

Understanding the Emilian Model: A Network Analysis (NA) approach to investigate industrial relationships

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1. Purpose

By observing the spatial agglomerations of small and medium-sized businesses in Sheffield and Lancashire, Alfred Marshall (1920; 1923) stated that “the advantages of production on a large scale can in general be as well attained by the aggregation of a large number of small masters into one district as by the erection of a few large works” (Whitaker, 1975 p. 196). In Italy, the considerable effort put by Giacomo Becattini (1987; 1990; 2004) and by other scholars (Brusco, 1982; 1986; Garofoli, 1991) has contributed to increase and to reinforce the importance of these geographically, culturally and historically identifiable areas where several small firms, specialized in activities related to a specific industry, coexist with an active community of people (Becattini, 1990). Nowadays, in fact, economists and geographers recognize the importance of local-firm agglomerations in order to generate external economic efficiencies (Lazerson and Lorenzoni, 1999). Yet, although industrial districts are present both among several advanced economies (Japan, United States, Germany, and Denmark) and developing countries (Brazil, Mexico, and India), is the Italian case that has aroused an international and national interest among both scholars and policy makers as an alternative productive model to the large firm (Lazerson and Lorenzoni, 1999; Lombardi and Magliocchi, 2016). For many decades, in fact, the Italian districts have demonstrated better competitive and innovative capacities than that associated to the vertically integrated

hierarchical firms (Becattini and Coltorti, 2006), representing the local socio-economic development model and constituting the source of the Italian industrial leadership (Lombardi and Magliocchi, 2016). It is in Italy, in fact, particularly in the eastern-northern and centralnorthern Italian regions, that we found a conspicuous number of small-firms industrial conglomerations where “ten thousand of well-paid artisans have helped push their country into the top world rankings for the production of luxury apparel, furniture, machine tools and ceramics” (Lazerson and Lorenzoni, 1999 p. 236). Furthermore, notwithstanding the dramatic consequences of the economic crisis of 2008 and 2012 that led to a drastic fall in foreign and domestic demand, industrial districts still play an important role for the Italian manufacturing system (Istat, 2015), showing an extraordinary capacity to react to the many challenges related to new forms of globalization (Lombardi and Magliocchi, 2016; Mosconi, 2018). Over the past decade, in fact, the cluster concept has been a lot used as a tool for evaluate competitiveness, innovation and growth at local, regional and national level

(for an overview see Porter, 1998; Enright, 1998). This is true for traditional industries (Sabel et al. 1989; Powell 1990; Becattini, 2004), as well as for emerging high-tech ones (Powell et al. 2002; Cooke 2004). Within this context, Emilia-Romagna, a highly important region in Northern Italy, provides an excellent testing ground to verify the extent to which the evolution of industrial districts has

favoured the creation of a fertile ecosystem able to foster the growth dynamics of this region. As Rodrik (2010) argues: “the essence of economic development is structural transformation, the rise of new industries replacing traditional ones”. Therefore, in a regional economy such as Emilia-Romagna - which, even though the 2008 financial crisis and the 2012 earthquake, was able to preserve a robust manufacturing base, a strong export vocation, and a high propensity to innovate (Mosconi, 2016; Mosconi and D’Ingiullo, 2021)- the industrial structure may have favoured the long-term capacity of the region to evolve and embrace the many challenges

related to the fourth industrial revolution (Industry 4.0), and to the globalization and the changes in the productive methods that stem from the ‘unbundling’ (Baldwin, 2013) of the productive process. In sum, given the growing attention paid to the regional dynamics and the importance of industrial districts to promote innovation and regional growth, this research project contributes to the literature by exploring the inter-sectoral linkages that occur within several EmiliaRomagna’s clusters.

