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Innovation Processes and Industrial Districts

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ABSTRACT

In this survey, we examine the operations of innovation processes within industrial districts by exploring the ways in which differentiation, specialization, and integration affect the generation, diffusion, and use of new knowledge in such districts. We begin with an analysis of the importance of the division of labor and then investigate the effects of social embeddedness on innovation. We also consider the effect of forms of organization within industrial districts at various stages of product and process life, and we examine the negative aspects of embeddedness for innovation. We conclude with a discussion of the possible consequences of new information and communications technologies on innovation in industrial districts.

JEL Classifications: L14, L25, O31, R11

Keywords: industrial districts, innovation, division of labor, embeddedness, information technology.

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1. Introduction

Innovation[1] is based on the generation, diffusion, and use of new knowledge. While it is possible to conceive of a firm that is so hermetic in its use of knowledge that all stages of innovation, including the combination of old and new knowledge, rely exclusively on internal sources, in practice most innovations involving products or processes of even modest complexity entail combining knowledge that derives, directly or indirectly, from several sources. Knowledge generation, therefore, must be accompanied by effective mechanisms for knowledge diffusion and for "indigenizing" knowledge originally developed in other contexts and for other purposes so that it meets a new need.

Because of their individual qualities, industrial districts (IDs) have special environmental characteristics for innovation. When accompanied by close social relationships, tight geographical proximity may affect innovation in ways that are less common in more highly dispersed environments. For example, an awareness of common problems can encourage several firms, or their suppliers and customers, to seek solutions, leading to multiple results that can be tested competitively in the market. These outcomes can then be relatively easily diffused among firms in the ID because of embeddedness in a common environment. The obverse of this commonality of inspiration and ease of transmission of knowledge, however, may be an inordinately

[1] Defined here as the introduction of new products, processes and ways of organizing at the level of the individual firm.

inward focus that results in an ignorance of or disdain for innovation processes in other regions or in industries not represented in the ID. Furthermore, there may be a relationship between the degree of embeddedness[2] in the industrial district and innovation. It has been suggested that innovation increases as embeddedness increases, up to a point, and that beyond that point further embeddedness results in reduced innovation performance at the firm level (Uzzi, 1997; Boschma, 2005).[3] Thus, depending on circumstances, participation in an industrial district can either encourage or impede innovation.

In this chapter, we examine the operations of innovation processes within industrial districts by exploring the ways in which differentiation, specialization, and integration affect the generation, diffusion, and use of new knowledge in IDs. We begin in Section 2 with an analysis of the importance of the division of labor in IDs and then investigate the effects of social embeddedness on innovation in the following section. The impact of ID forms of organization at various stages of product and process life cycles is discussed in Section 3, while the negative aspects of embeddedness for innovation are covered in Section 4. The possible consequences of new information and communications technologies on innovation in industrial districts are discussed in Section 5.

[2] Hess (2004) emphasizes three dimensions of embeddedness, social, network and territorial. All three dimensions are strong in traditional IDs.
[3] This is discussed in more detail in Section 4.

2. *Specialization and Embeddedness in Industrial Districts*

Differentiation, Specialization, and Integration

The traditional categories of differentiation, specialization, and integration, which are among the most important aspects of the operation of innovation systems, are also defining characteristics of industrial districts. Firms in industrial districts form relatively compact networks that promote efficient trade along supply chains. Although technical and economic relationships are important, exchanges of knowledge are also vital to the efficient functioning of IDs (Albino, *et al.*, 1999). Firms within an ID have different competences that are either the cause or the result of specialization, and that assist exchange and promote mutual prosperity. Many of the firms produce a narrow range of inputs used in final products or in other intermediate goods. Integration of the inputs then falls to other firms in the system. In an innovation system such as an ID, however, the technical characteristics of inputs and final products, and of production processes, are not necessarily fixed because the technical characteristics of both intermediate and final goods may change.[4] As adaptation usually takes time, a system that is optimized in the sense that there is near-perfect efficiency in the integration of inputs is probably not only stable but static and hence endangered if the surrounding environment is unstable (as is almost always the case). It is important, therefore, that an industrial district actively generate change in its internal relationships and in those with the outside world, and that it is flexible enough to absorb change

