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Knowledge Economy: A New Driving Force

In pursuing its economic development, China now has to deal with quite a new world, that of the emerging knowledge economy. This world is very different from that in which the West achieved advanced economy status, or even that in which the Asian Tigers shot to prominence. The driving forces of new technologies, global competition and market pressures are being felt in every corner of China.

— Center for Strategic Economic Studies, Victoria University

The global economy is witnessing rapid economic and social changes at regular intervals. In the process, many new concepts are emerging and attempts are being made to describe and analyze the process of change. Interestingly, new activities, arrangements and structures are taking place on a global basis. One of the key characteristics of the changes is the growing importance of knowledge in all sectors of economic activities. Most advanced economies have developed from an agricultural economy in which land was the key resource, followed by an industrial economy, in which natural resource and labor were the main resources. Now, it is the Knowledge-Based Economy (KBE), where knowledge is the prime resource. Accordingly, the global economy is characterized by rising knowledge intensity and increasing globalization processes for the creation, production and distribution of goods and services.

After opening the economy to the outside world in 1979, China's economic performance and its achievements in increasing the welfare and reducing the poverty of the country were quite impressive. During the period, growth has been driven by workers and resources transferred from low productivity agriculture to industries. Besides that, China is attracting far more FDI than any other country in the world. And a massive inward investment, an undervalued currency and derision for intellectual property rights are seen. However, sustaining the above said economic growth will be difficult for China, if it goes by the inefficient state-owned enterprises and an ailing banking sector with bundles of non-performing loans. Moreover, according to some rankings, China's international competitiveness is declining. For instance, the average worker productivity in China is a mere 0.8% in agriculture, whereas it is 3.6% in manufacturing in the US. If China boosts its productivity levels, it will need less labor and that will further aggravate the unemployment scenario.

To thrive and compete in the global knowledge economy, China ultimately needs to have more freedom on all kind of activities. On this front, China is aggressively deregulating

businesses. In order to grow, it has to bring knowledge and technology into t
provinces, but that's again a double-edged sword. As per the experts, technology
sharing of information, which leads to greater education. Education brings kno·
free thinking, which challenges the *status quo*. As the Chinese economy mov
KBE, America may lose skilled workers to China because of better economic op
in the days to come. In future, these developments will have some interesting globa
implications.

Policymakers are very optimistic about the knowledge economy in China. T
that it will bring new opportunities to China's modernization and economic de
in the 21st century. Further, the usage of knowledge-based technology like IT
reduce the prices of traditional products and services, and thereby, it will be ab·
the gap between China and the other advanced nations in the area of high-tech a
China's comparative advantages in textile and capital-intensive industrial sectors
get a boost with the help of knowledge-based technologies.

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A Scoreboard to Evaluate Cluster Competitiveness: Evidence from an Empirical Study on Emilia Romagna Region

Andrea Ganzaroli*, Gianluca Fiscato** and Luciano Pilotti***

recent years, there has been an increasing interest in the spatial dimension of economic activities. he concept of competitiveness has reached an incredible importance between academicians and ctitioners. However, local competitiveness remains an elusive concept. The main objectives of this er are two fold: first, to define the concept of local competitiveness in an ecological perspective; ond, to present a scoreboard useful to evaluate cluster competitiveness. A case study on seven erent clusters in Emilia Romagna is presented in order to test the scoreboard and show how it helps nderstand local competitiveness[1] and define local policies.

Introduction

he concept of local competitiveness is grounded on the notion of ecology of value rthur, 1996; Iansiti and Levien, 2004; Pilotti and Rinaldin, 2004; and Ganzaroli and lotti, 2006). Taking this perspective it is possible to claim that cluster competitiveness pends on the capacity to leverage on the firms' strategic autonomy and self-determinacy by oviding a context of interaction that is socially rich and adapted to sustain the development intense ongoing relationships. Traditionally, this field of literature refers mainly to ng-term, trusted and local relationships as strategic for local systems' survival. On the ntrary, the concept of ecology suggests that a matching between these kind of relationships d a high level of strategic autonomy is a precondition to enlarge learning capacity and prevent trust from diverting into collusion.

The scoreboard is structured in two levels (the micro and the meso-level) and it has the ective to assess the local competitiveness in an ecological perspective. The micro level ses on the firm and its capacity to learn and to work in a network. It is based on two trices. The meso-level refers to the role of local institutions in the economic development he system.

The paper reviews the concept of local competitiveness, introduces the ecological pective in the evolutionary concept of competitiveness, explains the objectives of the

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In this paper, the concept of cluster is used as synonymous of industrial district according to authors as askell (2001); Asheim and Isaken (2002); and Cooke and Huggins (2002). For a review about the concept of luster see Martin and Sunley (2003); and Belussi (2005).

scoreboard and its framework where methodological aspects are addressed: the sampling method and the questionnaire used to collect data are described, followed by the development of a case study on seven different clusters in Emilia Romagna to test the validity of scoreboard. Finally, the major findings are summarized, the contributions and implications of the research are highlighted, and the limitations and the future research are discussed.

The Concept of Local Competitiveness·

In recent years, there has been an increasing interest in the spatial dimension of economic activities. The concept of competitiveness has reached an incredible importance between academicians and practitioners. However, local competitiveness remains an elusive concept, measured with a huge number of imperfect indicators and leading to one-size-fits-all policies (Lovering, 1999). In addition to this, looking at the use of the term in the policy debate, a clear distinction between "competition" and "competitiveness" appears to be necessary to avoid misleading views (Kitson et al., 2004). When the two terms are synonymous and a vision of regions and countries competing over market share is adopted, then the Krugman's Argumentation (1994) about the competitiveness as "dangerous obsession" assumes meaning. Therefore, to examine the literature and to escape from the fuzziness, it is important to remember that the terms competition and competitiveness could not be used interchangeably (Budd and Hirmis, 2004).

The remaining part deals with a literary review on this concept. The aim of the review is to provide an assessment of the main interpretations of the concept, particularly as it is applied to clusters.

The first question is strictly related to the definition of local competitiveness so that the starting point is represented by the analysis of definitions present in literature.

Thinking of the definition of local competitiveness, it appears natural to adopt the definition used for nations. Consequently, localities would compete with one another in terms of the share of export markets (Storper, 1997; and Porter, 1998, 2000, 2001a). Also leaving out the question whether the application of a macro-level concept to a meso-level was meaningful, the problem about the consistency of the national competitiveness term arises.

