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**“The role of proximity in retrospective: the
coevolution of organizations, ICT and human
resources in Italian traditional districts’ firms”**

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The role of proximity in retrospective: organizations, ICT and human resources in Italian traditional districts' firms.

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Abstract: *The existence of strong complementarities between ICT diffusion, investment in human capital and organizational innovations has been recently stressed both by theoretical and empirical literature on industrial organization and economic growth. For many scholars, one of the reasons of the delay of Italian industries in addressing rising global competitiveness and improving productivity can be traced back to the inability to create the right environment for the synergetic coevolution of the three above-mentioned variables. This paper tests the hypothesis that the coevolution within the firm of the three variables, could have been influenced by the belonging of the firms to industrial districts' environments. In particular it controls whether firms which have made more use of proximity in their activity express retards or even "lock-in" phenomena in organizational innovations with respect to the two other complementary variables. After discussing the issue of coevolution for the three variables and the role that district environments can play for the formation of phenomena of organizational inertia, we test the hypothesis of co-evolution between organisations, ICT, and human resources through a survey of 223 'district' and 'non-district' Italian small firms.*

Keywords

Coevolution, ICT, Human Capital, Organizational Change, Geographical Proximity.

Jel Classification Code

R11, D21, O30.

1. Introduction

In the last decade there has been a strong interest on the causes behind the lost of competitiveness of Italian industry (Gallino, 2003; Onida, 2004)¹. Besides the analysis of the structural weaknesses of our economic, institutional and social context², recent studies have considered a more firm-centered perspective which tries to analyse the causes of the slow pace of Italian productivity growth. These studies focus on the forces that drive the co-evolution of three complementary variables: technologies, organizations, and human skills. This paper fits in this area by referring to those collections of studies that investigate the dynamics that link together the adoption, emergence and acquisition of: information and communication technologies,

¹ In particular the issue of the 'Italian model's decline' has gained particular relevance recently in Italy. The performances of many of the traditional industrial districts have seriously dropped because of the competition of low-wage countries, and the adoption of new forms of organization and technologies seems neither significant nor rapid enough to avoid industrial decline. This question has been recently brought to the attention of a wide international audience by The Economist (2005), in a special report on Italy. By writing that "Over the past decade or two, the structural failings of the Italian economy have become brutally clear" and that "what makes [such structural failings] especially hard to deal with is that for years many of them were seen not as weaknesses but as strengths" the authors openly associate Italy's "industrial decline" with the loss of confidence in the industrial district model.

² One can identify four fundamental areas of weakness on which the analyses have agreed: i) the exhaustion of the potentiality of a model of specialisation based on traditional sectors (Vivarelli e Pianta, 2000); ii) the prevalence of innovative choices of a marginal kind (based on incorporated technical progress) (Nardozi, 2004); iii) the predominance of small firms, that even if organized in the form of industrial districts, would not be able to supply the same support to the processes of innovation as would medium and large scale firms (Malerba, 2002); and iv) the diffused cultural corruption between social, institutional and governance levels (Graziani, 2000; Bianchi, 2002).

organisational change and human resources; and how the coevolution of these three variables is at the base of the productivity that is expressed in aggregate by a certain model of industrial organization (Brynjolfsson et alii, 1997; Bresnahan et alii 2002; Sterlacchini, 2005; Vivarelli, Piga e Piva, 2004).

After discussing briefly the literature on the co-evolution of the three above mentioned variables at the national, regional and firm level, a behavioural perspective is considered in order to assess the relevance of inertia and habits phenomena (Barnes, Gartland and Stack, 2004) in hampering the dynamics of this co-evolutionary process for small Italian firms. More precisely, the focus is on how the role of phenomena of cognitive anchoring to old and standardized practices, developed within mature industrial districts and linked to the use of proximity, fits into the above-mentioned coevolutionary process. Following this line of reasoning, the usual research methodology (mostly aimed at look for the determinants of ICT adoption, organisational change, and investment in human resources) is here reversed, and the analysis is focused on the conditions that slow down and hamper a more productive co-evolutionary processes.

The hypothesis is that if a certain degree of behavioural inertia is inherent in individuals' nature and organizations, that inertia could have been reinforced (and even 'locked-in') in mature industrial districts because of the social reinforcement of a series of habits linked to the use of proximity. The cognitive foundations at the base of such hypothesis are here briefly quoted³ and the resulting hypothesis tested through a sample of 223 firms.

The structure of the paper develops as follows. In the next section the relations of complementarity between organizational change, ICT adoption and human resources development are discussed at the national, regional, and firm level as they are presented in the literature. The third section analyses the economic implications of individual and organizational inertia, and the hypothesis that the natural inertia in organizational change can be amplified within those firms which have developed their organizational capabilities within a district environment, and thus which have been used to make a strong use of proximity, is analysed. In the fourth section the outlined hypothesis is empirically tested on the basis of a sample of 223 firms. Conclusions are presented in the last section.

