

Paper to be presented at the DRUID Summer Conference on
"Industrial Dynamics of the New and Old Economy - who is embracing whom?"
Copenhagen/Elsinore 6-8 June 2002

Theme D: Territorial Organization and the New Economy

CLUSTER ABSORPTIVE CAPABILITY: AN EVOLUTIONARY APPROACH FOR INDUSTRIAL CLUSTERS IN DEVELOPING COUNTRIES

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7 April 2002

Summary

The paper presents a review of the main literature regarding the economics of knowledge flows in clusters of firms, comparing advanced and developing countries' conceptual approaches. It goes further, proposing an analytical framework that links firms' absorptive capability with knowledge flows and new knowledge generation dynamics, thus conceiving the cluster as an evolutionary form of industrial organisation.

Keywords: industrial clusters, absorptive capability, knowledge flows

JEL - code(s). O14, O30, L20

The author would like to thank Martin Bell for his helpful comments on a previous version of this paper.

INTRODUCTION

"When an industry has thus chosen a locality for itself it is likely to stay there long: so great are the advantages which people following the *same skilled trade get from near neighbourhood to one another. The mysteries of the trade become no mysteries; but are as it were in the air, and children learn many of them, unconsciously.* [...] Good work is rightly appreciated, inventions and improvements in machinery, in processes and the general organisation of the business have their merits promptly discussed: *if one man starts a new idea, it is taken up by others and combined with suggestions of their own; thus it becomes the source of further new ideas.*"

(Marshall A., 1920, p. 225; emphasis added)

The idea that localised firms benefit from external (or agglomeration) economies, goes back to Alfred Marshall (1920), who placed the importance of skilled labour force turn over and knowledge spillovers *among* the key elements in the competitive advantage of industrial agglomerations. Since then, different contributions have focused on both static and dynamic factors influencing the competitiveness of geographically localised industries, organised in clusters or industrial districts¹, as opposed to the model of the big firm [Sabel, Piore, 1984; Sabel, Zeitlin, 1985]. Nevertheless, *knowledge* acquisition, exploitation and generation by localised firms has increasingly become the crux for explaining the cluster dynamic evolution. The importance of this perspective is reinforced by the fact that empirical evidence in advanced countries suggested that industrial districts were losing their competitiveness, while more theoretical work suggested that intra-cluster agglomeration economies might be less powerful than previously thought as an explanation of local competitive advantage. Accordingly, in the past 10 years, two kinds of considerations started to come to the forefront of academic research in this area:

- the first relates to the fact that the approaches applied in this kind of studies have analysed production linkages, while knowledge flows and knowledge systems within the cluster have been poorly investigated (Bell, Albu 1999).
- More specifically, the second concerns the risk of “lock-in” which clusters and districts have incurred (or could face) as a consequence of technological isolation – leading to ‘entropic death’

¹ Different diverging and overlapping definitions have been used in the literature to refer to agglomerated and inter-linked firms, that have been studied with different approaches. See among others: Schmitz, 1982; Becattini, 1990; Humphrey and Schmitz, 1996; Markusen, 1996; Guerrieri, Pirotbelli, 2000; Altenburg T., Meyer-Stamer J., 1999; Saxenian 1994; UNCTAD, 1998; Porter, 1998. Here, I will refer interchangeably to the terms “Clusters”, “Localised Production Systems” or “Districts” to agglomerated firms in a given geographical area (geographic dimension) where both firms and public institutions are inter-linked via knowledge and productive flows (economic dimension).

(cf. Camagni, 1991). This point raised the issue, for the firms in the cluster, of building linkages with external agents, of the need of being part of an international network (see among others Camagni, 1991, Freeman, 1991, Rullani, 1994).

As a result, there is a growing overall agreement about the need to investigate clusters or industrial districts in a way that extends beyond the previously dominant ‘internal’ perspectives, taking a cognitive approach that links local and external (usually international) knowledge flows (Belussi, Pilotti, 2001; Belussi, Gottardi, 2000).

The paper will be organised as follows: in the first part, a review of the main streams of thought as regards localised knowledge flows in advanced country contexts will be presented, whereas in the second part, the perspective will be shifted to the state of the art in research of such aspects in clusters in the developing world. Finally a framework will be presented to investigate the evolutionary nature of economic agglomerations, according to their degree of “absorptive capability”. Empirical evidence will be provided to support the framework.

I. LOCALISED KNOWLEDGE FLOWS AND THE SECRETS OF NEW KNOWLEDGE GENERATION

From the seminal contribution of Alfred Marshall (quoted above), it seems clear that the fact of being historically localised in a specific industrial area is beneficial for the firms that take advantage of the availability of skilled labour force and new ideas, flowing freely “in the air”. New ideas and technical improvements are said to be easily accessible to the bulk of localised economic agents, whose contribution is that of accruing and enhancing the existing stock of knowledge, thus generating new knowledge on an incremental basis (e.g. improvement of machines). The conception of knowledge here is very much that of a public good, whose diffusion is due to technological externalities (*spillovers*).

In recent times, this view has been subject to extensive in-depth analysis and reconsideration and, according to different conceptions of ‘knowledge’, at least three perspectives are worth mentioning²: the first one, which for convenience I will define as “Spillovers and Collective

² This clear-cut distinction does not mean that there is clear non-overlapping of understanding in different approaches. Nevertheless, each of them puts emphasis and relies on slightly different assumptions that in the end lead to divergent policy implications.

Learning” (hereinafter, SCL), the second one named “Neo-Shumpeterian I” and the last one, that is a more thorough development of the latter, “Neo-Shumpeterian II”.

The SLC perspective encompasses three schools of thought: the neo-marshallian economists (the Italian scholars of Industrial Districts), the economic geographers (especially the French school of GREMI as well as UK geographers) and finally, with a completely different approach, the “new economics of innovation” studies.