[4] For example, in contrast to Adam Smith's emphasis on learning-by-doing in a fixed technological regime, Kenneth Arrow has noted the importance of the introduction of new embodied technology in stimulating adaptive change (Cainelli and De Liso, 2004).

without serious losses in efficiency. Inability to change either or both of the internal and external relationships contributed to the decline of such industrial districts as the textile and fashion district of Como (Alberti, 2006) and the eyewear manufacturing district of Belluno (Camuffo, 2003)[5].

Embeddness and Centralization

Many mechanisms are available for the generation, diffusion, and use of innovative knowledge in open systems. These vary in their degrees of centralization. The least centralized mechanism, and the benchmark against which the others are judged, is the traditional competitive market in which buyers and sellers act anonymously, transaction costs are close to zero, and something approaching perfect knowledge prevails. Frequently, even a good approximation of a competitive market is infeasible in practice because there are significant transaction and transport costs and because knowledge on prices and quality is not freely available. As a result, relationships tend to form among firms that, by grouping themselves together, are able to reduce search and other types of costs. The main feature that distinguishes industrial districts, sectoral systems of innovation (Malerba, 2004) and similar groupings from systems that deal *more directly* with wider markets is their high levels of social embeddedness that, by strengthening some relationships at the expense of others, lead to truncated search patterns. But even this does not exhaust the extent of the variety in centralization that

[5] Note that although we take most of our examples from among the Italian industrial districts, similar systems of production have emerged in many other regions of the world (see, for example, Pyke and Sengenberger, 1992).

may occur. IDs are more highly centralized than sectoral systems, for instance, because of the integrating roles of assemblers and other integrators.

Because of their structure, industrial districts offer important benefits in innovation processes. For one thing, the high levels of differentiation and specialization allow firms, in Smithian fashion, to focus on aspects of the supply chain in which they are especially competent. Secondly, since the time of Marshall (1975), commentators have recognized the importance of close social relationship among entrepreneurs and workers in industrial districts (Bellandi, 2003a). The tight geographical proximity of competing firms within a district works to increase social ties within IDs and both the leaders of firms and their workers are embedded (Granovetter, 1985) in networks outside their work places. Thus all three dimensions of embeddedness - territorial, social and network – are reinforced. The resulting meetings may be purely extramural (sharing drinks at a pub, attending the same church) but still promote discussion of common problems – and of new initiatives. Strong ties (Granovetter, 1973) among workers, including managers, can increase the amount of information available to firms and the readiness of people to share what they know when relationships gain a dimension of friendship to counterbalance the competitiveness among firms.

Labor mobility further enhances the spread of knowledge within IDs. When there are many employers, workers can change jobs and roles, moving to other firms to become foremen as Marshall (1975) suggests, or setting up in business themselves if

capital requirements are low or financing is easily available[6]. New firms may fail, but talented people who have gone out on their own can then be reabsorbed as employees in other firms, especially where, as in Silicon Valley, entrepreneurship is rewarded but failure is not severely stigmatized (Saxenian, 1994).

Communities of Practice and Knowledge Diffusion

When embeddedness is strong, the creation of communities of practice (Wenger, 1998; Brown and Duguid, 2000) generates competences that, although possessed by individuals, are collective in that they are based on a set of practices that is common to all members of a community. These competences (both tacit and codified) can transcend firm boundaries and become characteristics of an entire industrial district. As Marshall (1975, 197) wrote of nineteenth century Britain, "To use a mode of speaking which workmen themselves use, the skill required for their work 'is in the air, and children breathe it as they grow up'". Even when a community of practice is not as all-embracing as Marshall suggests, novices become socialized to a community's mores and procedures as a result of continual association with colleagues. Communities of practice are also important as arenas of learning in which tacit knowledge is transmitted especially well (Lave and Wenger, 1991; Wenger, 1998), even though the range of ideas transmitted can be narrowed artificially by the stress placed on the local practices followed within the community. While in some cases, the knowledge held by a

[6] For a genealogical chart showing how people in the furniture ID in County Monaghan, Ireland, left firms to start their own businesses in the industry, see Mottiar and Jacobson (2002).

community can be classed as shared routines, it often has dynamic aspects that help to direct attention to solving problems that are widespread within the community.

