out that the emergence of CBCs is strongly related to how industries are organised, the specialisation of the firms analysed and the technological compatibility with the firms that could be CBCs' partners.

Looking at transaction costs and companies' specialisation may explain why some Costa Rican ICT producers attempt to establish CBCs whilst others do not. However, such explanation does not take into account some of the constraints that firms located in developing countries' clusters face, such as information failures. For example, a Costa Rican ICT producer may have all of the necessary characteristics to establish CBCs, but it may not have the necessary information, or the necessary resources to do so. Thus, it is necessary to look beyond firm specialisation and transaction costs, and discuss why and how firms that operate in a developing country cluster form different types of CBCs.

Scholars of global value chains contribute to the study of the globalisation and fragmentation of production by questioning the impact of cross-border, inter-firm relations on developing countries. Global value chains link the literature on globalisation with the studies of MNCs and FDI impact, questioning how far MNC-local firms relations in global value chains promote positive externalities, such as technology spillovers and other learning effects. Many of the studies of GVC analyse the relation between firms from the developing world and MNCs that play leading roles in a given value chain, for example,

large retailers in the shoe industry (Bazan and Navas-Aleman, 2004; Gereffi, 1999; Nadvi, 1999; Schmitz and Knorringa, 2000; Schmitz, 2006).

The GVC literature argues that the relations between developing countries' firms and global actors can be governed in different ways, depending on the competencies of the firms involved and the characteristics of transactions – their complexity and the extent to which they can be codified. Governance structures in turn affect the impact of such transactions on the performance, capabilities and evolutionary patterns of producers located in the developing world. (For a thorough discussion of GVC and governance, see Gereffi, Humphrey and Sturgeon, 2005; Humphrey and Schmitz, 2001). This chapter borrows extensively from the GVC literature. It illustrates the nature of the transactions involved in CBCs, how Costa Rican firms and their foreign partners govern their collaborations and whether such CBCs affect firm-level capabilities or promote the upgrading of products, processes and functions.

GVC scholars provide a useful analytical framework, supported by empirical evidence, for understanding cross-border collaborations between firms from developing countries and global players. However, not all of the CBCs found in the Costa Rican ICT cluster involve global players. Firms from the developing world, such as Costa Rican ICT producers, can also structure CBCs with foreign enterprises that are not MNCs, or that are not from the developed world. This chapter contributes to the literature on the cross-border relations of developing countries' producers by explaining why and how Costa Rican ICT firms collaborate not just with MNCs from the developed world, but also with small firms and MNCs from other developing countries.

The CBCs phenomenon has contributed to the debate on industrial agglomerations, showing that it is important to look not only at the relations that occur within clusters, but also at clusters' external linkages. The literature that deals with productive collaborations in industrial clusters, once dominated by concerns with cultural homogeneity and spatial proximity, has benefited from studies on clusters' external linkages and the relation between clusters and global value chains (on the external links of clusters, see Bair and Gereffi, 2003; Nadvi, 1999; Zheng and Sheng, 2006 and also the edited books Giuliani, Rabellotti, et al, 2005; Schmitz, 2004). Some authors, such as Nadvi, have pointed out that the external collaborations of clusters, just like collaborations within clusters, are

intertwined with, and affected by, the social relations of the decision makers involved (Nadvi, 1999).

Nadvi's arguments remind us that the formation of CBCs is an economic action that, according to the theoretical framework of this study, occurs in a socially embedded context – a context in which social relations deliver information and incentives, and thus helps to explain collaborative outcomes. Thus, in order to analyse the findings, it is necessary to look not just at global value chains, governance, and the specialisation of Costa Rican firms, but also at the social relations that underlie the emergence of CBCs.

Scholars of transnational migration, such as Portes, and of the relation between social and business networks, such as Saxenian and Ernst, provide a socially embedded analysis of CBCs. They explain the destination of firms' exports and the formation of CBCs by looking at cross-border social ties between the ethnic communities that operate in different clusters (Ernst, Haggard and Borrus, 2000; Ernst and Kim, 2002; Ó Riain, 1997; Portes and Sensenbrenner, 1993; Portes, Guarnizo et al, 2002; Saxenian, and Hsu, 2001; Saxenian, 2002, 2006).

These authors corroborate their arguments with empirical evidence concerning the importance of ethnic ties with emigrants in Silicon Valley for the development of the Indian, Irish and Taiwanese ICT industry. For example, Saxenian argues that "Taiwan's well-developed transnational community was critical for the formation and subsequent upgrading of a localised cluster of producers, who benefited greatly from direct links to Silicon Valley's technology and markets" (Saxenian, 2002: 200).

The literature on transnational ethnic ties shows how organisational resources and individual resources become intertwined when firms take collaborative actions, both within and beyond national borders; who an entrepreneur is and who he knows affect all of his actions, including the formation of productive collaborations such as CBCs. It also underlines that it is not possible to look at clusters as collective entities without taking into consideration that the decision makers involved are embedded in different communities and social networks, which affect their incentives and also the resources they can leverage to pursue such choices. However, looking at transnational ethnic ties is not sufficient to explain the findings: only one of the Costa Rican ICT producers established a CBC on the basis of a transnational ethnic tie.

The studies of transnational ethnic ties could be interpreted in a tautological way. They could be used to argue that CBCs emerge because of, and only when there exist, cross-border ethnic ties. This chapter challenges such a claim. It shows that Costa Rican ICT producers used their social ties as means to establish CBCs, but also that such ties do not have to be based on ethnicity or to predate the formation of CBCs. Entrepreneurs can build and accumulate transnational social ties in order to achieve certain objectives, such as penetrating foreign markets and finding foreign collaborators.

The following sections analyse the three subtypes of CBCs, focusing on their formation and impact. They discuss the impact of CBCs by questioning whether they have ignited or accelerated organisational and technological learning processes for the Costa Rican firms involved. They also illustrate how institutions and social ties help to explain the process through which Costa Rican ICT producers created their CBCs.

## 6.4 CBCs I: Product Distribution

Costa Rican ICT entrepreneurs who are not involved in CBCs consider them to be mainly an export strategy. Only the first subtype of CBCs, Product Distribution CBCs, the most common form of CBCs established by Costa Rican producers, is an export strategy – a strategy that firms choose in order to foster their sales in foreign markets. This section discusses its characteristics. Costa Rican ICT producers explained the different strategies they use to penetrate foreign markets:

1. Direct Exports – Sell directly from Costa Rica,
2. Subsidiaries – Set up a fully-owned subsidiary to distribute products and provide client support,
3. CBCs Ia – Form Direct Product Distribution CBCs with companies (usually partially-owned) that will distribute its products,
4. CBCs Ib – Establish Indirect Product Distribution CBCs with companies that will act as indirect distributors, generally system integrators.

Opening a subsidiary is the only strategy that allows Costa Rican firms to have direct contacts with clients as frequently as it may be necessary and to maintain a high visibility in a given export market. But it is also the most risky strategy because setting up and running a subsidiary can be very costly for Costa Rican producers. As a result, only two Costa Rican ICT producers have foreign subsidiaries. They have opened them as part of a gradual internationalisation process, after having been involved in different CBCs with foreign partners (the issue is discussed more thoroughly in section 6.5). Most Costa Rican firms adopt strategy 1 because they do not have the necessary resources to establish CBCs or open subsidiaries, or because their export sales are too low to justify investing in CBCs. Out of the four export strategies, only the third and fourth involve collaborating with distant partners and thus comply with the definition of CBCs.

Costa Rican firms establish CBCs I in order to enter a foreign market or to expand their exports to it by collaborating with a partner based in such a market. These collaborations play a similar role to Product Distribution collaborations between MNCs located in the cluster and their Costa Rican partners (MLCs I), which have been discussed in Chapter 5. However, in CBCs I it is Costa Rican ICT producers who rely on external collaborators to distribute their product in other markets. Let us discuss the difference between CBCs with direct and indirect distributors.

### 6.4.1 CBCs Ia: Direct Product Distribution

CBCs Ia occur when a Costa Rican ICT producer uses a foreign company to distribute its products in a foreign market. The distributing company can be an existing firm or it can be set up ad hoc for the occasion. CBCs Ia allow Costa Rican firms to overcome a lack of information about export markets and a lack of organisational reputation. Costa Rican firms involved in CBCs Ia explain that in their initial export phase, it was important to collaborate with firms that knew which clients to target and how to do so. In the cases in which CBCs Ia partners were new firms, Costa Rican ICT producers could not benefit from the organisational knowledge and reputation of such firms. However, they could rely on the personal reputation, contacts and market

knowledge of the CEOs of the newly-founded collaborating firms, achieving similar results.

The main impact of CBCs Ia was to facilitate exports. CBCs Ia did not promote upgrading. Nevertheless, they allowed Costa Rican firms to acquire knowledge about their export markets and about different distribution techniques. For Costa Rican ICT producers, direct distribution is a cheaper and organisationally easier option than having subsidiaries. It allows them to share with their collaborators the costs of starting and running a company in a foreign market. However, it can also entail some risks.

Costa Rican exporters do not fully own their distributors. As a result, distributors do not have to work exclusively for their Costa Rican partners. In certain cases, they also distribute rival products. Hence, they could act unfairly, for example by distributing rival software at preferential rates. Costa Rican firms try to minimise the risk of unfair behaviour by being the key investors in their distributors. Since they own shares of such companies, they are entitled to part of the profits made by those companies. This sort of agreement makes the incentives of a Costa Rican firm and its CBC Ia partner converge: they both gain when sales of the Costa Rican product increase in the market served by the distributor.

The Costa Rican firms explain that they are not willing to fully own their distributor partners because the actors who found and lead distributing companies have more reputational and economic incentives to improve performance if they are co-owners. Costa Rican ICT producers structured their CBCs Ia agreements making sure that they incorporated behavioural incentives for their collaborators to increase sales in their market and to avoid defecting to rival firms.

All of the firms that have CBCs Ia made use of their founders' social ties as a key element in their export strategies. Their founders resorted to old school friends and ex co-workers for the creation of CBCs Ia. In two cases, Costa Rican entrepreneurs actively pushed their old friends to found new companies specifically to distribute their product. In the remaining six cases they used their social ties to acquire information and get in contact with the companies that became their CBCs Ia partners. The social ties that underline these CBCs functioned as 'bridges'; they linked distant communities, allowed actors to

exchange information that was otherwise unavailable to them and helped firms to coordinate collaborative actions.

In another case, a Costa Rican ICT producer did not have enough resources to form a CBC Ia, but equally relied on his social ties to penetrate a foreign market. His firm began to export as soon as it was created, benefiting from his contacts to some ex colleagues abroad who introduced it to its first clients. Not being able to establish CBCs Ia, the Costa Rican entrepreneur acted personally as a distributor. He travelled often to export markets, where he gradually built a network of social ties to actors who work in client companies or who helped him to find new clients. In this case, the Costa Rican entrepreneur did perceive incentives to have a CBC, but chose a different export strategy because of resource constraints. Acting as a distributor, he used his own cross-border social ties in the same way as other Costa Rican firms used the personal or organisational contacts of their distributors: to find new clients in export markets.

### 6.4.2 CBCs Ib: Indirect Product Distribution

There are four Costa Rican ICT firms that have Indirect Product Distribution CBCs in their export countries. All of them collaborate with system integrators – firms that offer a broad range of products to their clients, integrating and bundling software applications purchased from external firms. The only two Costa Rican firms that have CBCs with both direct and indirect distributors claim that the two strategies can coexist. However, they point out that it is more difficult to establish CBCs with indirect distributors, for it entails not only finding the correct partners, but also being able to offer a product that is easily bundled and also that adds value to the partner's own services. All Costa Rican exporters describe CBCs Ib as a very desirable export strategy but explain that if a firm is willing to pursue the formation of CBCs Ib, it is has to comply with the following requirements:

- Must have the necessary resources to do it (financial resources to invest in product development and adaptation, technological capabilities to develop suitable products, contacts with potential CBCs Ib partners);

- Must accumulate the necessary organisational reputation to convince system integrators to incorporate its product and thus act as indirect distributors;
- Must specialise in products or services that can be easily bundled and integrated;
- Must attempt to collaborate with CBCs Ib partners that are technologically compatible (e.g. that use the same technological platform, database or programming language).

All companies that have indirect distributors established their CBCs Ib after at least five years of operations, precisely because of the difficulty of meeting such requirements. There are high costs involved in this type of CBC because, unlike in Direct Product Distribution CBCs, in CBCs Ib the product or service has to be modified and integrated with others that form the package sold by the indirect distributor. In order to ensure that their products are compatible for the CBC Ib, partners have to exchange information and perform joint product adaptation R&D. The objective is to codify the necessary information for the Costa Rican firm to provide to its system integrator a fully modular product – a product that does not require further adaptations and can be bundled and distributed in different combinations.

Thus, the formation of CBCs Ib occurs through a relational collaboration, but once a CBC is fully operational its governance becomes modular. Mutual learning takes place as partners collaborate to integrate products: system integrators learn about the specific application supplied by Costa Rican firms, which they may not be familiar with. Costa Rican firms learn how to make their product modular and how to integrate it with other products to suit specific clients.

The Costa Rican producers engaged in this type of CBC benefited from selling their product through the distribution network of their integrators, who are larger firms and thus have an established brand in their market. Costa Rican companies also received professional advice and participated in joint R&D sessions with the personnel of their partners. These aspects of CBCs Ib promoted the organisational and product-specific technological capabilities of Costa Rican firms, facilitating their product upgrading. However, there are also other incentives for Costa Rican companies to enter into a CBC Ib.

For Costa Rican producers, having indirect distributors implies selling a unit of their own software for every unit of product sold by the foreign partner. It allows them to share marketing and distribution costs, to use already-established client networks, and, potentially, to benefit from being associated with a well-respected provider of ICT services. For their partners, it allows them to diversify the range of services and products offered, and also to receive targeted benefits, such as software packages and training services at preferential rates, in exchange for their distribution role.