Neo-marshallians (Becattini, 1990; Dei Ottanti, 1995; Bellandi, 1982) rely on the Marshallian conception of knowledge and conceive the cluster (properly, in this case the Industrial District) as meso-level locus of learning, in their words a “cognitive laboratory” (Belliandi, 1989) that, as opposed to firms’ R&D labs, is capable of *somehow* generating innovations on an endogenous basis, due to “localised knowledge spillovers”. Via spillovers and labour turn over, knowledge is assumed to diffuse freely in the air in a way that it generates “diffuse innovative capacity” in the district³. While they mainly focus on agglomeration economies, economic geographers, instead, are more concerned with the geographic and locational dimension, but still have a tendency to interpret the major changes in both knowledge and technology as an outcome of mechanisms of diffusion of knowledge via informal contacts (Camagni, 1991; “cafeteria effects”), user-producer relations, skilled labour force turn over, demonstration effects, spin-offs etc., that are eased by local social endowments, trust and geographical proximity. Terms like “collective learning” have been coined to express the interacting and cumulative nature of learning of localised firms (hence, “collective”) and it is conceived as a sort of externality, described as a “dynamic process of accumulating knowledge, transferred *even against the will of the first inventor* among economic agents via interactive mechanisms based on common rules and common organizational and managerial procedures” (Capello, 1999; emphasis added). Ultimately, such collective learning is said to lead to incremental innovation. In this view not only knowledge enhancements are due to externalities, but knowledge is conceived as a “club good” à la Buchanan (Capello, 1999) as it is freely available to the economic agents *located* in the cluster, while it is not easily accessible to those who are external to it. Taxonomic exercises have been done to distinguish among different types of agglomerations according to the dynamism of such knowledge flows, so that “Industrial Districts develop from specialised areas, as close social interaction and supportive institution generate high trust and

³ The concept of “diffuse innovative capacity” (Belliandi, 1989) recalls Allen’s (1983) “collective invention”, used to describe the process of incremental technical change in the blast furnace practice in England’s Cleveland district (XIX century). Nevertheless, as Allen himself warns, “since 1900, collective invention has probably become less important, especially in comparison to R&D” (page 21), thus implying that patterns of “collective” innovation have become more complex and might require a more thorough consideration.

encourage informal and tacit knowledge transfers. This leads to industrial atmosphere external economies and savings in transaction costs. From co-operative relations and the free flow of knowledge, synergies and innovative capacity evolve and the industrial district becomes an innovative milieu” (Keeble, Wilkinson, 1999). They insist on the fact that the aforementioned mechanism of knowledge diffusion raises local innovative capabilities, as in Lawson (1997): "co-operation, trust, collective learning and the reduction of uncertainty are factors which are all of immense importance to innovation and general economic success, especially by small and medium sized firms and are all factors which are encouraged by geographical proximity" (p. 25). Others (Asheim, 1996; Maskell Malmberg 1999) emphasise the importance of localized collective learning to avoid the cluster lock-in within a given technological trajectory.

These approaches are rightly highlighting the importance of knowledge as a resource in the process of technical change and innovation but limit the unit of analysis to the meso-level, thus keeping the firm learning process as a “black box”. Furthermore, while relying heavily on local knowledge spillovers, they do not clearly provide evidence on the causal links (and the mechanisms underpinning it) between spillovers and innovation.

At this respect, quantitative empirical evidence has been provided by scholars of the “new economics of innovation” (see Audretsch, 1998 and Feldman, 1999 for a review) to support the relationships between localised spillovers and innovation. Using a ‘Knowledge Production Function’ (Jaffe, 1989; Feldman, 1994) or patent citations (Jaffe et al., 1993), those studies come to a common result: regions with higher level of “knowledge infrastructure” such as private and public Research Labs and Universities, are producing more innovative outputs (such as patents or commercialised new products) due to knowledge spillovers that tend to be geographically bounded within the region where new economic knowledge is created. As such, one could argue that localisation matters for innovation as a general rule, whereas there are strong reserves to assume that, as the those studies themselves demonstrate. In fact, in Audretsch, Feldman (1996) and Jaffe et al. (1993), the effects of proximity are important in the first phase of the Industry Life Cycle (ILC), where no dominant paradigmatic knowledge exists, codification is limited and face to face interaction are important carriers of tacit knowledge. Interestingly enough, they rely on the assumption that tacit knowledge flows freely in the air in such circumstances. Furthermore, those studies show a diachronic spatial concentration of innovative and production activities, so that when the former is highly localised the latter is not and, conversely, as the industry matures, production activity tends to localise, while innovative activity disperses (“new ideas need new space”; Audretsch, 1999). Finally one has to bear in mind that those results are based on empirical evidence of high tech and knowledge-intensive industries in which R&D, university research and skilled

labour are important inputs (Audretsch, Feldman, 1996). The results, thus, appear to be constrained by some technological and ILC-specificity so that, as Feldman herself says, “there is evidence that there are geographic limits to the extent to which knowledge may spillover, however this is not to say that location is important to innovation in all circumstances. There is further evidence that the degree to which location matters to innovation depends upon the type of activity, the stage of the industry life cycle and the composition of activity within a location” (Feldman, 1999: 21). In addition to that, none of those studies stress the mechanisms by which spillovers occur and are realised at the geographic level⁴, thus leaving the whole process of knowledge generation and diffusion unexplained.

A second perspective, named Neo-Shumpeterian I, comprehends a vast array of, mainly neo-shumpeterian contributions that, in a nutshell, recognise the distinction between tacit and codified knowledge, envisage the firm as a locus of technological capability accumulation and conceive the process of new knowledge generation as the result of a combination of complementary pieces of knowledge or/and of the interaction between localised tacit and external codified knowledge.

Here the knowledge acquires more depth as, following Polanyi's seminal contribution (1967), knowledge has been distinguished between *tacit* and *codified*. The latter has to do with objective received knowledge, such as scientific principles and laws; the former as a kind of highly specific and contextual knowledge, mainly embodied in people “capable of doing something specific”. This rough preliminary distinction has broad implications on the public or private nature of knowledge and on its transferability, thus on *learning* and *technological change*, as a consequence. Contrary to standard neo-classical theories, in fact, knowledge is not all easily transferred, it is not free and available to all economic agents, thus cannot be considered a public good (Lundvall, Johnson, 2001). In particular, tacit knowledge has the character of a highly idiosyncratic asset that is situated and accumulated within the boundaries of the firm over time. As such it is very difficult to imitate and therefore is not freely available in the air (cf. Belussi, Pilotti, 2001). Furthermore, tacit knowledge is considered as a strategic asset that allows for a competitive advantage either at firm level or, as in this case, at meso (regional, local) level. In particular, the actual debate on the role of local specificity (hence, localised technological knowledge) in a globalising economy has raised the question (among other different interpretations of the issue) of tacit, locally embedded knowledge as a key resource in global competition (Archibugi, Lundvall 2001). In this perspective, the role of the firm as an engine of technological change is emphasised, in a view that conceives firms as depositories of tacit knowledge: "firms have the function of being loci of productive knowledge

⁴ Exceptions are to be found e.g. in Almeida, Kogut (1997) for spillovers via skilled people turn over and Coe-Helpmann (1995) for spillovers and trade.

competence. Their knowledge can be considered a localised and not completely transferable good and the accumulation of productive knowledge by firms in specific geographical context is the foundation of the evolutionary patterns of local industrial systems" (Belussi, Gottardi, 2000: 25).

