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Stimulating Firms Networks Diffusion: The Italian Case

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Abstract

Cooperation among firms may be very important since it may allow those involved to realize benefits of different kinds: it stimulates economies of scale, continuous exchange of knowledge, competitive advantages, economic development and more market opportunities. A firm's network is a relatively new form of cooperation by which the involved firms can work together even if they are located far from each other; firms are usually organized in networks with the aim of improving their economic performance, reducing transaction costs and opportunistic behaviour by free-rider agents. This cooperation is a success organizational form that may generate benefits also for the economy in terms of growth and development. The context in which firms networks develop is the globalized market: it becomes global especially thanks to information and communication technologies (ICTs) diffusion and the entrance in the era of the knowledge economy. The aim of this paper is to define the key determinants of firms' networks formation for the Italian regions: many studies suggest that some factors such as research and development (R&D) investments, openness capability, social and human capital may facilitate the emergence of firm's networks at local level. The analysis to identify firm's networks determinants is performed for the Italian regions and the used methodology is the multidimensional scaling: it shows a spatial representation that best approximates the similarity/dissimilarity among the Italian regions with respect to the presence of the possible determinants for firm's networks formation.

Keywords: firms' networks, knowledge economy, social capital, human capital, ICTs

JEL Codes: L22, L25, R1

1. Introduction

The aim of this paper is to highlight the factors that may stimulate the formation of firms' networks as forms of cooperation among firms' at regional level. The new economic and social context is now characterized by globalization and internationalized markets that change the way firms' compete and communicate, increasing the importance of firms' networks, able to share knowledge even if firms' are physically located far from each other. In recent years, these new forms of spontaneous aggregation were developed in Italy, based on more articulate relationships. The goal is to support the competitiveness of firms' that are part of the network, especially if they operate in international markets, with the purpose of improving their economic performance; the aim is also to achieve economies of scale typical of large firms', even maintaining the flexibility of the small ones. In the global economy, where markets are internationalized and the boundaries become increasingly blurred, firms' networks allow participants to reduce both costs and risks, which are distributed among multiple partners: so it is possible to specialize each other, to become more competitive and creative, to innovate together, to share old and new knowledge.

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In a network the value of ideas is multiplied, the importance of knowledge is extended, the learning can be applied and useful for most purposes, given the vast possibilities that grows along with the number of firms' that cooperate in the network. The aims of firms' networks are different: the network organization can give the opportunity to enhance the competitiveness of firms' by means of shared R&D investments, the creation and development of new technologies, the increase in the range of products and services. Each firm becomes part of a larger system and benefits from economies of scale, knowledge sharing, as well as the extension of the consumer's base. At the same time, the firm preserves its flexibility as well as the degree of customization for its products and services. The network organization goes beyond the territorial dimension without nullifying it; stable functional relationships are created, which allow small and medium firms' to operate in the markets as one large firm, even if they are located far from each other. The aim of the paper is to analyze the firms' networks determinants in Italian regions considering different variables; in the second section, the literature about firms' networks explains the evolution and the importance of this form of cooperation (see par. 2); subsequently, we present a data analysis using a multidimensional scaling methodology, in order to identify groups of Italian regions that show similar characteristics with respect to the possible determinants of firms' networks (see par. 3). In par. 4 conclusions are provided that summarize the results achieved by the statistical analysis.

2. Possible Key-Factors for Firms' Networks Formation

As remarked by Powell (1987), Lorenzoni and Ornati (1988), and Jarillo (1989), the strategic use of external resources through the network, even in different sectors that are often incorporated into regional clusters (see Boari and Lipparini, 2000, and Lechner and Dowling, 2000), is considered to be an effective and indispensable tool to overcome potential disadvantages. Consequently it is clear that firm' networks are treated as an important model for economic, social and organizational development (see Powell, 1987 and 1990) that allows the involved firms' to grow, develop and survive. Firms' networks can be of various types (Alter and Hage, 1993) and the most important are: competitive cooperation networks, symbiotic cooperation networks, natural firms' networks, governed firms' networks, proprietary networks, non-proprietary networks, firms' networks provided with a reference centre, firms' networks provided with multiple centres of reference, firms' networks without a reference centre, converged networks, mutual conditioning networks, complementary networks, independent networks. Each type of firms' networks has multifaceted features but everyone has the characteristic in common of being "knowledge based". Many studies suggest how some key-factors such as R&D, openness to international trade, social capital, human capital and ICTs diffusion facilitate the origin of nodes at local level.