2. The co-evolution of ICT, human resources and organizations

Recently, both theoretical and empirical literature on technological innovation and organizational change have made important progress by recognising the complementarities existing between adoptions of ICT, organizational change and investments in human resources, and their effects on firms' productivity. The main point of this literature lies in the statement that the adoption of ICT fosters new organizational practices and requires new labour skills in a relation of mutual complementarities. Only actions simultaneously involving all these three variables can effectively increase firm productivity and avoid the so-called Solow paradox, i.e. an insignificant, or even negative, impact of ICT diffusion on the firm/sector/region's competitiveness and productivity (Brynjolfsson et alii, 1997; Caroli, 2001; Santarelli e Vivarelli, 2004; Vivarelli, Piga e Piva, 2004). But if one wants to go more deeply into the mechanism of this process, the task becomes more difficult and still not completely framed. In particular some fundamental questions remain unanswered concerning the causal unfolding of the three variables at the regional and local level. How to (re)frame in a local developmental perspective the causal relations that link the three variables is indeed not only a theoretical pressing question but strongly relevant for both the tasks of local policies design and intervention.

³ An extended analysis on the influence of proximity on cognitive processes can be found in Seri 2007.

At the aggregate-national level the analysis follows the thesis, largely rooted in economic theory⁴, that technological progress influences the composition of productive activity and its organisational assets, and as a result, human resources demand. In particular, the growing pervasiveness of ICT today, has sparked new interest in this debate. It can be hypothesised that the digital revolution, which has modified the inputs used by firms, implies also a structural change within human resources, that results in the requirements of new knowledge and organizational changes concerning qualifications and modalities of organization of the employees. These themes have been the objects of a series of studies known as “skill-biased technical change” that have, since the Nineteen-Nineties, analysed the impact of technological progress on the composition of the workforce of a nation (see among others, Greiner, Rubart and Semmler, 2004). The central hypothesis in this literature is that technological progress shows a distortion or bias towards workforces which are highly educated and qualified. Furthermore – as a complementary and reinforcing effect – the same progress reduces the possibilities for the employment of less educated and qualified people. Other authors, instead, support the opposite interpretation of these phenomena (Acemoglu, 1998, Acemoglu, 2002); according to these models, the increase in qualified work supply witnessed in the second half of the 20th century thanks to the wider diffusion of public education, would have seen technological progress result in a direction of development that is favourable to the utilisation of more abundant human resources, reversing in this sense the relation of causality between human resources and technology. However, the characteristics of cumulativeness, path-dependence and irreversibility of the process of technological evolution (Rosenberg, 1982; Dosi, 1988) allow us to assume that the latter is less-inclined to be passively formed by stimuli deriving from market and productive factors.

If one then introduces into the analysis the organisational factor, the theoretical literature proposes even in this case single cause explanations, where organisational change can be the result of technological progress (Aghion et alii, 1999), or, as in the case of the strong version of the skill-biased organizational change, its cause (Caroli e Van Reenen, 2001). In any case, as pointed out by Vivarelli et alii (2004), the focus is always on monodirectional explanations, while developmental processes involving changes on the three variables should be considered as a more complex co-evolving process including institutional and environmental variables.

The shortness of these mechanistic explanations appears in the empirical studies at the national levels, which, besides being still incomplete, are often not concordant. The theory of skill-biased technological change is strongly confirmed only for a limited number of Anglo-Saxon countries (essentially USA, UK and few others) while it's doubtful that it is valid for countries that have characteristically and institutionally different markets. And the same problem applies for the other declinations of the theory (Bratti and Matteucci, 2005), thus confirming the difficulty to find a general validation of monodirectional causal relations.

But the main limits appear when the focus is shifted on the (meso) perspective of local development, and when one tries to extract the normative insights of these theories. In fact, it is well known (and a main policy problem) that sub-national regions and local systems react in different ways to the push of technological progress.

The main problem for the task of generalization of the causal relations between the three variables here follows from the relatively high degree of irreducibility of the complex and open nature of the problem of (local) development. In fact, reducing the degree of complexity of the development's analysis of local systems to monodirectional causal explanation between the three variables considered here, would mean to eliminate a priori potential explanatory variables, and ultimately, to elude the reasons that justify the adoption of a local (territorial) unit of analysis. This means that the existence of a complex system of feedbacks between the three interested variables and other local variables makes it more difficult to reduce the analysis in terms of

⁴ Famous is, e.g., the chapter which David Ricardo, at the beginning of the 19th century, devoted to the analysis of the effects of mechanizations on labour, in his book “Principles of Economics”.

explanandum and explanantes. Ultimately, this would lead to believe that there exist 'local' ways of interaction and specific causal interdependence between the three considered variables.