The incentives that motivate this type of Distribution CBC, and also the institutions structured by actors to regulate it, are very similar to those adopted by MNCs with Costa Rican distributors in MLCs I (see chapter 5, section 5.5). Distributors receive specific benefits in exchange for distribution, marketing and product-bundling services. But Costa Rican exporters can use their networks of indirect clients (the clients of their indirect distributors) to attempt to create technological lock-in effects.[2]

As discussed in chapter 5, MNC providers of technological platforms have succeeded in using this strategy to capture Central American clients. They have locked their Costa Rican MLCs I partners and their clients into technological dependence with a carrot-and-stick method: targeted benefits to develop products based on their technology only, combined with the high costs of having technologically diversified R&D capabilities. Costa Rican ICT exporters respond to the same incentives as MNCs. They also attempt to generate technological lock-in by acquiring, in an addition to their own clients, a pool of business clients that use their applications integrated into other services.

There are signs that the strategy of Costa Rican exporters involved in CBCs Ib has not produced the expected results. It is costly for a system integrator to change some of the applications included in its services. But it is less costly for system integrators to substitute one of their modular application providers, for example, by changing the accounting software that they sell together with a broad range of other business applications, than it is to change the technological platform on which they develop all of their products. Whilst there are only a few MNC providers of technological platforms, there are many firms

[2] MLCs I are also different because the MNCs manage their collaborations with distributors from local subsidiaries in Costa Rica. This implies that the Indirect Distribution collaborations they have established are not CBCs, but rather more conventional collaborations between actors operating in the same cluster.

making rival applications compatible with the requirements of system integrators. Therefore, although they respond to the same incentives and pursue the same strategy, it is more difficult for Costa Rican firms to lock-in their clients via indirect distribution CBCs than it is for MNCs.

From the accounts provided, it has been possible to detect that Costa Rican exporters feel pressured from their CBCs Ib partners to maintain competitive prices and high quality standards. Such preoccupation points out that at the time of fieldwork, indirect distributors were not technologically dependent on their Costa Rican software providers. On the contrary, they seemed to exercise a considerable bargaining power over Costa Rican exporters, taking advantage of the fact that the latter are unwilling to compromise their CBCs Ib.

The incentives that determine Costa Rican firms' will to create indirect distribution CBCs, and those of their partners, are generated by some sectoral characteristics of ICT, such as the potential for generating technological lock-in. The choice to establish a CBC Ib can be also explained by looking at the resources and capabilities of the firms involved: firms with insufficient resources, reputation or a non-suitable product either fail to find partners for CBCs Ib, or adopt other export strategies. Having assessed the incentives that drive actors to form CBCs Ib and discussed their impact, it is now necessary to illustrate the process through which such collaborations emerged, explaining the role played by social ties.

The four Costa Rican entrepreneurs involved in CBCs Ib have made very different use of their social ties. One of them relied on the social ties he acquired during his postgraduate education. He structured a CBC Ib for Indirect Distribution with two ex schoolmates who run an ICT service integrator in Honduras. Through such collaboration, the Costa Rican firm provides one of the key components of the product that the Honduran firm sells. The CBC Ib is a formal agreement, whereby incentives are clearly structured. The Costa Rican exporter affirms that the same CBC Ib could be negotiated with partners with whom he had no previous social relation. However, his account of how the CBC was created shows that social ties played a determinant role.

The Costa Rican exporter decided to establish a CBC with a Honduran partner because he became exposed to the range of clients and opportunities available in this

market through his social ties. If he did not have access to information about the Honduran market, the Costa Rican entrepreneur may have not attempted to export there. Similarly, the Honduran system integrator decided to purchase the Costa Rican software instead of more well-known applications provided by MNCs because its CEO had access to information about the Costa Rican firm. Thus, the strategies that the two firms adopted have been affected by the social ties of the actors who lead them, which were used to obtain information and facilitate the formation of the CBC.

The second Costa Rican exporter involved in CBCs Ib insists that social ties do not explain CBCs Ib. He argues that the type of software his firm developed is easy to bundle for providers of integrated IT systems or IT consulting services, which facilitated the task of finding firms to establish CBCs Ib. But he also recognised that initially it was difficult to convince foreign partners to choose the application produced by his firm, and that he managed to do so after his firm had already acquired a good reputation.

In the first years of operations, the firm made use of its founder's social ties to pursue exports, not CBCs. Through his ties, the founder accessed information about export markets and obtained contacts with the representatives of the firms that became his first two foreign clients. His export strategy relied on personal contacts to promote direct exports. After having won a large contract with a foreign client, his firm gained credibility in Latin America, overcoming the information failure that makes the majority of Costa Rican ICT firms virtually unknown beyond the national borders. On the basis of the newly acquired reputation, he adopted an export strategy that relied on the active pursuit of both export clients and Indirect Distributors with whom his company could establish a CBC Ib. The implementation of this strategy made a different, yet intensive, use of social ties.

The founder of the Costa Rican firm emphasises that he did not have the necessary social ties to find suitable partners. He attempted to build such ties by participating in numerous international ICT forums and events. The strategy was successful, as it allowed him to establish eight CBCs Ib. In some cases, the social ties he gradually generated managed to secure export deals, and subsequently his export clients introduced the Costa Rican firm to system integrators who became collaborators in CBCs Ib. In other cases, these ties, supported by the reputation of his firm, helped to initiate information exchange and communication directly with firms that eventually became indirect distributors. In this

case, social ties served as a means to overcome information failure, deliver incentives to collaborate, shorten organisational distance, and thus facilitate the formation of cross-border productive collaborations.

The social ties that the Costa Rican firm used to obtain CBCs Ib link its founder to actors with whom there were no previous social relations. They are ties that have been specifically constructed to support export strategies. This underlines that having ties with potential CBCs I partners is not a precondition for forming a CBC I, and that social ties are part of the resources that a firm uses not only to export, but to establish collaborations, in this case with distant partners.

There are also two Costa Rican firms that are involved in CBCs Ib because of their collaborations with MNCs. In the first case, the Costa Rican exporter and the system integrators that indirectly distribute its product operate on the same technological platform. Hence, despite operating in different markets and product niches, they are all part of a network of firms linked to the same MNC via MLCs I – they all indirectly distribute the MNC product with their own. Through the events organised by the MNC, the CEO of the Costa Rican firm slowly built social ties with actors working in system integrators that operate in different Latin American markets. He used such ties as means to establish several CBCs Ib.

The strategy of the Costa Rican exporter is formally supported by the MNC, which favours alliances among its indirect distributors. However, the Costa Rican manager explained that the MNC only provided the circumstances in which to look for useful contacts – the networking events. The process of social tie-construction and the use of such ties to establish CBCs depended on factors unrelated to the MNC, such as product compatibility and the social compatibility of the actors involved.

The second case in which MNCs played a role in the formation of CBCs Ib is that of a Costa Rican exporter who does not act as an Indirect Product Distributor for MNCs (is not involved in a MLC I), but is linked to a MNC by a Product and Technology Development CBC (CBC III), which will be discussed in section 6.6 of this chapter. The Costa Rican firm produces an application that facilitates the transition from other technological platforms to the one supplied by its MNC partner, and it also provides support for clients that implement such a transition.

The MNC evaluated that boosting the diffusion of the Costa Rican transition-facilitating software could speed up sales of its technological platform in regions where its diffusion was low, such as in South America. For this purpose, the MNC itself generated social ties that link the Costa Rican entrepreneur to the CEOs of the South American system integrators that eventually become its Indirect Product Distributors. It introduced the actors to each other and created ad hoc situations in which they could meet, consolidate their social link and exchange information.

In both cases of CBCs that have been promoted or supported by MNCs, pre-existing social ties do not explain why or how distant actors managed to establish productive collaborations. Social ties built on purpose to promote CBCs have been the means through which actors communicated and eventually began collaborating. The main difference between the two cases is that in the first, it was the Costa Rican exporter who actively searched for CBCs by forming ties with suitable firms that shared alliances with the same MNC. In the second, it was the MNC itself that promoted the formation of the ties that led actors to collaborate over a long distance.

## 6.5 CBCs II: Customised Service Development

There are three Costa Rican providers of ICT services that are engaged in Customised Service Development CBCs. All of them have existed for more than five years and export over half of their sales. Two of them focus exclusively on providing outsourced ICT services to US companies. The third provides ICT services to large corporate clients in Latin America. The literature on transactions provides an explanation as to why they collaborate with their clients. Certain products and services cannot just be sold via arm's-length transactions. When transactions are difficult to codify, a certain degree of buyer-supplier collaboration is required in order to complete them. For example, in order to develop a customised product a supplier needs specifications from its buyer. Such specifications may not be easy to transmit in a codified form, such as a manual, and thus may require the two parties to work together. Relational governance structures characterise these sort of transactions (Gereffi, Humphrey and Sturgeon, 2005).

Many of the American firms that outsource software programming and the provision of certain ICT services to offshore locations, such as India and Costa Rica, tend to establish CBCs II with their suppliers (Saxenian, 2002). The outsourcing of services implies the exchanging of information, sharing some technological standards and often co-developing customised products. The more customised and complex the service required, the more it is necessary for buyer and supplier to work together to develop it. Thus, the main reasons for CBCs II to exist are related to the structure of the ICT industry, and in particular the way in which firms outsource ICT business. However, there are other factors that explain why Costa Rican firms attempted to form CBCs II.

The representatives of these companies pointed out that besides the nature of their business, which may require them to collaborate with clients, there are also other incentives to establish CBCs II with their foreign clients, including:

- Accessing information about their export markets;
- Obtaining contacts to new clients;
- Acquiring information about the organisational techniques of their clients;
- Developing new services with them that can potentially be sold to other clients;
- Learning how to improve their product development process by working together with the R&D teams of their clients.

The Costa Rican exporters who are involved in CBCs II responded to incentives to acquire information and learn from their partners, not just to incentives to penetrate foreign markets. There are also incentives for clients to collaborate rather than simply outsource services to Costa Rican firms. By working with their Costa Rican providers, clients can adjust the services they purchase to their specific needs. Clients that intend to have a long term relationship with Costa Rican firms have incentives to help them to improve their organisational and technological capabilities in order to ensure that they provide high quality services.

In the CBCs II identified, the three Costa Rican firms sent R&D teams to the offices of their clients/CBCs II partners. On the basis of their existing software products, they co-

developed customised services with their clients that combine different applications and services. In order to do so, they shared information about the products of their clients and used the same technological infrastructure. Costa Rican firms claim to have gone through a strong learning process thanks to their CBCs. They point out that it was useful to expose their teams not only to the technologies, but also to the work practices of their clients. As a result of the CBCs II, they have introduced new products, upgraded their production processes (they incorporated more complex quality testing systems) and acquired new capabilities (the technological and organisational capabilities to develop the services provided to their CBCs II partners). Let us explore the process through which the CBCs have been established and verify which role social ties played in the latter.

The three Costa Rican firms involved in CBCs II provided very different accounts of the role that social ties played in determining whether and how they established their cross-border collaborations. In the first case, the CEO of the Costa Rican firm openly pursued the formation of ties that could lead to CBCs with American clients by looking for employees with work experience in the US. He hired a US citizen with previous experience in outsourcing and IT services as one of his top managers.[3] The American manager used his social ties to colleagues from the companies where he worked before moving to Costa Rica to promote cross-border collaborations. He acted as a bridge between the Costa Rican firm and potential partners for CBCs that had no information about it. His role was not only to transmit information, but also to help the Costa Rican firm overcome its lack of reputation in the US market.

The Costa Rican entrepreneur did not have social ties of his own that could be used to promote CBCs. Thus, he worked to acquire such ties indirectly. Again, it is a case of social ties being used as resources to penetrate foreign markets and to facilitate the formation of a CBC, but also a case of social ties being constructed for their purpose rather than being inherited from past relations.

In the second case, the opposite path was taken. In this instance, a Costa Rican provider of outsourcing services entered the US market, expanded its exports and

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[3] According to the information available, the US citizen was willing to relocate to Costa Rica because he was married to a Costa Rican, not because he was offered a higher salary to attract him away from the US.

established cross-border collaborations using a kinship tie. The company was founded and is managed by two brothers, the eldest of which worked in Silicon Valley for a long time. Benefiting from his knowledge of the US market and his social ties, the eldest brother promoted the creation of three CBCs II and eventually established a subsidiary office of the Costa Rican firm there. He acted as the means through which the Costa Rican firm acquired clients and maintained a foreign client network without using distribution CBCs, and also as the means through which it formed a CBC II. Despite an initial unwillingness to attribute export performance and the existence of cross-border collaborations to a family tie, the CEO of the Costa Rican firm eventually illustrated the role played by his older brother not only with regards to CBCs, but also with regards to the strategies that the firm adopted, and its evolutionary trend.

This firm's CBCs II multiplied through time. However, they changed in nature, becoming a hybrid between cross-border and intra-cluster collaborations when the Costa Rican firm opened a small subsidiary office in the US to provide client support. It still sends engineers to the US from its home office and still carries out most of the work from Costa Rica, and communication goes through the same social tie, the brother who lives in Silicon Valley. But previously, he worked in different companies and only acted informally as a contact for the Costa Rican firm. Since 2004, his full time job has been to direct the US subsidiary of the Costa Rican ICT producer that he co-founded with his brother. This case is the only case of a cross-border collaboration that emerged because of the sort of transnational 'ethnic ties' described by Saxenian and other authors – ties that link professionals from a given ethnic group, in this case Costa Rican ICT producers, to emigrant communities in the country where they look for clients or collaborators (Saxenian, 2002; Portes and Sensenbrenner, 1993).

The last case is that of Soin, which was introduced in chapter 3 (see section 3.6.2: 97-99). Soin won a contract with one of the subsidiaries of a Mexican MNC. Subsequently, due to satisfaction with the services provided, the Mexican MNC hired the Costa Rican supplier for other subsidiaries in Latin America, increasing sales volumes and also the complexity of the services required. The CEO of the Costa Rican firm gradually built social relations with the managers of the MNC subsidiaries with which it worked. These social ties, which emerged as a result of a buyer-supplier relation, bridged the

spatial and organisational distance that divides the two companies limiting information exchange.