To date there is no unique definition of national competitiveness. Recently, Cellini and Soci (2002) presented a review of the definitions of competitiveness given by politicians, academicians and institutions and conclude that Krugman's view of national competitiveness "as the combination of favorable trade performance and something else" (Krugman, 1996b, p. 7) is supported by the recent use of the term. In addition, as observed by Krugman (1994; 1996a), the term competition loses its meaning when used on an aggregate national economy in place of a firm because (a) nations do not go out of business and not even compete as firms do; (b) international trade is not a zero-sum game.

Traditionally, the international trade theory was used to refer to the notion of comparative advantage between countries and over the past 20 years to the new paradigm of competitive

advantage. A brief explanation of the meaning of these two theories could be useful before focusing on the concept of local competitiveness.

The notion of comparative advantage goes back to Ricardo (1817) who in his classic book, *Principles of Political Economy and Taxation*, introduces this fundamental concept. Ricardo takes into consideration the distinction between acquired advantages and natural advantages made by Adam Smith in his seminal work but goes beyond the idea of absolute advantage. Ricardo demonstrates that the comparative advantage depends on the different production costs. It implies that: (a) increasing returns to scale are not necessary, (b) the value of a product depends on the quantity of labor needed to produce it. The model of Ricardo is based on the spatial heterogeneity in the use of technologies and considers labor as the only productive factor. The model developed by Heckscher (1919) and Ohlin (1933), almost one century later, represents an evolution. This model points to the cause of international trade in different factor endowments (land, labor, natural resources and capital), a country will tend to import factor-scarce good and to export factor-scarce good. Even though, the notion of comparative advantage is strongly static, assumes diminishing returns to scale, does not consider the technology and is ascribable to the equilibrium approach, it has received a lot of consideration by policymakers for focusing on the factor cost.

Despite the comparative advantage, a part of the initial specialization pattern of nations could not be explained, it starts with criticism because it does not appear to gather completely the role that government policy could play in determine the competitive position. As a result of this feeling a new notion of competitive advantage arose from the discussion. It was initially proposed by Porter (1985; 1990, and 1992):

[...] the competitiveness is a function of dynamic progressiveness, and an ability to change and improve.

Hence, the comprehension of nation's prosperity goes beyond the idea of market competition and it becomes strictly linked to nation's standard of living and as a consequence, to its productivity (Porter, 2001b). The productivity of national economy is measured by the value of goods and services produced per unit of human capital and natural resources. According to Porter, competitiveness and productivity are synonymous. This equation has had an incredible success between institutions and politicians (Martin and Sunley, 2003). In addition to productivity indicators, the price and trade performance indicators are the best known and commonly used. Cellini and Soci (2002) examine these three types of indicators and observe that for each one there are major indications often with slight changes. To conclude, they identify the absence of a clear definition as the reason of the blurriness in the measures of a nation's competitiveness.

In the recent years, Porter (1998) has put more emphasis on the local dimension of national competitive advantage. This shift makes regions, cities and clusters the main actors of the competitiveness policies but it leaves the question of its meaning and measurement unresolved. The result of this change of focus is the diffusion of a huge set of regional measures of productivity derived from micro-data. It implies three different types of problems. First, the indicators of regional productivity are affected by all the problems

related with the measure of national productivity (Kitson *et al.*, 2004) and with the indexes for industrial district (Cellini and Soci, 2002; and Belussi, 2005). Secondly, every measure at the regional level is affected by the issue of the residence vs. workplace based measures (Kitson *et al.*, 2004). Finally, a measure of regional competitiveness based only on productivity appear to narrow. According to Turok (2004), to avoid misleading considerations at least three important drivers need to be considered: the productivity, the trade performance and the employment level. However, these measures are not useful to point out the differences in terms of sources, technologies and performances over time. Indeed, local phenomena could be fully comprehended only through the study of historical and path-dependent process (Martin and Sunley, 1996, 2006; and Turok, 2004).

At a more theoretical level it is worth noticing that notwithstanding Porter's (Porter, 1990) contribution based on competitive advantage, Krugman's view appears to contradict based on the international theory, both stem from the work of Marshall (1920) on localization economies. According to Marshall (1920) economic activities tend to be localized because of external economies that rise from co-location and consequently, firms could reach a superior performance. Krugman's and Porter's view treat the location in the same way—as passive provider of external economies. In their view, the localization of economic activities is crucial for the development and performance of firms but is not related to territorial competition. The striking difference of the two authors is the importance given to clustering process and cluster policies to sustain national economies.

Cellini and Soci (2002) in their analysis of the notion of competitiveness point out the need to specify the "relative-to-what" argument to render the definitions less fuzzy. With this purpose they define three different levels of competitiveness based on the economic level (macro, micro and meso). Meso-economic level refers to an intermediate level between the micro (firm) and the macro (nation) level, which concerns the local system. It is important to notice that both the authors recognize the local system. The need for a different concept of competitiveness and not only a simple adaptation of the one used at macro-level and that at this level many economic aspects are involved in this concept.

An important contribution comes from the critical replies to Krugman's view and focuses on the bases of competitiveness. Camagni (2002) makes sense to consider the concept of territorial competitiveness not only as an environment where firms are settled, but also as a system of localized pecuniary and technological externalities of economic and social relation and of local governance. In addition to this, it fosters the process of knowledge accumulation and production. Hence, human, social and relational capitals are the real sources of territorial competitiveness and the focus is put on the non-price competitiveness. Camagni rightly observes that many contributors do not distinguish between different territorial levels as they would be subjected to the same economic laws. Taking this point he concludes that regions compete in term of absolute advantages because of the assumptions at the base of the international trade model and comparative advantages are no more valid and so in the international context, there is no room for efficient, automatic mechanism that give to every territory a range of goods in which it has a comparative advantage. Therefore, larger regions cannot benefit from any external force to close the gap.

Despite a coherent definition of local system, competitiveness is far from straightforward, the assessment of literature makes clear that: (a) a concept that goes beyond a static comparison of performance between places is needed to fully capture the meaning, (b) it is neither a simple sum of local firms' performance nor a weighted disaggregation of the national economy, and (c) the lack of a detailed conceptual framework negatively affects its application in policy-making.