In order to shed further light on this discussion, it is helpful to go back to the firm and reconsider the analysis that has been done at this level. Case studies at the micro level confirm the idea that firms introducing new ICT must implement this adaptation with higher demand for skilled workers and workplace reorganization⁵. In order to make the use of computers and related technologies more productive, firms need a well-educated labor force, thereby characterizing the ICT revolution at the aggregate level, as a skill-biased technical change. Moreover, since computers change the way and the speed by which information is produced and diffused, firms must accordingly change their internal functioning. As emerged from US firms' reorganizations, the trend is toward firm vertical disintegration with a reduction of the number of managerial levels and more decentralized decision and productive processes⁶. In turn, these workplace innovations induce a further increase in the demand for skilled labor, influencing also the pace of research activity and thereby the rate of growth. If this kind of descriptive analysis presents clearly a developmental flavour, it is explicitly not in the aim and possibilities of aggregated econometric works to define causal directions between the considered variables but, instead, to test for correlations and for aggregate effects produced by ICT adoptions. Effects which appear only in the case that they are effectively accompanied by change, at the firm level, of the other two variables. This doesn't explain, however, what happens in the other cases. What is the explanation for those firms that, while investing in ICT, don't implement these investments with changes in the organizational form and adaptation of human resources? Why and which firms, in the Italian case, do not enter (or complete) the processes of introduction of the three complementary changes even if they have been proven to increase productivity and to produce superadditive effects and synergies in terms of competitive advantages (the "*Edgeworth complementarities*" discussed by Holmstrom and Milgrom, 1994)?

Looking at those firms that fail to implement the upgrading, it becomes important to search for the obstacles at the basis of this failure. In other words, the absence of unambiguous cause-effect directions in the development processes of the three vertexes of the "competitive triangle" (as it has been called by Vivarelli, Piga e Piva, 2004), suggests to reverse the analysis and to look for existing blocks hampering the unfolding of the coevolutionary process.

Along this line of research Bugamelli and Pagano (2001) show – through a survey of 2,398 Italian manufacturing firms – that the low level of human capital and the lack of firm re-organization act as barriers to investment in ICT. Other works, as far as Italy is concerned, show little organisational change: Trento and Warglien (2001) find that over 80% of a representative sample of 1,500 manufacturing firms have left hierarchical levels unchanged, although most of them introduced new technologies.

Obstacles to organizational changes can be, of course, situational conditions that change in relation to the context, and thus hardly generalizable. Nonetheless, it is possible to develop some hypothesis on the general conditions under which entrepreneurial and organizational dynamics can be biased once a cognitive and behavioural perspective is taken.

The following analysis is focused on the role that phenomena of cognitive anchoring to old organizational routines can play in the above-mentioned co-evolutionary process, and on the hypothesis that the habits of making use of proximity within the organizational structure of mature industrial districts can hamper small firms' organizational dynamics.

⁵ According to Black and Lynch (2000) workplace practice accounted for approximately 90 percent of total factor productivity growth in US manufacturing in 1993-96.

⁶ For example, thanks to the cheaper monitoring over the entire production process made available by the new technologies, single workers are more autonomous and more frequently called upon to make crucial decisions.

3 The problem of organizational inertia and the role of 'district environments'

A large body of experimental results shows that human decisions display systematic deviations from fully rational ones, and that in many cases 'errors' persist even when the rational solution has been explicitly shown to the subjects. This happens both in individual and team decision-making. In the case of teams and organizations, it may happen that systematically erroneous decisions are made by organizations because – given the bounded rationality of individuals of which they consist – they may adopt routinized strategies, which are not changed even when they are highly sub-optimal (Bonini & Egidi, 1999). Levinthal and March (1993) single out a number of 'traps' into which an organization may fall during the process of organizational learning, and analyse among them the 'success trap', a specification of the generic phenomena of 'cognitive anchoring' for individuals. It regards the fact that the tendency of organizations to focus on success may induce them to persist excessively in the use of procedures and actions that have been associated with successes in the past. This tendency may induce organizations not to adapt, or to adapt with difficulty, to changed environmental conditions.