When the HQ of the MNC began considering a change in its IT applications and IT service providers, the Costa Rican firm was informed via the social ties that linked his CEO to the subsidiaries' managers. Using this information, the Costa Rican firm developed a preliminary product and presented it to the MNC, convincing it to try to co-develop a more customised set of services. The client was very satisfied with the result and demanded more complex services for all of its branches. In order to supply such a complex range of services, the CBC II became insufficient, so the Costa Rican firm opened a Mexican subsidiary, which currently accounts for a higher share of sales than the HQ.

Social ties served to link the managers from the two organisations and to allow information to flow between them across organisational and spatial borders. But such ties resulted from, rather than caused, the buyer-supplier relation between the two companies. This case also illustrates that social ties affect the formation of CBCs, but that predating ties of a social, kinship or ethnic type are not a pre-requisite for the emergence of CBCs II.

Through the collaboration with its Mexican client, the Costa Rican firm gained access to several other clients and successfully penetrated the Mexican market. It also improved its understanding of the services demanded by the MNCs that operate in the same area as its client. This CBC II also had the same positive developmental effects as the other two CBCs II: it provided access to key strategic resources, such as advice from the MNC professionals and R&D personnel; it facilitated the accumulation of new organisational and technological capabilities; and it fostered product and process upgrading.

## 6.6 CBCs III: Product and Technology Development

The only case of a CBC III found in the cluster links a Costa Rican ICT producer to the HQ of an American MNC, also an ICT producer. The Costa Rican firm had developed a service that helps clients transfer their programs and applications from their current

technological platform to a different one without resorting to manual reprogramming. This Costa Rican software application (provided with a supporting consulting service) dramatically reduces the cost of shifting between different providers of technological platforms. One of the MNCs that produce technological platforms became a client.

The MNC hired the Costa Rican firm to help it move some programs onto its newest technological platform, which was not compatible with its own previous standards. The two firms established a CBC II to adjust the service provided by the Costa Rican firm to the exact specifications of the MNC. The Costa Rican firm sent a team of developers to the HQ of the MNC, and its CEO travelled frequently to exchange information with the MNC officers in charge of the CBC. The joint adaptive R&D efforts that the two firms carried out had a similar positive developmental impact to that observed in other CBCs II. For example, they allowed the Costa Rican firm to acquire information about the technological and organisational practices of the MNC with regards to service development; they improved its understanding of the functioning of the MNC and the services it may need in the future; and they fostered product upgrading.

At the time of the cross-border collaboration, the MNC decided to change the core technology on which it ran all of the systems and programs of its HQ. This required a complex re-programming effort, or the development of a new technological solution suitable for the automatic migration of its entire network of interlinked software packages and systems. The service of the Costa Rican firm was not designed for such complex task and could not be adapted. The MNC needed to find a firm that could develop a new service to help it perform its internal technological change.

Through its CBC II, the MNC had the opportunity to work with the Costa Rican firm and acquire information about both its technological capabilities and its specific competencies. The MNC decided that the Costa Rican producer was the right supplier to provide the service that the MNC needed; it was capable and technologically compatible with the solutions chosen by its in-house R&D team. The MNC hired the Costa Rican firm and established a CBC III with it, a collaboration to co-develop a new service, which in this case involved developing a new technology.

The CBC III has been a three year project, during which time the Costa Rican firm had an R&D team constantly working in the R&D division of the MNC. In order to

perform the task, the Costa Rican firm had to increase its workforce by 100%. Its revenues increased, but the CEO struggled to cope with the sudden growth and with such a large contract. In order to support its partner, the MNC invested in the Costa Rican firm, purchasing half of its shares. It established an ILC II, which is discussed in section 2.7 of chapter 2. Supported by the capital injection, the Costa Rican firm fulfilled the expectations of the MNC, successfully co-developing the new technology and the service based on it.

This cross-border collaboration was governed in a relational way because, like CBCs II, it entailed the exchange of non-codifiable information. The CBC III had a more evident impact on the Costa Rican firm involved than the other types of CBCs. Firstly; the collaborative contract with the MNC boosted the Costa Rican firm's sales and its credibility as a supplier. Secondly, the MNC began promoting the Costa Rican firm with its own clients, providing new contracts and free marketing services. Thirdly, working in a technology and product development project together with the MNC exposed the Costa Rican and its engineers to advanced work practices, technologies, skills and organisational techniques.

This case provides evidence that MNCs' incentives to collaborate with firms from developing countries are related not only to the capabilities of the latter, but also to the products and technologies they develop. For example, if they specialise in products aimed at Central American markets, MNCs may collaborate with them if they have incentives to capture their regional clients, a phenomenon discussed in chapter 5. On the other hand, if they specialise in products for the global market, MNCs may have incentives to establish CBCs III.

In this CBC, social ties did not play such a strong role as they did with regards to the formation of other CBCs. The Costa Rican entrepreneur explained to us that it was through a social tie he acquired by working in the US that he managed to make his product visible to the MNC. However, once the MNC did test and eventually acquire its product and annexed services, the social tie that bridged the distance between the two

organisations stopped playing any role.[4] The MNC decided to collaborate with the Costa Rican firm because of its technological capabilities and specialisation. The social tie served to overcome information failure and expose the MNC to the Costa Rican firm. It was not, however, a main factor in causing the occurrence of the CBCs, partly because the acquaintance of the Costa Rican entrepreneur who works at the MNC does not have the necessary position or contacts to influence the MNCs' decisions with regards to its CBC II or CBC III partners.

## 6.7 Does everybody want a CBC? Incentives resources, and export orientation

The Costa Rican firms involved in CBCs seem to have benefited from their CBCs, especially those involved in CBCs Ib, CBCs II and CBCs III. Many firms that do not have CBCs claim to be actively looking for foreign partners to collaborate with. Such claims suggest that there are strong incentives for Costa Rican ICT producers to establish CBCs. However, fieldwork produced less clear cut answers: some firms do not attempt to create CBCs because they do not want to, and others because they do not have the appropriate resources to do so. And among those that do attempt to have CBCs, some manage to get them, and others do not.

**Table 6.3 Exporters and CBCs**

| Export orientation | Are involved in a CBC | Are trying, have tried, or will try to establish a CBC |
|---|---|---|
| Have foreign clients | 2/30 | 21/30 |
| Foreign clients account for over 50% of average annual sales | 5/10 | 5/10 |
| Non-exporters | 0/60 | 33/60 |
| Total | 7/100 | 59/100 |

Source: Author's elaboration based on interviews

[4] Section 2.7 of chapter 2 provides a more detailed account of how the social tie of the Costa Rican CEO helped him to sell his services to the MNC, which eventually became its CBC partner.

Table 6.3 shows in the first column from the left-hand side the export orientation of firms, distinguishing those that have some foreign clients, from those that do not have foreign clients, and those which sell over half of their products and services abroad. The second column from the left-hand side shows how many firms are involved in a CBC per each export orientation category, and the last column shows the firms that have tried or are trying to establish a CBC. All firms that export over 50% of their sales either have CBCs, or are trying to have them. Among non-exporters, fewer firms have incentives to have foreign partners and claim that they want to be involved in a CBC. Non-exporters seem to be less interested in CBCs. Those firms that do not export but intend to become exporters either have already attempted, or claim that they will attempt to find foreign partners.

The nine exporters that are not interested in CBCs export a small share of their sales to neighbouring countries. They explained that unless their export shares rise, they do not need to collaborate as they can manage client relations and distribution without having partners. Most non-exporters downplay the role that CBCs can have as mechanisms for favouring technological and organisational learning. For them, CBCs are mainly a way to promote exports. Exporters, on the other hand, consider it very important to be able to learn from their cross-border collaborators.

Exports and CBCs also depend on resources. Some firms do not export, and thus have not looked for CBCs, because they do not have enough resources to do it. Although these firms have not attempted to have CBCs, they intend to look for CBCs in the future. The firms that attempted to form CBCs but have not been successful explain the outcome in terms of time and resources. Most of them claimed that they just need more time, and that they are in the process of negotiating some CBCs. Some simply attribute their failure to a lack of sufficient resources to finance a continuous effort to look for foreign partners, and to a lack of useful contacts. However, all of them seem to be willing to keep trying to establish CBCs and to look for social contacts abroad that could be used for that purpose.

There are also firms that do not export, or export a very small share of their sales, but which make healthy profits in the domestic market. Although they have the resources to do so, these firms have few incentives to look for foreign partners. The main difference in incentives to establish CBCs occurs between the firms that export or intend to export, which want to form CBCs, and the firms that focus on the domestic market, which do not

want to form CBCs. In other words, propensity to export is the key determinant of incentives to establish collaborations with firms located abroad. But what determines Costa Rican ICT producers' propensity to export?

As discussed in other chapters, the propensity to export is strongly correlated to entrepreneurs' backgrounds: those with international experiences are more inclined to export. However, international experience affects entrepreneurs' decisions through the means of social ties. They decide to export because their contacts abroad transmit information to them about business opportunities and help them to find potential clients or collaborators. For example, in one case, an entrepreneur is attempting to form a CBC because he is emulating a foreign friend who, by virtue of collaborating with a MNC, boosted the performance of his own software firm. The social tie of this Costa Rican producer did not prove to be useful in helping him to find a CBC partner. But it exposed him to incentives to do so. In other cases entrepreneurs used their social ties as resources to support their internationalisation efforts, including the formation of CBCs.

The firms that did manage to have CBCs explained that they also were first exposed to the idea of cross-border collaborations through conversations with actors who work in other clusters, industries and countries. Costa Rican entrepreneurs' foreign social ties act as means to deliver incentives to export, and, as a consequence, to look for CBCs. They bridge distant business communities, introducing non-redundant information which can foster the formation of CBCs. Ties played a role also for those actors that responded to incentives not to export, and, as a consequence, not to form CBCs. They are the entrepreneurs without linkages to external communities, who are more tied to their own self-contained, non-collaborative, closed community (for a more thorough discussion of the Costa Rican ICT producers' community, see chapter 3). Their social ties circulate information about highly remunerative opportunities with the domestic public sector and about the difficulty of exporting. Such information generates an anti export bias, which reduces incentives to look for CBCs.

## 6.8 Conclusion

CBCs are productive collaborations between Costa Rican ICT producers and spatially distant firms. Together with MLCs, CBCs form the external linkages of the Costa Rican ICT cluster. CBCs also resemble MLCs because they have similar functions: MLCs I and CBCs I serve to distribute products, MLCs II and CBCs II serve to adapt a product or service and MLCs III and CBCs III serve to develop new products. The main difference is that several MLCs, namely most MLCs I, had a negative developmental effect on Costa Rican firms. There has been no case of a CBC having negative developmental effects on the Costa Rican producers involved, perhaps because there is no case of a CBC with a captive governance structure.

CBCs Ia are the only subtype of CBC that did not promote product upgrading. Nonetheless, they allowed Costa Rican firms to acquire new market knowledge and to use their collaborators' brand and client networks. All other CBCs provided access to professional advice and led to product upgrading. In CBCs II, Costa Rican firms had to adapt their services to the specifications of their clients. By doing so, they upgraded their processes, such as the way in which they test the quality of their services. CBCs Ib and CBCs II involved joint R&D activities to adapt products and services, which fostered the firm-level acquisition of new organisational and technological capabilities.

In the only case of CBC III identified, the Costa Rican firm involved learned how to develop new technologies and products following the procedures and standards of the MNC, and it had the opportunity to absorb both technological and organisational knowledge from its partner. The MNC supported such a strategic cross-border collaboration with an ILC and it also helped the Costa Rican firm to establish several CBCs I. The CBC III had the strongest developmental effects on the capabilities, international credibility and also the performance of the Costa Rican firm involved.

Costa Rican firms that are involved in CBCs are aware of the positive developmental effects of such collaborations and attempt to form them not only as means for exporting products. Nonetheless, incentives to look for CBCs are strongly related to the propensity to export. As discussed in chapter 3, whether local entrepreneurs decide to export is related to their social ties, which provide them with access to information. Those

entrepreneurs who do not have social ties to external actors rely on the information that circulates in their community, which leads them to focus on the domestic market, and thus not to look for CBCs. The producers that have social ties to actors located abroad respond to incentives to export. They thus develop products and services suited for export markets, and look for potential foreign partners. But social ties did not only affect incentives to look for CBCs. They also acted as a key resource through which Costa Rican ICT entrepreneurs pursued both exports and CBCs.

This chapter illustrates how entrepreneurs often leverage their cross-border social ties to acquire information, facilitate negotiations and establish new contacts. They use their social linkages as part of the resources of their firms. As a result, the networks of cross-border collaborations of a Costa Rican ICT enterprise are often related to, and interlinked with, the social networks of its founder or CEO. However, this chapter also shows that CBCs do not emerge exclusively in the cases where a Costa Rican ICT entrepreneur has cross-border social ties to promote them. Social ties, like other firms' resources, do not have to be inherited; they can be gradually accumulated. This implies that in order to explain the emergence of CBCs, it is insufficient to look just at the sort of social ties that actors have before deciding to engage in CBCs, such as ethnic or kinship ties.

Several of the CBCs found in the Costa Rican ICT cluster have emerged because of social ties that Costa Rican ICT producers built specifically to promote their sales and inter-firm relations with foreign actors. In one case, the social ties that facilitated the establishment of a CBC II developed because of an existing buyer-supplier relation between a Costa Rican producer and a MNC. Only one of the firms involved in CBCs has used a kinship tie as a basis for its cross-border collaboration. Other firms have made use of a diverse array of non-family ties, often with actors from different ethnic groups. The existence of CBCs between Costa Rican ICT entrepreneurs and foreign actors underlines that, as argued by Saxenian and Portes, ethnic communities may be used to explain cross-border collaborations. But productive collaborations between firms do not only cross national borders, but also ethnic borders.