But diffusion and exploitation of local tacit knowledge by local firms is by no means sufficient to guarantee the dynamic evolution of a cluster, as in this perspective, the combination of different bodies of complementary knowledge are needed in order to compete successfully on the international market. It is by the interaction of localised tacit skills and codified external knowledge flows, that new knowledge generation occurs: different attempts to adapt the Nonaka, Takeuchi (1994) and Nonaka (1991) interpretation of "knowledge conversion process"⁵ to the local context have been made (Becattini, Rullani, 1994; Morgan, 1997; Lawson, Lorenz, 1999; Cohendet et al. 1999) and all of them assume that local knowledge is inherently tacit and external knowledge flows predominantly in a codified way⁶. These contributions locate within that stream of thought that stresses the importance of linking local and global systems of knowledge (see Freeman, 1991) and in fact, there is now an overall agreement that the establishment of external knowledge networks is fundamental even in the most dynamic clusters. That is, links with external sources of knowledge are not simply a way to overcome lock-in and avoid "entropic death" (Camagni, 1991) but also to maintain and accrue local endogenous existing dynamism.

In a way, a systematic effort to analyse districts from a "cognitive" perspective has been made by Italian scholars (Belussi, Gottardi, 2000 and Belussi, Pilotti, 2001) who, based on empirical evidence of Italian industrial districts, distinguish between "static", "evolutionary" and "strong evolutionary" paths. These represent different evolutionary stages of localised production systems according to the innovative effort made by local firms, the knowledge exchange among them and the level of codification and transmission of localised knowledge. This view reinforces the idea of the cluster not as a static industrial agglomeration but as an ever-changing, dynamic phenomenon.

Another contribution, referring to high tech clusters (Antonelli, 1999; 2000), points out that knowledge creation is a "collective process" but his reasoning is different from that of the SCL perspective. In fact, he assumes that each firm possesses a piece of highly specific knowledge that has to be recombined with others' in order to have a creative outcome. In other words, parallel to inter-firm division of productive labour, industrial organisations (such as that of interest in this paper) are characterised by inter-firm "cognitive" or "innovative" division of labour (cf. Arora,

⁵ In Nonaka, Takeuchi (1994) framework, the "knowledge conversion process" is characterised by a sequence of interactions among tacit (T) and explicit (E) knowledge, whose outcome is new knowledge generation. The four phases encompass socialization (tacit-tacit), externalisation (tacit-explicit), combination (explicit-explicit) and finally internalisation (explicit-tacit).

⁶ This is in some ways an oversimplification, as external knowledge (technology) transfer can occur both in a codified way (e.g. blueprints, machine-embodied technology) as well as tacit one (e.g. training services focused on transmitting know-how).

Gambardella, 1994; Arora, Fosfuri, Gambardella, 2001), so that each firm has to exchange its proprietary knowledge in order to benefit from the gains of new knowledge generation⁷. This is then conditional on the existence of a well functioning “market for technology” that resolves the knowledge trade-off between the conflicting effects of property rights on innovation incentive and on information dissemination (“revenue effect” vs “profit dissipation effect”) (Arora, Fosfuri, Gambardella, 2000). In this frame geographical proximity is one of the factors influencing the “communication” of technological knowledge⁸.

The Neo-Shumpeterian II perspective is an in depth insight in the “realm of tacit knowledge” and stems from recent contributions of Cowan, Foray (1997) and Cowan, David, Foray (2000) that assert that tacit knowledge is indeed an important strategic asset, as it allows for codified knowledge to be used and exploited, but the mis- and over-use of the term has rendered it “unproductively amorphous” (Cowan, David, Foray, 2000). They agree with the fact that each firm needs localised tacit knowledge to use and absorb external codified knowledge. Nevertheless, the boundary between these two will vary according to the industry and to the incentives to codification (Cowan, Foray, 1997). More interestingly, they also try to unpack the concept of tacit knowledge, distinguishing between three degrees of codification (Cowan, David, Foray, 2000):

- a) articulated and thus *codified* knowledge: where a codebook exists and is available
- b) *unarticulated codified* knowledge *cum displaced codebook*, where a codified body of common knowledge (the codebook) exists but it is not evident and manifest to an outside observer
- c) *tacit* knowledge, where not even a codebook exists.

The distinction between b) and c) is critical as it defines a boundary (yet changing) between “pure tacitness” (c) and “apparent tacitness”, the latter corresponding to the case in which an external observer perceives as tacit knowledge what in reality is codified and transferred through common language and codes among the members of the same “epistemic community”. In other words, epistemic communities are networks of individuals (or firms) that share the same language (technical terms, jargon etc.) that is codified but not easily understandable to “outsiders”, as they do not have access to a codebook that allows for interpretation of that language. This insight is particularly fruitful in the analysis of localised knowledge flows in clusters as it leads to reconsider some of the assumptions made by previous approaches. In fact, it casts some doubts on the

⁷ This literature derives mainly from empirical evidence of high tech or knowledge-intensive industries and argues that there can be a market for knowledge and technology that arises from the need of firms with different complementary pieces of proprietary knowledge to exchange it (for details see Arora, Fosfuri, Gambardella, 2000; 2001).

⁸ For further details see Antonelli, 2000.

effectiveness of typical mechanisms of knowledge diffusion (e.g. informal contacts; skilled labour force mobility and geographical proximity) in the dissemination of valuable knowledge as “so often cited face-to-face contact serves only to ease the access to information about “who knows what and where is employed”, which is the only local public good. Embodied scientific and technical knowledge remain a private good, unless sharing agreements turn it into a club good” (Breschi, Lissoni, 2001). Empirical evidence suggests that “the existing firm-based communities of engineers may certainly be connected by a number of “weak ties”, which are apt at diffusing information and rumours about new technologies to be adopted or imitated. At the same time, though, those ties do not appear to vehicle the amount of technical information which is necessary to develop any commercially viable innovation” (Lissoni, 2001: 1492). Similarly, labour mobility may not represent a valuable mode of knowledge dissemination, for several reasons: the first of them being that workers who move across firms may be retaining their knowledge and not entirely transferring it to the new firm, unless both a codification effort (to transform tacit, human-capital embodied knowledge into shared knowledge) is undertaken as well as the definition of a proper sharing-inducing incentive system (Breschi, Lissoni, 2001). Moreover, labour mobility can produce valuable dissemination of knowledge if the employee is both particularly skilled and has acquired a substantial technical competence before moving. What follows is that labour turn over of low skilled labour force will not add anything to the “collective” knowledge of the cluster, and too rapid labour turn over, will be potentially damaging for the firms that are left, as it doesn’t allow them to amortise training costs (sunk costs). As a result, increasingly, local firms establish tacit agreements between themselves, in order to avoid stealing each other’s best employees.

While this last insight does not discard the previous neo-shumpeterian approach (neo-shumpeterian I), it raises some questions about the use of at least informal conversations and labour turn over as rough proxies of knowledge diffusion within clustered firms. It also goes further and casts doubts on the assumption that such mechanisms lead ultimately to technical change. In a way, this is an attempt to proceed with the ongoing process of opening up the black box of knowledge diffusion and creation at a meso level of analysis.