The evolutionary thinking from the seminal work of Nelson and Winter (1982) has received a lot of attention in economic geography because it allows to understand the path of time-specific development and place (Lawson, 1999; Lawson and Lorenz, 1999; Maskell and Malmberg, 1999; Bathelt et al. 2004; and Malmberg and Maskell, 2006). Furthermore, it accounts to the role of the environment (institutions, routines, networks, culture ...) in the action of the agents. The objective of this approach is to understand how agents, structures and environment co-evolve in different spatial contexts.

Recently, Boschma (2004) attempted to apply the evolutionary theories on competitiveness of firms to the territorial level. In other words, it demonstrates that the cumulative, localized and interactive nature of knowledge creation and learning can also be considered at a geographical level. According to Boschma (2004), the evolutionary framework can also be used for regions because:

- Regions like firms are affected by history that can determine the performance of a region in a period independent from its efficient behavior;

- Regions compete between themselves, often indirectly, to attract investment and knowledge (human capital). Furthermore, some times, regions compete directly (e.g., assignation of Olympic Games);

- Even if regions do not act, firms that operate in a local context are strongly affected by the institutional and cultural environment;

- Regions have a specific knowledge and competence base of geographically bound knowledge externalities. The location in the same space helps in connectivity, knowledge transfer, and interactive learning. Moreover, the institutional and cultural framework of regions affects the level of variety within and through the region. This asset is fundamental to foster interactive learning and avoid problems of lock-in; and

- Regions have a specific institutional-environment which is accumulated over time. The institutional environment affects the intensity and quality of the transfer of knowledge. In addition to this, it influences the selection mechanism of the firms. Therefore, the dynamic capabilities of institution have a great impact on the long-term competitiveness.

The study focuses on regions; however, as observed by Boschma from an evolutionary point of view, regions are a flexible entity. Thus, the relevant territorial level is the one in which it is possible to observe co-evolutionary process.

To conclude, it is important to highlight that the main issue that evolutionism attempts to solve is to define the governance structure that enables the region to remain open to the emerging technological and learning trajectories.

Towards an Ecological Perspective of Local System

The perspective adopted in this paper is not only evolutionary, but also ecological. Indeed, the notion of evolutionary ecologies of values is in the evolutionary field of literature.

The use of the term ecology is not new to the managerial literature[2]. It identifies a specific field of study, which is grounded on the hypothesis that evolution in a population of firms such as in an industry—does not take place through organizational change, but through market selection. According to this perspective, successful firms are affected by the organizational inertia. Indeed, success inhibits the firms' capacity to perceive and interpret change. Additionally, even if this is perceived and understood, the organizational inertia is too hard to contrast and the introduction of the relative organizational solutions is rough. Because of the loss of competitiveness by the leading firms, new firms which are technologically and organizationally advanced will be set up which progressively overwhelm the established ones. Thus, it is market selection and not organizational change which is the main driver of innovation in an industry.

The most important point in an ecological perspective is the selection process. Traditionally, the Darwinistic mechanism of selection is used. In this perspective, evolution:

* Is the outcome of natural selection of those genetic mutations that have proven themselves more efficient in a given environment; and

* Takes place through an error, in the recombination and transmission of the genetic pool from one generation to the next.

This view does not consider the network of reactions and feedbacks that these mutations enact on the system. Actually, if this phenomenon is taken into account then it is possible to state that nature does not select beings that have proven themselves most competitive and effective in a given environment. Conversely, nature selects the beings that have proven themselves more faithful and loyal to the environment they are embedded in (ecology or ecosystem). This means that they are able to construct a network of complementarities—collaborations and antagonisms—that is compatible with the reproduction and evolution of the ecology (Morin, 1980).

One major change of this second perspective is that evolution stops to be the result of a casual mutation. Therefore, the rate of reproduction is no more a key variable to understand the process of innovation. In fact, the quality of ecology becomes crucial because it enables the firms' capacity to absorb, create and transfer knowledge rather it determines the learning capacity and the knowledge creation of the system. Ecology can be characterized by four qualities (Morin, 1980):

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[2] *See* Baum *et al.* (2006), for a recent review on the subject.

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1. Variety: The number of recombinations that are potentially productive increase exponentially with the variety of available resources in the ecology;

2. Connectivity: The probability of recombination increases with the network connectivity, so it also increases the spontaneous encounter between diverse resources;

3. Openness: Ecologies that are not capable to exchange and share energy are destined to implode as a consequence of asphyxia (e.g., lock-in phenomena); and

4. Freedom: It is the possibility to do something. The possibility to do something implies the ability to do it, this means knowledge and competence are needed. Therefore, the concept of freedom is complementary to the concept of autonomy.

In addition to these four aspects, it is important to notice that there is a trade off between variety and connectivity. The interaction between any variety of available resources does not make ecology. Ecologies are built up on a core network of relationships. Indeed, life springs into ecologies where each component enjoys large freedom to explore its potential to combine through a network. Again, relational goods such as friendship may emerge only in the context where both parties are free to choose to enter into a relationship. Freedom has been recently recognized in the economic literature as fundamental for the development of the forms of reciprocity that are far more complex than the contractual one (Bruni, 2006). Literature distinguishes the negative and positive freedom (Sen, 1995). The first refers to the freedom from something and/or someone. The second refers to the freedom to do something. In this second form of freedom, which is the most relevant and complete one, the exercise of freedom does not only require the possibility to do something, but also the ability to do it. Thus, the exercise of positive freedom is grounded on the availability of knowledge and competence.

The ecological perspective could be applied to study the local competitiveness. The population corresponds with the set of local firms and institutions. Additionally, the local competitive resources and competencies (cultural homogeneity, trust ...), that were the drivers of competitiveness in the past could be seen as the core rigidities which prevent evolution—the enlargement of the base of innovation and knowledge—of these systems.

The choice to study the competitiveness of regions from an ecological perspective affords to build a concept of competitiveness strongly based on the idea of selection and evolution. Moreover, one major reason and argument behind the choice to take an ecological perspective on local competitiveness is the key role assumed in the local system (e.g., Italian district) by the governance of openness in order to assure economic development. This is due to the incapacity of local systems to self-produce the knowledge necessary to compete in a global market. The opening of these systems to global network of knowledge creation, transfer and diffusion represents the answer to this problem.