Whether firms are willing to establish CBCs, and also whether they manage to do so is related to many factors: their capabilities and specialisation, the social ties of their

decision makers, the resources they can invest in tie-building strategies, the sort of ties they manage to acquire and the use they make of such ties. In CBCs, but also in MLCs and other types of productive collaborations, social ties affect both incentives to collaborate and the process of establishing collaborative arrangements. The findings suggest that the debate on the external linkages of clusters – of which CBCs and MLCs are a very important part – would benefit from taking into account the effects of social ties and networks on the formation of such linkages.

# 7 Social ties, incentives and the emergence of developmental productive collaborations in industrial clusters

## 7.1 Introduction

Industries, agglomerations and individual firms from developing countries tend to be latecomers, especially in knowledge-intensive sectors. To catch-up with their first world rivals they have to acquire organisational and technological capabilities. This is a costly and lengthy process: technology, skills, and information are not freely available, especially to firms from developing countries, which are far from the locations where "the mysteries of trade become no mysteries" - the Lancashires of the industrial revolution Marshall refers to in his quote, but also the Silicon Valleys of our contemporary world. (Marshall, 1920: 225) When President Figueres took it as a personal mission to attract Intel to Costa Rica, his long term aim was not just to create some well paid employment and exports. It was to stimulate via FDI the emergence of a Costa Rican Silicon Valley: an ICT agglomeration where domestic firms could develop and thrive alongside MNCs, learning 'the mysteries of trade' – in modern terminology, knowledge and technology.[1]

Figueres' idea was not new; building competitive capabilities in sectors that do not rely on natural resources and cheap labour has been the priority of Latin American countries from the 1950s. Only the instruments to promote certain industries have changed since the debt crisis. The state is constrained by agreements with other countries and multilateral institutions to maintain low trade barriers and macroeconomic stability. It cannot borrow at low interest rates to finance private sector development projects, and it has to service its debts. In the post-debt crisis world, the main potential source of capital and technology for many developing countries are MNCs (Lall and Narula, 2004). For this

[1] Interview with the ex President of Costa Rica Jose Maria Figueres shown in the video attached to Porter and Ketelhohn, 2002. Interview: Oscar Arias, President of Costa Rica, 22 February 2005.

reason, Figueres attempted to promote Costa Rica's ICT industry by attracting a cluster of multinationals flagged by Intel.

Attracting investment by MNCs is only the first step of cluster policies. The second step is to ensure that they generate technology and knowledge spillovers to the host economies. Linkages are often measured by looking at what MNCs buy from local suppliers. However, the value of local purchases and transactions does not necessarily reflect the developmental impact of MNCs. A large manufacturing plant, such as Intel in Costa Rica, may purchase a relatively high amount of services from local providers. Yet, as far as they are services not related to its knowledge-intensive core activities, for example, security services, they are unlikely to contribute to Costa Rican ICT producers' capabilities. On the other hand, smaller MNC offices may purchase lower values of security and packaging services, but be engaged in activities that directly stimulate the development of local firms' capabilities. What determines whether MNCs help local firms' learning process, or whether they just constitute large and sophisticated processing zones with few links to local economic structures?

The idea of promoting MNC-dominated clusters (rather than focusing on industries or sectors) stems from the principles of Marshallian economics, reformulated by the scholars of the Italian industrial districts, clusters and global value chains. Firms located in agglomerations can benefit from external economies that contribute to their competitiveness, ranging from the circulation of knowledge to the creation of collective goods (Brusco and Pyke 1990; Markusen, 1996; Knorringa, 1996; Piore and Sabel, 1984; Pyke, Becattini and Sengeberger 1990; Rabellotti, 1995; Porter, 1990). If some of the firms are MNCs, they can also access superior technology and work practices (Belderbos, Capannelli and Fukao, 2001, Blomstrom and Kokko, 1998; Görg and Ruane, 2000). However, co-location per se does not explain the success of the Italian industrial districts, or the acquisition of technological capabilities by the Taiwanese or Irish ICT firms (Hewitt-Dundas et al, 2005; Kishimoto, 2003; White, 2004; Wade, 2004). The external economies that according to Becattini, Porter, and Schmitz characterise successful clusters occur when firms that are co-located also coordinate their activities and engage in productive collaborations (Becattini, 2004; Piore and Sabel, 1984; Porter, 1998; Schmitz, 2000).

This research showed that even in a relatively new MNC-dominated cluster, such as Costa Rica's, it is possible to find an array of productive collaborations which are not captured by the accounting exercises of procurement indexes and sourcing data. However, the issue is not just whether there are collaborations. There are several ways in which domestic firms and other actors can collaborate. Some of them have developmental effects. Others have negative effects on the capabilities of local firms, depending on the activities actors perform together, the way in which collaborations are governed, and the resources to which they provide access. The impact of being located in a MNC-dominated cluster depends on what local producers do with other actors – in other words, on the specific nature of the collaborations they establish.

The main objective of this research was to deconstruct the collaboration phenomenon in order to improve our understanding of clusters and their role in promoting firm-level competitive capabilities in developing countries. The diversity of collaborative outcomes found in Costa Rica provides empirical evidence of the multifaceted nature of collaboration and the variety of impacts it can have. The information collected underlines that evaluating the impact of collaborations may not provide sufficient insight into how and when clusters can foster the capabilities of local firms. In order to improve our understanding of clusters, it is necessary to question the determinants of developmental and non-developmental collaborations - in other words, why local firms and other actors try to establish certain types of collaborations, and how they do so. Understanding the motives behind the formation of collaborations, and the processes through which they are established, can help in designing policies that promote the formation of developmental collaborations, or that limit the emergence of non-developmental collaborations.

Different literature streams tend to converge in pointing out the potential impact of productive collaborations. But there is insufficient empirical evidence and much disagreement about the determinants of such collaborations, especially between the literature that explains them as an economic phenomenon only, and the literature that explains them by referring to non-economic variables, such as culture. This project collected extensive information about the nature of collaborative agreements, the actors involved and their motivations. The aim was to reconstruct the process through which actors establish their productive collaborations and to identify their reasons for doing so.

The stories of why and how Costa Rican entrepreneurs engaged in certain collaborative arrangements made it clear that productive collaborations cannot be explained by focusing exclusively on either economic or social variables.

Productive collaborations are a complex phenomenon which involves both economic and social factors. Actors establish them to pursue economic objectives, given the information available to them, and the incentives that institutions generate to regulate their behaviour. But who actors are, who they know and who they socialise with all interfere with this process. Some institutions, such as behavioural customs, are diffused and enforced by means of social contacts. The problem, as several chapters of this research have shown, is that actors do not just operate in an insulated institutional context, such as a remote village with no connections to the outside world. Producers in knowledge-intensive sectors, such as ICT, travel and interact with managers, investors and clients operating in foreign clusters, which may not be regulated by the same institutional framework (Saxenian, 2006). They socialise with actors who transmit information and behavioural customs to them which differ from those prevailing in their own context. For this reason, some actors are found to be exposed to different, even opposite institutional incentives.[2]

In order to explain exposure to incentives and different behavioural choices under a given institutional framework, this research analysed the social connections of the actors in question: local ICT entrepreneurs, professors, directors of MNCs' subsidiaries, investors and external actors. The key finding is that although institutions and social ties are analytical categories conceptualised by scholars coming from very different traditions, their functioning is strongly interlinked in real life situations, such as in the decision to establish productive collaborations. The way in which actors are socially linked to their community and to other actors affects the range of incentives to which they are exposed. This explains why similar actors choose very different collaborative outcomes although they are operating under the same institutional context.

As summarised in section 4 of this chapter, social ties affect collaborative outcomes in different ways, according to their function. Not only do they transmit and enforce certain institutions via social rewards and sanctions, but they also transmit and filter

[2] Section 7.3 summarises the institutional incentives actors are exposed to, which have been discussed in detail for each type of productive collaboration in the previous chapters.

information – a particularly important function given that incipient clusters in developing countries are likely to suffer from severe information failure. Ties that bridge actors belonging to unlinked communities, such as MNCs and local firms, circulate non-redundant information, which in the case of Costa Rica introduced incentives to form developmental collaborations. Ties that link actors belonging to the same community circulate existing information. In the Costa Rican ICT cluster this feature led to either non-collaborative outcomes, or to non-developmental collaborative outcomes.

This research also provides evidence of how entrepreneurs from developing countries may use personal ties as part of their firms' resources. Costa Rican ICT producers leveraged their social ties to achieve several objectives, including developmental collaborations. They often used their ties to leverage their personal reputation when they perceived that the organisational reputation of their firm was not sufficient to achieve a certain goal. In certain cases, they also used their ties to negotiate collaborative agreements that involved the exchange of tacit knowledge, such as productive collaborations that involve joint product development. The most significant finding about the use of ties is that actors do not perceive them as a static endowment determined by social and academic background, career choices and past events only. When not endowed with the necessary ties to achieve their objectives, local entrepreneurs invested in creative measures to build them. This shows a strong awareness of the potential of ties as resources to support entrepreneurial activities.

The theoretical framework developed by this research analyses collaborations as an institutions-determined phenomenon that occurs in a socially embedded context. By doing so, it links economic and social theories of behaviour. The world described through such a lens is characterised by actors who perceive the incentives produced by institutions and respond to them. But they also engage in social interactions with each other, and these interactions ultimately affect the working of institutions and thus their choices to establish given types of collaboration. The next sections compare and discuss different dimensions of the findings presented in each chapter: the developmental impact of collaborations, the institutions that regulate collaborative choices and the role of social ties.

## 7.2 Productive collaborations and the development of firm-level capabilities

The developmental impact of collaborations has been conceptualised as the extent to which local firms upgrade their products, processes or functions, get access to new resources and accumulate organisational or technological capabilities.[3] This depends on what activities local firms carry out with their collaborators, which resources they share with them and how the collaboration is governed. Hence, it differs for each type and subtype of collaboration. The resources and skills that firms acquire change according to the actor with whom they are collaborating. For example, local firms can acquire access to scientific knowledge by collaborating with academic institutions, and access to capital by collaborating with investors. However, learning and access to resources depends also on the activities local firms carry out with their collaborators, which change across subtypes.

Two actors, such as a MNC and a local firm, may establish subtypes of collaborations that involve very different joint activities and resource sharing. In Product Distribution MLCs, MNCs use local firms as distributors and increase their organisational capabilities in marketing, but they do not share their global market knowledge or their technological knowledge. In Product and Technology Development MLCs, MNCs actively promote the technological capability development of local partners and share technological knowledge with them. For this reason, the developmental impact of collaborations depends on both the actors involved, which define the five collaboration types found in the cluster, and the functions they perform, which define the subtypes identified for each type of collaboration.

Drawing on the literature on global value chains (Gereffi, Humphrey and Sturgeon, 2005; Schmitz, 2000), there is another dimension of collaborative relations which should affect their developmental impact: their governance. In the GVC theories, governance determines the extent to which global buyers exert power over local suppliers, affecting their choices, their technological and organisational learning processes and their

[3] For a discussion of how the developmental impact of collaborations has been conceptualised and evaluated, see chapter 1, section 1.5: 36-39.

performance (Gereffi, Humphrey and Sturgeon, 2005).[4] This is relevant in cases where local firms may acquire capabilities, but become dependent on the decisions of other actors, such as MNCs, and thus lose their transactional, technological or organisational independence. In the Costa Rican ICT cluster, governance affects the developmental impact not only of relations along the global value chain, such as those linking MNCs and local firms, but also of relations between local actors. The governance of collaborations also changes across types and subtypes, but varies little between collaborations of the same type and subtype (see Table 7.1).

[4] The GVC literature identifies five forms of value chain governance, three of which apply to collaborations: captive, relational and modular governance. The complexity of transactions (or interactions, in case a collaboration does not involve transactions), the codifiability of information and the capability of the actors involved influence the type of governance that given collaborations and transactions acquire (Gereffi, Humphrey and Sturgeon, 2005) If actors have to exchange uncodifiable information, such as the tacit knowledge embodied in technology, they tend to operate under relational governance structures. If the information is codifiable, governance can be either modular or captive, depending on the capabilities and on the relative power of the actors involved. (for an operationalisation of the governance concept, see section 1.5: 38-39).

**Table 7.1 The effects of productive collaborations**

| Type (Actors involved) | Subtype (Functions performed) | Observed developmental impact on local firms | Governance |
|---|---|---|---|
| ILCs | I: Venture Capital Fund Investment | Ia) Financing and Support: access to capital and advice<br>Ib) Collaborative Network Creation: access to capital, advice, allied firms' clients, and the Integrated Strategy LLC. | a) Relational<br>b) Modular |
| | II: MNC-owned Venture Capital Fund Investment | Access to capital, advice, international credibility effect (because of MNCs' brand), exposure to clients, and support of a Product Adaptation MLC. | Relational |
| | III: Direct Investment | Access to capital, advice, international credibility effect (because of MNCs' brand), exposure to clients, and support of a Product and Technology Development CBC. | Relational |
| LLCs | I: Production Outsourcing | Outsourcing firm: access to additional productive capacity<br>Providers of outsourced services: Access to clients' network and shared use of brand. Transactional dependence. | Captive |
| | II: Spin-off Support | Supporting firm: Exclusive access to new products and processes. Product upgrading.<br>Spin-off: Access to capital, infrastructure, advice and exposure to clients. Product and process upgrading. | Relational |
| | III: Integrated Strategy | Access to technology, infrastructure, advice, client networks, services provided by collaborating firms. Links to an ALC, an ILC and a CBC. Product and | Relational<br>↓<br>Modular |

Table 7.1 summarises the findings: types, subtypes, observed developmental impact and governance of collaborations in the Costa Rican ICT cluster.[5] Subtypes are indicated by describing their function and are identified via roman numbers. In cases where two local partners have different roles, such as a supporting firm and its spin-off in LLCs II, Table 7.1 shows the developmental impact distinguishing between the effects for each party.[6] Governance structures, which are shown in the last column from the left-hand side, are sometimes static, such as in Product Distribution MLCs, and thus have been identified by one definition only. In other cases, such as Indirect Product Distribution CBCs, governance changes through time. It has thus been represented by using two terms and an arrow: the first term defines the initial governance of a given collaboration subtype, the arrow symbolises the change in governance structures, and the second term describes how the collaboration is governed after such change. When a collaboration subtype, for example Venture Capital Fund Investment, has two different subcategories, in this case Financing and Support and Collaborative Network Creation, they are indicated with lower case letters – ILC Ia, ILC Ib – and their developmental effects and governance are shown separately.