In a recent publication, Barnes, Gartland and Stack (2004), refer to the notion of "behavioural lock-in", as a phenomenon that "occurs when the behaviour of agents (consumer or producer) is 'stuck' in some sort of inefficiency or sub-optimality due to habit, organizational learning, or culture." In their introductory analysis they point out that while an increasing number of scholars have begun to argue that marked forces may not automatically select the best technologies (David, 1985), the behavioural dimension to lock-in is not as well documented in empirical work. The discussion about pathological phenomena of deviation from optimal allocation (such as path dependence and lock-in phenomena) has been mostly focused on non-cognitive mechanisms. For instance, regarding the possibility that inefficient technologies will be adopted and persist due to increasing returns, self-reinforcing mechanisms, and externalities, much of the focus has been on the possibility of market failure due to industry-wide adoption of an inferior standard. Less attention has been paid to the role of path dependence as it pertains to individuals and organizations, and to the influence that the local environment can exert on this process.

Recently, there has been some attempt to apply experimental results to empirical research on industrial organization, but despite the relevance of the cognitive realm that has been recognised for some time in economics, works on behavioural lock-in at the organizational level are still rare.

With respect to organizational change, once a particular behaviour is embedded in organizations, a strong "status quo" inertia may discourage other behaviour. It takes tremendous efforts to change, and individuals may simply be uninterested (even when they suspect it is necessary). Employees may resist trying and learning a new process or technology, especially when they are too set in their ways to learn something new, while the employer's cognition of important economic processes can remain anchored to former and out-of-date practices.

Heffernan (2003) states that inefficient path dependence can exist and does persist in the short run as the result of the fact that economic agents cannot conceive of, and react to, all possible contingencies, and thus it can occur as a result of the rules following behaviour. This does not mean that it should necessarily result in lock-in. Following the Austrian tradition on entrepreneurship research, he considers entrepreneurial alertness to be the variable which can dissuade individuals and organizations from continuing to adhere to a clearly dysfunctional set of rules. If this occurs, the result will be rules following behaviour for extended periods punctuated by changes in the set of rules when shocks produced by entrepreneurial alertness occur. In other words, path dependence can result in real inefficiencies but they may be relatively short-lived due to entrepreneurial alertness.

The hypothesis tested in this paper is that industrial districts environments and the 'habit to proximity' in its spatial, emotional, cultural and relational context can produce – in certain circumstances – a reinforcement of the natural inertia of entrepreneurial and organizational

adaptation, hence, producing persistent obstacles to the co-evolution of organizations, ICT and human resources.

In order to argument this hypothesis, however, we must consider together the two – still quite separated – fields of research of organizational learning and geography of innovation. In fact, usually the obstacles present in ICT-related organizational changes, are traced back to the internal environment of the firm (e.g. small size, ownership's structure and inadequate human capital, lack of internal R&D, etc). Little importance is given to the informal influences that firms receive from the external environment. The role of the local environment has been mainly limited to the generation of informal mechanisms with positive externalities on technological and organisational learning (knowledge and informational spillovers), while potential negative influences have been quite neglected, giving rise in this sense to a sort of asymmetry in the literature (Seri, 2003). In these perspectives, obstacles to organisational change have been mainly identified within the boundaries of the firm or within their formal relations with other organizations. If it is broadly accepted that learning obstacles occur in large part within the firm's organisational boundaries (and in part in the formal relations established with external organisations and institutions), recently some authors have developed the hypothesis that the framework of analysis of the variables influencing firms' behaviour should be complemented by those negative informal externalities that districts' environments can exert. Some specific case studies on this issue have been presented in literature on economic geography (Grabher, 1993; Isaksen, 2003; Menzel, 2007), while other authors (Seri, 2003 and 2007; Broekel and Binder, 2006) offer some theoretical issues for the understanding of cognitive obstacles to local development and the broader influences of proximity on cognitive and behavioural processes. For the analytical foundations of this issue I refer to the above mentioned literature, while for the aim of this work I will briefly outline the fundamental concept with the aim to make the hypothesis empirically testable.

Proximity between economic agents produces direct and indirect effects on knowledge transfer and individual cognitive processes, (Seri, 2007). Direct effects are those related to space as a physical variable, i.e. mere *physical distance*, and relate to the cases where the variable 'distance between agents' enter directly the individual cognitive functions (being it the function of attention and 'alertness' (selective attention processes), of learning, of motivation, etc.) without the intermediation of any other variable. In this case the activation of specific cognitive mechanisms is defined by spatial proximity by means of our physiological constraints that limit the space to which we can relate, and make use of, our sensory orders.

Indirect effects depend, instead, from localized variables historically generated and socially constructed. They refer to all those influences that proximity exerts on cognitive processes at time t , but distinguish through the intermediation of third variables (which can be trust, social cohesion, reciprocity, or more generally shared mental models, etc.) those which have originated within a local community in periods before t (i.e. by the repetition in time of the condition of spatial proximity between agents). In this sense this distinction distinguishes the influences of the local environment intended as an *historicized context*, from those that are the immediate effects of the physical proximity between agents.