According to the Darwinistic mechanism of selection, local competitiveness depends on the number of firms entering and exiting the local market. Consequently, a local system updates and upgrades its competitive sources by means of this process. However, as it has been argued before, a non-Darwinistic mechanism of selection appears to be more appropriated. If this perspective is taken, then an ecological definition of local competitiveness could

be given as follows: the capacity of a local system to match a high level of social connectivity and individual autonomy. Where autonomy is defined by the positive freedom, namely, as the availability of knowledge and competencies necessary to interact in an open environment (the global world).

The ecological approach illustrated above represents the theoretical framework on which the scoreboard is based which is built in order to evaluate cluster competitiveness.

The Scoreboard

The scoreboard is built with an objective to evaluate the competitiveness of cluster characterized by the prevalence of Small and Medium Enterprises (SMEs) and facing the challenges of global economy. It is based on the concept of local competitiveness in an ecology perspective, as previously defined. To be more precise, the main objective of the scoreboard is to build a benchmarking tool useful to determine the level of competitiveness, know the strengths and the weakness and monitor the impact of globalization and the effect of policies in clusters.

In the definition of the scoreboard, careful attention was paid to avoid a tool that fosters a "one-size-fits-all" policy and puts every cluster in the same trajectory of evolution. Actually, it should permit to understand the competitiveness framework and avoid the use of standard local industrial policies. Therefore, it is a scoreboard which is based on benchmarking, useful to define a "tailor-made" policy portfolio. Furthermore, it gives some insights on how clusters cope with the constant undermining of the sources of territorial competitiveness and the evolution path being undertaken by these systems.

Here, it is important to clarify the role of benchmarking because too often this method is seen as a "policy fad" by academicians or considered as an economic panacea by policymakers. The main criticisms to the usefulness of benchmarking made by academicians are based on:

- The absence of an optimal development model in evolutionary thinking;

- The role of path-dependence and lock-in, in determining the competitive asset of a local system (Boschma, 2004); and

- The impossibility to have a universal policy portfolio ready to be applied to every context (Amin, 1999).

However, if the benchmarking helps policymakers to identify the range of successful development paths and shed light on the specific context in which this models have origin, it could be an important learning tool (Boschma, 2004). Since the effectiveness of regional policies correlate directly with the environment in which they are embedded, there is room for useful benchmarking that fosters local policies aimed to upgrade the local context rather than imitating the best practices. Furthermore, benchmarking might help to avoid phenomena of institutional lock-in with no room for variety since it makes policymakers aware of the range of local policies used in other context and its effect.

The remaining part examines the framework of the scoreboard and how it is interpreted. The meanings of the three matrices that constitute the scoreboard and its axes are also illustrated.

The scoreboard is structured into two economic levels of analysis (micro and meso level) and three matrices (Figure 1). First, an analysis of the meso-level is necessary to understand the role of the territory in the economic development. Secondly, an analysis of the micro-economic level is made to understand the level of ecological competitiveness of cluster. During this analysis highlighting different policy priorities is possible.

The first matrix evaluates the role of local system as a factor of long-term competitiveness. It is called the Local System Matrix. It evaluates the relevance of local system in term of economic coordination and sustainable development. The firms in a cluster compete globally through the mobilization of location-specific resource. The thickness of local system is seen as one of the most important variable to overcome the "globalization trap" (Lagendijk, 2000).

Figure 1: Scoreboard Framework
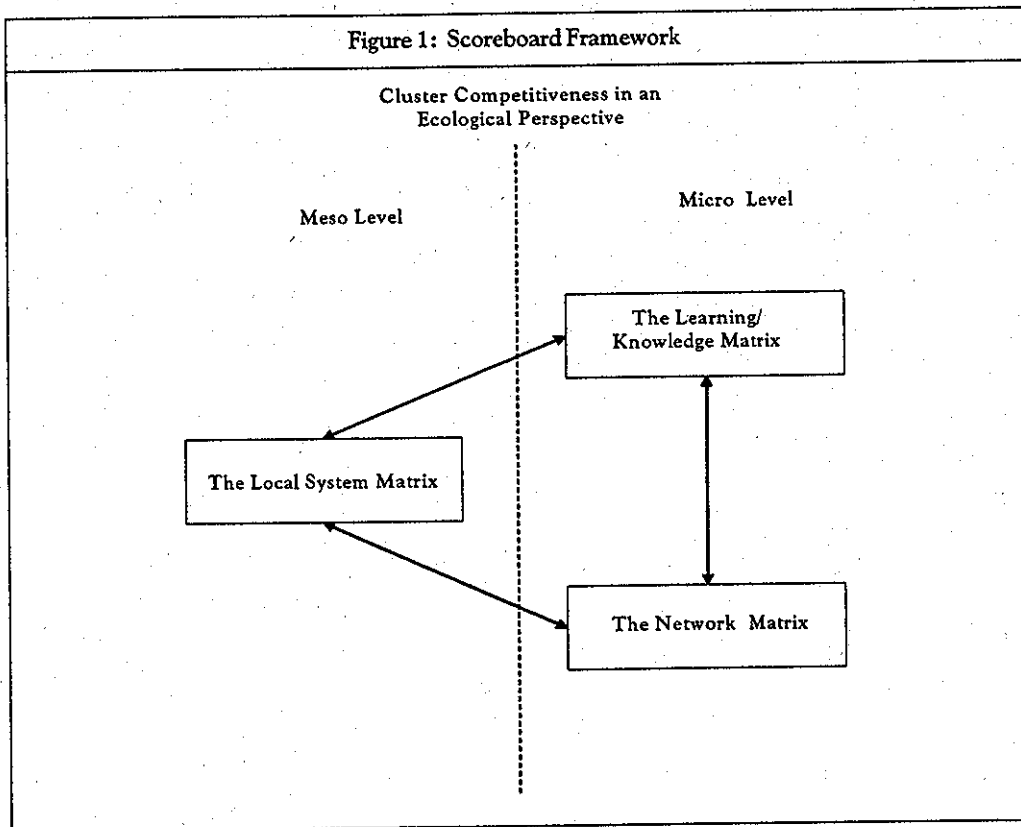
The matrix is defined by two dimensions:

- Sustainable Development: it is defined as an average between strategic practices and business performances. In other words, the index evaluates the economic sustainability giving a score to the current firm's economic performance and the strategic practice necessary to sustain it.

