Chapter XXII
Competitive Advantage of Geographical Clusters

Vito Albino
Politecnico di Bari, Italy

Nunzia Carbonara
Politecnico di Bari, Italy

Ilaria Giannoccaro
Politecnico di Bari, Italy

ABSTRACT

This chapter deals with complexity science issues from two sides: from one side, it uses complexity science concepts to give new contributions to the theoretical understanding of geographical clusters (GCs); from the other side, it presents an application of complexity science tools such as emergent (bottom-up) simulation, using agent-based modeling to study the sources of GC competitive advantage. Referring to the first direction, complexity science is used as a conceptual framework to identify the key structural conditions of GCs that give them the adaptive capacity, so assuring their competitive advantage. Regarding the methodological approach, the agent-based simulation is used to analyze the dynamics of GCs. To this aim, we model the main characteristics of GCs and carry out a simulation analysis to observe that the behaviors of GCs are coherent with the propositions built up on the basis of complexity science literature.

INTRODUCTION

This chapter deals with geographical clusters (GCs), which can be defined as geographically defined production systems, characterized by a large number of small and medium-sized firms involved at various phases in the production of a homogeneous product family. These firms are highly specialized in a few phases of the production process, and integrated through a complex network of inter-organizational relationships (Becattini, 1990; Porter, 1998; Maskell, 2001; Pouder & St. John, 1996).

In particular, the chapter analyzes the sources of competitive advantage of GCs, which is a relevant topic in the referred literature (e.g., Porter, 1998). The latter, in fact, has focused much attention on the reasons explain-

ing the GC competitive success such as: the flexible specialization conceptualized by Piore and Sabel (1984); the localized external economies concept anticipated by Marshall (1920), and further formalized by Becattini (1990) and Krugman (1991); the industrial atmosphere notion conceived by Marshall (1919); and the innovative milieux notion developed by the GREMI (e.g., Maillat, Lecoq, Nemeti, & Pfister, 1995).

These studies have identified the main critical factors governing the success of GC firms. These can be traced back to the following features that successful GCs possess: the physical and cultural proximity of many small and medium-sized firms; the division of labor among firms; the presence within the area of complementary competencies and skills; the high degree of specialization of both firms and workforce; the existence of a dense network of inter-firm relationships where firms cooperate and compete at the same time; the presence of a dense network of social relationships mainly based on face-to-face contacts; and the easy and fast circulation of knowledge and information in the area.

These features, which assure the competitive advantage of GCs when the competitive context is characterized by increasing and not particularly sophisticated demand, seem to be insufficient to guarantee the GC success in the current competitive scenario, which is much more dynamic, unpredictable, and instable. In such a context many GCs are undergoing a decline phase.

As a result, the attention of scholars and policymakers has been shifted and is now much more oriented to develop theories on GC survival in the new competitive scenario by looking for new sources of competitive advantage for GCs (Baptista, 2000; Sull 2003).

Recent studies have in fact pointed out that changes in the GC organizational structure and in their strategies are necessary to guarantee the GC competitiveness. For example, some GCs have internationalized their production system by delocalizing their production process in foreign countries, so determining profound changes in the GC structure (Corò & Rullani, 1998; Biggiero, 2002). Some GCs have introduced new innovation strategies much more focused on developing radical innovations by creating alliances with universities and research centers (Belussi & Arcangeli, 1998; Carbonara, 2004; Corò & Grandinetti, 1999). Therefore, these studies suggest how GCs have to change to survive. This means that the competitive advantage of GCs is associated with a new set of features. Taking things to the extreme, GCs possessing these features are competitive and survive, the others not.

This approach, which is consistent with the traditional studies on GCs, presents some limitations. It adopts a static perspective aimed at identifying a set of features explaining GC competitive advantage in a given particular context. In this way every time the competitive scenario changes, it is necessary to identify a new set of features. In addition, the dynamics that have forced the changes in features cannot be investigated in depth by using this approach. These can in fact be analyzed and identified only after that they are already in practice. Furthermore, this approach considers the entire GC as the unit of analysis, so failing to determine how the global properties of the whole system result from the behaviors of different local parts. New theoretical and methodological approaches overcoming these limitations are then needed.

Complexity science offers both: it investigates properties and behaviors of complex adaptive systems (CASs) and aims to explain how heterogeneous agents "self-organize" to create new structures in interactive systems, with the goal of understanding how such structures emerge and develop (Casti, 1994, 1997; Coveney & Highfield, 1995; Holland, 1995, 1998; Johnson, 2001).

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