In order to clarify the developmental effects described in Table 7.1, Table 7.2 (see next page), presents them by dividing them into three categories: access to resources, acquisition of capabilities and upgrading. Table 7.2 shows different dimensions of developmental impact and indicates in which collaboration types and subtypes they have been observed.

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[5] The developmental implications of collaborations are shown in Table 7.1 and Table 7.2. They are illustrated in each chapter on the basis of qualitative evidence on the microeconomic processes of learning, capability acquisition and upgrading that each category and subtype of collaboration fosters. The operationalisation of developmental impact, capability acquisition, upgrading and governance concepts have been discussed in chapter 1, section 1.5: 36-39.

[6] When collaborations have two subtype levels, such as ILCs I and CBCs I, the second level is shown in lower case letters, such as ILCs Ia and ILCs Ib, and the definition of the second subtype level is given in the developmental impact column.

**Table 7.2 Aspects of developmental impact**

| | | ILCs | LLCs | MLCs | ALCs | CBCs |
|---|---|---|---|---|---|---|
| **Access to resources** | Brand | II, III | I | I, II, III | N.o. | Ib, III |
| | Clients and distribution network | Ib, II, III | I, II, III | II, III | N.o. | Ia, Ib, III |
| | Infrastructure | N.o. | II, III | III | N.o. | III |
| | Capital | I, II, III | II | N.o. | N.o. | N.o. |
| | Additional capacity | N.o. | I | N.o. | N.o. | N.o. |
| | Training courses and discounted services | N.o. | I | I | N.o. | N.o. |
| | Professional advice | Ia, Ib, II, III | II, III | II, III | I | II, III |
| | R&D personnel | N.o. | II | II, III | I | II, III |
| | Scientific knowledge | N.o. | N.o. | N.o. | I | N.o. |
| | Other types of collaboration | Ib, II, III | III | N.o. | N.o. | III |
| **Acquisition of capabilities**[7] | Organisational skills | Ib, II, III | II, III | II, III | N.o. | Ib, II, III |
| | Product or location-specific technological capabilities | N.o. | II, III | II | N.o. | Ib, II |
| | Core technological capabilities | N.o. | N.o | III | I | III |
| **Upgrading** | Product | N.o. | II | II, III | I | Ib, II, III |
| | Process | N.o. | II, III | II | I | II |
| | Functional | N.o. | III | III | N.o. | III |
| | Downgrading | N.o. | N.o. | I | N.o. | N.o. |

Source: Author's elaboration

Table 7.2 shows in the first two columns from the left-hand side different aspects of developmental impact, distinguishing three main categories: access to resources, acquisition of capabilities, and upgrading. The third, fourth, fifth, sixth and seventh columns from the left-hand side show in which cases these effects have been observed. The first row reports the collaboration types (ILCs, LLCs, MLCs, ALCs, CBCs), whilst the roman numbers written in each column, from the third to the seventh, indicate the subtype for which a developmental impact has been observed. Lower case letters distinguish when a given collaboration subtype occurs in different forms, such as Direct and Indirect Product Distribution CBCs (CBC Ia and CBC Ib).

[7] Technological capabilities have been divided into those circumscribed to the development either of a given product, or of a range of products for a specific location, versus the capability to develop basic technologies applicable to different products and markets.

Table 7.1 and Table 7.2 show that ILCs did not lead directly to any form of upgrading. They provided access to several types of resources, especially capital and advice. Their most interesting aspect is that their II and III subtypes led to other collaborations, MLCs II and LLCs III, which in turn generated other developmental effects.

Product Technology Development MLCs and CBCs have had the strongest developmental impact. They led to product and functional upgrading, placing local firms in more sophisticated nodes of global value chains. They are also the only subtypes together with ALCs that contributed to the acquisition of core technological capabilities by local firms. Collaborations that involved adjusting a product or service to a specific condition – MLCs II and CBCs II – also contributed to the development of technological capabilities by providing local firms with access to partners' R&D resources. However, MLCs II and CBCs II entailed collaborating in adaptive technological activities, such as adapting production processes to local conditions, or adapting a service to the needs of a specific client. Thus, they helped firms improve their organisational skills and fostered the development of specific, rather than core technological capabilities.

Collaborations related to product distribution, such as MLCs I, CBCs I, did not lead to any upgrading, save for some cases of CBCs Ib. Their main benefits were to guarantee access to distribution related resources, such as brand and client networks. Indirect distribution CBCs, which occur when Costa Rican firms distribute their products via foreign system integrators (see chapter 6 for a detailed discussion), differ from other distribution collaborations: they led some firms to upgrade their products and also to acquire new organisational skills.

All of the collaborations with relational or modular governance structures have had some developmental impact (Table 7.1). On the contrary, negative developmental impact is directly related to captive governance structures, which push local firms into transactional and technological dependence (MLCs I, LLCs I). For example, Product Distribution MLCs in most cases lead local firms into technological lock-in situations where their future development is constrained by loss of technological capabilities, or process downgrading, and by dependence on one technological platform supplier. In Production Outsourcing LLCs, large domestic firms lead hierarchical networks of small

subcontractors, which are similar to those found in some of the Italian industrial districts (Harrison, 1994: 75-104, 189-215). The smaller firms that operate in LLCs I suffer from transactional dependence on their larger partners, which limits their strategic choices. However, unlike Product Distribution MLCs, it does not interfere with their technological choices, and does not provoke a loss of organisational or technological capabilities.

Access to capital was provided in all subtypes of ILCs and in the Spin-off Support subtype of LLCs. Professional advice instead was provided in many cases, including ILCs, LLCs III, MLCs II and III and CBCs II and III. ILCs also provided access to client networks, which was one of the most common developmental effects of collaborations, generated also by all subtypes of LLCs, by MLCs II and III, and CBCs Ia, Ib and III. In ILCs II and III MNCs are the investors. This allows local firms to benefit from being associated with their brand. Branding effects also occurred in other collaborations that involved MNCs, such as most subtypes of MLCs and CBCs.

Only two out of all of the collaboration subtypes provided firms with additional productive capacity. Three provided training courses and discounted services. Most other subtypes have less direct developmental effects, ranging from the use of brands to the use of R&D resources. Access to scientific knowledge occurs only through ALCs, which provide few other benefits. The improvement of organisational skills occurs in most subtypes of collaborations, with the exception of those related to direct product distribution (MLCs I, CBCs Ia), product outsourcing (LLCs I), transfer of academic knowledge (ALCs) and venture capital investment. This section described the developmental impact of collaborations. But how did different types and subtypes of collaboration emerge? The next section addresses the issue by looking at institutions and incentives.

## 7.3 Institutions, incentives and productive collaborations

Different types of collaborations have been analysed in the course of this project as a three-stage phenomenon:

- Motivation: Why actors collaborate;

- Formation: How actors establish their collaborations;
- Developmental impact: How collaborations affect local firms.

To explain the first stage, namely the motivations of actors, this research borrowed the key concepts of new institutional economics. It assumed that actors respond rationally to the incentives generated by institutions, intended broadly as the 'rules of the game'. Looking at which institutions regulate the behaviour of the actors involved provided a first set of explanations of the range of collaborations found in the cluster.

**Table 7.3 Institutions and incentives to collaborate**

| Actors | Institutions | Incentives |
|---|---|---|
| Local firms | Local customs | To collaborate with MNCs in product distribution collaborations; for exporters only, to collaborate with external actors in direct product distribution collaborations.<br>Not to collaborate with each other, investors, or academic institutions. |
| | Central American market characteristics | Not to collaborate with each other because they are competing for the same clients. |
| | Global industry trends (ascertained from empirical studies of other ICT clusters) | To collaborate with MNCs and external actors to acquire technology and insertion into GVC, with investors to acquire capital, with universities to acquire access to academic knowledge. |
| MNCs' subsidiaries | MNCs' mandates, Costa Rican EPZ regulations | To find product distributors or collaborators to adjust products to local markets (depending on MNCs' specialisation). No incentives to find Product and Technology Development collaborators. |
| Local universities | Customary rules | Not to collaborate with private sector. |
| | Formal regulations for state-funded research | No co-financing of collaborations with the private sector. |
| Investors | Local market regulations | To invest in protected sectors, which offer higher returns. |
| | Global industry trends (ascertained from empirical studies of other ICT clusters) | To invest in ICT and collaborate to facilitate recipients' development. |
| | MNCs' mandate (for MNC-owned investors) | To invest in firms with specific strategic value. |
| Firms located outside of the cluster | Global industry trends | System integrators: to collaborate with Costa Rican firms as indirect distributors to diversify own product offering. |
| | Central American market characteristics (actors located in Central America) | To exploit small, fragmented, domestic software markets by directly distributing the products of collaborating Costa Rican firms. |

Source: Author's elaboration

Table 7.3 shows the actors involved in collaborations in the first column from the left-hand side, the institutions to which they respond in the second columns, and a summary of the incentives that institutions generate according to the actors themselves in the last column. Actors operate under different institutional frameworks, ranging from the corporate rules of MNCs to the behavioural norms of local investors. Some institutions, such as the mandates of MNCs' subsidiaries, follow global regulatory structures and trends of the ICT industry. Other institutions, such as local market regulations, have a specifically local nature, either Costa Rican or Central American.

Global and local institutions sometimes generate converging, and at other times, conflicting incentives. For example, both local customs and MNCs' mandates generate incentives for MNCs' subsidiaries and local firms to establish Product Distribution collaborations. It is thus unsurprising to find collaborations of this type and subtype. However, incentives do not always converge. Looking at institutional incentives (Table 7.3) does not explain how actors react when they are exposed to conflicting incentives. For example, global ICT trends generate incentives for local firms to have external investors, which is contrary to local customs. Why do some local firms look for investors, whilst others do not?

Table 7.3 shows that the nature of local markets leads domestic firms to not collaborate and investors to target non-ICT sectors. However, the fragmentation and regulation of Central American markets also stimulate the emergence of Product Distribution and Product and Process Adaptation collaborations with MNCs (MLCs I and II), and of direct Product Distribution cross-border collaborations (CBCs Ia). Out of these, only MLCs II, Product and Service Adaptation collaborations with MNCs, have a positive developmental impact (see Table 7.1 and Table 7.2). Local customs also create incentives for local firms to not collaborate (in the case of ILCs, LLCs and ALCs), or to form collaborations with a negative developmental impact (for example MLCs I). The institutions identified, including those stemming from Costa Rican cluster promotion policies (EPZ mandates, market regulations), did not generate incentives for local firms to establish the most developmental productive collaborations, such as MLCs III and ALCs.

Referring to the principles of new institutional economics is not sufficient to explain how actors respond to divergent incentives, nor how some of the most developmental collaborations emerge in spite of the existence of contrary incentives stemming from the customs of local firms and universities, MNCs' mandates, and local market structures. The formation of productive collaborations is an economic act, in that it is aimed at productive purposes. For this reason, its economic determinants have been explained with the tools of new institutional economics. Yet, collaboration is also a social act, as it does not take place in a social void. Having discussed how institutions shape the decisions of the organisations that take part in productive collaborations (local firms, MNCs' subsidiaries, investment funds, universities, firms located abroad), this research has also provided an account of the social context of collaborative economic actions. The next section illustrates how communities and social ties affect the emergence of productive collaborations.

## 7.4 Communities, social ties and the formation of collaborations

On exploring actors' embeddedness in social networks, the first finding is that some of the actors operate in relatively closed and self-contained communities: local entrepreneurs, academics and the directors of MNCs' subsidiaries. They tend to be socially connected with each other but to have few connections to other groups of actors. They identify themselves as being part of their respective communities, especially local entrepreneurs and academics.

This community identity is based on the role actors perceive themselves to be playing in society. Ethnicity does not contribute in defining these three communities. Academics and local entrepreneurs share similar ethnographic profiles: most of them are Costa Rican males who have studied electronic engineering or informatics in the two public universities. Yet, they perceive themselves as belonging to two different communities, defined by their profession and by the role they play in society.

The directors of MNCs are a more diverse group, also dominated by males, but from several countries and academic institutions. They form a self-contained community

because most of them are expatriates with few links to the local society. They share the situation of being foreigners working in similar positions in the ICT sector. Many of them also share uncertainty about the locations to which their HQs are going to assign them.

The other two groups of actors identified in the cluster do not have a similar sense of belonging to a given community. Investors are divided between those who work for MNCs, either as direct investors or through a MNC-controlled venture capital fund, and those who work for independent venture capital funds. Some of the latter invest in many sectors, others only in ICT. They have different backgrounds and different views of ICT and of their own function in promoting ICT development. Because they are such a diverse group, some investors have social ties to other investors in the cluster, others, especially the MNC investors, have social ties to actors located outside of the cluster but do not have many social connections within the cluster.

External actors are a heterogeneous group. Like investors, most external actors are not linked to each other. They have been considered as a group only because they all are located outside of the Costa Rican ICT cluster and collaborate with a Costa Rican ICT producer. They include directors of MNCs' offices in Latin America and the US and CEOs of local software distribution companies in Central America. Most of them have few or no social links to the actors of the cluster, save for those who have established productive collaborations. Having described the groups of actors, let us now look at how each decision maker's social ties affected incentives to form, and the actual formation of different types and subtypes of collaborations.

Throughout different chapters, this project showed that actors' social ties performed three different functions:

- They transmitted and filtered information about collaborations;
- They diffused and enforced social incentives to form or not to form specific collaborations;
- They provided a means to form collaborations.