- Local System Efficiency: it is defined as the weighted average between the perceived relevance of links with the local context in comparison to the links with global system.

The weighted average is based on four different types of connection (from the lowest to the highest): supplier market framework (4 items), low-service framework (3 items), high-service framework (3 items) and research and development framework (3 items).

Moving from left to right increases the local system efficiency and, thereby, the endogenous development processes. Therefore the local context moving along the x-axis, changes from a status of institutional thinness to one of the institutional thickness (Henry and Pinch, 2001). Moving from bottom to top improves the sustainable development and consequently, the level of strategic practices implemented and business performances obtained. Therefore, moving along the y-axis changes the competitiveness foundations from a short-term to a long-term view.

The second level is defined by two matrices, which address most of the factors that contribute to understand the cluster competitiveness from an ecological perspective. The matrices at this level measure:

1. The learning system activated in the cluster (The Learning/Knowledge Matrix);

2. The degree of matching between strategic autonomy and networking (The Network Matrix).

The first matrix evaluates the relationship between types of activities carried out internally and quality of the competence available. It is called the Learning/Knowledge Matrix. The matrix is defined by two indexes:

1. **Capabilities:** It is calculated as weighted average of the scores on these aspects: production management, supplier management, customer management, channel management, technology management, human resource management, financial management and strategic management. In other words, it evaluates the distinctive business competencies that belong to firms' cluster.

2. **Processes/Activities Internalized:** It is calculated as weighted average of processes/ activities carried out in the firms. It uses a different weight for the activities and for the degree of control on it. It gives a score to the firms' position on value chain.

On the basis of these two dimensions, it is possible to identify the main form of learning in the cluster. Low levels of both the dimensions identify a prevalence of learning by doing. Low number of processes and high level of competencies identify the prevalence of learning by imitation. In this case a majority of cluster firms are specialized in a small number of activities that are carried out without controlling all the processes. High levels of both the dimensions identify the prevalence of learning by interacting characterized by high-knowledge intensity. The last case—low competencies and high number of processes—identify alike the prevalence of learning by imitation but it is characterized by low-knowledge intensity.

The second matrix addresses the matching between the firms' relational intensity and firms' strategic autonomy. It is called the Network Matrix. This matrix enables us to evaluate how the firms in a cluster behave ecologically. In other words their capability to mobilize

external resources to their own advantages without exhausting the internal ones are evaluated. The matrix is defined by two indexes:

- **Strategic Autonomy:** it is calculated as a difference between the weighted average of the number of activities/processes that the enterprise is able to control and the weighted average of the number of activities/processes that the enterprise is not able to control. It uses a different weight for the activities and the degree of control on it. It gives a score to the firms' strategic autonomy;

- **Relational Intensity:** it is calculated as a mean of the importance attributed by the enterprise to networking practices and alliances with clients and suppliers. In other words, the geographical proximity only creates a potential for interaction and evaluates the strategic importance give to networking by firms.

Moving from left to right improves the strategic autonomy and thereby the levels of knowledge and competencies. Therefore, the firms, moving along the x-axis, improve the degree of specialization and/or specialize in high-value activities. Moving from bottom to top improves the relational intensity and consequently changes the type—from short-term to long-term—and the mode—from transactional to relational mode—of the relationships. Therefore, the density of local relations, moving along the y-axis, increases. Furthermore, the matrix identifies an area called ecological area. The clusters in this area are characterized by a medium-high strategic autonomy and a good networking capacity.

Research Methodology

In this part of the paper, specific attention is given to the theoretical justification of sampling methodology chosen and the questionnaire developed.

One major problem to conduct a case study on a cluster is the difficulty to choose the right subjects (respondents) to be interviewed because the structure of the network is not known in advance. According to Atkinson and Flint (2001) snowball sampling can be applied as a formal methodology for making inferences about hidden and/or hard-to-reach populations. Therefore, the snowball sampling method was chosen. Snowball method begins with a set of actors. The sample is created by asking every respondent to name one or more players who could contribute to the study. This process is based on the assumption that a link exists between the initial sample and the target population (Berg, 1988).

The initial set of actors was chosen by selecting the cluster's most relevant—in terms of size, age and turnover—firms. The initial set was selected with the help of local policymakers and trade associations. Since the snowball sampling method was used to asses the relationship and knowledge framework, the top ten suppliers in terms of knowledge exchange and/or relationship's quality was request to everyone of the initial firms. With this method it is possible to interview both leader firms (typically in the initial set) and sub-contractor. The process stops when the sample realized covers all the filiére or the limits of time and resources are achieved.

The snowball method has problems of representativeness due to the selection process of the initial set (Atkinson and Flint, 2001). The size of the sample for every cluster should

solve this type of problem. Furthermore, it should be avoided to over-emphasize cohesiveness (Van Meter, 1990).

In order to collect the data, a questionnaire was developed. It was structured in two parts to minimize the cost of data collection.

The first part contains self-explicatory questions which is sent by e-mail. Firms were previously contacted by phone or mail in order to solicit participations, provide them with a background of the research project and a description of the questionnaire. The questions on this part refer to:

1. Firm's general data (contact details, address, name and address of Managing Director), size of the company (number of employees) and economic activity (ATECO sector)[3];

2. Type of processes/activities carried out by the firm and the degree of control retained over it (14 binary items).

The second part, whose compilation may have required some additional assistance, was collected through a series of personal interviews to firms' entrepreneurs or managers. The questions on this part refer to:

1. Relevant information about operations managerial practice and performance (30 items);

2. Assessment of firm's distinctive competence in eight (production management, supplier management, customer management, channel management, technology management, human resource management, financial management and strategic management) different areas (51 items); and

3. Relevance and type of links with regional system in comparison to links with global system (13 items).

The first set of questions is based on Frames benchmarking tool[4]. Frames is designed on the hypothesis that firms' sustainable development is constructed on the balance between performance and manufacturing, design and business practices. This tool developed by Ecipar gathers information on key firms' strategic dimensions, such as organization and culture, production, quality, competitive positioning, financial-economic performances. Responses range from 1 to 5, where 1 represents the basic level of practice/performance and 5 the best[5].

The second and the third set of questions were linked to a five-point Likert type scale from "absolutely non important" to "remarkably important". The first draft of the questionnaire was self-developed on literature and subsequently tested with academicians and practitioners.