Relationships within industrial districts therefore lead to diffusion but also to the creation of new knowledge through shared preoccupations. Because many people or firms can work on a problem simultaneously, a number of different solutions may be found (Bellandi, 2003b). The result is a larger and stronger "gene pool" within the sector (Loasby, 1990, 117), with the further advantage that solutions that are originally regarded as competing may turn out to be complementary and well-suited to different niches within the district.

Differentiation and Modularity

In addition to these casual relationships, close proximity within IDs can enhance the deliberate exchange of information. Managers who meet cheaply and frequently with suppliers, customers, and competitors can gain a better appreciation of problems in a sector than when forced to communicate at a distance and through writing. The resulting changes to the system can then be integrated by lead firms that collect information along several segments of a supply chain. Lead firms can provide coordination not only of ideas and inputs, but also of people and of entire firms who might otherwise not be aware that they have complementary needs and knowledge. This integrating function can be performed by merchants who, as in the early modern putting out system, are in touch with distant markets and are able to communicate information on what is popular to small localized firms, but it may also be a function of lead manufacturers that coordinate changes in the physical configuration of technology

as well as in design. Rugman and d'Cruz (2000) call the lead firm the "flagship firm" that "pulls the network together and provides leadership for the strategic management of the network as a whole". More recently, as in Silicon Valley, the integrating role has on occasion been undertaken by venture capitalists or lawyers who have a broad generalist knowledge of what is happening in a district and arrange packages of services and make other connections among small highly specialized firms (Kenney and Florida, 2000).

Some of these integrating activities can take place without spatial proximity (Heanue and Jacobson, 2001/2; Jacobson *et al*., 2001). For example, networks of professionals like those in law or medicine are communities of practice that arguably constitute a geographically dispersed "virtual" industrial district (Savage, 1994). In this case, the virtual character of the network has to do in part with the dispersion of customers and the need to produce the product (provide the service) near the consumer. But it may also have to do in part with the knowledge-intensive character of the products involved. One might thus argue that manufacturing firms outsourcing knowledge-intensive business services are most likely to do so with suppliers elsewhere, because these services are not subject to transport costs and are amenable to provision over distances through information and communication technologies.[7] Evidence suggests, however, that manufacturing firms frequently outsource knowledge-intensive activities locally, with "geographic proximity, knowledge

[7] See Section 5 below. It should be noted that even where complex component manufacturing is outsourced, cost considerations can drive production to far distant locations. See Egeraat and Jacobson (2005).

spillovers and closer interaction among agents mak[ing] it easier for firms to manage complex transactions". This result is supported by research that shows, among other things, that Italian manufacturing firms are more likely to outsource knowledge intensive business services within industrial districts (Antonietti and Cainelli, 2007).

Geographical proximity may also encourage implicit integration of firms. When common practices within an industrial district lead to high degrees of consistency of products and processes, the introduction of formal and informal modularity is easier. Formal modularity occurs when there are "design rules" and specified interfaces between components that allow firms to change the components they produce while knowing that this will not require adjustments to other parts of an assembly (Baldwin and Clark, 2000).[8] Codified design rules may be unnecessary in IDs, however, as informal modularity can arise when firms within a district have a common vision of what their business is and how they are expected to go about it. The self-image of such firms, as well as their public image, may involve distinctive designs or particular market niches (expensive or cheap products, for example), in this way providing guidance to firms along a supply chain on the kinds of innovations that are likely to succeed in the marketplace. On a technical level, familiarity with production processes within a district gives firms, including suppliers of capital goods, a good working knowledge of how their products relate to existing configurations of components. Thus differentiation and specialization within an industrial district can lead to implicit

