



Open Research Online

The Open University's repository of research publications and other research outputs

Linking learning with governance in networks and clusters: key issues for analysis and policy

Journal Item

How to cite:

Parrilli, Mario Davide and Sacchetti, Silvia (2008). Linking learning with governance in networks and clusters: key issues for analysis and policy. *Entrepreneurship & Regional Development*, 20(4) pp. 387–408.

For guidance on citations see [FAQs](#).

© 2008 Taylor Francis

Version: Accepted Manuscript

Link(s) to article on publisher's website:

<http://dx.doi.org/doi:10.1080/08985620801886463>

Copyright and Moral Rights for the articles on this site are retained by the individual authors and/or other copyright owners. For more information on Open Research Online's data [policy](#) on reuse of materials please consult the policies page.

oro.open.ac.uk

**Linking Learning with Governance in Networks and Clusters:
Key Issues for Analysis and Policy**

Mario Davide Parrilli

Silvia Sacchetti

Institute for Economic Development Policy

Birmingham Business School

University of Birmingham

B15 2TT Edgbaston

Birmingham, UK

m.d.parrilli@bham.ac.uk

s.sacchetti@bham.ac.uk

Tel. +44-121-4145144

Fax.+44-121-4146689

Linking Learning with Governance in Networks and Clusters:

Key Issues for Analysis and Policy

Abstract

In this paper we analyse the relationship between governance and learning in clusters and networks. In particular, we see these two key-elements as interdependent, suggesting that, under particular circumstances, that interdependence may drive clusters and networks towards a dynamic development trajectory. A pure ‘governance perspective’ makes the development of any locality dependent on the system of powers that exists within the locality or across the global value chain. In parallel, a pure ‘competence-based approach’ focuses mainly on the capabilities of actors to learn and undertake activities. In contrast, we open the prospects for an interdependent relation that may change the actual competences of actors as well as the governance settings and dynamics in networks and clusters. When supported by public policies, the learning process may have the potential to modify the governance environment. Simultaneously, the learning process is intrinsically influenced by economic power, which may seriously affect the development prospects of clusters and networks. This is why an intertwined consideration of both aspects is necessary to promote specific approaches to learning and to design appropriate policies. In this paper we offer two preliminary case studies to clarify some of these dynamics: the first taken from the computers cluster in Costa Rica and the second from an Italian biopharmaceutical firm and its production network. The first case study refers to the software cluster that was created from scratch in Costa Rica thanks to an enlightened government policy in coordination with new local enterprises and important foreign direct investor, while the second reflects on the ability of an individual company to create a network of relationships with large transnational companies in order to acquire new competences without falling into a subordinate position with respect to its larger partners.

Keywords: governance, competence view, learning, clusters, networks.

1. Introduction

In this paper we analyse clusters and networks of firms from two complementary theoretical frameworks. The first one draws upon the strategic decision-making approach to the theory of the firm, which analyses the governance of the economic system and defines the firm in terms of strategic planning (Cowling and Sugden, 1998). As a consequence, this approach sees both networks and clusters as organisational structures where firms relate with each other adjusting relationships on the basis of their economic power (Sacchetti and Sugden, 2003; Humphrey and Schmitz, 2004).

The second perspective is grounded in the competences mastered by the firm. This perspective implies the integration of different, although complementary, pieces of knowledge that belong to different actors through a process which, under particular conditions, may lead to the creation of new experiences and new knowledge within and amongst firms (Richardson, 1972; Cohen and Levinthal, 1989; Lundvall, 1992; Antonelli, 1999; Sacchetti and Sugden, 2004).

The objective of our paper is to bring together the strategic decision-making and the competence-based view in order to explore the conditions underlying the development of different types of networks, geographically and non-geographically clustered. In particular, this work suggests that learning processes and the governance structure may be interdependent, once public policies or private strategies (either at the corporate or the cluster level) are set up. We suggest that the specific governance system of inter-firm relationships influences learning opportunities in different ways, for instance, when the pace and diffusion of innovation is controlled by a single firm for the entire network, as opposed to a situation for which knowledge is created out of mutual exchange of experiences. At the same time, the specific competences accumulated by firms operating through networks and clusters may stimulate change and inject

dynamism into the governance system, through, for instance, the creation of a plurality of active socioeconomic actors. A possible effect is the modification of an otherwise static governance environment and the increase in actors' participation in strategy-making.

Section 2 focuses on clusters and networks, the two forms of production organisation that we analyse in this paper. In this section we identify cluster and network typologies as well as their development trajectories. In Section 3, we address a different perspective by examining, in turn, the competence view and the governance view, which can then be applied to networks and clusters. Next, we argue for these two approaches to be complementary and interdependent. In Section 4, we analyse two case studies that offer examples of clustering and networking; they also help us to begin a preliminary analysis of the interaction between the system's governance and the learning process that takes place in those contexts. From these examples, in Section 5, we sketch some likely lessons for network and cluster policy in a global context.

2. Clusters and Networks

In the past two decades, clusters have been presented as production environments where small and medium enterprises can be more competitive. By contrast, it has been argued that isolated small firms do not have sufficient capacities to offset the scale and scope economies implemented by large companies (Schmitz, 1992; Sylos Labini, 2000). Moreover, dense local social and institutional networks set up around a critical mass of actors are more likely to strengthen the economic competitiveness of the firm and its territory (Johannisson et al., 2002). The importance of local relationships is reinforced by the idea of 'milieu' where the local environment is presented as an economic actor in its own right, where dynamic uncertainty is reduced (Camagni, 1989).

On the whole, the literature on clusters identifies the strength of clusters in their capacity to benefit from joint actions and external economies (Schmitz, 1992). These features give clusters the capacity to generate economies of scale and scope that permit them to compete with larger firms in global markets.

The district/cluster model of industrial development implicitly identifies networking within a production context spatially defined within local geographical borders where actors share a common cultural and entrepreneurial background. Actors are part of a complex system of interrelationships which, in turn, may originate a multiplicity of networks amongst firms within the district or the cluster. Both clusters and networks are forms to organise production. However, when based only on the exploitation of external economies, which by definition do not reflect the explicit strategy of firms, clusters indeed may involve a limited number of explicit relationships amongst firms, which, in an extreme situation, could be even proximate to zero (e.g. in ‘survival clusters’). Differently, networks specifically exist because of the *voluntary and strategic coordination* of competences and activities between firms (Penrose 1995 [1959]), which may eventually exceed local borders. A focus on networks (and therefore on the linkages that are explicitly created amongst firms and between firms and other organisations) emphasises the nature of the relationships, and the way firms are positioned with respect to each other in terms of resources as well as decision making power (Sacchetti and Sugden, 2003). Whilst the essence of cluster analysis is in the relationship between the firms and their local embeddedness, the essence of network analysis is in the firms, their strategies and motivations.

>> **Figure 1: an illustration of a cluster within and outside which networks (N) may develop**

The two forms of production organisation, clusters and networks, may be therefore complementary (Figure 1): in a context where the agglomeration of firms and institutions is relevant to enhance local competitiveness and make relational activities easier, the explicit interactive dimension of networking provides an indication of the relational thickness of the system as well as of its openness with respect to linkages across different localities (Amin and Thrift, 1994).

Keeping these distinguishing elements and the complementarities in mind, typologies of clusters offered by the literature could be usefully read by identifying how the cluster structure is related to the main networking strategies within the cluster. This approach might prove useful from an analytical point of view to understand the governance mechanisms within the cluster, its implications and possible evolution.

These insights have been flanked and supported by the successful experience of industrial districts, formalised in a model that identifies networking within a common production context, spatially defined within local geographical borders where actors share a common entrepreneurial, social and institutional background. Firms are all small and medium and are part of a complex system of relationships that implies a detailed division and specialisation of labour which improves the overall competitiveness of the district (Brusco, 1982; Piore and Sabel; 1984; Becattini, 1990; Porter, 1987¹; Markusen, 1996).