Both categories of effects, in turn, can be functional or dysfunctional to the adaptation and learning necessities needed by individuals and organizations at different contingencies and periods of time. The first category produces forms of habits toward the organization of a production process which makes a strong use of proximity, and let small entrepreneurs to tendentially avoid new organizational forms. While the second group of effects is at the base of the well-known hypothesis of over-embeddedness of economic decision and actions with the local social sphere (Granovetter, 1985; Zucchella, 2006). Following this hypothesis, socially constructed behaviour can be defined as the set of shared practices, heuristics and values developed through repeated interactions and the sharing of a common patrimony of resources, competencies, production routines, and objectives at the local level. In this sense, individual behaviours in industrial districts

are constrained by socially embedded forms of production, trust, cooperation, reciprocity, motivation and search.

Because of these effects individuals and organizations, which are parts of local production communities based on proximity, may experience inadequate capability to react to sudden changes. If this is true, the spontaneous co-evolution between ICT, human resources and organizational forms, can be hampered by the anchoring effect to old organizational behaviour deeply rooted into locally constructed shared mental models. Following this logic, explanatory models which suppose spontaneous adaptation mechanisms, such as the *skill-biased technological change* theories cannot be taken for granted in industrial districts' environments. This seems to be confirmed by data on the still very weak demand for educated human resources within the 'so-called' traditional Italian industrial districts (Unioncamere, 2007). It seems more realistic to include into the chain of explanation of the analysed co-evolutionary process, a control variable expressing the effective belonging of small firms to the organizational structure of mature industrial districts, in order to control for the "organizational lock-in" effect of this variable.

4. Testing the hypothesis

4.1 Data and variables definition

Almost 1000 questionnaires were sent out at the end of 2003 together with Censis who was the leader of an ICT development project for the province of Macerata⁷. A stratified random sample of the firms with less than 250 employees was extracted from the universe of firms collected in the registry of the regional chamber of commerce by using size and industry as stratification variables. 363 firms filled out and sent back the schedules (36% answer rate). The fact of limiting the analysis to a particular region (the Province of Macerata), although dictated by obvious exigencies of budget, is functional to the adopted comparative method of research, since it allows us to exclude distortions due to institutional, or strong cultural differences.

The resulting distribution of industries provides a good representation of the manufacturing industries located in the region (Tab.1) and reflects the interest of the project in the shoes' industrial district of Civitanova Marche/Fermo, one of the major Italian shoes industrial districts which is facing a strong decline in relative productivity and competitiveness⁸ due to aggressive competition of new industrialising countries.

After excluding from the analysis those firms with less than 5 employees and those with more than 50 in order to focus our analysis only on small firms, we were left with the following 223 firms

Tab. 1

Industry	Firms	Employees	Average
Shoes	109	1702	15,61
Mechanics	46	635	13,80
Electronics	22	235	8,50
Other manufacturers	32	700	21,87
Other non manufact.	14	215	15,36

The questions asked in the questionnaire include information about the three variables discussed previously in the paper (ICT, human resources and organizational changes) with a particular degree of analyticity for ICT.

⁷ For a detailed description of the project ("SprintMacerata") see <http://www.censis.it/277/372/4976/388/cover.asp>, while for a study of the collected data concerning ICT adoption see Seri 2005.

⁸ Although a few larger firms show an opposite trend, the overall situation in the district is such to cause major social problems of unemployment.

Three indexes are provided in order to measure the three complementary variables of the 'competitive triangle' for each firm, i.e. ICT assets (ICT), human resources (HUM) and organizational innovation (ORG). Besides these three variables, a fourth index is provided, in order to describe the degree of geographical proximity of each firm's productive network (PROX). This allows to test the hypothesis on the reinforcing role played by proximity on organizational inertia.

ICT assets

With respect to ICT, we know the firm's level of ICT investment devoted to hardware, software and telecommunications equipment in the last five years. Since we found that the Pearson's and Kendall's correlation coefficients between different measures of ICT investment and the other variables won't change the results significantly, for the following analysis we have aggregated the values and weighed the result by the number of employees, obtaining an index of general ICT investment.

Human Resources

To measure the level of the skills in the firms' workforce we consider the composition of the workforce by level of education: in particular the index HUM indicates the share of university degree graduates hired during the last five years per employee.

Organizational Changes

In order to generate this variable, we asked for organizational change induced both by the firm's product innovation and by process innovation, obtaining a unique binary variable. Unfortunately, the dataset does not provide more detailed information about the nature of organizational changes. Given the size of the firms included in our dataset (between 5 and 50 employees), we may suppose that for most of the cases, the value '1' for this variable indicates the change from a very low degree of organization to the introduction of a first organic structure, with the routinization of procedures and the adoption of new-work practices which include in the main cases the first attempt of de-layering in order to spare entrepreneurial resources (Robertson and Langlois, 1995).