Areas characterized by a higher level of R&D activities host firms' with higher chances of joining together in networks. Changes in the modern economy and firms' organization are closely related to the new dimensions of the innovation process. Researches carried out on technological progress and new firms' networks development claim that R&D activities lead to economic growth (Chen and Dahlman, 2004). It was also shown that in areas with good level of economic development there is a higher probability for firms' to associate in networks. The field of networks has been subject of extensive investigations also related to the internationalization of firms': the ties of cooperation can guarantee opportunities in the global context. As argued by Welch et al. (1998), the network agreements are aimed to promote exports by means of the creation of different types of contracts and relationships among firms', with shared knowledge and joint activities. Another determinant for firms' networks formation may be the social capital. For example, high levels of crime in the territory may inhibit the presence of nodes. Firms' that decide to become part of a network, have access to important resources, such as a higher level of information and knowledge, but also more market opportunities (Rutter and Boekema, 2007). The acquisition of knowledge by firms' also depends on the processes of interaction and learning, typical of network contexts: thus the participation in network itself is considered to be a particular form of social capital (Landry et al., 2002). Particularly crime and low level of social capital generate significant costs for society. They are not represented by direct monetary payouts but they consist in "speculative" costs that society accepts as lost opportunities for development, in the form of reduction in the growth rate and missed investments (Daniel, 2009). These costs can be considered as negative externalities that affect the whole community, and this also impacts on the reduction of forms of associations, which otherwise tend to be higher in the presence of low crime rates (Buonanno, 2006). Territories with a higher degree of human capital benefit of more opportunities for firms' to join in networks. Human capital is a concept that was first developed in the 1960's by Shultz (1961 and 1963) and further developed by Becker throughout the 1980's and 1990's. The main idea is that, although humans possess tangible financial capital such as bank accounts and stocks, they are also the repository of knowledge, skills, and qualities that can also be considered capital.

Becker (1975) argued that it is a worthwhile endeavor to invest in human capital. As he put it, "*Economists regard expenditures on education, training, medical care, and so on as investments inhuman capital*" (p. 74). The subsequent works of Romer (see, for example, 1986 and 1990) and Lucas (see, for example, 1988), another leading figure in the Chicago School, further stress the effects, both quantitatively and qualitatively, of human capital on growth rates. More recently, hundreds of empirical studies on economic growth include human capital measures (Barro, 1991; Hanushek and Kimko, 2000; Cohen and Soto, 2001). Other recent works on the role of human capital in economic dynamics propose models assessing investments in education and multidimensional analyses directed to evaluate the complex dynamics of the knowledge economy (Mattoscio, 2005; Carlei et al., 2008; Mattoscio and Colantonio, 2005; Mattoscio and Carlei, 2006; Mattoscio et al., 2007). Finally, the ICTs are the basis of the existence of firms' networks, since they arise thanks to the development of technologies that allow firms' to communicate and collaborate on a global scale. The ICTs make feasible the permanent relations and facilitate the aggregation among firms' in the network. ICTs allow a fluid circulation of information both in the firms' and among them. Though not directly generating innovations, ICTs are regarded as the backbone of the knowledge economy and have been recognized as an effective instrument for sharing knowledge. Owing to their relatively low cost of use and their ability to scale distances down, ICTs have revolutionized information and knowledge transfer all over the world. In a nutshell, by referring to the above-mentioned contributions, we might postulate the existence of at least four possible preconditions necessary for firms' networks origin and development:

- an effective innovation system, made up of firms' capable of raising the stock of knowledge and to absorb it and adjust it to local needs;
- a good degree of openness to trade, encouraging contracts and relationships among firms', with higher chances for knowledge sharing and joint activities;
- a good level of social capital, facilitating interactions among firms';
- an educated and qualified population, able to create, share and use knowledge;
- an adequate ICTs infrastructure, facilitating information and knowledge diffusion;

Based on this theoretical framework, a number of indicators, mainly representing aspects of the so called knowledge economy, have been identified as possible drivers for firms' networks formation.