Besides the above typology, defined as ‘Marshallian industrial district’, Markusen (1996) identified three other forms of clusters, including: the ‘hub-and-spoke cluster’, centred around a hub firm, which plays a leading role within the district and which is able to orchestrate the evolution of the local industry through the creation of a number of linkages with suppliers and subcontractors; the ‘satellite platform’ and the ‘state-anchored district’, which represent two variants of the former in which the leadership is located outside the locality (satellite) or

controlled by a state enterprise or institution. In addition, two more typologies of clusters can be identified: the 'artisanal cluster' observed in the early years (1940s and 1950s) of Italian industrial districts (Brusco, 1990; Parrilli, 2004) and the 'survival clusters', which are currently quite common in developing countries (Altenburg and Meyer-Stamer, 1999; Parrilli, 2007). These two types are characterised by micro and small enterprises that adopt manual techniques and production processes in which division and specialisation of labour are not particularly developed; their output is represented by medium to low quality products for the local market. The first four typologies are characterisations of the prevailing forms of networking within the cluster, whereas the extreme case of 'survival clusters' represents an agglomeration of firms that, given their nature and objectives, do not originate substantial networking.

Since the mid-1990s the theorists of clustering opened a significant reflection on the appropriate focus of the analysis by questioning the importance of typifying models. Humphrey (1995), for instance, takes a dynamic view on clusters, especially in the context of developing economies where the distance from ideal models is so great, and instead focuses on trajectories of growth. This approach is more likely to help policy-makers to understand limitations and opportunities and to identify the programmes and initiatives that can help to upgrade SMEs and their local production systems (Parrilli, 2007). In particular, recent contributions on competitive 'marshallian industrial districts' identify two evolutionary trends. The first shows the tendency within these districts to create groups of firms that pull together stronger organisational structures as well as advanced research and marketing abilities (Brioschi et al., 2002; Parrilli, 2004). These districts exploit new economies of scale and scope that strengthen the competitive position of the cluster in worldwide markets (see, for instance, the ceramic tile district in Sassuolo, Italy, analysed in Russo, 1989). The second trend refers to districts that show the emergence of individual local firms which are capable of creating linkages with leading international

companies in a complementary sector. This is pursued in order to benefit from the specific competitive advantage of larger external partners, such as access to new markets and to low cost financial capital, new competences in complementary production sectors (see, for instance, the footwear industry in the Brenta region, Italy, analysed in Rabellotti, 2004).

The latter trajectory, in particular, seems to be leading the ‘marshallian industrial district’ into a ‘hub-and-spoke’ cluster, presented in the literature as the current most competitive organisational solution in both developed and developing economies (Guerrieri and Pietrobelli, 2004). Amongst the observed advantages of this model is the ability of leading firms to bypass local borders and build external linkages, which may enrich the competitiveness of a local system as a result of easier access to new markets, as well as to new ideas and technologies (Ibidem; Albino et al., 1998).

The latter evolutionary trend emphasises the importance of widening the space of firms’ linkages beyond the cluster in order to capture new knowledge, markets, and finance. This suggests that the analysis should not focus only on geographically limited spatial contexts (e.g. industrial districts and clusters), but also on ‘networks’ spanning localities and countries as a way to involve the wider environment that supports the competitiveness of firms and their local production systems (Guerrieri and Pietrobelli, 2004; Sacchetti and Sugden, 2005). This focus on global networks is likely to help explaining relevant dynamics of economic development across firms and territories (Johannisson et al., 2002). A number of theoretical aspects linked to the concept of ‘networks’ are discussed in Section 3, such as ‘mutuality’, which is central in Powell (1990), for whom a network is essentially a relational organisation where actions are reciprocal, preferential and mutually supportive. The concept of network as a number of ‘nodes’ and ‘links’ amongst actors, where each one dynamically aims at improving its position within the network (Thorelli, 1986:38) is also analysed, as well as the definition of industrial networks that relates

the distribution of resources amongst actors to the structure of actors' interdependencies (Håkansson and Johanson, 1993).

Overall, the literature on 'networks' has historical roots in both the theory of the firm and the literature on 'growth poles'; in particular, the latter recognises the leading firms' role and potential for positive spillovers for a number of non-geographically concentrated production and commercial partners, through a 'process of polarisation' or 'propulsive development' (Perroux, 1950). This theoretical construct had significant impact in the promotion of 'linkage studies' that, rather than being related to the idea of geographical proximity, develop and discuss the importance of linkages within trans-local *filières* (ADEFI, 1985), subsectors (Boomgard et al., 1992), commodity chains (Gereffi and Korzeniewicz, 1994), as well as global value chains (Schmitz, 2004). All these represent key efforts stressing the importance of networks and linkages within wider spaces as a way to benefit from abilities and advantages that cannot be reaped in local economies alone.

3. Theoretical Framework

3.1 The Competence View

From the perspective offered by the 'competence view' (Penrose, 1959; Richardson, 1972), linkages established across firms can be explained by the need of firms to access external competences and abilities, which may or may not be found in their closest neighbours. In fact, it has been said, firms do not look for clones of themselves, but for complementarities that may eventually enrich their original knowledge with dissimilar abilities and competences (Maskell and Malmberg, 1995; Sacchetti and Sugden, 2005).

This argument has been explained mainly by Richardson (1972) who argues that firms that need to coordinate qualitatively different and complementary activities may choose a third form of coordination (different from 'market' and 'hierarchy'), cooperation. This point was inspired by Penrose (1959), who pointed out that firms grow by exploiting exceeding competences in related activities and was then expanded with respect to business networks by Penrose (1995) herself in the preface to the third edition of her 1959 book. Richardson's contribution emphasises that, when a firm cannot master the knowledge required to expand its activities in a given direction, then external coordination through the establishment of inter-firm linkages is required (Richardson, 1972). This perspective is useful to explain recent dynamics of industrial districts and clusters in the organisation of production, especially with respect to innovation and access to new markets (Guerrieri and Pietrobelli, 2004). In these cases local firms created bridges of cooperation with leading firms located outside the cluster in order to incorporate new competitive advantages (Ibidem; Rabellotti, 2004).

According to this view, networks are instruments that may help firms to voluntarily expand their own competences by means of complementary partners beyond limitations of their own organisation and of the localities where they are settled. In this context, the process of learning offers a dynamic perspective on the nature of both networking and clustering. Since learning is a cognitive phenomenon generated also through interaction and socialisation, repeated contacts and joint work can activate the cognitive resources of individuals and organisations, thus generating new experiences and routines. Therefore, following the competence view, networking can be beneficial because it may stimulate communication and convey new stimuli towards firms, thus enhancing learning opportunities that may lead to technological upgrading and improved competitiveness. Policies to improve learning within clusters might address the promotion of linkages of that type.

A vast literature on the determinants of competence acquisition may be now briefly considered for the relevance they assume within this specific work. In particular, the local embeddedness of social and economic agents in clusters, rooted in several ‘institutional’ mechanisms (e.g. reputation, common values, shared rules, etc.) may be identified as a unique basis to facilitate the diffusion and acquisition of tacit knowledge and learning-by-doing across the local economic fabric (Audretsch, 1998). Complementarily, although knowledge acquisition be based on local productive specialisation and on the related abilities of workers, firms and local institutions should also be open to an effective interaction with external sources of knowledge (Antonelli, 1999). This latter aspect directly points to the notion of ‘absorptive capacity’ (Cohen and Levinthal, 1989), which applies to firms as well as to clusters and networks in the attempt to incorporate new knowledge inputs coming from external sources (e.g. suppliers and customers, external R&D centres) and to adapt these to local purposes and specificities. As another face of the same coin, the capacity to change the environment (and not just the other way around) in order to suit one’s own strategic objectives (Penrose, 1952) is a crucial factor of competence acquisition (Langlois, 2003). This is relevant both for the individual firm as well as for its system of inter-firm relationships because it may lead to overcome very common market failures, such as, in the case of small firms, limited access to credit (e.g. by creating a credit consortium or a guarantee fund that facilitate access to credit and servicing by banks).

The promotion of knowledge creation processes builds on the recognition of the communicative nature of learning. This implies nurturing and developing interaction between specific types of local/national/international actors consistently with the idea of dynamic production systems as well as of national and regional innovation systems (Lundvall, 1992; Cooke et al., 2004). This variety of theoretical features specifies ways in which knowledge develops through firms, within clusters and spanning multinational networks.

3.2 The Governance View on Networks and Clusters

The activation of a process of learning and knowledge creation within a cluster or a network, however, is not disjoint from the nature of relationships. Literature on technological transfer, in these respects, often refers to spillovers of knowledge from leader firms towards subcontractors and suppliers (Lazerson and Lorenzoni, 1999). It has been argued that leader firms may promote technological upgrading and the search for competitiveness in mature and stagnating clusters. In this sense, a number of cases show that active industrial policy is needed to ensure technological spillovers from large firms to their small subcontractors, either by means of legal protection (e.g. the Japanese 1956 law for the protection of small subcontracting companies: Caddy, 1998) or through development programs for the promotion of subcontracting (e.g. the Mexican program for the development of subcontracting: Garrido, 2002).