2. Methodology

Understanding the industrial structures in a region is an inevitable step for effective policy development. Currently, industrial district (cluster) is evaluated by macro-economic metrics such as size of the regional market represented by GDP value, number of employees, and patents as a measure of the innovative capacity (Buesa et al., 2006). However, the literature is not so rich yet as to understand and evaluate the network structure of industrial districts also considering that industrial districts vary considerably in type, origin, structure, organization, dynamics and developmental trajectory. Empirical studies indicate that co-location should not be considered as a sufficient condition for cluster benefits (Huber, 2012). From an evolutionary perspective, it has been argued that it is the firms’ embeddedness, rather than their geographical proximity, that promotes knowledge spillovers and enhances collective learning in clusters (Crespo et al., 2014). Firms in a cluster become embedded in a dense mass of internal linkages: at the local and urban scale, each actor is not necessarily connected to everyone else, but there are many durable ties and multiple links between actors that can be of a different nature, productive, commercial, cognitive or social (Owen-Smith and Powell, 2004). Within the cluster, a network of actual and virtual information linkages develops among firms (Uzzi, 1997): firms are likely to become familiar with each other’s activities, be able to pre- screen information according to their partners’ needs before passing over the information and, once received, correctly interpret the information that is passed over. Accordingly, policymakers have put great emphasis on networks as a means to

stimulate learning and innovation and to achieve efficiency gains, but most of the available evaluation attempts are based on a very poor understanding of what networks are, and key concepts like “networking,” “connectivity,” “connections,” and “linkages” are often measured through rather loose and rough indicators. There is, therefore, an ever-increasing need for studying networks in more analytical terms than has been done in prior evaluation studies, so as to inform policymakers about industrial districts support and evaluation. In order to better understand the economic actor within its context of belonging, network analysis (hereafter called NA) represents a theoretical and methodological framework that allows us to consider the economic actor in the network as an entity that “exchanges, coproduces and co-divide [goods, services,] information and knowledge” (Lo Re, 2018 p. 659). The methodology, in fact, offers the possibility to deepen the dynamics of the network’s structure in terms of organisational model, hierarchical configuration, number of leaders, roles and responsibilities, as well as the owned capacities in terms of technical and social equipment, human and technological resources, and external connections (Lo Re, 2018). Yet, some questions need to be addressed in order to understand the importance of this methodology for the purpose of our research project, and in particular, what is the value added of NA applied to industrial districts? Why is it so important that the inter-sectoral relations become visible? What do we learn from unravelling the network structure of a district and the position of a sector within? First, the application of the NA, besides allowing to analyse the pair-wise relationships between sectors, enables us to suitably identify inter-sectoral interdependencies and the potential influence of one sector on other, crucial sectors and/or groups of key sectors (Tsekeris, 2017). Second, this methodology could support the identification of those sectors which are considered critical for the robustness of the whole regional economy. In other words, by implementing a network analysis, we are able: “(a) to identify main sectoral clusters, which accumulate interrelated economic activities, (b) to determine key sectors, which can potentially contribute to the restructuring of the economy, by favoring the production of internationally tradable goods and services, and (c) to determine critical sectors, which can mostly ensure the stability and resilience of the whole economic system.” (Tsekeris, 2017 p. 414). In particular, crucial sectors are of fundamental importance to define and to implement growth-enhancing policies, since an increase of activities of these key industries could have beneficial consequences for the entire economic system as they contribute to expand the economic activities of many other sectors.

3. Results

By analysing the inter-sectoral relationship associated with each Emilia-Romagna’s cluster and starting with the analysis of the role played by the mechanical ones, Figure 1 clearly shows the strong supply relationship that intervene with several sectors: the mechanical (46.5%), the wholesale trade (20.2%), the constructions (9.2%), and the intermediate and construction products (8.1). Moreover, it must be underlined that the 59% of total sales put in place by this cluster is directed towards the mechanical industry. This sector, in fact,

requires the most consistent portion of productive inputs with respect to the other industries, resulting a crucial node for the economic development of the Emilia-Romagna's mechanical cluster. By shifting the attention to the biomedical industrial district, different features seem to emerge. In particular, while the mechanical, the intermediate and construction products sector, and the wholesale trade still represent important suppliers of this cluster with a share equal to 18%, 13.3%, and 29%, respectively, we also found an important demand oriented towards two