3. An Exploratory Analysis for the Italian Regions

As shown by the Observatory Intesa Sanpaolo - Microcredit study, in Italy the phenomenon of firms' networks is strongly increasing: between 2011 and 2013, the number of nodes of firms' rose from 1263 to 6435 and therefore it is clear that, in addition to the advantages mentioned above, there may be conditions that support the origin and development of firms' networks at local level. As mentioned before, the aim of the paper is to highlight potential firms' networks determinants in the Italian regions. In this paragraph a multidimensional scaling analysis has been performed in order to provide a graphical representation of clusters of elements (the twenty Italian regions in this case), based on the degree of similarity/dissimilarity among them. The multidimensional scaling creates a representative map that best approximates the observed distance among the regions, with respect to the considered indicators, but merged in a small number of dimensions (two in our case). The resulting map positioning has the capability to divide regions into homogeneous groups, so that the degree of association between two regions is maximum if they belong to the same group and minimum otherwise. For the analysis, therefore, it has been considered a matrix constituted by the twenty Italian regions and eleven indicators (for the year 2013; the source was the Italian Institute of Statistics ISTAT). The first variable was represented by the percentage of nodes, with respect to the total number of firms' at regional level. The remaining variables represent aspects of the knowledge economy and may stimulate the formation of firms' networks. Particularly, with respect to the R&D activities, we considered the employees in that field and the Innovative capability of the region; referring to the openness to trade, we selected the Export capability and the Openness to trade index (that is the sum of exports and imports, divided by GDP); in order to summarize the lack of social capital, two different crime indicators were chosen; with respect to human capital, we introduced the Public expenditure on education and the relative number of employees attending courses; finally, referring to the ICTs distribution, we considered website diffusion and the internet use at firm level. Data were normalized within each variable in order to avoid possible distortions due to the different measurement units, ranges and magnitudes.

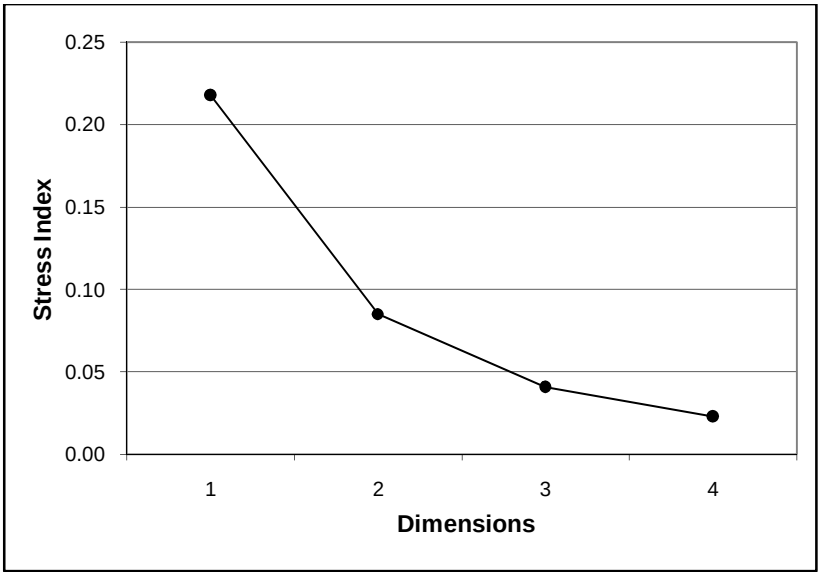
The model's goodness of fit was assessed via the RSQ (0.967), that indicates the proportion of variability explained by the corresponding dissimilarity distances, and the Stress Index (0.085). As a general rule, results are found to be robust when the size k (number of dimensions) achieves a Stress Index value lower than 0.15. A two-dimensional model was judged to be acceptable according to the values of the Stress Index, reported in Tab. 1. Further investigation provided additional basis for choosing the two-dimensional solution: the "elbow" rule suggests choosing the number of dimensions in correspondence to where the diagram yields an "elbow", beyond which the broken line flattens (see Fig. 1).

Tab. 1: Relations between Dimensions and Stress Index in the Multidimensional Scaling Analysis

Dimensions	Stress Index
1	0,218
2	0,085
3	0,041
4	0,023

Source: our computation on ISTAT data

Fig. 1 – Relations between Dimensions and Stress Index in the Multidimensional Scaling Analysis



Source: Our representation

The correlation between dimensions and variables (see Tab. 2) was useful for naming the axes.