Of course within a governance approach to the globalisation of production activities, a number of key contributions stress the difficulty to generate such positive spillovers from large companies to local production systems (Sacchetti, 2004). Hymer (1972) emphasised the long-lasting tendency of corporations to concentrate their high value-added operations in the cities hosting their headquarters (New York, London, Paris and Tokyo, at the times he wrote). Building on Hymer (ibid.), Cowling and Sugden (1994) analyse large corporations identifying pivotal characteristics of hierarchies, namely concentration of strategic decision-making power within restricted groups, and apply this perspective to address the nature and impact of large transnational corporations, emphasising risks of centripetalism, short-termism and subverted terms of trade. Differently, Dunning (1988), building essentially on transaction cost theory, analyses internationalisation of corporate hierarchies through the incentives provided by location,

ownership and internalisation advantages. These approaches based on the governance of transnational hierarchies provide relevant insights to analyse local production systems and, in particular, help to appreciate differences in development trajectories between, for instance, contrasting governance structures in local networks, such as ‘hub-and-spoke clusters’ as opposed to ‘marshallian industrial districts’ (Humphrey and Schmitz, 2004).

Consistently, although the above-mentioned considerations offer an analysis of some possible benefits of the ‘hub-and-spoke’ model, networks centred on a leader firm suffer from a ‘participation lacuna’ with respect to governance issues (Sacchetti and Sugden, 2003). Following the ‘strategic decision-making approach’ developed by Cowling and Sugden (1998), Sacchetti and Sugden (2003) argued in favour of an analysis of networks on the basis of the modality of governance underlying relationships between participants². Two opposite situations are identified, which are consistent with the dichotomy between mechanistic and organic organisational forms identified by Burns and Stalker (1961). The first may refer to ‘networks of direction’ and the second to ‘networks of mutual dependence’. The first is a ‘hub-and-spoke’ network, where one core firm controls the others and takes strategic decisions independently on the consensus of ‘spoke firms’. Relationships are based on direction and control. The main criteria of assessment of partners are prices, compliance to standards and efficiency (Sacchetti and Sugden, 2003; Humphrey and Schmitz, 2004). Conversely, ‘networks of mutual dependence’ are heterarchical networks characterised by substantial participation in strategic decision-making. These networks represent an environment where firms co-operate on shared objectives which they have contributed to define. Such cooperation enhances processes of communication and learning that are based on mutual sharing of resources, research and trust, rather than on strategies imposed by a core firm to the spoke or satellite firms (Ibidem).

These two cases explicitly refer to extreme situations as means to contrast alternatives in a neat way. In between, governance systems can vary with characteristics that may broadly take networks and clusters in an intermediate area, closer to one extreme or to the other. There are in fact other types of systems, such as the afore-mentioned ‘artisanal clusters’, ‘survival clusters’ and ‘satellite clusters’ where inter-firm relationships tend to be horizontal; notwithstanding this, communication and learning processes are likely to be shallow and, therefore, unlikely to promote processes of participation and development (Parrilli, 2002). In this case, non-hierarchical relationships do not help the system to be dynamic. As a matter of fact, a number of concrete cases exemplify the co-existence of mixed governance systems; this implies that some firms may establish, in some cases, relations of ‘mutual dependence’ whilst, in others, market relationships or agreements with buyers and suppliers that may not impinge on the ability of firms to define their own development strategy. This is observed in the shoe cluster in Agra, India (Knorringa, 1999) or in the surgical instrument cluster in Sialkot, Pakistan (Nadvi, 1999) where firms operate through a number of market channels, some of which may be controlled by ‘hub’ companies and others may be more flatly structured. This may mean that, within the same locality, some market channels may offer to small local firms better prospects for endogenous development than different channels where these prospects are more limited. The worldwide variety of cases reinforces the importance to take a ‘governance approach’ as a way to identify network dynamics as well as governance constraints that influence the economic activity of firms, clusters and networks, their prospects of development and the policies that may help these systems to dynamically interact with global markets.

3.3. The Interdependence between Learning and Governance in Clusters and Networks

>> Figure 2: The Interdependence between Learning and Governance in Clusters and Networks

Figure 2 summarises the concepts analysed so far. ‘Clusters’ and ‘networks’ are considered as units of analysis that offer the critical mass of firms for local development and, under particular circumstances, the possibility to drive development towards the strengthening of the local economy. When analysing the ‘governance’ of production systems, we find that relationships may be hierarchical in both clusters and networks, unless the local embeddedness permits a more horizontal organisation, i.e. in specific forms of clusters (e.g. marshallian industrial districts) or when partners design a framework for relationships that reflects participation and mutuality, e.g. in networks of mutual dependence. We argue that building up ‘competences’ through explicit firm strategies and/or active public policies may push both clusters and networks towards more horizontal, ‘organic configurations’. This outcome requires a locally-embedded and driven development and, following Burns and Stalker (1961), a kind of interaction that is based on the knowledge of each other’s role within the production system and on each actor’s (firm) competences. ‘Organic system’ is, in fact, a kind of organisation in which “participation runs laterally as much as vertically, (whereas) communication between people of different ranks tends to resemble lateral consultation rather than vertical command” (Burns and Stalker, 1961: 5-6).

The interdependence between governance and learning and, in particular, the implications of network governance on the learning possibilities of firms, clusters and networks and, viceversa, the impact of learning processes on the governance of networks and clusters are the interpretative keys of our work. Where direction of one firm over others prevails (e.g. in ‘hub-

and-spoke' clusters or in 'networks of direction'), 'voice' strategies in day to day problem solving may give way to 'exit' strategies when solutions can be more easily found outside the network (Helper, 1993; Sacchetti and Sugden, 2003). This event may occur, for example, when directed firms are low-tier suppliers for which price competition may be a selective element vis à vis competitors. On the contrary, 'voice' strategies allow the exchange of information and, to a certain degree, knowledge transfer through a cumulative and gradual process of learning. In 'networks of direction' and in 'hub-and-spoke' clusters this is likely to occur with strategic partners with whom the core firm assesses ex-ante long-term opportunities for collaboration. The knowledge upgrading of the directed firms may, therefore, occur also in these cases, but tends to be confined to core or upper tier firms or to independent firms that operate through different market channels in the same cluster. These firms have established their own capabilities and knowledge, thus contributing to define their own nodal position within the network.

Yet, even in 'hub-and-spoke' clusters and in 'networks of direction' there may be room for an evolution, but under specific conditions. These involve the existence of localised pools of knowledge (e.g. a qualified human and social capital, institutional 'thickness'), which can support the local system when actively interacting with the large 'hub' that leads the cluster or the network. Specific competences and abilities at the regional level, however, need to be flanked by a growing participation in the governance of the main networks within and beyond the cluster, for instance by means of a growing 'institutional thickness' and participation in the economic life of the cluster/network (Amin and Thrift, 1994; Parrilli, 2004). In this way, the governance system could progressively move towards more horizontal 'networks of mutual dependence' involving a variety of private and public organisations and their actions, as well as a growing plurality of network typologies (e.g. when the 'marshallian cluster' coexists close to a 'hub-and-spoke' cluster, as in the afore-mentioned cluster of Agra: Knorringa, 1999). In this sense, the learning

process may be more diversified and may allow small and medium local firms to grow, in part, independently on large corporations. This would be consistent with the promotion of an endogenous development path.

Opposite to ‘networks of direction’ and ‘hub-and-spoke’ clusters, ‘networks of mutual dependence’ and ‘marshallian districts’, ideally, tend to be based on participatory forms of governance. According to this governance system, strategic decisions are jointly defined by participants and activities are coordinated through the definition of participatory rules, which reflect shared values and objectives (Locke, 1995; Cowling and Sugden, 1999; Humphrey and Schmitz, 2004; Sacchetti and Sugden, 2005; Parrilli, 2007). These more horizontal types of networks and clusters should not be confused with relationships established, for instance, in ‘survival clusters’, whose learning process is hindered by the lack of local collective capability to generate innovation and disseminate it through the cluster (Romjin, 2002; Parrilli, 2002).