additional suppliers of the biomedical cluster: the electronic and electrical equipment industry and the other manufacturing sector with a share equal to 10.5% and 8.2%, respectively. In contrast, considering the sales put in place by this cluster, the main destination sectors are the wholesale trade and the other manufacturing which generate, respectively, the 46.2% and the 36.7% of all the economic transactions. A residual role, instead, is played by the mechanical sector and by the electronic and electrical equipment industry (2.4% and 8.8%, respectively). Another important group of Emilia-Romagna's cluster firms is classified as electronic industry, where about three fourth of the necessary productive inputs are supplied by three sectors: the mechanical (28%), the wholesale trade (24.4%), and the electronic and electrical equipment industry (21%), while a marginal role is associated with the intermediate and construction product sector (14%). Furthermore, when we consider the forward linkages of this cluster, once again the mechanical industry exhibits the higher share equal to 40%. There are, in truth, other two economic branches that strongly depend on the output produced by these cluster firms: the wholesale trade (which is, as already seen, a transversal economic activity for several clusters), and the electronic and electrical equipment industry. Interesting features seem to emerge also when the inter-sectoral relationships of the EmiliaRomagna transport equipment cluster are taken into account. First of all, also in this case what emerges is the greater role associated with the mechanical sector. With a share of 42%, in fact,

it represents the most important supplier of intermediate inputs for this category of firms. At the same time, by looking at the forward linkages, the 90% of the products generated by the cluster firms are directed towards the mechanical sector. As a consequence, it is clearly evident the stronger symbiotic relationship between these two economic activities that must be taken into account in the policy formulation. Furthermore, given the strategic position of the mechanical industry, both in the upstream and downstream stages of many value chains, we could affirm the predominant role of this sector for several Emilia-Romagna's industrial districts.

On the contrary, the supply-chains of both the agri-food and the fashion system share some commonalities due to the fact that they are mainly characterized by intra-sectoral linkages. More than half of the upstream economic transactions, in fact, occur between firms belonging to the same industry. More specifically, the 57% of the exchanges put in place by the agri-food as well as the 59% of the transactions related to the fashion system take place with firms that belong to the same sector. At the same time, also a great part of the downstream economic

transactions is intra-sectoral since a large part of the demand rises within the same industry (68% in the case of agri-food and 67% in the case of fashion system). Moreover, in both cases, the remaining share of economic exchanges are carried out with the wholesale trade industry. In other words, we could say that notwithstanding the importance of these two clusters for the Emilia-Romagna economy, they seem to be disconnected from all the other economic activities.

Slightly different, instead, is the situation which characterizes the firms that belong to the home system cluster which present a greater variety of suppliers. More specifically, in 2018 the demand has had the following structure: 37% from the intermediate and construction products industry; 22% from the same home system; 15% from the fashion industry; 10% from the wholesale trade sector. Yet, also in this case, the downstream activities mainly concern intrasectoral economic transactions since the 47% of the sales are in favour of the same industry. We also found important forward relationships with the transport equipment industry (27%), with the intermediate and construction products sector (12%), and with the wholesale trade activity (7%).

Finally, the supply-chain of the construction products cluster seems to be structure as follow: a strong supply relationship with the intermediate and construction products industry (53.3%), and a residual demand oriented towards two economic branches: the wholesale trade sector (17.4%) and the mechanical industry (9%). Concerning the downstream activities, the data reveal that the great part of inter-sectoral linkages involves the wholesale trade industry and the intermediate and construction products sector with a share equal to 55.2% and 38%, respectively.

4. Implications

Preliminary results suggest to anchoring the Emilia-Romagna economic growth to the development of the mechanical and electronic and electric sectors which already represent the most important industries of the region. In particular, structural reforms targeted at these specific sectors as well as coordinated allocation of resources (such as an increase in the private and public R&D investments) should help increase the efficiency and robustness of the resulting production system (productivity, investment and employment). More important, in the light of the peculiar characteristics of Industry 4.0 the support of these industries could represent a forward-looking policy strategy that look at mechatronics as the crucial sector to create the preconditions for the economic development of the region in the following years.