[8] One of the benefits of formal modularity is that it obviates the need for common ownership across stages of production. Because the use of design rules reduces transaction costs, it allows firms to communicate cheaply with little, if any, hierarchical coordination.

integration that is highly effective despite its informality because, as long as particular design and production paradigms do not change dramatically, they offer inexpensive guidance on the types of innovation that firms in an ID can expect to succeed.

3. Life Cycle Considerations

Inspired by Adam Smith's discussion of the benefits of the division of labor, a number of classic accounts of the life cycle have associated the development of decentralized production systems with an increase in the extent of the market (Young 1928; Stigler 1951). In Stigler's version, for example, firms start out vertically integrated because small markets do not permit specialization. An increased extent of the market permits the spinning off of those stages of production that benefit from increasing returns, thus generating the potential for an industrial district. As an industry ages in Stigler's account, declining demand for the industry's output would lead to an eventual reintegration. It is the central insight of transaction-cost economics since Coase (1937), however, that production costs alone cannot determine whether the division of labor will be coordinated through markets (as in an industrial district) or internally within vertically integrated firms. Transaction costs also matter. And technological change is one important source of transaction costs.

When innovation is radical or systemic, dynamic transaction costs may oblige an innovative firm to produce many of its own inputs in the early stages of both product and process life cycles because the novelty of its activities makes it hard to communicate its requirements to potential external suppliers (Langlois and Robertson, 1995). As in Stigler's account, dynamic transaction costs may initially militate against

the appearance of an industrial district, with external suppliers appearing only after the product had established itself. But the reverse can also happen: an industry may develop quickly into an industrial district but transform into one of vertically integrated firms when a systemic innovation raises dynamic transactions costs. Examples include automobiles in Detroit in the early twentieth century (Langlois and Robertson, 1989) and watches in Switzerland in the late twentieth century (Langlois, 1998).

Moreover, the relationship between innovation and the life cycle of an industrial district can be complex. Under appropriate circumstances, the organization of firms into industrial districts can have – and has had – important effects at all stages of product and process life cycles. Depending on the extent of economies of scale, networks of suppliers (multiple networks in the case of complex final goods) can develop to stimulate innovation for all of the reasons discussed in earlier sections, pushing products further along their innovation life cycles. As it takes time for knowledge to diffuse, the generation of clusters of suppliers located near lead firms is not surprising since the significance of new developments will occur first to those who have been closely exposed to them.

In the early stages of an ID, the increasing number of firms and accompanying increases in differentiation and specialization are similar to the network externalities that characterize patterns of adoption of high-technology consumer goods (Rohlfs, 2001). Although Marshall (1920) based his argument primarily on pecuniary externalities derived from economies of scale, producers can also benefit substantially from membership in networks such as industrial districts. Assemblers and other

integrators gain to the extent that, by being closely involved in a network of input suppliers, they are able to gain better services. While the latter may involve lower prices for inputs, improvement in the quality of the inputs (as measured by their suitability to perform designated functions) is another important benefit. Thus, an accelerated flow of innovations stemming from suppliers, or from the soundness of the relationship between the assemblers and their suppliers, can occur. Other things being equal, in comparison to geographically-isolated producers or members of more diffuse networks, integrators involved in a successful industrial district can reasonably be expected to benefit from the generation of a wide range of improvements offered up by their suppliers, just as users of a popular computer operating system can expect to have access to a wider range of software than would be available to users of a marginal operating system.

In addition to competing on cost, suppliers operating in an ID in the early stages of an innovation life cycle can offer new variations on their components, contributing performance improvements that can benefit assemblers in two ways. In some cases, all assemblers may adopt an innovative improvement that consumers perceive to be superior, but in other cases an innovative component that is not seen to be of general value will offer strategic advantages as some producers gravitate to particular market niches by (for a price) offering variations on a generic product for customers with special needs.