The hypothesis of this paper is that governance and learning may be interdependent. Within clusters and networks, both processes of knowledge creation and governance need to be contextually considered in order to understand the capacity of local firms to develop. A perspective on local learning processes must be flanked by a governance perspective to assess the impact of linkages on the strategic decision-making of firms, clusters and networks and to structure more appropriate programmes for local development. This means identifying whether the learning processes are being constrained by existent hierarchical powers within the cluster that prevent these processes from advancing, thus modifying the *status quo*. It may be the case, for example, in a dairy product cluster that the large ‘hub’ company does not want its suppliers of milk to provide their products to other industries in the region and, for this reason, it limits the active interaction with their suppliers and the related technology transfer to a minimum (e.g. they may not want to give advice to farmers about the adoption of best feeding practices to raise cows’

productivity beyond a certain level). In this case the learning processes of dairy producers would be seriously affected.

Simultaneously, the analysis of governance alone could leave a lacuna when ignoring the possibility to modify the system from within, once endogenous forces are activated by learning processes that can be catalysed, for instance, by public policy. These may contribute to transform a vertical network in more horizontal organisational forms, by enabling and encouraging both the creation of competences and the active participation of all relevant local actors to strategy-making. This may be the case of innovation and development processes activated by important technical schools, public universities and agencies that help local firms to progressively count with more skilled human capital in a cluster where a large firm is leading the process of economic growth through a hierarchical pattern of governance (e.g. a cluster developed around a large car manufacturer). In this environment, public stimuli instigated by such institutions may create a number of local dynamic enterprises capable not only to interact on a more equal basis with the large hub, but also to open up new market channels within and outside the sector (e.g. the local producers in the Salmon cluster in Chile vs. the large Norwegian and Canadian multinationals, Maggi, 2006).

4. Cases studies from Clusters and Networks in High-Tech Industries

4.1 Context and Methodology

Some of the aspects developed so far can be illustrated through two case studies that are taken within a 'cross-case synthetic' perspective that helps us to focus on the most significant aspects of our research (learning and governance in clusters and networks) and to show their

relevance and interdependence in the selected cases: (Yin, 2003:133-5). The first case study is taken from the computers cluster in Costa Rica, which involves a large hub firm (Intel Corporation) and a number of local firms across different sectors. In this case a ‘learning’ group of small firms has grown and maintained its independence from the large hub located in the cluster. The second case is about the network created by a growing Italian bio-pharmaceutical firm (Domp ) with other firms and, in particular, with two giant transnationals that are prominent in the bio-genetic sector worldwide. In this second case pre-existing strength in organisational and pharmaceutical competences gave Domp  enough capacity to cooperate with them over innovation, maintaining a significant independence in decision-making. Given the complexity of the relationship between learning and governance, these case studies do not show all the dynamics that we hypothesise. However, they are meant to illustrate how we envisage the interrelationship between governance- and competence-based views within clusters and networks, possibly paving the way for deeper “explanatory” analyses based on selected and representative interviews to firms and institutions (Yin, 2003). Having first highlighted relationships that are not easily observable, and having accordingly emphasised possible policy solutions, we focus here on identifying linkages between economic facts that are deemed to be significant. By proposing these two case studies, we attempt to look at the real world and try, as far as possible, to find out whether the analytical relationships identified are important in actual situations (Day, 1955). Policy-makers will then have the responsibility to appreciate what factors are more likely to influence the reality they face (Caff , 1970).

In one case (the Costa Rican case study), we integrate multiple sources of evidence that are mainly based on macroeconomic data available from official databases (Bank of Costa Rica) and sectoral studies, that are complemented with interviews with key informants (university researchers and information technology experts) that help us make hypotheses on ‘how’ and

‘why’ simultaneous developments took place in the electronic and software sectors; in the second case (the pharmaceutical case study), we rely on an extensive direct interview with the CEO of the selected firm, later reviewed with key informants (academics), as well as on a number of sector documents. We structure these cross-case syntheses on the bases of the main argument of this work; for this purpose we review the governance system in place (4.2.1) and the competence acquisition (4.2.2) and we represent the apparent relationship of interdependence, with a particular view to emphasise what has occurred in the selected contexts and what can be achieved for broader development purposes. In the case of the computers cluster in Costa Rica we then focus on the active policy regime that helped the local software firms to open a dynamics with the large transnational ‘hub’ and that, on these bases, supported local firms to gradually upgrade their capabilities and their insertion in global markets (4.2.3). In the second case we rather stress the firm strategy as a means to spur the formation of higher internal competences (4.3.1) and of more horizontal and mutual exchange relationship with giant pharmaceutical companies (4.3.2).

We apply a ‘theory-building’ compositional structure (Yin. 2003: 154) by picking these cases and by comparing them through the utilisation of a common theoretical skeleton (learning and governance), and finally by identifying the common trends that seem to be at work there; this procedure helps us inferring the internal validity of a development approach that pulls together the afore-mentioned interdependent aspects in the context of clusters and networks. As a complementary means to strengthen the construct validity of our hypothesis of ‘interdependence’ (Ibid.: 143), we have targeted and presented this work (and in particular the Costa Rican case) to a public of Costa Rican as well as of other Latin American and European academics, policy-makers and businessmen during the course of three intensive summer schools held in Central America and in Europe over the past two years; this helped us to discuss and further refine the overall argument of this work.

Shortcomings of case-study methodology, as Day (1955: 71) emphasises, are that ‘evidence will be subject to differing interpretations. Some evidence will be unobservable. Much will be verifiable only within large margins of error’. However, we would recommend, as the next step, that further applied research is undertaken to reinforce understanding and reliability of analysis with respect to the dynamics of learning and governance within production systems. In fact, future extensive research based on surveys with a significant number of software and pharmaceutical entrepreneurs (and eventually with entrepreneurs in other sectors, for external validity purposes) as well as with key informants may help us to build up more in-depth explanatory case-studies and to strengthen even further their overall reliability.

4.2 The Computer Cluster in Costa Rica

4.2.1 The growth of a new sector and its apparent governance pattern

Here we make a preliminary application to the computer industry in Costa Rica and, more specifically to what can be defined the Large San Jose cluster (the central metropolitan area of the country). This case-study provides some interesting observations on the interaction between an apparently hierarchical governance environment and the localised learning processes activated by the private sector in cooperation with public policy; overall this case permits sketching how the proposed interdependence may work in favour of local development.

The computer industry is a complex sector that includes the production of semiconductors, hardware and equipment, as well as the elaboration of software and a number of related supplies that include plastic, metallic and packaging materials among others. In Costa Rica, the computer industry has emerged over the past fifteen-twenty years and has received a big boost when, in 1997, Costa Rica won the international bid for the new Intel Corporation plant that

started assembling Pentium 4 and Intel Xeon and then moved to the production of innovative ‘chipsets’ (i.e. new components for microprocessors). Intel has soon catalysed the investment of other hardware and software companies that use to work with it in global markets, such as Microsoft, Phillips, Oracle, Delta Design, RVSI, NKT, and Alphasem Corporation (Larrain et al., 2001); in this way, the typical multi-tier supply structure that multinational companies use to work with has been formed, which combines the highest tier with the most valuable firms and the lower tiers with firms that may be more easily replaced (e.g. packaging firms). This situation imposes a question mark on the governance system in that there are great risks of developing a hierarchy in which the local economic agents depend on the individual strategy defined by the large ‘hub’ firm; if this firm moves elsewhere for purposes of cost reduction or for changes in market demand, the local small firms may remain idle and incapable to determine their own development prospects (on these risks see Hymer, 1972; Dunning, 1988; and Cowling and Sugden, 1994, among others).

4.2.2 A dynamic local environment: competence acquisition in the cluster

As a matter of fact this kind of analysis tends to create a static analytical framework and a dangerous economic situation; the need to activate positive dynamics within the local system as a means to initiate an endogenous development process calls for a second, complementary, theoretical and policy approach based on the afore-mentioned knowledge acquisition and competence formation (section 3.1).