Use of Proximity

In order to provide an objective criteria for distinguishing between real 'district' or 'non-district' firms, where the 'district' label refers to the actual condition of proximity between the networking firms, we asked for a group of information indicating the location of productive and commercial partners. This last group of variables contains data about the rate of partners according to their degree of geographical proximity with the interviewed firm. Productive and commercial partners have been distinguished between suppliers of raw materials, jobbing and semi-manufactured, intermediate products, retailer agents. The possible answers for the different kinds of partners could be: local, regional, national or abroad. The range of the PROX index has been standardised between '0' and '1', where the '1' value means that 100% of the suppliers find themselves into the local environment, whilst 0 means that no one is there, thus, either in the regional or national territory or abroad. The usual practice in empirical works aimed to observe different behaviours between firms which make a strong use of proximity and firms which do not, is to distinguish between district and non-district firms, and consequently look for differences in the interested variables. This distinction is usually based on a dummy constructed on the geographical location of the firm, which could be inside or outside a district area, which in turn, is often arbitrarily defined. In fact, such definitions are either supplied by algorithms that define geographical areas inside which commuters gravitate (the so called local labour systems, Sforzi, 1989), or by the direct declaration of being (or not being) a member of the district by the entrepreneurs or managers who filled out the questionnaire. A third method (mainly used in Italy) is to refer to the laws that indicate those municipalities that belong to a district area at the aims of policy design. All of these

methods have been broadly criticized for various reasons (Breschi and Lissoni, 2001; Lissoni and Pagani, 2003). In fact, for a firm to be located inside a district area does not mean it is actually a part of a local network of production (Seri, 2007). In other words, the geographical location is not a sufficient criterion to tell something about the actual “use” of proximity by the firm. The index PROX utilised here instead expresses the actual geographical extension of each firm’s networks.

4.2 Results

Table 3 reports the Pearson’s correlation coefficients between the obtained variables distinguished by sectors.

The correlation between the investments in ICT and in human resources has the expected sign for all of the industries. ICT investments are positively associated with the index expressing the share of university degree graduates hired during the last five years per employee plus the share of participants in ICT training courses.

Tab.3

Industry			PROX	ICT	HUM	ORG
Shoes n = 109	PROX	Pearson Correlation	1	,193 [*]	,144	-,227 [*]
		Sig. (2-tailed)		,044	,137	,017
	ICT	Pearson Correlation	,193 [*]	1	,825 ^{**}	,126
		Sig. (2-tailed)	,044		,000	,190
	HUM	Pearson Correlation	,144	,825 ^{**}	1	-,116
		Sig. (2-tailed)	,137	,000		,229
	ORG	Pearson Correlation	-,227 [*]	,126	-,116	1
		Sig. (2-tailed)	,017	,190	,229	
	PROX	Pearson Correlation	1	,030	-,047	-,332 [*]
		Sig. (2-tailed)		,842	,754	,024
	ICT	Pearson Correlation	,030	1	,525 ^{**}	,467 ^{**}
		Sig. (2-tailed)	,842		,000	,001
Mechanics n = 46	HUM	Pearson Correlation	-,047	,525 ^{**}	1	,085
		Sig. (2-tailed)	,754	,000		,574
	ORG	Pearson Correlation	-,332 [*]	,467 ^{**}	,085	1
		Sig. (2-tailed)	,024	,001	,574	
	PROX	Pearson Correlation	1	,004	,114	-,487 [*]
		Sig. (2-tailed)		,987	,614	,021
	ICT	Pearson Correlation	,004	1	,849 ^{**}	-,085
		Sig. (2-tailed)	,987		,000	,708
	HUM	Pearson Correlation	,114	,849 ^{**}	1	-,240
		Sig. (2-tailed)	,614	,000		,282
	ORG	Pearson Correlation	-,487 [*]	-,085	-,240	1
		Sig. (2-tailed)	,021	,708	,282	
Electronics n = 22	PROX	Pearson Correlation	1	-,266	-,156	-,534 ^{**}
		Sig. (2-tailed)		,141	,395	,002
	ICT	Pearson Correlation	-,266	1	,797 ^{**}	,185
		Sig. (2-tailed)	,141		,000	,311
	HUM	Pearson Correlation	-,156	,797 ^{**}	1	-,061
		Sig. (2-tailed)	,395	,000		,739
	ORG	Pearson Correlation	-,534 ^{**}	,185	-,061	1
		Sig. (2-tailed)	,002	,311	,739	
Other Manuf. n = 32	PROX	Pearson Correlation	1	-,266	-,156	-,534 ^{**}
		Sig. (2-tailed)		,141	,395	,002
	ICT	Pearson Correlation	-,266	1	,797 ^{**}	,185
		Sig. (2-tailed)	,141		,000	,311
	HUM	Pearson Correlation	-,156	,797 ^{**}	1	-,061
		Sig. (2-tailed)	,395	,000		,739
	ORG	Pearson Correlation	-,534 ^{**}	,185	-,061	1
		Sig. (2-tailed)	,002	,311	,739	