Because IDs do not comprise an entire market, their role in the generation of technical standards is complex. The relatively close levels of association between firms

in an ID can ease the setting of standards within the district because much of the agreement may be achieved informally and the limited number of firms within an ID makes it easier to bring the interested firms together. Furthermore, when there are only a few integrators who are determining overall designs, less discussion may be needed to achieve commonly-accepted interfaces between components. The effects of concentration on overall industry standards are less clear-cut and an industry may fragment into a number of groups dominated by local standards without agreement being reached on an overarching set of standards because there is sufficient volume of output within each ID to allow for self-sufficiency. As a result, while IDs may accelerate innovation along certain trajectories, they may also encourage myopic behavior in the gathering, generation, and use of new knowledge.

The role of industrial districts in promoting innovation in mature industries may also be considerable. Although mature industries, especially those with high concentrations of small- and medium-sized enterprises (SMEs), are sometimes portrayed as being technologically stagnant, this is far from the case (Robertson and Patel, 2007; Hirsch-Kreinsen, *et al.*, 2006). The European Union's Community Innovation Surveys and other studies show that the proportion of innovating SMEs in mature industries is at approximately the same level as for firms in general, a finding that applies to at least some mature industrial districts such as those in Emilia-Romagna where Cainelli and De Liso (2004) found significant levels of "intentional innovation" among firms.

It is clear that more-or-less successful innovation can sometimes be undertaken in the traditional industrial district mode. In Prato, as processes have become more complicated and marketing arrangements have altered, the production of textiles has been accompanied by a reactive "comflexification" in which new clusters of specialist firms have been added within the district to deal with an increasingly complicated and differentiated environment. Although some of these new clusters within the Prato ID represent new techniques, in many cases new service firms have arisen to deal with areas such as marketing and sales (Lazzeretti and Storai, 2003). In this case, at least, the traditional ID format has proved to be flexible enough to accommodate important organizational innovation.

4. Negative Effects of Embeddedness

Much of the impetus behind innovation may nevertheless derive from events outside a district – as a result of innovations developed elsewhere and of shifts in consumer demand. The survival of firms, and of entire IDs, therefore depends largely on their ability to adjust to external developments. Indeed, Piore and Sabel's (1984) championing of industrial districts was based largely on their contention that small firms with generic equipment are more flexible in responding to shifts in demand than large, capital-intensive firms with substantial investments in dedicated equipment.

Nevertheless, the factors underlying successful innovation in some industrial districts may turn out to be weaknesses depending on the broader innovation environment within a trade or industry. Firms in an ID may simply be slow to notice changes arising outside their district because they do not have good external channels

of communication. As Marshall (Loasby, 1990) recognized, close relationships among firms and their workers could reduce their access to knowledge developed outside the district and their willingness to consider ideas from unfamiliar or distant sources.

Paradoxically this failure of firms is possible after their IDs have had a period of market leadership. They become over-confident and suffer from what Alberti (2006) calls "success myopia". The result is that *trends* in innovation (and not just innovation *per se*) in an ID tend to suffer from inertia[9] – that once tendencies develop, they are harder to stop or to reverse than might be the case if knowledge were generally collected far and wide and if new knowledge were not generated to accommodate implicitly standardized local interfaces. This can lead to severe, perhaps fatal, difficulties when the district is not at the leading edge or when consumer tastes have changed.

Boschma (2005) argues that "too much and too little proximity are both detrimental to learning and innovation. That is, to function properly, proximity requires" just the right amount of distance between actors or organizations. Geographic proximity, for example, may enhance inter-organizational learning and innovation, though in the absence of geographic proximity other forms of proximity may substitute for it. On the other hand, too intense proximity, geographic and otherwise, can result in lock-in. Proximity/embeddedness can evolve over time, too, from not enough, to just enough, to too much, suggesting a link between the issues of embeddedness and life cycle considerations.