The insight into knowledge acquisition, diffusion and generation of clustered firms throughout the different conceptual approaches presented has implications for further analysis. On one side, empirical and theoretical contributions in advanced countries’ contexts might be enlightening for similar studies in developing countries, in order for them to produce parallel contributions. On the other it serves as a stimulus to proceed in the understanding of knowledge flows and technological change in clusters both at micro and meso level.

2. THE EXPERIENCE OF DEVELOPING COUNTRIES: APPROACHES AND LIMITATIONS

In developing economies, the first systematic effort to analyse industrial clusters has followed a common approach based on the concept of “collective efficiency”. This concept was firstly introduced by Schmitz (1982, 1995 and more recently 1999) in an attempt to define a methodological approach to assess the functioning of clustered firms in such countries. This focus was stimulated by the success stories of Italian industrial districts in the '70s-'80s that diffused the interest in this new "model" of industrial organization (Piore and Sabel, 1994; Pyke, Becattini, Sengenberger, 1990). In developing countries, thus, clustering was thought of as a viable way to foster the development of small local (informal) industry and to eliminate the growth-constraints of small realities (Schmitz, 1982)⁹: "...such clustering opens up efficiency gains which individual firms can rarely attain. The concept of collective efficiency is defined as the competitive advantage derived from local external economies and joint action" (Schmitz H., 1995: 530). In this approach, geographical and sectoral concentration (clustering *per se*) does not necessarily provide any beneficial effect unless an active process of inter-firm co-operation and constructive competition has been set up, especially in critical situations.

In the perspective of analysis of this paper, a review of the main literature has been carried out in order to examine the common patterns of knowledge acquisition and diffusion. Let me first say that, mostly, this approach has focused on the observation of links in the local “Production Systems”, while, as rightly noticed by Albu (1997) and by Bell and Albu (1999), “Knowledge Systems” have been weakly analysed. Despite that, a detailed observation of each case study offers useful empirical evidence of both intra- and extra-cluster knowledge flows so that local firms appear to acquire knowledge from different sources *external* to the cluster (trade fairs, buyers, suppliers, international consultants and the like) and also to participate, at times through the support of local public institutions, to the *local diffusion* of information and knowledge. The theoretical explanation of the knowledge flows occurring in the cluster regards exclusively localised knowledge (thus, not paying attention to the economics or mechanisms of knowledge acquisition from external sources) and relies heavily on the first of the perspectives previously analysed (SCL). In fact, spillovers and “information in the air” are often mentioned as main explicative factors of knowledge transfer and ultimately (eventually) as an incentive to innovate: “Upgrading requires a capacity to learn both at

⁹ Similarly, Aftab and Rahmin (1989) noticed that informal firms in the Punjab tubewell industry were facing internal growth constraints within a given technological frame and that the market itself was unable to provide the capabilities and skills to overcome such constraints. Accordingly, they argue that inter-firm linkages and institutional support might be potential solutions to that.

the level of the individual firm and in the relations between firms. *In the cluster context, knowledge spillovers can facilitate such learning (Audretsch, Feldman, 1996)*. Moreover, cluster-wide bodies and real service centres can accelerate the dissemination of know-how among local producers (Brusco, 1992)” (Nadvi 1999: 1606, emphasis added). Similarly, “It seems that in the ceramic tile cluster there is at least some *information in the air*. There is substantial informal information exchange going on between professionals from tile producers; unlike in other branches, it is perfectly normal for them to visit competitors' factories.” (Meyer-Stamer J., 1998: 1505; emphasis added).

More recent contributions have started emphasising the role of external sources of knowledge in rejuvenating local knowledge flows and on this point there is growing concern about finding a theoretical approach that could link local agglomerations such as clusters of small and medium enterprises and the global economy: as already noticed by Humphrey and Schmitz (2001), “the cluster literature emphasises the need to improve co-operation and local governance. Even the resources for product and functional upgrading are seen mainly to come from within localities. Links with the wider world are frequently acknowledged, but they are weakly theorised” (p. 14). Thus, the focus of analysis has shifted from local co-operation dynamics to local-global links and has increasingly adopted the “Global Value Chain” approach (see Gereffi, 1994). Different studies now, both theoretical and empirical, (see among others, Gereffi, 2001; Humphrey, Schmitz, 2001; Sturgeon, 2001; Gereffi, Humphrey, Kaplinsky, Sturgeon, 2001; Rabellotti, 2001) put emphasis on the role of global *foreign buyers* as main carriers of knowledge flows towards the cluster. Buyers exert on local firms a quasi-hierarchical form of governance which is aimed at producing product and process upgrading. In fact, there is substantial evidence of increased “production capabilities” (in the sense given by Bell, Pavitt, 1993) in local firms, that “upgraded” the quality and the pace of their production (thus reducing time to market and time to order) (Humphrey, Schmitz, 2000). In other cases, limited “functional upgrading”¹⁰ is observed: “a large number of spinning firms in Tamil Nadu have integrated forwards into apparel and garments by establishing new companies or purchasing existing companies to position themselves in a new and higher value-added growth sector. [Their production] includes items such as work uniforms for public and private sector employees (postal workers, airline ground staff, hotels) or industrial textiles where volatility of design is less of an issue and where typical branded retailers are less of a stake and interest. Others, typically smaller producers, have gone from producing only fabric to producing finished items such

¹⁰ By “functional upgrading” what is meant is the involvement in different activities in the chain (e.g. by moving from simple assembler of imported inputs to the design of products sold under the name of other firms (OEM) or, even, better to the sale of own branded products (OBM) (cf. Humphrey, Schmitz, 2000).

as complete packages of home furnishing- cushion covers, table covers, napkins, curtains and bedspreads- under contract from chains such as Ikea, Macy's and Wal-Mart" (Dolan, Tewari, 2001: 98).

This latter approach provides no thorough understanding of the economics of knowledge transfer, as it makes it conditional to the governance structure of the chain. Actually, it goes both one step forward and one backward compared with previous "collective efficiency" literature; a step ahead as it introduces into the frame external sources of knowledge, a step backward as it focus on buyers as the main sources of such knowledge thus disregarding the role potentially played by other (documented in previous studies) actors (National Systems of Innovation as well as other external sources). In fact, a scenario of co-evolution of governance structure along with technological change seems to be plausible, in which the controversial dichotomy 'state vs market' is overcome in favour of a more complex interpretation based on evolutionary interactions among politics, culture, markets and technology, which might altogether be contributing to the alignment of local, regional and global networks (Kim, Von Tunzelmann, 1998).