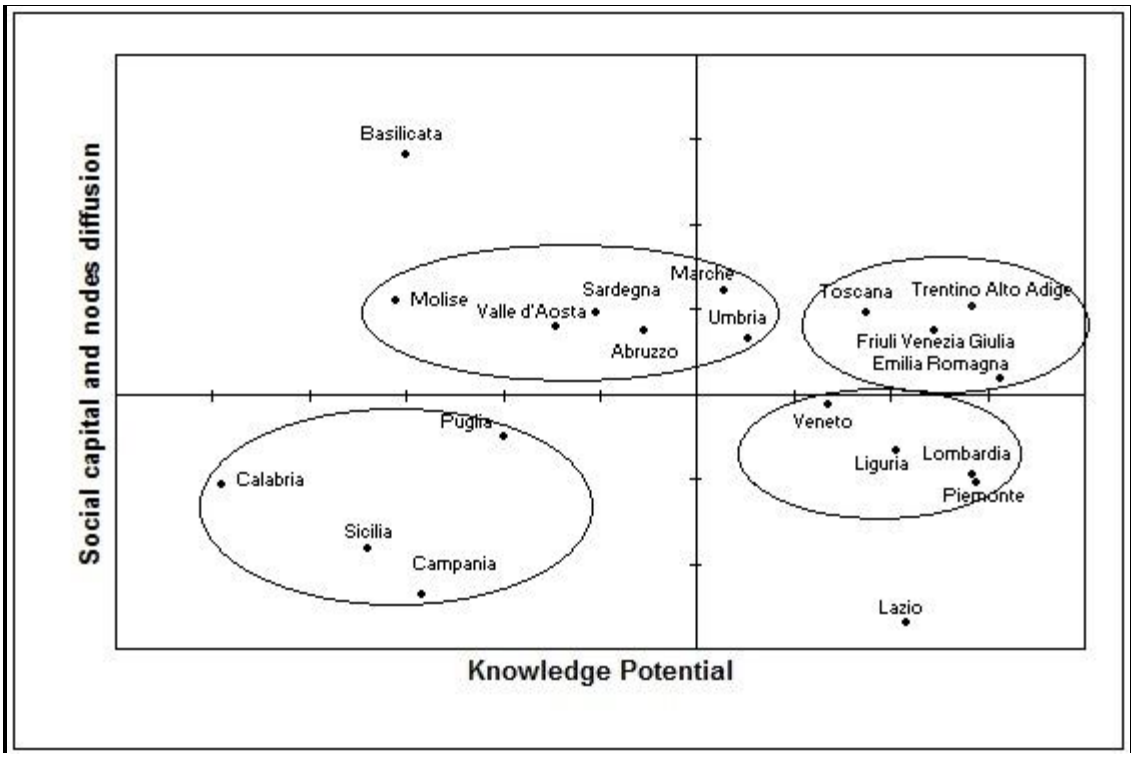
Tab. 2 - Correlation between variables and dimensions (r > |0.5|)

Variables	Dimension 1	Dimension 2
Nodes diffusion		0,65
R&D employees	0,94	
Innovative capability	0,80	
Export capability	0,77	
Openness to trade index	0,79	
Criminal organization diffusion	-0,61	-0,61
Crime index		-0,76
Public expenditure on education	-0,95	
Employees attending courses	0,79	
Website diffusion for firms'	0,79	
Internet use for firms'	0,86	

Source: our computation on ISTAT data

The horizontal axis mainly represents the variables concerning with the knowledge economy, with the exception of the uncorrelated Crime index, while the Public expenditure on education is negative correlated with the axis (probably it is due to an inefficient spending). Furthermore, note that the network diffusion at regional level is not deeply correlated with those variables representing the knowledge economy: probably some nonlinear relationships exist among them. On the other hand, the vertical axis is positively correlated with the firms' networks distribution and negatively correlated with crimes diffusion at regional level: consequently the lack of social capital seems to be an obstacle for firms' networks diffusion.

Fig. 2: Clusters of Italian Regions in a Two-Dimensional Space



Source: our computation on ISTAT data

Substantially four clusters of regions appear (and two outliers). At the bottom right of the chart there are the main industrialized and developed Northern regions of Italy, which show relatively high levels with respect to the knowledge economy indicators, but also high crime rates and low percentages of nodes. In this last case, the relatively shortage of firms' networks may also depend on the high number of firms' localized in those regions (which represents the denominator of the percentage). At the top right of the graph there are regions with the highest levels of knowledge potential and nodes diffusion. At the top left of the diagram there are many Central regions, with a good level of firms' networks distribution and the indicators of the knowledge economy close to the average. These relationships seem to be typical of those regional economies characterized by small and medium firms' with a high added value, predisposed to internationalize and to invest in R&D. Finally, Southern regions are positioned at the bottom left of the chart, showing low values with respect to their knowledge potential, as well as a shortage in terms of nodes diffusion: this last aspect is probably linked to the presence of strong criminal organization at local level.

4. Conclusions

In the current social and economic context, globalization has stimulated a new way of collaborating among firms'. The main representative academic studies agree that firms' networks play multiple roles for firms' competitiveness, such as an increase in the exchange of knowledge, acceleration in the innovation process, a stimulus in the economies of scale and new opportunities in the markets. Starting from this, the aim of the paper was to highlight some possible determinants at the base of firms' networks origin.

We have identified a number of variables that may promote the formation of nodes, each of which representing an aspect of the so called knowledge economy. The analysis performed on the Italian regions suggests that probably there are non linear relationships between knowledge potential and firms' network diffusion, while a stronger negative correlation exists between nodes distribution and criminal factors at regional levels. Further investigations are however required to better explore the dynamics of this phenomenon (basing on the availability of new data in the future) and the existence of non linear relationships with the identified potential stimulating variables.

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