Within the San Jose computer cluster the growth of a great number of software start-ups can be observed in the past fifteen years (68.5% after 1992, see Vargas, 2004: 27); these now make for around 105 small firms producing 170 million dollars of sales (in 2002), of which 70

million dollars (41%) were sold abroad, mainly in Central America (63% of the 41%; Ibidem). These firms, controlled mainly by national capital (97% fully or through joint-ventures), are capable to produce advanced software for national and international markets and to acquire leadership position in their own market niches (Larrain et al., 2001). It is the case of Artinsoft, leader in Central America for the automation of legacy systems; Predisoft, leader in data mining, mathematic and statistic data analysis; Sysde, leader in pension funds automation; Codisa, leader in business intelligence for the private sector; TecApro leader in call accounting and IP telephony, among others (Vargas, 2004; CINDE, 2006). These firms were born in the 1990s on the basis of the association of small groups of young engineers and computer scientists graduated in national universities who were able to undertake a process of learning and competence formation that gave way to successful applications within specific market niches. For example, Artinsoft has recently established a joint-venture with Microsoft to develop software transformation technologies based on Artinsoft's expertise as a migration service provider. Codisa has invested in a small department of research and development to study applications of business intelligence to a number of sectors including industry, trade, banking and finance, card emission and pension funds administration; these applications permitted CODISA to expand its market to sixteen other countries across Latin America. Similarly, TecApro has been able to progressively open new branches that add to the first field of specialisation and that deal with the creation of secure applications to virtual stock exchange channels, internet banking and website publishing (Vargas, 2004; CINDE, 2006).

4.2.3 Active public policy

These firms are formed by university graduates from electronic engineering and computer science that set up new firms from the early nineties onwards; they benefited from the variety of public policies (as displayed in Figure 2) oriented to create capabilities in these fields through higher investment in tertiary education with special emphasis in the relevant scientific careers (e.g. with the increase by more than 50% of university students enrolled in careers in engineering at the Technological Institute in Cartago and the other main public universities (Vargas, 2004); various prizes and research projects funded by the Ministry of Science and Technology and the National Council for Science and Technology –CONICIT-). The new entrepreneurs benefited also from a number of other policies and actions set up by the state (e.g. broadband connection, better airport infrastructures, industrial parks, business incubators, etc.) to attract international businesses in hi-tech sectors (e.g. Intel in electronics, Baxter in pharmaceuticals). The whole of these public and private efforts have promoted the acquisition of ‘competences’ that we identify as the endogenous force that helps the local system to avoid a dangerous dependence on the large ‘hub’ based in the locality. Under the current circumstances, it is hard to think that Intel may decide to leave Costa Rica as it also decided to set up its own R&D facility: the Latin American Engineering Service Group –LAES- where local and international specialised personnel works to design components and to develop new software relevant to its own operations (CINDE, 2006). However, if this were to happen (leaving the country) the local software system is much more likely than before to result unaffected and to keep working, innovating and exporting products to Latin America and North-America.

In this sense, the importance of our theoretical framework seems to be consistent with the strengthening of local development processes; in fact, an approach that lacks the focus on governance would not realise the risks implied by the attraction of a large enterprise; the recent experience shows that Costa Rica was the first Central American country to attract textile

industries from the US and Asia but it was also the first to be left idle because production costs became too high compared to Nicaragua, Honduras and Guatemala; the overall negative impact includes the significant growth in urban unemployment in the early 2000s. Simultaneously, a development approach that only focuses on governance would not be able to modify a static hierarchical situation where all policies and incentives are dominated by the large ‘hub’ that would treat fairly only a first tier of well-developed suppliers (usually other TNCs) while exploiting (or neglecting) the rest of local suppliers. This is why a policy approach that is oriented to create dynamic learning processes and to activate local capabilities may permit to break this dependence from the large ‘hub’ and to set up the long-run bases for endogenous development.

4.3 Networking in the Pharmaceutical Industry and the case of Dompè in Italy

4.3.1 Networking and competence acquisition

This case study illustrates how the networking experience of an Italian pharmaceutical firm may be analysed from a perspective that links the governance and the learning perspective. . . Networking, in this particular case, has been oriented towards the development of relevant biotechnological capabilities and, therefore emphasis will be on the particular learning opportunities generated by networking, with some parallel reference to the governance set-up of the firm’s relationships. Overall, this supports the view that a focus on governance mechanisms that allow to retain decision making power on what capabilities have to be created permits the firm to offset possibly imbalanced governance systems.

The scientific and technical characteristics of the pharmaceutical sector provide a favourable context for the appreciation of the evolution of industrial innovation patterns. In

particular, with reference to the interrelationships between the governance and competence view developed in Figures 1 and 2, it is possible to appreciate Penrosian's insights to the theory of growth based on managerial competences and, in particular, how the expansion of the firm's activities has bypassed its competence limitations organically, through networking and subsequent adaptation of both managerial and administrative functions in a way that maintains organisational coherence (Penrose, 1995 [1959]).

We find an interesting framework for understanding the particular strategy pursued by means of networking in the experience of Dompé,³ a biopharmaceutical multidivisional firm with 800 employees that has diversified traditional pharmaceutical production by introducing a number of biotechnological related activities. In response to those changes, the firm is currently organised in five divisions, each of which deals with a specific activity; *Dompé S.p.A*, which produces, researches and develops pharmaceutical products specific for respiratory and articulation diseases; *Dompé Pharmaceuticals*, focused on rare pathologies; *Biogen-Dompé*, born out of a joint venture with Biogen, a world leader in biotechnologies; *Dompé International*, a small division based in Switzerland that aims at giving an international perspective to the group; and *Dompé Biotech*. The firm has its headquarters in Milan⁴ and it has a number of partners in production and R&D in Italy and abroad. Two of its divisions are the result of alliances with US biotech corporations (Amgen and Biogen).

The production of pharmaceutical products began in 1940 in the area of Milan, where all Italian pharmaceutical activities were concentrated over 1940s and 1950s. Dompé introduced specific research programmes in biotechnology through the creation of a new division in 1988, Dompé Biotech, of which Dompé holds 51% and Amgen 49%. Originally the biotechnology division of Dompé's group was not involved in production, but in the commercialisation of biopharmaceutical products licensed by top international biotech companies. This led Dompé

Biotech to a position of leadership in the diffusion of pharmaceuticals containing recombinant DNA⁵ (such as vaccines). Access to the licenses of emerging biotech firms was the first step towards the accumulation of a critical mass that enabled Dompé to develop a specific knowledge base for, first, distribution and, then, clinical testing. Moreover, this provided Dompé with the expertise to cope with drug regulatory requirements in the EU and US. These subsequent steps contributed to the building of internal competences to undertake in-house R&D in biotechnology⁶ (Picchio, 2003: 172).

The economic and industrial system where the group's activities developed is that of Lombardia, the most industrialised region of Italy. Spatially, the area is populated by major Italian pharmaceutical firms.⁷ Of these, some have been acquired by large foreign transnational corporations.⁸ The region has been the destination of a number of greenfield investments by Aventis, Bayer, Pharmacia, Roche, Novartis, Sanofi-Synthelabo, amongst others. As a result, 71.5% of sales in the industry are controlled by foreign capital⁹ (Farindustria, 2003: 60). In parallel, during the last twenty years small family-owned firms have grown in number¹⁰, becoming specialised in the production of pharmaceutical active principles and compounds, exporting on average 80% of their production (Picchio, 2003).

Although biotechnology firms are increasing in number, within particular therapeutic areas specialists are confined to a few companies. Thus, in creating contacts, first movers have benefited from a great advantage over other pharmaceutical companies. This aspect has been emphasised also at Dompé, where the speed of action goes in tandem with accessibility. In particular, access and speed are reckoned as the main conditions for the firm's competitiveness on project design. For this reason, Dompé's network has been developed through long-distance linkages, especially with US firms, Amgen and Biogen, that are at the forefront of biotechnology.

The ability to produce in itself has not been recognised as the main source of the firm's competitiveness, rather, its ability to rapidly organise the resources that are needed to undertake specific projects (from R&D to production, to distribution). From a Penrosian's point of view, this process focuses on which are the services attached to a firm's resources. The notions of economies of scale and scope can be transferred from physical production to the capacity to access and to build relevant networks: once the critical mass of contacts and linkages is reached, project design becomes faster and results less uncertain. Dompé's networking strategy is paralleled by a commitment to internal R&D and to the acquisition of scientific personnel who is able to understand and interpret the evolution of pharmaceuticals and biotechnologies. This dual attitude - to build external linkages on the one hand and internal competences on the other - is strictly connected to the problem of accessibility. The 'ticket of admission' (Rosenberg, 1990) to scientific and knowledge building networks is in-house R&D (Freeman and Soete, 1997: 269).