Furthermore, it is now increasingly recognised (see Humphrey, Schmitz, 2000) that foreign buyers may be keen on transmitting the limited amount of knowledge that allows local firms to produce to international standards (thus, in an infant phase of development), but at the same time, are inclined to hinder any important local breakthrough that can possibly discard the established governance structure. What follows from this is that the diffusion of knowledge in this approach is constrained by the governance structure and by the stage firms occupy in the GVC. Also in this case, no deep insights are made in understanding the dynamics of knowledge absorption and of technological capability accumulation by local firms, whose position in the GVC might not change whereas technological capabilities are (indeed) accumulated. It is in fact an oversimplification to think that moving along a value chain is *the* way in which firms upgrade, as, as showed by the case of Taiwanese SMEs in the electronics industry (Ernst, 2001) firms may remain OEM suppliers in a commercial sense but improve dramatically their production and technological capabilities, thus raising their bargaining power with foreign buyers or starting a parallel product development trajectory.

A third way of analysing agglomerated firms in developing countries has been that of applying the National System of Innovation (NSI) approach (Lundvall, 1992; Nelson 1993) to a local context (hence, "Local Systems of Innovation" (LSI)). More in general these approaches are grounded on evolutionary theories and conceive innovation as an interactive, complex (non-linear) and path-dependent process, that, as such, is open-ended and never reaches a state of equilibrium (opposite to

neo-classical economics) (Edquist, 1997). As such, innovation and learning are not limited to R&D effort but learning by using, by doing and by interacting (Lundvall, 1988) are emphasised. The interaction among actors in the innovative process is central in these kinds of studies, thus reinforcing the idea that localised firms enjoying different kind of links (as in clusters), might easily interact and produce changes.

A systematic research effort to apply this approach to developing countries and to local productive systems (*arranjos productivos*) has been made by scholars in Latin America (see Cassiolato, Lastres, 1999; 2000a, 2000b; 2001). Those studies map different local innovation systems identifying both private and institutional actors (Research Institutes, Universities, Financial Institutions, Business Associations and the like) that take part in the process of learning and technical change of firms. Sources of innovation and learning at firm level are empirically analysed as well as the linkages existing between them¹¹. How far this approach will lead to the understanding of knowledge flows and generation it is still uncertain: NSI as well as the LSI is not an appreciative theory (“it is not in its present form easily integrated in any theoretical discourse” (Lundvall et al., 2002)) as the conjectures made are not yet formalised hypotheses with empirical matter. “[...] we know too little about whether the hypotheses are true or false or about causal relations between variables” (Edquist, 1997: 30). As such, this approach may be a useful and alternative policy tool (Mytelka, 2000) but is still in a preliminary phase, and has not yet shed sufficient light on the causal relations among the different constituents of the system and the capability to innovate.

What is clear though is that this last approach is based on neo-shumpeterian tradition and is closer to the ‘neo-shumpeterian I’ kind of perspective in that it emphasises the linkages among firms and institutions, indirectly assuming that innovation requires interaction and combination of complementary pieces of knowledge. It assumes a cognitive division of labour and distinguishes between tacit and codified knowledge: “if information and codified knowledge present growing conditions of “transferability”- given the efficient diffusion of IT- tacit knowledge (which has a localised character) continues to have a prime role for the innovative success and is still very difficult to be transferred” (Cassiolato, Lastres, 2000: 8).

The literature so far reviewed is heading, both in advanced countries and developing countries contexts, towards a better understanding of the mechanisms governing knowledge acquisition, diffusion and generation in clustered firms. The impression that one gets is that moving from a “pure externality” (SCL) perspective to a neo-shumpeterian one (both I and II) yields a clearer

¹¹ For a comprehensive review of empirical cases see the web site: <http://www.ie.ufjf.br/rede/P3/index.html>

picture of the whole process. Nevertheless, at least in developing countries, a further effort is needed to join external knowledge flows, local knowledge systems and firms' absorptive capabilities into a unique framework. In fact, what seems to be missing in the literature reviewed is the distinction between the knowledge that is *accessible* to firms (coming from fairs, specialised journals, customers, business associations etc.) and that which is (potentially) *absorbed* by the firm. Clearly, the links among firms (both internal or external to the cluster) are important sources of knowledge when firms are capable of capturing that knowledge in a way that leads to adaptive change or innovation. In view of that, an attempt to proceed in this direction has been made in the next paragraph.

3. CLUSTER ABSORPTIVE CAPABILITY: AN INTERPRETATIVE FRAMEWORK

External shocks like liberalisation, quality and environmental standards pressure and macroeconomic turmoil have recently produced contrasting effects on clusters of firms (and local networks) in developing countries: from one side has been reported an increase in co-operative behaviour (cf. Rabellotti, 1999; Nadvi, 1999), from the other a disarticulation of networks (more in general), along with reduced local capabilities and increased modernisation (Cimoli, 2000; Cassiolato, Lastres, 2000), and there are cases in which results are mixed: some firms isolate, some others join together to overcome threat (e.g. Sinos Valley; Schmitz, 1999; Vargas, Alievi, 2000). Accordingly, agents become more heterogeneous (Rabellotti, Schmitz, 1999), larger firms yield growing influence, bilateral-horizontal co-operation is low and decreasing and growth trajectories seem to be more dependent on external links (Bair, Gereffi, 2001). In this scenario, it is possible to assume that actors operating in a cluster are heterogeneous in size, in the activities performed, in capabilities and knowledge accumulated. The latter is a critical point, as capabilities require time to be acquired along with, of course, experience, practice and deliberate effort. The cumulative and path dependent process of capability accumulation, thus, is highly specific to each firm, so that even if the same amount of time has passed and firms operate in the same macro environment and industry, they may end up with different levels of technological capabilities (Figueiredo, 2002). Accordingly, it is possible to assume further that the dynamics of the cluster are shaped, among other things, by some *key actors*, that for different reasons (one of those, the level of capabilities that they have accumulated) find themselves in the position of channelling external knowledge towards the cluster and contributing to this diffusion. Borrowing from Allen (1977), it is possible to refer to both private and institutional agents that perform that function within the cluster as

“Technological or Knowledge Gatekeepers”¹². Empirical evidence at the firm level (Allen et al, 1971; Allen, 1977; Brown, 1979) showed that the acquisition of external knowledge is not equally distributed among employees, on the contrary only a small bunch of them are receptive and work as technological gatekeepers, thus diffusing the acquired knowledge to their colleagues. This had implications on the policy adopted by firms, that focused on the identification of such particular actors and invested heavily in strengthening their capabilities and the potentiality of them linking with external institutions. Thus, like in a firm where not all the employees are equally exposed to the same external sources of knowledge and not all are actually committing themselves in investing time in searching for interesting or useful knowledge, the same may possibly happen in a cluster. Similarly, as such technological gatekeepers in firms are those to whom other “non-technological gatekeepers” (NTGs) refer when they have a problem they can’t solve or they look for information, this may also be the case in a cluster. In both cases a two- or multi-step pattern of knowledge diffusion is assumed (see Allen et al., 1971; Allen, 1977). Of course, the dynamics and incentives of knowledge diffusion in clusters are not the same as those occurring within the boundaries of a same firm but this insight leads a step ahead towards the definition of the “Cluster Absorptive Capability” (hereinafter, CAC). Deriving the concept from Cohen and Levinthal (1989, 1990) and adapting it to a meso level of analysis, CAC is the “*capacity of the cluster to identify, assimilate and exploit knowledge coming from sources external to the cluster*”. It will very much depend both on the absorptive capacities¹³ (AC) of each individual actor (firms and institutions) and on the interactions between them. In particular, the dynamics of acquisition and diffusion of knowledge will depend on those agents with higher degree of Absorptive Capacities¹⁴ that work as ‘receptors’ of external technical change (cf. Gambardella, 1993) and to some extent as ‘decoders’ thus diffusing it to other firms (Non-Technological Gatekeepers, hereinafter N-TGs).