The Empirical Study on Emilia Romagna's Cluster

This section reports the evidence of an empirical investigation conducted on seven clusters located in the Emilia Romagna region differentiated by the level of technology and industry. The case study tests the capacity of the scoreboard to assess the competitiveness and gives some interesting examples of its application by the policymakers.

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3   To this purpose ATECO 2002, is used. It is the Italian economic activity classification based on NACE Rev 1.1.
4   The data collect by Frames' questionnaire enable the firms of a sample to participate at the Regional Excellence Award 2005, and at the Regional Report on Competitiveness 2005. However, only a sub-set (8 items) of Frames' items is used in the scoreboard.
5   The Frames tool was used in some European Projects and Frames' database contains more than 3800 firms.

The empirical study was conducted on seven clusters located in Emilia Romagna.

The research was conducted as follow:

- Nine clusters in Emilia Romagna facing the challenges of global competition and knowledge economy were detected. These clusters are—the automotive cluster in Bologna, biomedical cluster in Mirandola, ceramics cluster in Sassuolo, footwear cluster in Fusignano and San Mauro Pascoli, Packaging cluster in Val d'Enza, plastic cluster in Correggio and textile cluster in Carpi. These clusters are chosen because they can be differentiated by sector and technology;
- Sample was defined using a snowball methodology;
- Data was collected by a questionnaire;
- A case history, based on the literature, for every cluster was written and a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis, based on an interview with the local policymakers and trade associations, was conducted; and
- For every cluster the results of scoreboard were discussed in a focus group to verify the reliability of the model and the capability as policies' tool. The focus group participants are the local policymakers, trade associations and some firms of the sample.

In the following paragraph, how the sample was realized will be illustrated. A little description of the main characteristics of the final sample will also be illustrated.

During the snowball process, 700 enterprises were contacted by telephone and the first part of questionnaire was sent by e-mail. A total of 497 questionnaires were returned[6]. Initially, data from the nine clusters were collected except for two (the shoe factory cluster of Fusignano and the automotive cluster of Bologna) the number of firms contacted was not large enough, so the study focused on seven clusters. The firms interviewed for the second part of questionnaire were 368.

The number of usable data for every cluster is shown in the Table 1.

Table 1: Size of the Realized Sample and Population for Every Cluster				
Cluster	Sample	%	Population 2003 (P)*	$\frac{S}{P}$%
Biomedical (Mirandola)	38	10.3	78	48.7
Footwear (S Mauro Pascoli)	65	17.7	111	58.6
Ceramics (Sassuolo)	54	14.7	1726	3.1
Shipbuilding (North Adriatic)	34	9.2	292	11.6
Packaging (Val D'Enza)	69	18.8	458	15.1
Plastic (Correggio)	53	14.4	300	17.6
Textile (Carpi)	55	14.9	1483	3.7
Total	368	100.0	#	#
Source: Istat, 2003.				

[6] The response rate (52,6%) is high because the enterprises were encouraged to completion by the possibility to participate at the Regional Excellence Award.

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Broadly speaking, the seven clusters investigated were a cluster of SMEs settled in Emilia Romagna and operating in high-technology sector (Biomedical cluster) or medium-technology sector (Ceramics, Packaging, Plastic and Shipbuilding cluster) or low-technology sector (Footwear and Textile Cluster)[7].

Firms varied in size as shown in Figure 1 and sales. Participants report a size ranging from two employees to 494 and turnover ranging from €100 thousand to €98 million annually. The firms were leaders (89; 24,2%), designers (101; 27,4%) and subcontractors (178; 48,4%). Table 2 summarizes the main characteristics of our final sample.

Although the sample is geographically constrained, it is consistent to the objective of testing the scoreboard as a benchmarking tool. Indeed Emilia Romagna is considered one of the best Regional Innovation Systems (Braczyk, Cooke, and Heidenreich, 1998) and located in the so called Third Italy (Bagnasco, 1977). Italian clusters are industrial model based on a social network and a mix of cooperation and competition (Pyke, Becattini, and Sengenberger, 1990). Now this industrial model is facing the challenges of globalization (Belussi and Sammarra, 2005) and the knowledge based-economy (Belussi and Pilotti, 2002). Moreover, the set of clusters used to test the framework are differentiated by the technology level and industrial sector. However, the constraints and the sample is solid enough to test the scoreboard and to derive some interesting conclusions about its usefulness as a supportive policy tool.

The main findings are presented and a benchmarking analysis is developed. The presentation of the findings will follow the framework of the scoreboard presented in Figure 1. The benchmarking analysis is made comparing the performances of clusters where the data were collected. Some policy indications emerged from this analysis are discussed at the end.

The Local System Matrix explores the role of local system as an enabler of long-term competitiveness. The analysis of the matrix (Figure 2) points out three different situations:

- Plastic, Footwear, Packaging and Textile clusters do not find in the local context the right sustenance to compete successfully. This depiction points out a lack of relevant actors in the cluster. A good policies portfolio has to start from this type of problem. The following matrices could help to create a hierarchy in the policy objectives. The most adequate approach may be to link this cluster to an external system to improve the general competitiveness foundations.

- Biomedical, Ceramics and Shipbuilding clusters have a good position in terms of institutional thickness. Therefore, to define the right policies, a portfolio is needed to analyze the following matrices.

The Learning/Knowledge Matrix is useful to explore the differences between clusters in terms of the quality of learning and knowledge (Figure 3).

- The Ceramics cluster is in the best position. The learning/knowledge framework of this cluster seems to be adapted to facing the challenges of the knowledge economy;

- The Biomedical and Shipbuilding cluster have a good system of learning. However, there is a lack in terms of capabilities. These clusters point out a lack of infrastructure