In the case of Dompé, the firm has been able to construct a number of networks including 31 collaborative arrangements with different firms and institutions within national borders and abroad. The majority of R&D co-operative agreements undertaken with universities and publicly founded research centres are concentrated in the North of Italy. However, whilst research excellence can be found nationally, expertise in the application of scientific discovery in biotechnologies can hardly be found within national borders. Looking at Dompé, in particular, 58 per cent of collaborative agreements in production related activities are undertaken with firms overseas.

>> Table 1: Dompé's network

4.3.2 Apparent governance dynamics

The mechanisms used at Dompé to co-ordinate activities in the network are explicitly oriented towards communication about scientific and technological changes, as well as changes in the rules for drug approvals, together with quick responses and adaptation to such transformations. A key lesson in terms of networking offered by this specific case is that starting from a leading position in the Italian context given by its strong competence in pharmaceuticals, and keeping a number of corporate divisions dedicated to traditional drug preparation, Dompé was able to create new divisions to build linkages with major biotech leaders whilst improving its learning opportunities. At the basis of Dompé's networking strategy was a strong attitude towards innovation and the ability to conceive the organisation of production by means of cooperative linkages which, in the case of biotech production, is also reflected in Dompé's corporate structure.

Governance dynamics seem to be intertwined with the active learning processes undertaken by Dompé, where administrative solutions aimed at including new activities have avoided an imbalanced relationship with US giant companies. This would have been very unlikely if the Italian firm did not have much to offer in terms of competitive advantages and R&D capabilities; similar considerations to the case of Artisoft in Costa Rica show that the learning processes and the competences accumulated by these smaller firms generated a number of advantages that make them attractive to foreign multinationals and that also protect them from the uncontrolled exploitation of their resources.

5. Ongoing Conclusions and Prospects for Research Agenda

This paper proposes an approach to the development of clusters and networks that relates the competence-based view and the governance perspective. This combination improves our understanding of the structure of specific production systems (e.g. clusters and networks) and the opportunities and constraints to development. For instance, there are situations in which a large company controls unilaterally strategic decisions related to production, such as prices and standards. In this way, this large firm may push small suppliers and subcontractors towards a ‘low-road’ competition based upon conflictive relations amongst suppliers and producers, workers and owners, subcontractors and producers. This would generate the worst growth prospects for the system (Kaplinsky and Readman, 2001). Secondly, the competence-based approach focuses on learning processes that can inject dynamism into otherwise hierarchical and static governance structures. This may be realised through industrial development policy or collective/individual business strategies that support the local/national system (e.g. cluster). Over time, small firms within the local system can build up capacities to upgrade functionally and inter-sectorally, increasing their independence from the large hubs on which they rely in the first stages of growth (Pietrobelli and Rabellotti, 2004) and to strengthen their capacity to design their own development strategies on a participatory basis (Locke, 1995; De Propris, 2001; Humphrey and Schmitz, 2004; Sacchetti and Sugden, 2005).

These two case studies support our hypothesis of interdependence between learning and governance. In high-technology sectors such as biopharmaceuticals and computers, both in clusters and networks, the leadership of large corporations (e.g. Amgen and Biogen in the first sector; Intel and Microsoft in the second) is a common structural element. These large corporations control major quotas of sector production, export markets, innovations and patents, and tend to reproduce their internal structure by designing hierarchical inter-firm relations both within their own countries and in lower-cost countries. Large corporations tend to build up

partnerships based on knowledge, collaboration and ‘voice’ with firms whose organisational structure is similar to them, and/or with small and medium specialised firms that constitute the first tier suppliers. This networking practice often spans localities and firms across nations due to the need to expand activities through the absorption of new knowledge. This is exemplified by ‘Dompé Biotech’, which has been growing over time along a trajectory that involved specific steps, based on absorptive capacity (Cohen and Levinthal, 1989) as well as on managerial and administrative abilities to adapt to that new knowledge and activities (Penrose, 1995 [1959]).

Large corporations investing in developing countries tend to create a local network of relations with suppliers and subcontractors that help maintain a competitive product by exploiting local low prices. The case of the computer cluster in Costa Rica shows that giant firms dealing with high-tech products tend to catalyse geographical clustering of some traditional brand suppliers that help them stabilise the quality. With these suppliers the relationships tend to be based upon knowledge, thus more horizontal, which express interdependence between firms. Despite this dual behaviour versus local and foreign partners, two positive effects can be observed in the more vertical relations that the large hub maintains versus national small firms. On the one hand, the ‘hub’ pushes some local firms (e.g. by direct training) into a process of quality upgrading in order to be able to supply it with competitive inputs; on the other, spillovers from these large investments (e.g. by means of imitation and technical education) supported the booming growth of the Costa Rican software industry in the past few year, which led a few small national companies to acquire leadership in specific software markets and a growing export capacity. This evidence shows that the local environment and local producers need neither to accept passively the leadership of large multinational companies nor their hierarchical ‘networks of direction’. In contrast, they may find their own way to upgrade the quality of their production on the basis of both knowledge acquisition and learning-by-doing, as well as through the support

of state-funded R&D activities implemented by national universities and labs (Lundvall, 1992; Audretsch, 1998). In this case, industrial development policy has certainly accomplished a key-role to avoid a static governance system controlled by the large giant corporation. Public policy organised significant incentives to attract international investors, but simultaneously promoted the upgrading of national small firms too. In particular, it prompted the development of the national production capacity and of endogenous learning capabilities which have been able to modify the otherwise static governance environment. This happened with the Italian industrial districts from the 1940s onwards: industrial development policy was supportive of the endogenous capabilities acquired by local production systems and helped SMEs and clusters to grow with or without large firms (Parrilli, 2004).

The two case studies analysed in this paper exemplify what we mean by linking learning processes and governance structures. The question is what this interdependence signifies. If it was merely a one-way relation where governance unidirectionally impacts on learning, the structure of relationships would be likely to define and, perhaps, to preclude local development options. If, conversely, we conceive a bidirectional relation, including proactive dynamic interaction between governance and learning, endogenous learning may possibly contribute to changing the governance system from within, promoting convergence between the development of production systems, localities and countries. This means promoting programmes and actions targeted to create competences in local human capital to dialogue on a more balanced level with the 'hub' in the production system and, in parallel, to promote a culture for the emergence of different systems of relationships that do not feed the inherited hub-and-spoke system of values (such as control and direction), and which can eventually shape the future development of local production. This latter may help the governance environment to become more flexible and to

direct public and private actions towards the creation of a larger multiplicity and dynamism at the local level.

NOTES

¹ The formalisation proposed by Porter (1987) is slightly different. He conceives the cluster at the basis of all the agents that participate in the ‘diamond of competitiveness’ (i.e. the firm, its suppliers, clients and service providers), thus operating on a wider geographical basis.

² Four elements are suggested to be taken into account. The first is the ‘locus of strategic decision-making’, in order to make explicit who takes decisions with strategic relevance within a network. The second element is the modality of problem and conflict resolution, whether allowing for voice or exit options (Hirschman, 1970). A third element refers to the basis of relationships, which could be grounded on reciprocity trust and participation or, rather, hierarchical direction and control. The fourth element refers to the type of rationality diffused amongst firms, whether purely instrumental or communicative. The mix of these four elements characterises the nature of network relationships as well as their impact on the ability of participants to enlarge their opportunities.

³ Its head, Sergio Dompé is also president of Assobiotec, the business association that links Italian biotechnology firms and technological parks that are active in this research field.

⁴ Dompé Pharmaceuticals is the headquarters which was founded in Milan in 1940.

⁵ They provide patients with molecules that are normally produced by human organisms but that in pathological situations are absent, insufficient, or altered.

⁶ The main research projects that are actually undertaken are oriented towards the creation of pharmaceuticals that prevent organ-transplant rejection and the development of genetically modified cultures of maize, wheat and grapevine.

⁷ Besides Dompé, we mention Zambon, Recordati and Bracco.

⁸ Such as Carlo Erba pharmaceuticals.

⁹ This data has been obtained considering national firms and foreign subsidiaries where the share of foreign capital prevails.

¹⁰ 212 firms over 267 have less than 50 employees, 21 firms are sized between 50 and 99 employees, whilst 34 firms are over 100 employees (authors' elaboration on ISTAT, 2004).