Other non manuf.. n = 14	PROX	Pearson Correlation	1	,058	,184	-,314
		Sig. (2-tailed)		,844	,530	,274
	ICT	Pearson Correlation	,058	1	,830**	,157
		Sig. (2-tailed)	,844		,000	,591
	HUM	Pearson Correlation	,184	,830**	1	,067
		Sig. (2-tailed)	,530	,000		,821
	ORG	Pearson Correlation	-,314	,157	,067	1
		Sig. (2-tailed)	,274	,591	,821	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Concerning the shoes sector, we can observe that the weak positive correlation of ICT with PROX can be the result of the inducement to invest in ICT produced by different incentive-policies activated from the local institutions, in particular from those dedicated to the shoes industrial district. But what is more noticeable here is the significant negative correlation of ORG with PROX. This could mean that organisational innovations decrease in the case of firms operating within a strictly local network.

The situation in the mechanical sector is similar concerning the negative correlation of ORG with PROX, with minor changes in the other relations (essentially a stronger correlation of ORG with ICT which reflects the specific use of ICT made by this sector), and in the electronic sector, where we can notice an even stronger negative correlation between ORG and PROX.

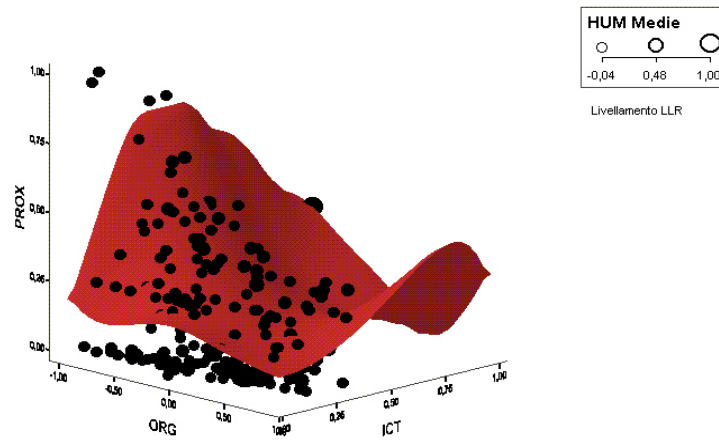
The test for the partial correlation of the two variables, with the firm size as a control variable, confirms their negative correlation (Tab.4).

Tab. 4

Industry	Control variables		PROX	
Shoes	N. of employees	ORG	Correlation	-,242
			two tails sig.	,011
Mechanics	N. of employees	ORG	Correlation	-,386
			two tails sig.	,009
Electronics	N. of employees	ORG	Correlation	-,491
			two tails sig.	,013
Other manuf.	N. of employees	ORG	Correlation	-,554
			two tails sig.	,015
Other non manuf.	N. of employees	ORG	Correlation	-,315
			two tails sig.	,009

Figure 1 shows a 3-D plot of the bivariate logit model for the total sample of firms in the 5-50 class employee. The solid circles are the observed values. The negative correlation between organizational innovation (ORG) and geographical proximity of the productive network (PROX) is clearly visible.

Fig. 1.



In order to supply a further qualitative description of the group of firms that show the above outlined delay in organizational innovation, two groups have been selected expressing two fixed parameters of geographical proximity. The first group, called 'proximity group' (PROX_) includes all those firms with 100% of suppliers localized into the local environment (45 firms in the all-sector sample group), while the second group, (EXT_NETW) includes all those firms with less than 50% of suppliers localized into the local environment (75 firms in the all-sector sample group). The average firm-size of the two groups is very similar (16,82 and 16,64 respectively).