Table 2: Main Characteristics of Final Sample

	Biomedical	(%)	Footwear	(%)	Ceramics	(%)	Shipbuilding	(%)	Packaging	(%)	Plastic	(%)	Textile	(%)
Micro: Employees < 5	3	7.9	6	9.2	3	5.6	5	14.7	18	26.1	3	5.7	9	16.4
Small: 5 ≤ Employees <20	17	44.7	27	41.5	13	24.1	22	64.7	43	62.3	17	32.1	31	56.4
Medium: 20 ≤ Employees <40	13	34.2	18	27.7	10	18.5	3	8.8	4	5.8	21	39.6	7	12.7
Large: Employees ≥ 40	5	13.2	14	21.5	28	51.9	4	11.8	4	5.8	12	22.6	8	14.5
Total	38	100.0	65	100.0	54	100.0	34	100.0	69	100.0	53	100.0	55	100.0
Leader	8	21.1	10	15.4	11	20.4	15	44.1	14	20.3	5	9.4	26	47.3
Designers	9	23.7	19	29.2	33	61.1	10	29.4	17	24.6	7	13.2	6	10.9
Subcontractor	21	55.3	36	55.4	10	18.5	9	26.5	38	55.1	41	77.4	23	41.8
Total	38	100.0	65	100.0	54	100.0	34	100.0	69	100.0	53	100.0	55	100.0
Mains Nace Sectors	33/25		19		26/29		34/35/60		27/28/29		25		17/18	
Technology Level	High Technology		Low Technology		Medium Technology		Medium Technology		Medium Technology		Medium Technology		Low Technology	

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17/18	Manufacture of textiles and textile products
19	Manufacture of leather and leather products
25	Manufacture of rubber and plastic products
26	Manufacture of other non-metallic mineral products
27/28	Manufacture of basic metals and fabricated metal products
29	Manufacture of machinery and equipment n.e.c.
33	Manufacture of medical, precision and optical instruments, watches and clocks
34/35	Manufacture of transport equipment
60	Transport, storage and communication

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Figure 2: The Local System Matrix

Increased Levels of Strategic Practice and Business Performance

Long term. Competitiveness

Struggle for Survival

Biomedical Cluster

Shipbuilding Cluster

Plastic Cluster

Footwear Cluster

Ceramics Cluster

Packaging Cluster

Textile Cluster

Increased Presence of Relevant Local Actors

Organizational Thinness — Organizational Thinness

Figure 3: The Learning/Knowledge Matrix

Processes/Activities Internalized

Learning by Interacting
(Medium-low-knowledge Intensity)

Learning by
(High-knowledge Intensity and two-way Relations)

Biomedical Cluster

Ceramics Cluster

Schipbuilding Cluster →

Textile Cluster

Footwear Cluster →
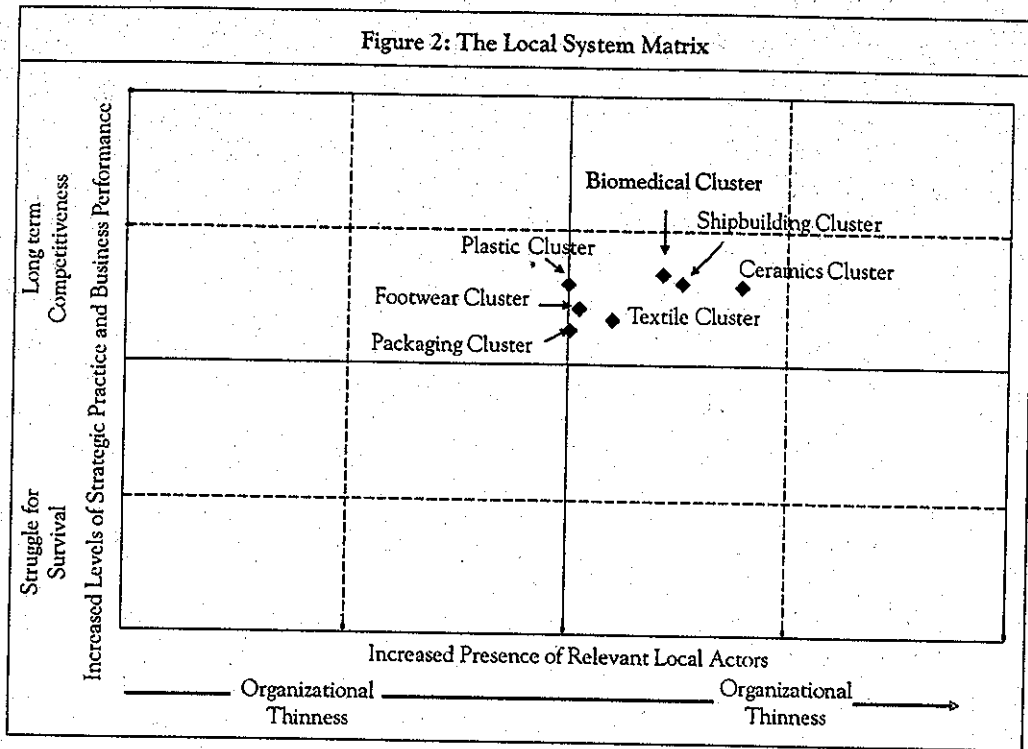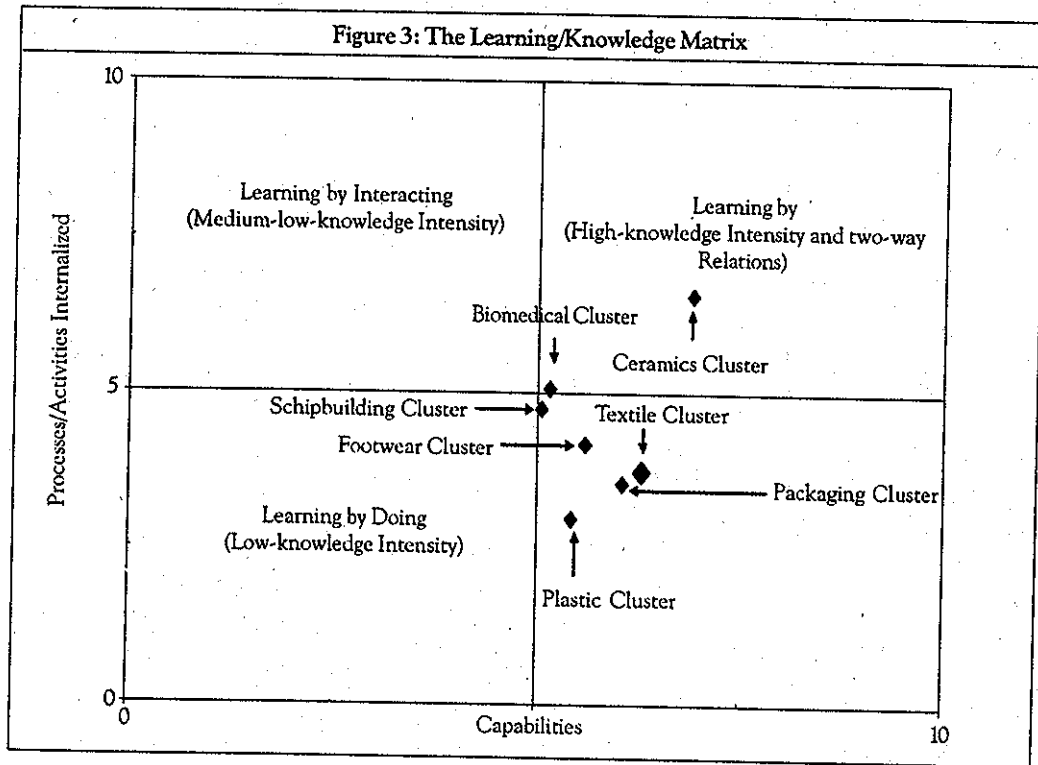
Packaging Cluster