[9] For an account of the decline of the Ruhr, see Grabher (1993).

For instance, decentralized systems of innovation (including industrial districts) may be at a disadvantage in generating genuinely systemic innovations (Teece 1986), that is, innovations that require the development of new components as well as new ways of integrating components. In such a case, the location of much of the relevant knowledge within a tightly coupled system is likely to facilitate innovation. This need not mean a single vertically integrated firm, but it does mean that lead or coordinating firms — in modern terminology, systems integrators — must possess a wide range of knowledge or capabilities and must indeed "know more than they do" (Brusoni, Prencipe, and Pavitt, 2001). They also need to be powerful enough to force other firms to follow their lead.

In addition, their reliance on local standards can impede efforts by firms in an ID to indigenize innovations from outside, again raising the costs of adjustment and the time required. Finally, firms within a mature ID that do develop innovations may not only find it difficult to generate interest within their ID but are poorly placed to market their innovations externally.

For example, the ability of firms in an ID to jump from one technological trajectory to another (Robertson and Langlois, 1994) is often limited by the cumbersome decentralized organization of many districts. Because of high degrees of specialization and the large number of firms that participate in the production process, reeducation procedures are likely to be lengthy. Attributes that once were strengths, such as the presence of implicit standards, can turn into weaknesses that retard a transition from one technology to another. Thus, during periods of major change, the role of integrator

firms with strong connections to the external environment is especially important since it is unlikely that smaller suppliers of inputs would have the resources to gather information from diverse sources quickly. The upshot could be major centralization of power and, perhaps, the destruction of many smaller firms as they consolidate or disappear. Nevertheless, there are exceptions, as in the ski boots and sports footwear district of Asolo and Montebelluna where, through concerted development efforts, the producers have coped successfully with a radical change from leather to plastic (Camuffo and Grandinetti, 2006).

The problems in adjusting are illustrated by changes in the organization of two Italian industrial districts following the development of important export markets. Although innovative production processes in the "*distretto murgiano*", which specializes in the production of leather sofas, were undertaken by small suppliers, the processes were introduced under the direction of a "leader firm" (Natuzzi) that had penetrated international markets to become the world's leading producer (Albino, *et al.*, 1999). Because of its special needs as a larger firm and of its knowledge of international best practice, Natuzzi was able to direct the upgrading of supplier technologies. In the process, however, the organizational model seems to have changed from the canonical industrial district to something approaching relationships in Japanese Keiretsu in which the large firms routinely dictate innovation paths to their small suppliers (Miyashita and Russell, 1994). A second example is the eyewear industry in the Belluno district in the Italian Dolomites. In this case, as a result of entering export markets and later of intensified competition in the domestic market by non-Italian firms, the organizational

model fragmented as the larger firms, notably Luxottica (by far the world's leading producer of eyewear in 2001), first adopted a leader-firm model similar to that in the leather sofa industry, but eventually went all the way to vertical integration, eliminating dependence on external suppliers altogether. Ultimately four large integrated firms (including Luxottica) were established, but several hundred small firms have continued with diminishing success to operate in the traditional ID mode (Camuffo, 2003).

The shift towards computer aided manufacturing in the furniture industry in Ireland is also changing the nature of the relationships among firms in the region. Leading firms are emerging with the more sophisticated technology, with reduced linkages to the local region and closer ties with strategic allies – particularly but not exclusively upstream – in other countries (Heanue and Jacobson, forthcoming).

In some cases, exogenous technological shifts can render obsolete virtually the entire set of competences of an industrial district. One such example is the venerable Swiss watch industry, which saw its advantage in mechanical watch movements destroyed by the development of the electronic movement in Japan (Langlois, 1998). In such a case, no incremental or endogenous processes of innovation could have been expected to respond adequately to the challenge. In the event, the Swiss industry adapted with a centralized response that incorporated some existing competences (like design and marketing) but left the industry far more vertically integrated — far less an industrial district — than it had been.