Depending on actors' embeddedness in the communities found in the cluster, and their linkages to other actors, the first two functions of ties generated incentives to

establish specific types and subtypes of collaborations, whilst the third function helped them to do so. The first function occurs because actors respond differently to the information acquired via social ties than to that acquired via non-socialised means, such as publications. Social ties operated as a filtering mechanism in a context where information is available, but the processing of it is costly. Most actors explained that they can access information through the internet and various publications, but that most of it is either irrelevant or difficult to test. Social ties compensate for this market failure, delivering previously-filtered information to actors, who respond by transforming it into behavioural incentives. Thus, the very incentives to which actors are exposed are shaped not only by institutions, but also by their social ties to other ICT-related actors.

Social closure means that some groups of actors (local entrepreneurs, MNC officers and academics) are exposed mainly to the information circulated within their own communities. This limits the emergence of certain collaborations and promotes the emergence of others. In the local ICT entrepreneurs' community there is a widespread notion that it is not convenient to have external investors because they assume control of firms. Most local entrepreneurs are aware of the literature that explains the advantages of ILCs. But they do not use such literature to shape their actions. Reading publications on the positive effects of ILCs does not generate behavioural incentives to establish ILCs – at least not for Costa Rican ICT producers.

Instead, they respond to the information acquired via social ties with other entrepreneurs. For this reason, the majority of them do not try to form ILCs. Similarly, investors that are deeply embedded in the Costa Rican society, but have few ties to the global ICT industry, do not form ILCs, or expect ICT firms to generate returns without collaborating with them. They are familiar with the high-returns low-commitment investments that characterise protected domestic sectors, not with the commitment-intensive investments observed in advanced ICT clusters, such as Silicon Valley (Zhang, 2003).

Costa Rican ICT producers also circulate information amongst themselves about collaborations with multinationals. The information prevailing in their community suggests that collaborating with MNCs is convenient only for extracting material rents, such as discounts, but not as a means of acquiring new skills and capabilities. On the basis

of what they hear from colleagues, Costa Rican ICT producers underestimate the dangers of becoming technologically locked-in through an exclusive Product Distribution collaboration with a MNC. Although it is different from what they read or learn from publications or the internet, they transform the information that circulates in their community into behavioural incentives. This explains why the majority respond to incentives to form Product Distribution MLCs, and many do fall into technological lock-in, which has negative developmental implications.

Costa Rican producers endowed with social ties to actors operating in other ICT clusters are aware of the dangers of technological lock-in, and hence diversified their technological base. Accessing information about the experiences of friends and colleagues abroad, they attempted to form MLCs and CBCs as a means to acquire technology, skills and value chain insertion from their partners. Thus, they did not focus on Product Distribution collaborations, but on Product and Process Adaptation MLCs, Customised Service Development CBCs and Product and Technology Development MLCs and CBCs.

The information circulating in the community of Costa Rican ICT producers pushes them to sell in the domestic market, where they know some of their rivals have obtained very high returns. The domestic market is characterised by a small number of large clients, half of them public, which offer remunerative contracts, and by a high number of smaller clients that do not. Because they have little access to information about export markets, most firms target the same basket of clients, which increases mutual rivalry and thus reduces their incentives to collaborate with each other. Those with social ties to actors located abroad used them to acquire information and contacts to potential foreign clients. Being exporters, they do not compete for the same clients, and thus have more incentives to collaborate with other domestic firms.

The findings provide evidence that the information delivered by social ties tends to be more readily transformed into behavioural incentives than the information transmitted via non-socialised means, such as the internet. Local entrepreneurs who are socially connected to actors from different communities, or to actors operating in other ICT clusters, such as Silicon Valley entrepreneurs or investors, respond to different incentives, ranging from incentives to export to incentives to have investors. Their social ties expose them to information about the developmental impact of several types and subtypes of

collaborations, such as ILCs, Product and Process Adaptation MLCs, Product and Technology Development MLCs, Customised Service Development CBCs and Product and Technology Development CBCs.

Having acquired such information from their social contacts, they perceive it to be already-filtered and also relevant to their case. Through socialisation, different pieces of information become part of the behavioural incentives that shape the economic actions of Costa Rican ICT producers, such as their effort to establish different productive collaborations. This explains why some local entrepreneurs respond more promptly to incentives generated by institutions that regulate the ICT industry at a global level, such as MNCs' mandates, whilst others respond to incentives stemming from more local institutions, such as entrepreneurs' custom to avoid external investors.

The second effect of social ties is that they circulate and enforce social incentives in the three self-contained communities. For instance, the behavioural norm of academics to not collaborate with the private sector is diffused via social ties. Operating in a small closed community, academics monitor each other's behaviour. They marginalised a professor who also runs an ICT firm and created obstacles in his academic career. Similarly, local entrepreneurs diffuse in their community the custom of not having external investors. Having investors is seen by the local entrepreneurs who are socially embedded in their community but have no external ties as a sign of weakness, and it is punished via negative reputation.

The last effect that social ties had was to work as a mechanism through which actors attempt to establish collaborations. Some actors, such as the directors of MNCs' subsidiaries, investors and most external actors, do not have access to information on Costa Rican ICT firms. This reduces the number of opportunities to collaborate. Some MNCs declared that they have incentives to establish more Product and Process Adaptation collaborations, but their directors do not feel they possess sufficient information to do so.

Most local firms have not accumulated sufficient organisational reputation to convince MNCs and external collaborators to enter into the most developmental subtypes of collaborations, which entail higher mutual commitments and risks. In several cases, social ties linking local entrepreneurs to the directors of MNC subsidiaries and to external

actors helped local firms overcome their lack of organisational reputation. Entrepreneurs used their personal reputations as engineers or managers as a substitute for the organisational reputations that their firms may not yet have. Those local entrepreneurs who could leverage ties with MNC officers and external actors used them as a means to shorten organisational distance and to facilitate the formation of collaborations. Investors and external actors made a similar use of their social ties to Costa Rican ICT producers. Through them, they acquired information about the firms they financed or collaborated with, and also about potential clients for their partners.

Domestic entrepreneurs used their social ties to establish specific collaborations. In certain cases, the use of social ties as firms' resources can also halt the emergence of collaborations. Local ICT producers operate in a small closed community, where everyone knows each other. Those who are not exporters seek to establish ties with actors who can facilitate winning some of the large domestic contracts, such as public officials. They use their social ties to gain advantage over their domestic rivals by obtaining information and approaching clients in a market affected by lack of transparency and by uncompetitive practices. Fear of information leakage and of losing exclusive control over their ties stops Costa Rican producers from collaborating with each other. In this case, the social closure of their community does not promote collaborations such as those observed in the Italian industrial districts. On the contrary, it diffuses non-collaborative customs.

## 7.5 The function of ties, developmental collaborations and cluster policies

This research explained the three stages of different types and subtypes of collaborations (incentives to collaborate, process of forming collaborations and impact) looking at how institutions and social ties affected collaborative outcomes. Its main finding is that the social embeddedness of decision makers[8] (local entrepreneurs, MNC officers, professors, investors, managers of firms or MNCs' subsidiaries located abroad)

[8] Intended as the set of social ties that link decision makers to communities and to other actors in the cluster, and to those external actors who are involved in collaborations.

can explain some of the aspects of the emergence of productive collaborations that institutions do not account for.

Social ties complement, mediate, or even contrast institutional incentives to collaborate, leading to different outcomes. In the Costa Rican case, social ties exposed actors to incentives to collaborate, worked as a means to form collaborations and circulated and enforced certain institutions, leading to the diverse range of outcomes pictured in Table 7.1 and Table 7.2. However, the way in which ties affected the formation of different collaborations in the cluster also followed some common trends:

- The ties that link actors to their own communities reproduce existing information. This function in the Costa Rican ICT cluster led actors to establish collaborations with a low or negative developmental impact, such as Product Distribution MLCs, or to avoid collaborations altogether;
- The ties that bridge different communities and groups of actors provide the means to overcome information failures. In the Costa Rican cluster this introduced incentives to form developmental collaborations, such as MLCs II;
- The ties that bridge different communities can also provide the means to establish collaborations, by allowing local firms to overcome a lack of organisational reputation and information failures. Costa Rican ICT producers used their ties to establish collaborations with investors, MNCs and firms located abroad.

Local entrepreneurs use their social ties as resources. But their initial endowment of social ties does not necessarily define how they may use ties to establish productive collaborations. In some cases, Costa Rican entrepreneurs invested in building social ties that could be used as means to facilitate the establishment of collaborations. In other cases, through existing collaborations, decision makers formed personal relations, which subsequently helped the formation of more developmental collaborations. That is the case of a local entrepreneur and a MNC officer who developed a personal friendship because of the Product and Process Adaptation collaboration that linked their firms. Their friendship

facilitated inter-firm communication and the evolution of the collaboration into a Product Technology Development MLC.

The findings illustrate how companies attempt to overcome their resource constraints by leveraging the social ties of their founders or CEOs in order to achieve different objectives. Although the project analysed only ICT producers in the Costa Rican cluster, a body of empirical evidence shows that a large share of firms in developing countries' clusters are affected by similar constraints – lack of financial resources, limited access to information, lack of reputation (see for example Bazan and Navas-Aleman, 2004; Dijk and Rabellotti, 1996; Giuliani, Pietrobelli and Rabellotti, 2005; Schmitz, 2000). Other studies provide evidence of the use of social ties as firms' resources by entrepreneurs in both the developing and developed world (Nadvi, 1999; Saxenian, 2006) The results of this project suggest that studying how developing countries' entrepreneurs use their ties as firms' resources could improve our understanding of clusters and more generally of industrial development.

In the Costa Rican cluster, most of the ties that performed 'bridging' functions, linking actors from different communities and leading to developmental collaborations, have been built through work-based relationships rather than through relationships based on ethnicity or kinship. For example, only in one case does a kinship tie explain the emergence of a cross-border collaboration. All other CBCs are based on ties that link ethnically diverse, spatially distant actors. What determined the influence of actors' ties on the emergence of collaborations was their function – whether they bridged divided communities or not – not their origin. When they did link actors from different communities, such ties exposed them to different information not previously available. Sometimes 'bridging ties' also served as a means to create a collaboration, whilst at other times they only introduced different behavioural incentives.

Another lesson that can be learned from the study of the productive collaborations of Costa Rican ICT producers is that entrepreneurs do not just leverage their social ties as firms' resources, in many cases they actively build social ties for such a purpose. And, as illustrated by the discussion of cross-border collaborations, in certain cases they may build ties and form collaborations across the borders of community, ethnicity, and space.

The several functions of social ties, and the fact that entrepreneurs use them to pursue given economic objectives, all point out that an understanding of productive collaborations – and thus of clusters – should include a discussion of the social context in which they occur. In particular, this project highlights that the functioning of institutions is often affected by social structures. Thus, looking at institutions, such as the mandates of MNCs, may not be sufficient to explain the patterns of productive collaborations that emerge in developing countries' clusters.

There are also other lessons that can be drawn from the study of the influence of social ties on the formation of productive collaborations in the Costa Rican ICT cluster. The most evident is that the cluster is affected by information failure, which social ties can either make worse or compensate for, depending on the circumstances. Actors have to have access to information in order to form developmental collaborations. Given that they operate in a context affected by information failure, they rely on their social ties as an information transmission and filtering mechanism.

Community closure and community divisions limit information flows between different actors in the cluster, thus hampering the emergence of certain types of collaborations. 'Bridging ties' lead to developmental collaborations because they let information flow across divided communities and introduce incentives that institutions per se do not generate. As Rodrik emphasises (Rodrik, 2004), the development of competitive capabilities entails the coordination of economic activities between different interlinked actors, which can occur only if they have appropriate access to information.

In the Costa Rican ICT cluster, 'bridging ties' compensated for information failure. However, actors not endowed with this type of tie missed opportunities to form developmental collaborations. The cluster policies adopted by Costa Rica have failed so far to address this market failure: the government does not provide accurate information about the firms that operate in the cluster and their specialisation, and this limits the extent to which actors can coordinate their activities.

In order for cluster policies to generate external economies and have a developmental effect on domestic firms, it is essential for actors to have not only information, but also incentives to establish developmental collaborations. Certain actors, such as the directors of MNCs' subsidiaries and university professors, have no incentives to find information

about the cluster or to form developmental collaborations, because they operate in a socially and economically disembedded context. Many MNC officers have no contact with "the locals", and run subsidiaries that have very limited linkages to the local economy. They can do so because Costa Rican cluster policies, unlike the Taiwanese, Irish and Israeli policies to promote ICT clusters, do not include incentives for MNCs to establish developmental productive collaborations with local firms (Breznitz, 2005b; Görg and Ruane, 2000; Lall, 1999; Lee and Tunzelmann, 2005; Paus, 2005; Wade and Kang, 1995; Wade, 2004). The result of this combination of factors explains why there are several non-developmental collaborations between MNCs and local firms and a small number of collaborations with strong developmental effects.

The last aspect of information and coordination failure observed in the Costa Rican cluster is the division between universities and the private sector. The often-praised Costa Rican academic institutions, which generated the human capital on which the ICT cluster has been built, are almost completely insulated from the economic activities of the cluster. They contribute to a large share of Costa Rican R&D activities. Yet, their R&D expenditure does not generate a pool of knowledge-intensive spin-outs as it did in Silicon Valley and Israel. (Bercovitz and Feldman, 2003; Castilla, Hokyu and Granovetter, 2000: 229). Perhaps more importantly, universities also do not play an important role in creating the knowledge of the knowledge-intensive Costa Rican ICT cluster. The knowledge they create is not used by either MNCs or Costa Rican ICT producers.

Universities tend to focus on basic instead of applied research, and regard it a duty of the state to broker between their scientific research and the applied needs of the productive sector. Domestic producers are afraid of intellectual theft, but also consider universities to be incapable of understanding their needs. MNCs carry out little R&D in Costa Rica, and those that do, such as Intel, take extreme measures to avoid, rather than to promote, knowledge transfers and spillovers. The retreat of the state from its technology generation and diffusion roles has generated coordination failures, which cluster policies have failed to address. As a result, most knowledge-creating activities are carried out individually, in an insulated way.

This coordination failure, which has only occasionally been compensated for by 'bridging ties', may be the most severe market failure affecting the Costa Rican cluster

because it halts the emergence of systemic innovation dynamics, such as those observed in Silicon Valley and other advanced knowledge-intensive agglomerations. It is a consequence of both the lack of social contacts between the communities of the cluster, and the absence of targeted science and technology policies to support the ICT cluster.