References

- Albino V., Garavelli C., Schiuma G. 1999, Knowledge Transfer and Inter-Firm Relationships in Industrial Districts: The Role of the Leader Firm, *Technovation*, Vol. 19, pp. 53-63.
- Altenburg T. and Meyer-Stamer J. 1999, How to promote clusters: policy experiences from Latin America, *World Development*, Vol. 27, no.9, pp.1693-1714.
- Amin A. and Thrift N. 1994, Living in the global, in Amin and Thrift, *Globalisation, institutions and regional development in Europe*, (Oxford University Press).
- Antonelli C. 1999, The Evolution of the Industrial Organisation of the Production of Knowledge, *Cambridge Journal of Economics*, Vol. 23, No. 2, pp. 243-60.

-
- Audretsch D.B. 1998, Agglomeration and the location of innovative activity, *Oxford Review of Economic Policy*, Vol.14 n.2, summer.
- Ballance R., Pogány J., Forstner H. (1992) *The World's Pharmaceutical Industries. An International Perspective on Innovation, Competition and Policy*, (Hants: Edward Elgar).
- Becattini, G. 1990, The Marshallian industrial district as a socio-economic notion, in F. Pyke & Sengenberger, *Industrial districts and interfirm cooperation*, (ILO, Geneva).
- Burns T. and Stalker G. M. 1961, *The Management of Innovation* (London: Tavistock).
- Brioschi F., Brioschi M.S., Cainelli G. 2002, From the Industrial District to the District Group. An Insight into the Evolution of Local Capitalism in Italy, *Regional Studies*, Vol. 36, No. 9, pp. 1037-1052.
- Brusco S. (1982), *The Emilian model: productive decentralisation and social integration*, *Cambridge Journal of Economics*, Vol.6.
- Brusco S. 1990, The idea of industrial districts, in Pyke F., Becattini G. and Sengenberger W., *Industrial districts and interfirm cooperation*, (ILO Geneva).
- Brusoni S., Prencipe A. and Pavitt K. 2000, Knowledge Specialisation, Organisational Coupling, and the Boundaries of the Firm: Why do Firms Know More than They Do?, *Administrative Science Quarterly* Vol. 46, No. 4, pp. 597-621.
- Caddy, J. 1998, The changing role of SMEs in Japan, *AESMEC Conference*, May, Naples.
- Caffé F. (1970), *Politica Economica*, Bollati Boringheri, Torino.
- Camagni, R. 1989, Cambiamento tecnologico, "milieu" locale e reti di imprese: verso una teoria dinamica dello spazio economico, *Economia e Politica Industriale*, No. 64, pp. 209-236.

CINDE 2006, <http://www.cinde.org>.

Cohen W.M. and Levinthal D. A. 1989, Innovation and Learning: The Two Faces of R&D'

The Economic Journal, Vol. 99, No. 397, pp. 569-96.

Cowling K. and Sugden R. 1994, *Beyond capitalism*, (Pinter, London).

Cowling K. and Sugden R. 1998, The Essence of the Modern Corporation: Markets, Strategic

Decision-Making and the Theory of the Firm, *The Manchester School* Vol. 66, No. 1, pp. 59-86.

Day A. C. L. (1955), 'The Taxonomic Approach to the Study of Economic Policies',

American Economic Review, Vol. 45, No. 1, pp. 64-77

Dei Ottati G. 2002, Social Concentration and Local Development: The Case of Industrial

Districts, *European Planning Studies*, Vol. 10, No. 4, pp. 449-466.

De Propriis L. 2001, Systemic flexibility, production fragmentation and cluster governance,

European Planning Studies, Vol.9, No.6., pp. 739-53.

Dunning J.H. 1988, *Explaining International Production*, (Unwin Hyman, London).

Freeman C. and Soete L. 1997, *The Economics of Industrial Innovation*, (London and

Washington: Pinter (3rd edition)).

Garrido C. 2002, Las pequeñas y medianas empresas manufactureras en Mexico, in Peres W.

and Stumpo G., *Las pequeñas y medianas empresas industriales en America Latina y el Caribe*, (Naciones Unidas, Siglo XXI, Mexico).

Granovetter M. 1992, Problems of explanation in economic sociology, in Nohria N. and Eccles

R., *Networks and organizations: structure, form and action*, (Harvard Business School Press, Boston).

-
- Guerrieri P. and Pietrobelli C. 2004, Industrial districts' evolution and technological regimes: Italy and Taiwan, *Technovation*, Vol. 24, pp. 899-914.
- Hakansson, Hakan and Johanson J. 1993, The network as a governance structure: interfirm cooperation beyond markets and hierarchies, in Grabher G. (Ed), *The Embedded Firm*, (London and New York: Routledge).
- Hymer S.H. 1972, The Multinational Corporation and the Law of Uneven Development, in Bhagwati J. N. (Ed.), *Economics and World Order from the 1970s to the 1990s*, (London: Macmillan).
- Helper, S. 1993, An exit-voice analysis of supplier relations: the case of the US automobile industry, in Grabher G. (Ed), *The Embedded Firm*, (London and New York: Routledge).
- Huber G. P. 1991, Organizational Learning: The Contributing Processes and the Literatures, *Organization Science* Vol. 2, No. 1, pp. 88-115.
- Humphrey J. and Schmitz H. 2004, Governance in global value chains, in Schmitz H. editor, *Local enterprises in the global economy*, (Edward Elgar, Cheltenham).
- Humphrey J. 1995, *Industrial reorganization in developing countries: from models to trajectories*, *World Development*, Vol.23 no.1, pp.149-162.
- Johannisson B., Karlsson G. and Ramirez-Pasillas M. 2002, 'The institutional embeddedness of local interfirm networks: a leverage for business creation', *Entrepreneurship and Regional Development*, Vol.14 no.4, Routledge.
- Kaplinsky R. and Readman J. 2001, Integrating SMEs in global value chains: spreading the gains from globalisation, *IDS Bulletin*, Vol.32, no.3, Sussex University.

-
- Knorringa P. 2002, Cluster trajectories and the likelihood of endogenous upgrading, in van Dijk M.P. and Sandee H. (Ed.), *Innovation and small enterprises in the Third World*, (Edward Elgar, Cheltenham).
- Knorringa P. 1999, Agra: an old cluster facing the new competition, *World Development*, Vol.27, no.9, 1587-1604.
- Larrain F., Lopez L. and Rodriguez A. 2001, Intel: a case study of foreign direct investment in Central America, in Larrain F., *Economic Development in Central America*, Vol. I, (Harvard University Press).
- Lazerson M. and Lorenzoni G. 1999, Resisting Organizational Inertia: The Evolution of Industrial Districts, *Journal of Management and Governance*, Vol. 3, pp. 361-377.
- Locke R. 1995, Remaking the Italian economy, (Cornell University Press, Ithaca).
- Lundvall B-Å. (Ed.) 1992, *National Systems of Innovation. Towards a Theory of Innovation and Interactive Learning*, (London and New York: Pinter).
- Maggi 2006, The Salmon farming and processing cluster in southern Chile', in Pietrobelli C. and Rabellotti R., *Upgrading to compete: global value chains, clusters and SMEs in Latin America*, (Harvard University Press).
- Markusen A. 1996, Sticky places in slippery space: a typology of industrial districts,' *Economic Geography* Vol. 72, No. 2, 294-314.
- Maskell P. and Malmberg A. 1995, Localised learning and industrial competitiveness, BRIE Working Paper No. 80.
- Nadvi K. 1999, Collective efficiency and collective failure, *World Development*, Vol.27 no.9, pp.1605-1626.

-
- Parrilli M.D. 2007, *SME cluster development: a dynamic view of survival clusters in developing countries*, (Palgrave-Macmillan, Basingstoke).
- Parrilli M.D. 2004, A Stage and Eclectic Approach to Industrial Districts Development: Two Policy Keys for Survival Clusters in Developing Countries, *European Planning Studies*, Vol. 12 no.8, Carfax Publications.
- Parrilli M.D. 2002, Innovation and competitiveness within the small furniture industry in Nicaragua, in van Dijk M.P and Sandee H., *Innovation and small enterprises in the Third World*, (Edward Elgar, Cheltenham).
- Penrose E.T. 1995 [1959], *The Theory of the Growth of the Firm*. (Oxford: Blackwell).
- Penrose E. T. 1952, Biological Analogies in the Theory of the Firm, *The American Economic Review* Vol. 52, No. 5, pp. 804-819.
- Perroux F. 1950, Economic Space: Theory and Applications, *Quarterly Journal of Economics* Vol. 64, pp. 89-104.
- Picchio N. 2003, *L'Italia che conta*. (Milano: Il Sole 24 Ore).
- Pietrobelli C. and Rabellotti R. 2004, *Upgrading in clusters and global value chains*, Inter-American Development Bank (Washington: IADB,).
- Piore M. and Sabel C. F. 1984, *The Second Industrial Divide*, (New York: Basic Books).
- Polanyi M. 1958, *Personal Knowledge. Toward a Post-Critical Philosophy*, (London and New York: Routledge).
- Porter M. 1987, *The competitive advantage of Nations*, (Free Press: New York).
- Powell, Walter W. 1990, Neither market nor hierarchy: network forms of organization *Research in Organizational Behavior* Vol. 12.
- Putnam R. 1993, *Making democracy work*, (Princeton University Press, Princeton).