In other words, the learning pattern of the firms in the cluster (or the support of public institutions) determines the knowledge system and the linkages between the cluster and other agents or sources

¹² The literature on Technological Gatekeepers goes back to the end of the 60s and refers to studies conducted at firm level. “Technological Gatekeepers” were defined as follows: "There thus existed in all of these organisations a small number of key people to whom others frequently turned for information. These key people ("technological gatekeepers") differed from their colleagues in the degree to which they exposed themselves to sources of technical information outside their organization [...]. and fortunately for their organizations they tend to be the same people to whom others come for information" (Allen, 1977: 145). "The Technological Gatekeeper can understand at least a portion of the material published in the referee journals and can then translate this information into the terms that the average technologist can use" (Allen, 1977: 148).

¹³ Here I use Absorptive ‘Capacity’ and ‘Capability’ interchangeably.

¹⁴ Absorptive Capacity influences and is influenced by the *effort* made to accumulate new knowledge: “to develop an effective absorptive capacity, whether it be for general knowledge or problem solving or learning skills, it is insufficient merely to expose an individual briefly to the relevant prior knowledge. Intensity effort is critical” (Cohen, Levinthal, 1990: 131). It therefore casts a distinction between mere access to technology and its actual absorption and constructive exploitation. ‘Absorptive capabilities’ have also to be conceived differently from ‘technological capabilities’, as the latter are rather an outcome of the former, even though the relation between those two might be mutually reinforcing.

of external knowledge. Actors with more absorptive capability are central in this and shape the process of knowledge *acquisition*, *diffusion* and ultimately *creation* in the cluster. The literature offers empirical support in this interpretation: two cases have been selected (Table 1), where TGs played an important role in helping to overcome the crises that some of those clusters faced due to external shocks. The first one is that of the Ludhiana woollen knitwear cluster in India (Tewari, 1999) where, following to the collapse of the Soviet Union (the mayor “institutional buyer” of the cluster) and the liberalisation of markets at the beginnings of the 90s, a bipolar behaviour by firms was observed. In fact, the firms that overcame the crisis were those that had a major degree of openness and started hiring new designers or engaged designers coming from Italy and France at the beginning of each season. Some of those were operating with high-end markets and had accumulated considerable design capabilities even prior to the crises. At the same time, the role of those firms has been that of contributing to the diffusion of such acquired capabilities or knowledge via both horizontal (imitation) and vertical links, so that it can be affirmed that they were operating as private TGs in that cluster.

The case of Sialkot (a surgical instrument cluster in Pakistan), instead, provides an effective example of Institutional TG in that of the local “Surgical Instrument Manufacturer’s Association” [SIMA]. Pressed by the need to comply with international quality standards (GMP, ISO), local SMEs were supported by the intervention of SIMA that negotiated a contract with a US quality assurance company aimed at providing local technical assistance and transfer of know-how. This also allowed small firms to be involved in the process of quality upgrading, initially encompassed only by large firms (Nadvi, 1996; 1999).

In both those cases, then, the role of such TGs was crucial in both acquiring external valuable knowledge and transferring it to the other N-TGs, which finally helped to overcome (at least) those critical phases.

Cluster	External shock	Private TG	Institutional TG	Evidence of diffusion to NTGS	Overcoming of the problem
Luhdiana woollen knitwear cluster, India (Source: Tewari, 1999)	<ul style="list-style-type: none"> • 1991: Collapse of Soviet Union and liberalisation of markets 	<ul style="list-style-type: none"> • many better performing firms started hiring new designers after the collapse of Soviet Union and liberalisation in 1991 • even prior to the dual crises, middle sized and big firms engaged designers from France and Italy, so that local staff learned how to produce new designs, new capabilities were created as a result 	- no evidence	<ul style="list-style-type: none"> • benefits accrue to the whole region not only to a subset of large producers • those firms serving high end domestic markets, searched for external knowledge and diffused in the cluster via imitation (horizontal) or vertical links <p><i>“these knitwear producers would travel abroad and pick up new item or designs and work closely with local spinning firms to develop new kind of yarns” (1661)</i></p>	Prior to the crises in 1991, firms that accumulated capabilities operating in the high end domestic market as well as in the low end and homogeneous market of the Soviet Union were able to face increased global competition and were also integrating their acquired external knowledge with local firms. An interpretation of the relative success of this cluster might lie in the capabilities accumulated prior to and after the crises by some TGs and by the exploitation of distinctive knowledge (in this case the design capabilities) combining it with local tacit knowledge of NTGs (e.g. spinning mills)
Sialkot surgical instrument cluster, Pakistan (Source: Nadvi, 1996, 1999)	<ul style="list-style-type: none"> • beginning of 90s: international quality standard (GMP, ISO) pressure 	<ul style="list-style-type: none"> • By December 1994, one large firm in Sialkot had managed to become GMP certified by the FDA. It did so by hiring the services of a foreign consultant 	<ul style="list-style-type: none"> • SIMA [Surgical Instrument Manufacturer's Association]: in April 1995, 11 months after the FDA action, SIMA negotiated a contract with a US quality assurance consultancy to provide technical training for local producers to upgrade to GMP standard 	<ul style="list-style-type: none"> • The cluster-wide consultancy service, financed by the state and organised through SIMA, made such know-how more widely accessible, thus making it possible for many of the smaller producers to obtain GMP certification and continue competing with their larger local rivals 	The exogenous shock was overcome due to the intervention of some local agents (big firms at the beginning and the local business association, SIMA, afterwards) that captured the external knowledge necessary to upgrade and be competitive on the international market (Nadvi, 1999). Only in a second moment, such standards were diffused among local actors thanks to active and co-operative behaviours.