The Costa Rican case illustrates that it is not enough to have investors, good universities, a pool of domestic firms, and several MNC subsidiaries. Without targeted incentives to compensate for information and coordination failures, economic actors that operate in the same agglomeration do not necessarily collaborate, or, may structure productive collaborations that have negative developmental effects. This study also provides evidence that to understand the formation and evolution of productive collaborations it is necessary to recognise that firms and the other actors who operate in industrial clusters are embedded in specific social contexts which impact on their economic actions.

Coordination and information failures in the Costa Rican ICT cluster should be taken into consideration when discussing cluster policies as a new means of promoting structural change and economic development. Cluster policies that do not help local firms overcome their resource constraints and become more competitive through productive collaborations, do not achieve their objectives of promoting industrial development and structural change. They just generate new industrial agglomerations. In order for cluster policies to be effective, they need to take into account the social context in which actors are embedded, incorporate measures to reduce market failures, and support the formation of developmental productive collaborations.

# 8 Appendix

## 8.1 Data collection methodology

In order to provide some significant answers about productive collaborations in the Costa Rican ICT cluster, it has been necessary to isolate the variables that we have focused on by keeping the others constant, or at least limit their influence on the phenomenon analysed. The effect of physical proximity has been controlled by analysing a cluster that is spatially concentrated in one area only. All of the actors involved are located at maximum 40 kilometres from each other, and many are located in the same industrial park or building. Some actors that operate in the same building do not collaborate, and some that are located far from each other do collaborate. It has been impossible to find any correlation between the emergence of productive collaborations and physical distance.

Cultural proximity has also been discussed by carrying out an ethnographic study of the actors involved in collaborations, and by analysing the language used by interviewees to explain their reasons for collaborating or not collaborating. Most actors are Costa Rican males educated in one of the two public universities, who demonstrated having different social ties and approaches to collaborations independently of their cultural and ethnic homogeneity. Expatriate managers have few ties to Costa Rican society, and perceive themselves as belonging to a self-contained community. However, cultural distance does not explain their behavioural choices. Expatriate managers from different ethnic backgrounds showed similar, if not equivalent patterns of social embeddedness: dense ties with other expatriates, and few ties to Costa Rican actors. Their social embeddedness is related to the incentives generated by their jobs, which often involves only temporary assignments in Costa Rica and the prospect of moving to other subsidiaries.

The developmental impact of collaborations is also not related to cultural proximity. Some of the most developmental collaborations, such as Customised Service Development CBCs, emerged between actors divided not only by cultural, but also by physical distance. Costa Ricans and foreigners alike are involved in collaborations that have positive

developmental effects; and there are Costa Ricans and foreigners alike involved in collaborations with negative developmental implications.

The impact of sectoral characteristics has been controlled by focusing on ICT only. Empirical evidence of ICT clusters where a high number of productive collaborations have emerged has provided a benchmark for discussing the pattern of collaborations found in Costa Rica and their developmental impact (Breznitz, 2005a; Commander, 2005; Görg and Ruane, 2000; Lee, 2000; 2005; Saxenian, 1994, 2002). The following paragraphs discuss how information about Costa Rica has been collected, and present the data sources.

Information about the Costa Rican cluster was collected through two rounds of direct interviews with the highest available representatives from all of the organisations involved. This entailed targeting the directors of MNC subsidiaries, venture capital funds, and deans of the electronic engineering and informatics faculties of the two research universities. In most cases it has been possible to interview the CEO or founder of local firms. Interviewing founders and CEOs provided a thorough understanding of the firms' strategies, and of the content of their collaborations because, given the small size of most local firms, the key decision makers are involved in all of the activities of the organisations they lead. When this was not possible, the next highest person in the organisational hierarchy was interviewed.

Four representatives of actors located abroad who collaborate with Costa Rican firms were asked to comment on their collaborations via email and telephone conversations. In two cases, it was also possible to meet the decision makers of cross-border collaborating organisations at ICT fairs in Costa Rica.

The first round of interviews, carried out with the help of a postgraduate researcher from INCAE Business School, was exploratory[1]. Its purpose was to detect collaborations

[1] The interviews have been carried out in Spanish without the use of translators. They were carried out in English only with interviewees that were not Spanish speakers. The exploratory interviews not conducted by the author have been recorded on a tape recorder. Second-round interviews, and all the additional interviews carried out by the author, were not recorded. During the interviews, the author took notes on a notepad, registering all the relevant details. This method was preferred because it is less intrusive. It let interviewees feel at ease and speak openly, without concerns about being recorded. It was explained to them that if they were quoted, it would be done without mentioning their name, or their organisation's name, unless they consented to it.

and to collect basic data. First-round interviews were semi-structured, lasting on average one hour, and covering 80 out of 150 local software producers. The second round of interviews were conducted by the author to collect qualitative information about the collaborations found, the social ties of the actors involved, and information about the other actors of the cluster.

Second-round interviews were open-ended, and lasted on average one and a half hours. They targeted all of the local firms that were identified during the first round of interviews as being involved in collaborations. They also targeted firms not interviewed during the first round but that were mentioned by their collaboration partners. The second round also covered five local firms not involved in collaborations, all of the MNC subsidiaries, three representatives from the two research universities, five investors, and four cross-border actors.

The exploratory information collected in the first round was cross-checked by interviewing the actors who were named as members of collaborations and asking them about their relations with local firms. This process allowed the author to verify whether different parties of a collaboration would provide different accounts of its content, features, and functions.

The second round of interviews included two different interview styles. For the actors that had not been interviewed during the first round, the interviews were semi-structured and open-ended. The first part of these interviews collected basic information, the second part collected qualitative accounts of how collaborations emerged and how they function through an unstructured open discussion. Actors whom had been interviewed in the first round, were only questioned via unstructured open-ended interviews. They were asked to speak about their collaborations, describing their exact nature. Their accounts in most cases provided the information necessary to identify joint activities, resource-sharing, governance, and also the developmental impact of collaborations. When they did not, the author directed the conversation in order to extract more detailed explanations of the impact of collaborations.

In order to understand collaboration formation, actors were asked to 'tell the story' of their collaborations, recalling when, how, and why they established them. Their discourse has been analysed to detect behavioural incentives. For example, phrases such as "here we

do things in this way" have been considered to identify a sense of belonging to a given local community, and the existence of a certain behavioural norm. A phrase such as, "here most people think that..., but to me it doesn't matter if my reputation here suffers...", has been considered to point out the existence of a local customary norm enforced via reputational incentives, to which the actor interviewed is not responsive.

In most cases, actors explicitly identified incentives and institutions during their accounts of how collaborations emerged. When explaining the motivations for attempting to establish a specific type of collaboration, they pointed out the norms that regulated their behaviour and the incentives to which they responded. For example, MNC managers explained that they responded to MNC mandates, which affected their careers and salaries, when looking for product distribution partners. When the behavioural incentives did not emerge clearly from actors' accounts, they were asked to provide more information about why and how they formed, (or did not form) collaborations, by using non-directive items, such as, "Could you please tell me some more about this?", or, "I find this very interesting, are there any other aspects to it?". The chapters mention the specific way in which institutions and incentives have been identified in each case, providing examples and quotations.

Second-round interviews also served to collect information about social ties. Actors identified the ten people they most often talk to with regards to ICT, in particular when they ask for advice or seek information. Their answers provided a first outline of how actors are socially embedded in different groups and communities. This was corroborated and cross-checked with an evaluation of how actors refer to other actors, both similar and different from them - for example how a Costa Rican ICT producer refers to other producers, who are similar actors, and to investors, who are different actors. The use of "we, us" to indicate similar actors has been considered to point out self-identification in a given community. The use of "they, them" pointed out that there are actors perceived to be external to a given community. In order to corroborate this sort of evidence, the interviewees have also been asked to name "who they talk to" in the cluster when they need advice or information with regards to their ICT activities. Generally, actors' answers included an explanation of why they talk to certain actors and not to others. These

accounts were used to identify communities and the social networks in which actors are embedded.

The functions of social ties have been researched by referring to actors' descriptions of their collaborations, and by asking for additional information when the latter were not sufficient. If actors mentioned their social contacts when explaining the formation of collaborations, for example, by claiming that they gathered information through them, they were asked to provide more details, such as how such ties emerged, and when. If actors did not mention their social ties when explaining the formation of a given collaboration, their relationship to the decision maker of the collaborating organisation was questioned, to verify whether or not there was a pre-existing social tie. The accounts provided have been analysed and led to the identification of different processes through which ties influence collaborations, discussed in section 1.2.

In the cases of firms involved in multiple collaborations, second-round interviews were followed by other visits. The latter were conducted in an unstructured way, often in informal settings, so as to limit the researcher's influence on the interviewees' narratives and processes of reconstructing past decisions. The author was invited to take part in some workshops involving different parties of the collaborations analysed, which provided information about the mechanisms of inter-organisational communication and about the joint activities performed. The author also participated in ICT fairs and events, such as meetings of the Costa Rican ICT Producers' Chamber (Camtic), corroborating the information collected via interviews with additional qualitative insights from informal conversations.

Several representatives of the public sector were also interviewed in order to understand cluster policies and how they have been carried out. They include the President of Costa Rica (elected in 2006), his Vice President, his Minister of the economy, the Costa Rican Ambassador to the UK, and representatives of the export promotion agency (Procomer), the Local Procurement Program, and of the foreign direct investment attraction agency (Cinde).

The study was structured into six phases. The first phase dealt with the collection of basic data and information about the cluster. This phase lasted about one month. It was carried out between June and July of 2004 by combining the existing literature with

interviews with public sector officials and representatives of the Chamber of ICT producers to grasp the nature of the ICT cluster, and its role in the development policy of Costa Rica. The first phase terminated with the collection and filtering of existing data about the cluster.

The second phase was a pilot study with two firms involved in collaborations and one not involved in collaborations. It lasted about one month and was carried out in August 2004, immediately after the first phase. This pilot study allowed the author to fine-tune the interview technique needed to detect behavioural incentives, the function of ties, and to facilitate the reconstruction of how collaborations emerged.[2] It also aided in the outlining of some preliminary ideas about different collaboration types and subtypes, and about the institutions local entrepreneurs may respond to.

The third phase consisted of collecting basic data from local firms and detecting collaborations, and lasted about four months: from January to April 2005. This led to the first elaboration of the five collaboration categories. The fourth phase consisted of cross-checking the information provided by local firms by interviewing all the partners mentioned as collaborators, and by interviewing all of the other actors of the cluster who could be collaborating (universities, MNCs, investors). This phase involved collecting detailed information about the nature and developmental impact of collaborations, which was organised into the five categories and all of their subtypes. It lasted from June 2005 until March 2006. Counter-factual information was taken into account by questioning firms and actors that were performing similar activities in the cluster but making opposite collaborative choices - for example two Costa Rican ICT producers of similar software applications, one of which collaborates with MNCs, the other of which does not.

The fifth phase lasted from May 2006 to December 2006. During the fifth phase, the qualitative information collected was organised and analysed in light of the different theories of collaboration described in section 1.4. The analysis started with the outcome of collaborations, their developmental impact, and their typologies; and subsequently it

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[2] Extended periods spent in Costa Rica allowed to author to perfect the use of Costa Rican colloquial Spanish, Costa Rican ICT-related Spanish, and the customs according to which conversations are held in a business context. This was necessary to create the informal atmosphere necessary for actors to feel at ease and develop their discourse as to provide qualitative details about incentives, ties, and their behavioural determinants.

reconstructed how collaborations of different types and subtypes emerged. This process allowed for the identification of the motivations that led actors not just to collaborate, but to become involved in specific types and subtypes of collaborations. Such motivations were related to the institutions that regulate actors' behaviour.

During the fifth phase, additional qualitative information was collected through follow-up visits and participatory observation in industry events. Combining and analysing the information collected led to the construction of the theoretical framework of this research. In the last phase, which was carried out between January and March 2007, the findings were discussed with informants and the theoretical framework was re-discussed with the project supervisor and refined accordingly. The next section outlines the sources of information.

## 8.2 Sources of information

The most important official source of ICT information in Costa Rica is Camtic, the ICT Sectoral Chamber, which is also the only organisation that exclusively represents the ICT industry. Camtic is a private, non-profit, business association. Membership is voluntary. However, there are no rival business associations in the ICT sector, and no public institution or organisation that promotes ICT. As a result, about 90% of the local producers are members of Camtic.

Camtic provides on its website a survey called "Estado Nacional del Sector de Software 2005", with data on employment, sales, and exports. Camtic's data has been revised using data from Cinde, Procomer, and the World Bank. The list of firms obtained has been further checked through telephone calls, which were also used to establish the dates for interviews. Firms that had ceased to exist were eliminated from the list. The research focused on the 80 firms (out of a total of 150) that at the time of data collection resulted to be commercially active, had a physical address and a contact number, employed more than 1 person, and had been selling products and services for a minimum period of two years. This methodology, devised following the advice of local informants, limited the analysis to firms that had already overcome the start-up phase, and that were commercially operative.

The list was progressively updated when interviewees referred to collaborating firms not recorded in the official databases. Firms that did not comply with the above-mentioned criteria were interviewed only in the cases where other firms mentioned them as being collaborating partners. This occurred mainly in the case of collaborations between larger domestic firms and their spin-offs (LLCs II). The Universidad Central de Costa Rica (UCR), INCAE Business School, and Camtic helped in obtaining) both the necessary information and the interviews. INCAE Business School also provided financial support to complete the fieldwork.

Definitions of ICT vary strongly from publication to publication. This research considers the ICT cluster to be the group of actors involved in the production of information and telecommunication technologies in the Costa Rican Central Valley. It includes domestic firms, MNCs, universities, and investors. Camtic divides ICT firms according to their product specialisations: call centres, component producers, software developers, and outsourcing service providers. The list of MNCs that operate in the cluster provided by Cinde includes electrical equipment manufacturers, back offices, and call centres as part of the ICT cluster.