Less positive results are also possible in the mature stage of the industry cycle. Alberti (2006), writing of the decline of the textile ID of Como, identifies a number of

cyclical factors, including the "erosion in top market segments" from new entrants. At the same time, there was a downturn in the global textile industry. In this case, rather than large firms emerging, as in Belluno, with vertical corporate integration providing solutions to low levels of inter-firm collaboration, production, exports, number of firms and employment all declined. The number of workers, for example, went from over 36,000 in 1991 to less than 1,900 in 2003.

5. Conclusion: Innovation and The Future of Industrial Districts

Our survey leads to a mixed evaluation of the advantages that industrial districts hold for the generation, diffusion, and use of innovative knowledge. When circumstances are favorable, the high degrees of differentiation and specialization in IDs, combined with high degree of social embeddedness, can encourage knowledge creation in a Smithian sense. As technology evolves in the wider environment, however, the advantages that industrial districts often offer for the generation and diffusion of knowledge may weaken.

As we have shown, much of the attractiveness of compact, highly-localized areas of production results from their ability to reduce search costs, but this is accompanied by the risk that the knowledge available in any given district may be substandard. But new information and communications technology (ICT), may make it possible for firms to draw more cheaply and effectively on diverse sources of knowledge and therefore to increase their access to innovative ideas (as well as their ability to market their own innovations if they wish) (Langlois, 2003; Christensen, 2006). This may not undermine all aspects of the operations of IDs because differentiation and specialization retain their

importance, and proximity is useful in just-in-time and other lean ways of organizing production. For innovation, however, an ability to tap wider sources of knowledge quickly and cheaply can reasonably be expected to allow firms all along supply chains to consult more broadly than in the past. Improvements in ICT and new search techniques, many of them associated in one way or another with the internet, not only increase access to knowledge but may force innovation on firms that in the past could shelter in IDs. Because their customers can be better informed, firms in IDs need to keep up to date in order to maintain competitiveness.

This does not mean that all firms in industrial districts will need to become knowledge junkies in the sense of *directly* searching their broader environments in detail. Commentators on IDs sometimes forget that many firms are embedded in several different networks albeit with different levels of strength and commitment. Firstly, as is generally recognized, even small and highly specialized firms in traditional industrial districts usually maintain indirect contact with the outside world through the sale of final products in external markets. In very traditional IDs, *impannatori* and distributors act as conduits for information, but even in more sophisticated markets such as eyewear, the manufacturers that develop marketing expertise are able to inform their suppliers on product and process innovations.

Secondly, industrial districts constitute only one type of industrial agglomeration and even in an ID some firms may belong to more than one type of cluster. In particular, in addition to regional or local systems of innovation, of which IDs may be considered to be one variant, many firms also belong to sectoral systems of innovation

(Malerba, 2004: 2005) that give them access to new knowledge from other regions or even globally[10]. When this is true, the close relationships in an ID may be both devalued and enhanced because, although locally-developed innovations are no longer as well placed to capture attention within an ID as when isolation is greater, the close relationships among firms can still encourage a rapid and cheap diffusion of innovations, no matter their source. Because the benefits of cheaper global searches are unlikely to greatly affect many small suppliers, for whom the limited amount of time available to managers to consider non-routine activities remains the crucial bottleneck, the diffusion capabilities of IDs will remain important because they will allow one or two firms, or perhaps a cooperative association, to conduct efficient searches to the potential benefit of all firms in the district.

Therefore, while industrial districts will continue to offer advantages for knowledge diffusion and also when considerations such as time and transport costs are important, it is probable that improved methods of communication will generate substantial changes in many cases as local exchanges of knowledge become less advantageous and systems integrators assume tighter control over their suppliers.

[10] This may be called "stretched" or "distantiated" embeddedness. See Heanue and Jacobson (forthcoming).

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