Table 1. Private and Institutional Gatekeepers: two cases in developing countries' clusters

The presence and effectiveness of such TGs shapes the capability of a cluster to absorb external knowledge. As such, the concept of CAC is by no means a static one, but changes over time and depends heavily on the absorptive capabilities of the firms operating in the cluster or by the operations of bridging institutions. Accordingly, drawing from the evidence of the empirical cases available, it has been possible to “map” clusters with different levels of CACs. Five levels have been identified, on the basis of the presence and strength of TGs (which have been distinguished between asymmetric and symmetric¹⁵), the flows of knowledge existing between TGs and N-TGs and the “creative” participation of the latter to the process of new knowledge generation¹⁶ (knowledge outflows) with the former. Accordingly, a taxonomy has been elaborated, which distinguishes between the following degrees of CAC:

- a) Basic, for clusters characterised by the absence of firms or institutions that link local knowledge flows to external sources of knowledge (both tacit and codified); where firms tend to operate independently and knowledge spillovers (e.g. demonstration effects, labour force turn over) seem to constitute a weak basis for the enhancement of localised knowledge.
- b) Low-intermediate, when there are knowledge (in)flows from external sources of knowledge *via* local (asymmetric) technological gatekeepers which, nevertheless, interfere poorly with other local N-TG firms. More precisely, in this case it would be proper to define those agents as ‘external stars’(cf. Allen, 1977) as they interact more with external sources of knowledge than with internal firms.
- c) Intermediate, if proper asymmetric technological gatekeepers are observed that effectively transfer external knowledge into the local network. Moreover, at this stage knowledge flows (developed as a result of deliberate action or in the form of externalities (e.g. spillovers)) within the cluster are important to disseminate acquired external knowledge even though there is still very limited creative effort carried out by TGs and N-TGs.
- d) Upper-Intermediate corresponds to a stage in which creative effort in producing new knowledge and innovation is pursued by local technological gatekeepers that therefore establish a mutual relationship with external sources of knowledge or produce outflows of knowledge. In this case, a shift with respect to previous scenarios is done as technology and knowledge are not only absorbed but also generated. The involvement of local N-TGs to the process of local knowledge production is nevertheless not systematic.

¹⁵ “Asymmetric” refers to the “passive” acquisition of external knowledge (inflows) while “symmetric” implies some degree of mutual exchange of knowledge with external actors (inflows and outflows) which in turn implies an effort of creative knowledge generation by the recipient firm.

¹⁶ By ‘new knowledge generation’ I here refer to both the increased understanding and technological advance produced as *codified* knowledge *per se* and/or that *embodied* in innovative products.

e) Advanced, finally, it adds to the previous case only the enhanced participation of local N-TGs to the activity of local knowledge generation, thus presenting the case of a cluster in which the innovative process is really ‘collectively’ pursued. Hence, local knowledge flows are nurtured by external knowledge flows which are in turn spurring technological change and innovation, in a way similar to that described by Nonaka (1991).

The threshold between d) and e) is very subtle, with e) tending to a perfect alignment of external and internal knowledge flows which self-reinforce in a virtuous way over time. Moreover, advanced levels of CAC correspond to an increased openness of the cluster to external knowledge, which in turn contributes to reducing the distance with the technological frontier (Bell, Albu, 1999).

These patterns are assumed to be influenced by *firms’* level of absorptive capability which is determined by a process of knowledge accumulation over time and of technological effort¹⁷. A cluster showing a basic level of CAC is bound to be ‘lagging behind’: limited levels of firms’ technological (Bell, Pavitt, 1993) and absorptive capabilities do partly explain the poor performances of such clustered firms, with agglomeration-externality, geographical-concentration and collective-efficiency arguments telling only part of the story. A ‘*collective learning*’ process is instead attained when localised firms *do* have some useful knowledge to exploit and eventually transfer (or share) to other localised firms (exp. non-technological gatekeepers) approaching an intermediate level of Cluster Absorptive Capability. In this stage the firms are trying to ‘catch up’, demonstrating accrued absorptive capabilities and an increased degree of openness towards external sources of knowledge and technology. Finally, when on top of ‘collective learning’ a step ahead is made (which is by no means automatic) towards the ‘collective creation of new knowledge’ (thus showing an innovative dynamism), an advanced level of Cluster Absorptive Capability is reached. In this case the technological frontier is approached and firms are not just absorbing external knowledge on an imitative or adaptive basis but they are rather investing to participate in the international network of knowledge generation.

As such, the taxonomy is also an attempt to shed some light on the differences between collective learning *per se* and its effects on the technological dynamism of a cluster, discarding the idea that this link is automatic. In fact, it is not, as if it was the case, most of the clusters in developing countries that show an intermediate level of CAC (see Table 2) would be far more dynamic than they actually are.

A detailed review of the literature analysing clusters in developing countries, has micro-founded this framework, as shown in Table 2.

¹⁷ In this sense, the different stages of the taxonomy are conceived in an evolutionary way because they are subject to continuous changes which go along with the path of accumulated technological knowledge of localised firms.