The definition of the ICT cluster adopted in this research excludes call centres and electrical equipment manufacturing. In Costa Rica, electrical equipment manufacturers produce goods that are not related to ICT hardware industries, for example home switches or hairdryers. Therefore, they have not been considered to be part of the cluster. The call centres are all multinationals (except for one) that provide customer support services. They do not produce any ICT technology, although they are users of ICT. For this reason, call centres have also not been included in the ICT cluster, unless they also develop internal software, in which case only their software development departments have been considered.[3] The list of MNCs that produce ICT provided by Cinde was checked via telephone interviews, internet research, and the use of information collected by INCAE Business School to verify the activities they perform in Costa Rica. The list has been filtered in order to exclude all of the MNCs that have back offices in Costa Rica, but that

[3] There is only one call centre that also develops software in a separate department, which is also the only domestic call centre. Its software development division has been considered in this research as an independent ICT producing firm.

perform activities not related to ICT production, for example, accounting functions.[4] The next sections list the interviews with private sector and public sector actors.

### 8.2.1 Interviews with actors from the private sector

| NAME | FIRM | DATE | POSITION |
|---|---|---|---|
| Alberto Gramuno | Merrimac Industries | 27-Aug-04 | Director |
| Alejandro Castro | Graphicom Soluciones | 16-Mar-05 | CEO |
| Alejandro Granera | Gigatech | 10-Feb-05 | CEO |
| Alejandro Madrigal | Align Tech. | 17-Mar-06 | Director |
| Alexander Mora | Tecapro | 16-Mar-06 | CEO |
| Alfonso Sojo | Xpersoft | 05-Aug-05 | CEO |
| Alvaro Moscoa | Logics Sistemas S.A | 08-Mar-06 | Sales Manager |
| Alvaro Villalobos | ITS | 18-Mar-05 | CEO |
| Ana Cristina Murillo | Soluciones de Internet Hermes | 08-Aug-05 | CEO |
| Ana Maria Monge | Sicoe | 24-Aug-05 | Founder |
| Andrés Castro Monge | Su Grupo Consultor | 02-Mar-06 | Founder |
| Andrés Rodríguez | Mantis CR | 23-Jan-06 | Founder |
| Antonio Ferrán | e-FIBS | 08-Aug-05 | CEO |
| Antonio Robinson | GPS Satelite | 15-Feb-05 | Sales Manager |
| Arnoldo Mora | Caiman Infrastructure | 18-Jan-05 | CEO |
| Bryan Hidalgo Trejos | Soluciones de Multimedia | 16-Feb-06 | Founder |
| Carlos Araya | Artinsoft | 26-Jan-05 | CEO |
| Carlos Guillen | Cesand | 21-Nov-05 | CEO |

[4] The exception was made when a local ICT producer explained to be engaged in a productive collaboration with a MNC that is not specialised in ICT, or does not perform ICT operations in Costa Rica. This occurred in one case of cross-border collaboration, described in chapter 6.

| | | | |
|---|---|---|---|
| Carlos Mora de la Orden | M&B Investors | 14-Jul-05 | Founder |
| Carlos Ruiz Herrera | C.R Conectividad | 08-Mar-06 | Founder |
| Claudio Pinto | Exactus | 18-Jan-06 | CEO |
| Cristian Vargas | Procom | 04-Jul-05 | CEO |
| Daniel Cantillo | MC Logistica | 22-Feb-06 | CEO |
| David Quesada | Sinertec ACS SA | 14-Jul-05 | CEO |
| Denis Alvarado | Deinsa | 15-Jul-05 | CEO |
| Diego May | Intel Capital | 23-Aug-05; 7-Feb-06, 20-Jan-07 | Ex Director |
| Edgar Oviedo Blanco | Babel | 14-Feb-06 | CEO |
| Edgar Vasquez | Oracle | 29-Mar-05 | Director |
| Eduardo Carvajal | S-Com | 18-Aug-05 | CEO |
| Eduardo Castillo | Teico | 02-Aug-05 | CEO |
| Eduardo Sanchez | Freetic | 02-Feb-06 | Founder |
| Eduardo Weelock | Sysde | 4-Mar-05, 7-Apr-06 | Founder |
| Eduardo Zambrano Quintero | GVSA Grupo Vector | 15-Jul-05 | Founder |
| Elizabeth Solano | Panduit | 27-Aug-04 | Operations Manager |
| Erick Villalobos Alvarez | Exceltec Software | 19-Aug-05 | CEO |
| Esteban Ramírez | Creatica | 14-Feb-06 | CEO |
| Evangelina Avendano | Grupo CMA | 08-Mar-06 | Sales Manager |
| Fabian González | Central America Advisors | 12-Apr-06 | CEO |
| Fernando Hernández | Evolution Software | 14-Mar-06 | CEO |
| Flor Obando | Electromática | 03-Mar-06 | Founder |
| Francisco Font Carranza | Font Sistemas | 23-Feb-06 | Sales Manager |

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|---|---|---|---|
| Francisco Monge Blanco | One Intermedia | 08-Mar-06 | CEO |
| Franklin Lizano | Sicoe | 24-Aug-05 | Founder |
| German Herrera | BPO International | 08-Mar-06 | Director |
| Greivin Salas | Ralpes | 19-Apr-06 | CEO |
| Guido Goicoechea | Software Consulting Group | 20-Jan-05 | CEO |
| Hubert Hernandez | Proyectica | 08-Aug-06 | Founder |
| Ian Thorpe | Fiserve | 11-Mar-06, 24-Feb-06 | Director |
| James Pérez | Photocircuits | 08-Feb-06 | Sales Manager |
| Javier Marin Hoffa | Desarrollo Fintec | 14-Apr-06 | CEO |
| Johanna Herrera | Quarzo Sistemas | 03-Mar-06 | Sales Manager |
| John Blanco | Tecnysis s.a. | 10-Aug-05 | Director |
| Jorge Hernández Canessa | Integracom | 20-Jan-05 | Sales Manager |
| Jorge Peña Guzmán | TGA consultores | 12-Aug-05 | CEO |
| Jorge Quesada | Identiga Karto | 09-Feb-05 | CEO |
| José Antonio Pacheco Alfaro | Infobanca | 24-Mar-05 | CEO |
| Jose Daniel Rodríguez | Creatica | 13-Feb-06 | Sales Manager |
| Jose Luis Moreno | Sysde | 10-Mar-05; 27-Aug-04 | Sales Officer |
| Juan Carlos Sanabria | Novacomp | 17-Feb-05 | CEO |
| Juan Carlos Bertsch | Análisis MSS | 08-Mar-06 | Sales Manager |
| Karla Naranjo | Masterlex | 13-Jul-05 | Sales Manager |
| Katia Quesada | Sidif de Centroamérica | 08-Mar-06 | Sales Manager |
| Lilliana Sancho | Advansys | 17-Aug-05 | Director |
| Luis Araya | Geotecnologias | 19-Jan-05 | CEO |

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|---|---|---|---|
| Luis Carlos Rojas | ADN Solutions | 15-Feb-05 | Director |
| Luis Chavez | Avantica | 18-Apr-06 | CEO |
| Luis Crespo | Soin | 04/03/2005 | Sales Manager |
| Luis Fernando Pérez | Metodus | 03-Mar-05 | Sales Manager |
| Luis Ferran | Infocr.com | 08-Mar-06 | Founder |
| Luis Miranda López | Lagos Software de Costa Rica | 20-Jul-05 | CEO |
| Luis Obando Hernandez | Informática de CentroAmérica | 15-Feb-05 | CEO |
| Luis Sanz | M&B Investors | 10-Aug-04, 20/03/2007 | Investor |
| Manfred Kissling | Aura, Uno a Uno | 08/03/2005, 13-Apr-06 | Founder |
| Manuel Acón, | Avionyx | 09-Jun-05 | Director |
| Manuel Jiménez | Xpersoft | 05-Aug-05 | Sales Manager |
| Marcelo Azua | infoweb | 03-Aug-05 | CEO |
| Marco Antonio Jiménez | Business Integrators Systems | 11-Aug-05 | CEO |
| Marco Antonio Vargas | Prides, Tecnosistemas | 24-Mar-05 | CEO |
| Marilyn Herrera Castillo | Alienware | 08-Feb-06 | Director |
| Martin Castillo | Hewlett Packard | 20-Aug-04 | Sales Manager |
| Michael Salazar | Logical Data | 22-Jul-05 | CEO |
| Miguel Morales | Mm soluciones | 01-Mar-06 | CEO |
| Monica Vargas | BTC Caiman | 11-Mar-05 | Sales Manager |
| Moshe Fazlian | Intel | 29-Mar-07 | Director |
| Name Withheld | Trimpot | 20-Aug-04 | Operations Manager |
| Name Withheld | Pycon | 09-Jun-05 | Director |
| Name Withheld | L3 | 10-Mar-06 | Operations Manager |

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|---|---|---|---|
| Name Withheld | Sawtek | 04-Aug-05 | Operations Manager |
| Name Withheld | Suttle | 09-Jun-05 | Operations Manager |
| Neissan Welter | Hosta Rica | 25-Mar-05 | CEO |
| Oldemar Rodriguez Rojas | Presidosoft | 05-Apr-05 | Founder |
| Omar Emo | Worldcap | 02-Apr-06 | Founder |
| Orlando Ramírez | Sisnet | 10-Aug-05 | CEO |
| Oscar Mesén Jiménez | Indeinsa | 11-Aug-05 | Founder |
| Oscar Trejos Hernández | Reinsa | 30-Mar-05 | Sales Manager |
| Pablo Barrantes | Intergraphic designs | 07-Apr-05 | CEO |
| Pablo Elizondo | Smartsoft | 17-Feb-05 | CEO |
| Paul Fervor | Ixo | 09-Mar-05 | Sales Manager |
| Paula Munera | Masterlex | 04-Jul-05 | CEO |
| Peggy Ferran | Infocr.com | 08-Aug-05 | Sales Manager |
| Ramírez Echeverría Orlando | Sisnet Consultores | 08-Mar-06 | CEO |
| Randal Peres | Modus | 09-Aug-05 | CEO |
| Ricardo Bonilla | Grupo Asesor en Informática | 13-Jul-05 | Founder |
| Roberth Wolf | OutCoding Group | 01-Apr-05 | Sales Manager |
| Roberto calvo | Dinamica | 06-Jul-05 | CEO |
| Rodrigo Arias | Flecha Roja Technologies s.a | 08-Nov-05, 07-Feb-06 | CEO |
| Rodrigo Ayala | Microsoft | 09-Jun-05 | Director |
| Ronald Fallas | Corporación Rempro | 07-Jul-05 | CEO |
| Ronald Jiménez | Codisa | 08-Mar-06 | Founder |
| Ronald Piedra | RyJ Consultores Informáticos | 15-Feb-05 | Founder |

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|---|---|---|---|
| Roy Vargas | Isthmus, Lidersoft, Predisoft, Interamerica, M&B Investors | 22-Mar-05, 07-Feb-06, 09-Feb-06, 4 Apr-06 | Founder, CEO, Investor |
| Steve Ramírez | Cypress Creek | 08-Feb-06 | Sales Manager |
| Tyson Ennis | Global Marketing Solutions | 27-Jan-05 | Director |
| Victor Alpizar | GBSYS Global Business System | 08-Mar-06 | Sales Manager |
| Victor Cuesta | MDG developers group | 08-Mar-06 | CEO |
| Victor Manuel Herrera | SV Conta Costa Rica | 08-Feb-05 | CEO |
| Victor Ojeda | Database Technologies | 15-Nov-05 | Founder |
| Víctor Solano | BSP Technologies | 15-Feb-05 | Sales Manager |
| Vinicio Diaz | Cgtec | 30-Mar-05 | Sales Manager |
| Willie Valverde | Alfa Group Technologies | 09-Mar-06, 10-Apr-06 | CEO |
| Wilman Oviedo | Sidif de Centroamérica | 08-Mar-06 | CEO |

### 8.2.2 Interviews with actors from the public sector

| NAME | ORGANIZATION | DATE | POSITION |
|---|---|---|---|
| Alexander Mora | Camtic | 28-Jan-05; 12-Apr-06, 20 Mar-07 | Director |
| Camtic, Board of Directors | Camtic | 20-Oct-05 | Board of Directors |
| Cesar Garita | TEC | 07-Aug-06 | Director |
| Juan Carlos Bonilla | CEI-TEC | 25-Aug-05 | Director |
| Luis Fernando Chavez | Procomer | 12-Aug-04 | Director of Local Procurement Program |

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|---|---|---|---|
| Gabriela Marin | UCR Postgraduate Program in Computing and Informatics | 18-Jul-06 | Director |
| Federico Cartin | Camtic | 20-Ju-04, 15-Mar-05 | Ex Director |
| Betsy Murray | Inter-American Development Bank | 08-Aug-06 | Head of Costa Rican Office |
| Rosalia Morales | Camtic | 07-Mar-07 | Marketing Officer |
| Guillermo Zuniga | Government of Costa Rica | 21-Apr-06 | Minister of Finance |
| Oscar Arias | Government of Costa Rica | 22-Feb-05; 20-Mar-07 | President of Costa Rica |
| Francisco Mata | UCR, Postgraduate School of Computing and Informatics | 10-Jun-06 | Professor |
| Gabriela Rubio | Cinde | 20-Jul-04 | Research Officer |
| Anita Mora | UCR | 11-Feb-06 | Student |
| Carlos Torres | UCR | 12-Feb-06 | Student |
| JoseMorales | UCR | 10-Feb-06 | Student |
| Lorena Sanchez | UCR | 13-Feb-06 | Student |
| Silvia Centeno | UCR | 08-Feb-06 | Student |
| Walter Salas | UCR | 09-Feb-06 | Student |
| Marcelo Jenkins | UCR, School of Computing and Informatics | 19-Jul-06 | Vice-Director |
| Kevin Casa | Government of Costa Rica | 18-Feb-06; 10-Mar-07 | Vice-President of Costa Rica |

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