-
- Rabellotti R. 2004, The effects of globalisation on industrial districts in Italy, in Schmitz H. ed., *Local enterprises in the global economy*, (Edward Elgar, Cheltenham).
- Richardson G. B. 1972, The Organisation of Industry, *The Economic Journal*, Vol. 82, No. 327, pp. 883-896.
- Romjin H. 2002, Acquisition of technological capability in small firms in developing countries, in Van Dijk M.P. and Sandee H., *Innovation and small firms in the Third World*, (Edward Elgar, London).
- Rosenberg N. 1990, Why do firms do basic research with their own money?, *Research Policy*, Vol. 19, No. 2, pp. 165-175.
- Sacchetti S. 2004, Knowledge Caps in Industrial Development, *New Political Economy* Vol. 9, No. 3, pp. 389-412.
- Sacchetti S. and Sugden R. 2003, The Governance of Networks and Economic Power: The Nature and Impact of Subcontracting Relationships, *Journal of Economic Surveys*, Vol. 17, No. 5, pp. 669-91.
- Sacchetti S. and Sugden R. 2005, Mental Proximity: Identifying Networks of Mutual Dependence, in Theurl T. and Meyer C. (Eds) *Strategies for Cooperation*, (Verlag).
- Sacchetti S. and Tomlinson P. 2006, Globalisation, Governance and Clusters: North Staffordshire Ceramic and Prato Textile Industries, in Pitelis C., Sugden R. and Wilson J. (Eds.), *Clusters and Globalisation: The Development of Urban and Regional Economies*; (Cheltenham, Edward Elgar).
- Schmitz H. 1992, On the clustering of small firms, *IDS Bulletin*, Vol. 23., Institute of Social Studies, Sussex University, Brighton.

Thorelli H. 1986, Networks: between Markets and Hierarchies, *Strategic Management*

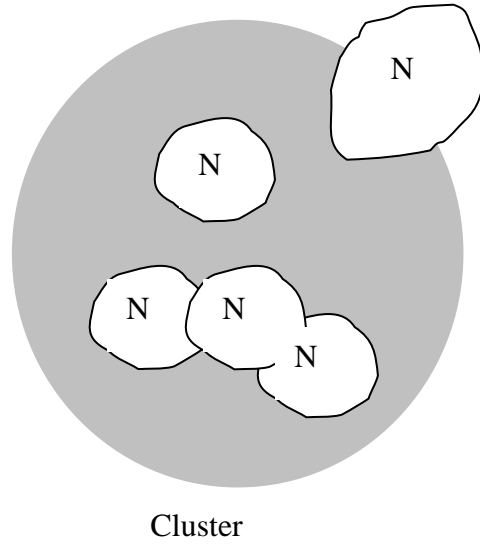
Journal Vol. 7, no. 1.

Vargas Alfaro L. 2004, ICT strategy in Costa Rica: the case of the Costa Rican software industry, paper presented at “ICT in Learning Regions”, Aalborg, 1-2 June.

Wolter K. 2005, A Life-Cycle for Clusters? Agglomerations, Bifurcations and Adaptation, Paper presented at DRUID Conference, Skørping, Denmark, 27/29 January.

Yin R. 2003, *Case study research: designs and methods*, 3rd edition, (Sage Publications).

Figure 1: an illustration of a cluster within and outside which networks (N) may develop



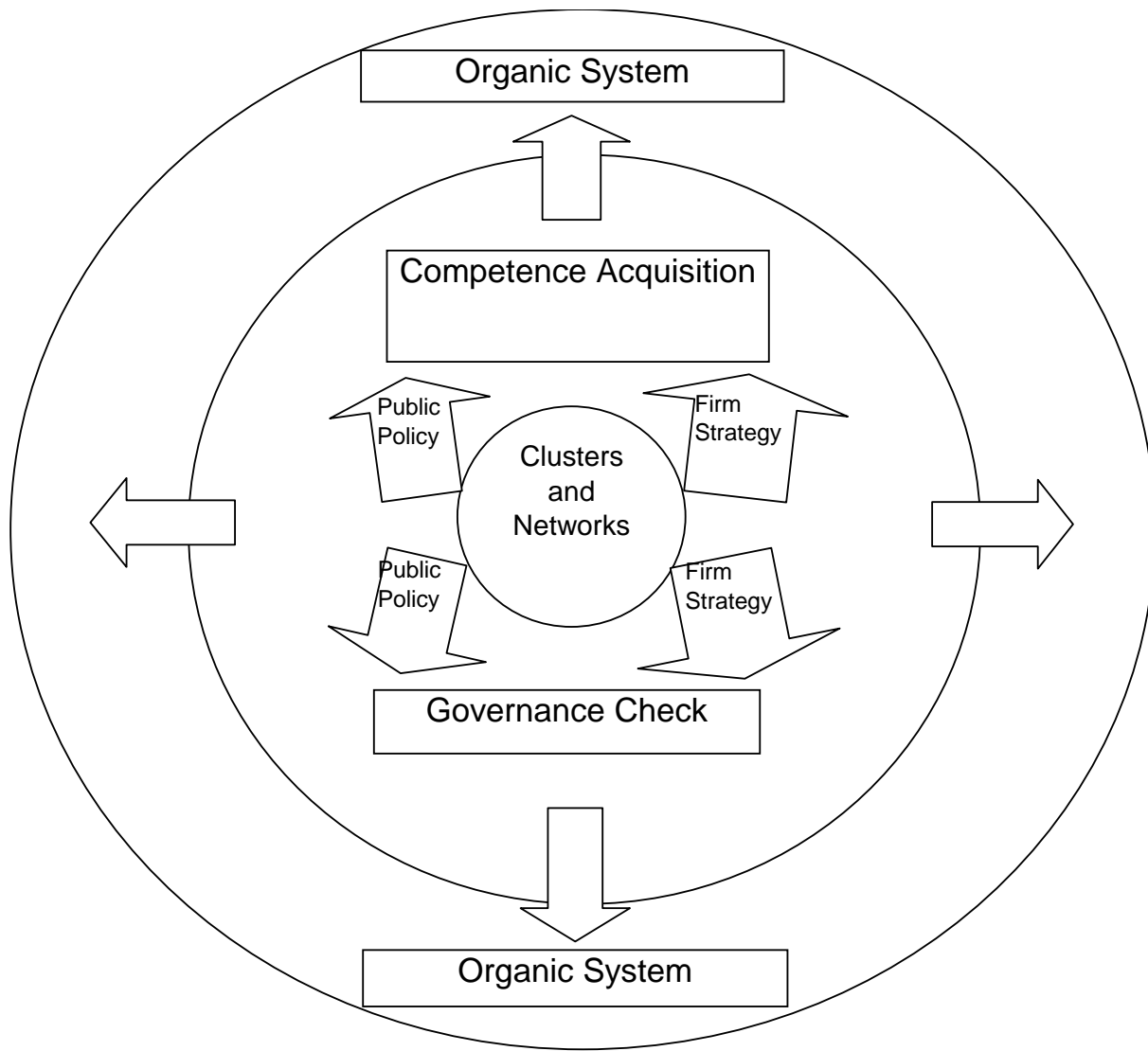


Figure 2: The Interdependence between Learning and Governance in Clusters and Networks

.

Table 1: Dompé's network

	R&D collaborations	Other co-operative arrangements (licensing, production, marketing and distribution)	Total
Total nr. of linkages	12 (100%)	19 (100%)	31 (100%)
Linkages with Italian Firms/Institutions	8 (66.67%)	5 (26.32%)	13 (41.94%)
Linkages with Italian Subsidiaries of Foreign TNCs	-	3 (15.79%)	3 (9.68%)
Linkages with Foreign Firms/Institutions	4 (33.33%)	11 (57.89%)	15 (48.39%)

Source: Authors' structuring on corporate data.