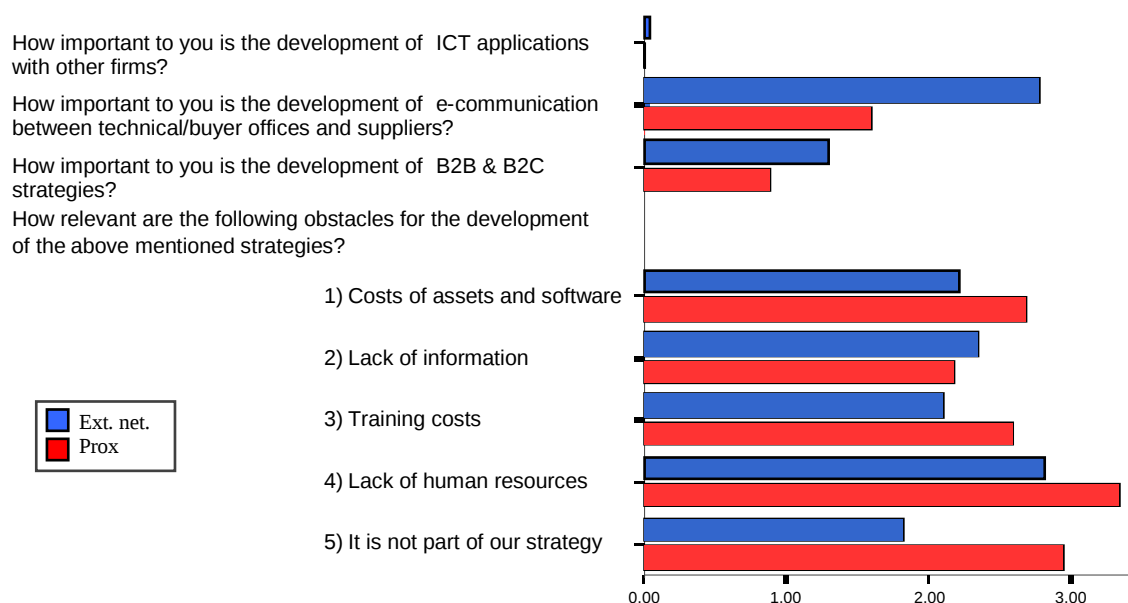
A t-test calculated on the average value of the ORG index for the two groups gives the results showed in Table 5, confirming that firms working within a complete local network have a lower propensity to introduce organizational change with respect to those which belong to a more extended geographical network.

Tab. 5

Levene's test of the equality of variances		t test of the equality of means						
F	Sig.	t	df	Sig. (2-tails)	Difference between means	Difference standard error	Confidence for the difference at 95%	
							low	high
,184	,668	-3,267	121	,001	-,24780	,07585	-,39796	-,09763

Fig. 3 compares the average value performed respectively by the two groups (the proximity group and the extended network group) on some specific question concerning the adoption of, and the obstacles to organizational changes which imply the substitution of face-to-face relation with ICT. Answers were from 1 (irrelevant) to 5 (very important).

Fig. 3 - Adoption and obstacles to ICT-linked organizational change



The first question about the development of ICT applications with other firms refers principally to a project of e-management between the local firms for the optimization of the stock-in-trade (<http://www.censis.it/277/372/4976/388/cover.asp>). As shown by the figure, the scarce interest in such a project indicates a high cognitive anchoring of both groups to traditional organizational routines which are largely individualistic and non-cooperative, contrary to what has been often assumed by the district literature. The answers to the second and third questions confirm a major predisposition of the 'extended network' group of firms to the introduction of new strategies, which implies the substitution of old organizational routines linked to the use of proximity (i.e. face-to-face relations between technical and buyer/suppliers offices etc.), with new ICT-based ones.

It is worth mention that firms which belong to the 'proximity group' show higher values as to what concerns the perception of obstacles linked to the introduction of ICT-related organizational innovations, as is shown by the generally longer red bars in the low part of the figure. The exception of the values expressing the lack of information may simply reinforce our hypothesis, being often a strong belief of the entrepreneurs of small districts' firms (those firms immersed in thick district environment) to be perfectly informed. Last but not least, the important difference of the variable expressing the activation of digital forms of communication between technical or buyer offices and suppliers signals the cognitive anchoring of firms belonging to the PROX_ group to proximity-linked organizational forms.

6. Conclusions

This paper considers the hypothesis of 'lock-in' of routinized behaviour and organizations into the discussion of the causes at the base of the loss of competitiveness by Italian industry. In particular, it considers the complementary roles for productivity growth played by ICT adoptions, investments in human capital, and organizational changes, and tests the hypothesis of the reinforcement role played by proximity on organizational inertia.

From the analysis of a sample of 223 firms, it has been shown that small firms with a geographical network of partners mainly restricted to the local environment, show major problems in the

introduction of organizational innovation with respect to those firms with an extended geographical network of partners.

While this work can be considered an initial introduction to the issue, the recognition and theoretical definition of the causes at the bases of organizational inertia and lock-in – and the role played by proximity in the formation and persistence of such phenomena – can offer significant advancement to the comprehension of industrial dynamics and local economic development.

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