CLUSTER ABSORPTIVE CAPABILITY		
TGs absorption and generation of knowledge	Intra-cluster knowledge flows	Participation of NTG to knowledge outflows
BASIC		
- Absent to weak	- Limited	- Absent
<p>1] Gamarra (Peru), clothing cluster (Visser, 1997;1999)</p> <ul style="list-style-type: none"> • Very limited evidence of knowledge exchange among firms (exc. knowledge flows with spin-off firms) • No evident of external links with sources of knowledge <p>2] African vehicle repair clusters (Suame, Ziwani) (Mc Cormick 1999)</p> <ul style="list-style-type: none"> • Positive technological spillovers • Exchange of information and knowledge also via local consultancy in engineering 		
LOW INTERMEDIATE		
- 'Asymmetric' TGs ('external stars')	- Limited to moderate	- Absent
<p>1] Nairobi (Kenya) , garment (MC Cormick, 1997):</p> <ul style="list-style-type: none"> • Exchange of information (assistance with machine breakdown, learning new design) among neighbouring firms operating in the same semi-open stall (some circulation of local information) • Limited exchange of information and knowledge with traders (limited to market characteristics) • No evidence of new design generation <p>2] Agra (India), footwear cluster (Knorringa, 1999)</p> <ul style="list-style-type: none"> • Weak exchange of information with buyers and suppliers to improve quality and time to order/market • Limited contribution of local Institution to train and upgrade local labour force 		
INTERMEDIATE		
- 'Asymmetric' TGs	- Moderate to high	- Limited and occasional
<p>Sinos Valley (Brazil), footwear cluster (Schmitz, 1995 ; 1998, 1999 and Vargas M.H., 2000)</p> <ul style="list-style-type: none"> • Mix of pattern of learning, only a group of firms that became ODM enjoys both internal and external knowledge flows (international competitors, suppliers of machinery, trade fairs) while other firms are passive and rely heavily on external buyers <p>Guadalajara (Mexico), footwear cluster (Rabellotti, 1999)</p> <ul style="list-style-type: none"> • Knowledge flows and co-operation with domestic buyers and retail chains • Some horizontal co-operation in knowledge exchange among firms • Evidence of (yet weak) co-operation in new product development <p>Luhdiana (India), knitwear cluster (Tewari 1999)</p> <ul style="list-style-type: none"> • Presence of TGs and diffusion of knowledge among clustered firms • Some creative attempt to design new clothes <p>Santa Catarina (Brazil), tile cluster (Meyer-Stamer, 1998a;1998b; Meier-Stamer et a., 2001)</p> <ul style="list-style-type: none"> • Typical pattern of supplier-based industry, this cluster is traditionally relying on external sources of technological knowledge and change provided by Italian tile machine producers and Spanish glaze suppliers • Local affiliates of Spanish <i>colorificios</i> provide technical support to local firms • Local presence of institutions established to promote learning and technological development (did not completely take off) • Some local firms established close links with Italian firms in the Sassuolo cluster (visit abroad) • Some "information in the air" and collective learning <p>Sialkot (Pakistan), surgical instruments (Nadvi, 1996; 1999)</p> <ul style="list-style-type: none"> • Presence of TGs (both private and Institutional) • Pivotal role of foreign buyers in creation and development of local production capabilities • After the crises there is evidence of some firms increasing exchange on information and in co-operating to improve quality (vertical, with subcontractors) <p>Vale do Itaji (Brazil), textile cluster (Ramos Campos, Ferraz Cario, Nicolau, 2000)</p> <ul style="list-style-type: none"> • Considerable local institutional effort in technological research and provision of technological services, design and training • Typical pattern of supplier-based industry: innovation induced by external suppliers of machinery and raw materials • Poor endogenous innovative capabilities (some R&D in medium and big firms) 		
UPPER INTERMEDIATE		
- 'Symmetric' TGs	- Moderate to high	- Increased but not systematic
<p>Taiwan, electronics cluster (Ernst, 2001)</p> <ul style="list-style-type: none"> • High level of interaction with external sources (esp. OEM purchaser) • High level of design and production capabilities • High level of exchange of knowledge and information at local level ("peer groups") • Local firms (second, third tier suppliers) operate often on the spot, no stable commitment 		
ADVANCED		
- 'Symmetric' TGs	- Moderate to high	- Systematic
-		

Table 2. Cluster Absorptive Capability: evidence from developing and NICs countries

The literature is supplying the information needed to make this classificatory exercise as a by-product for other kinds of analysis. Despite that, a central idea on the position of each case study/cluster (at least at the time when the researches were carried out) is given and from it a few interesting issues can be raised. One first observation can be made about the fact that most of the clusters in the developing world are characterised by basic to intermediate CACs, thus revealing that in the most successful cases they absorb external knowledge more on an imitative basis (e.g. technology transfer, reproduction of foreign designs) rather than on a creative one¹⁸ (an exception being the Taiwan electronics and IT case). Furthermore, an interpretation of the literature suggests that those clusters which appear to have lower CAC are also performing extremely poorly, and the opposite stands for higher-intermediate CAC. Many cases, that appear to show an intermediate degree of CAC are not surprisingly attempting to make a step ahead and gain competitiveness, despite the challenges they had to face in the last decade due to changed macroeconomic conditions. This by no means constitutes a claim for causality among CAC and cluster's performance, but gives enough support for further research.

Certainly, there are other factors influencing the performance of a cluster in the developing world. As different studies show, it is a complex combination of elements which determines the capability of local firms to compete in the s.c. 'global economy' and escape the threats of an 'immiserising growth'¹⁹. Of course international *demand* or *market* conditions are fundamental²⁰ and more than that is the *access* to such a demand. In many of the clusters reviewed this access seems to be increasingly mediated by the figure of a foreign agent (e.g. a buyer) who, as it has already been remarked, is also supporting some productive capability building especially in an infant stage of the cluster's growth. Even so, in the long term, improved dependency on buyers might lead to a scenario of fragmentation of local knowledge 'networks' with few firms catching up and increasingly depending on foreign buyers, while other firms are being excluded from the game and keep on falling behind. That reinforces the argument of 'capabilities' being important to build up a

¹⁸ What is observed is that those firms have a tendency to assimilate external knowledge and technology in an *operational-replicative-adaptive* way rather than in an *innovative* one (see Bell, 1997). Nonetheless that does not mean that firms haven't accumulated productive or technological capabilities over time necessary for replicating and adapting acquired technologies to the contextual environment of the firm, which at some point in time might sustain a step towards higher levels of CAC.

¹⁹ This describes a situation where there is increased economic activity (more output and more employment) but falling economic returns (Kaplinsky, 2000: 120).

²⁰ Many developing countries (e.g. Latin America) are now facing the increased competition from countries like China in low-end standardised production and are trying to focus on high-end markets or niches in order to shift the emphasis from low skilled labour force and low cost of inputs to increased quality and value added (see e.g. in the footwear industry, Schmitz, 1999).

sustainable growth, which allows such a commercial dependency at some point of the ‘upgrading’ process to be overcome.

One might also raise *industry-specificity* arguments, as if the industry influenced the differences among levels of CAC, so that traditional low tech sectors (footwear, textiles) are bound to remain within an intermediate level of CAC and are condemned to lag behind, while more dynamic high tech sectors (electronics, IT, biotech etc.) are more likely to show a pattern of advanced CAC and allow for leapfrogging. In reality, this argument needs further investigation, both theoretical and empirical. Suffice it to say here that traditional sectors need not to be envisaged as static and passive as in many cases they have gone through a process of technological change and dynamism²¹, which casts some doubts on the meaning of low and high tech industries as if they could be identified in a clear-cut way.

CONCLUSIONS

This paper is meant to contribute to the studies regarding industrial clusters in developing countries that are not leapfrogging and need a viable strategy to overcome growth constraints and face international competition. Even though no ‘recipes’ can be formulated to guarantee a successful outcome, the review of both theoretical and empirical contributions in advanced and developing countries’ contexts suggests that (at least in the latter) a step ahead is required in the understanding of the economics of knowledge absorption and generation at a meso level of analysis. This cannot be pursued without a clear framework that takes into consideration firm’s absorptive capabilities and the role they play within local and external (national or international) networks. As a result, it is hoped that this contribution will stimulate further research in this direction.

More broadly, this conceptual framework should allow systematic empirical investigation in different contexts and comparisons both at intra- and inter-sectoral level, which could be potentially useful in informing innovation policy. Hence, in contrast to the emphasis in cluster-centred policy initiatives that is currently given to strengthening connectivity among firms, this work is likely to shift the prior emphasis to issues surrounding “capabilities” and technological learning at the level of individual firms and other organisations.

²¹ Among those the cases often cited in the literature concerning Italian industrial districts are the Montebelluna ski-boots production districts and that of spectacle frame production in Belluno, which have become highly dynamic and technologically-intensive clusters over time.

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