Learning by Doing
(Low-knowledge Intensity)

Plastic Cluster

Capabilities

capable of supporting collective learning and innovation. This situation is especially negative for Biomedical cluster. In fact, the Biomedical firms make knowledge intensive activities but they do not activate a system of knowledge-networking;

- The Packaging, Textile and Footwear clusters have a difficult situation in terms of knowledge/learning and particularly in term of internalized processes/activities. It could be due to a high-dependence by external technologies or external market. For the Packaging cluster it could mean a specialization in outdated technologies. For the Textile and Footwear cluster the need is to specialize on processes or activities with more value added. In both cases it requires to open up the networks to external actors and/or to mobilize the firm's complementary local asset (universities, trade unions, etc.);

- The Plastic cluster is in the worst position. It points out problems in the production and exchange of knowledge.

The Ecological Network matrix enables us to explore the quality of network. The matrix (Figure 4) points out that:

- The Ceramics cluster is characterized by a high strategic autonomy and a good networking of material and immaterial activities. It confirms the results of the previous matrix;

- Packaging, Textile, Footwear and Shipbuilding clusters have a balanced situation between the two dimensions. The first three need to mobilize the endogenous factors to improve the strategic autonomy in terms of knowledge. The Shipbuilding cluster points out a lack of relational intensity probably due to the nature of the

Figure 4: The Network Matrix
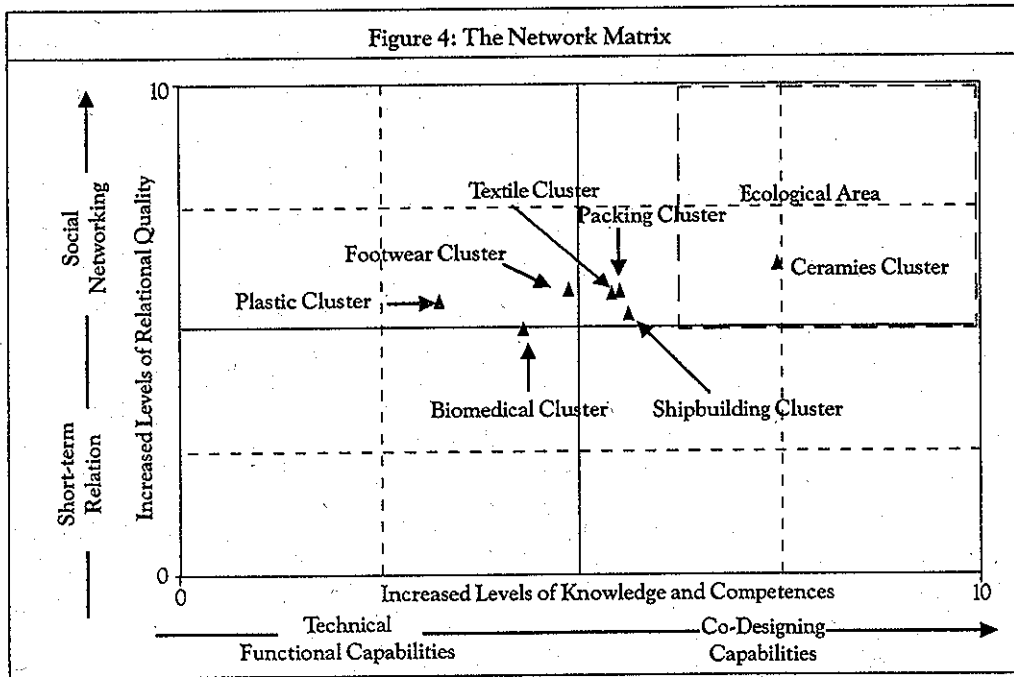
sector and the process of production. Once again, it shows the need of an infrastructure capable of stimulate networking and learning;

- The Biomedical cluster has a position that reveals two aspects. The first is the absence of a strong network. The second is the low level of strategic autonomy. The cluster's profile reveals a low use of knowledge. It could mean a lack of specialization on innovation activities, despite the high-technology sector, on behalf of production activities. These are high-knowledge intensive; however, without a renewing of these activities through interaction, the competitive framework of the cluster is not sustainable; and

- In the previous matrix as well, the Plastic cluster is in the worst position. The firms in this cluster appear poor in terms of strategic autonomy. The situation depicted until now shows the no-ecological competitive framework of this cluster. It competed using the endogenous resources without renewing it. Now it is not able to face the global competitiveness.

In conclusion, the application of the scoreboard to seven clusters has helped to avoid misguiding the policies due to false myths, portfolios or success stories. In fact, the scoreboard assesses the presence of the most important requirements: the presence of a network, the system of learning and the presence of co-operation with local system. It permits to depict the follows situations:

- First an institutional thinness in Footwear, Plastic, Packaging and Textile cluster. Furthermore the matrices point out that: in Packaging and Textile clusters, it is necessary to open up the networks to external actors and/or to mobilize the firm's complementary local asset (universities, trade unions, …), in Footwear cluster it is necessary to mobilize the endogenous factors to improve the strategic autonomy in terms of knowledge, and finally in the Plastic cluster it is necessary to stimulate a renewing of endogenous resources;

- The need of an infrastructure which can stimulate networking and learning, and supporting collective learning and innovation in Biomedical and Shipbuilding cluster; and

- The good framework of Ceramics cluster. Its competitive framework seems to be adapted to facing the challenges of the global economy. This cluster could represent a benchmark in term of policies and performances.

The conclusions drawn by the scoreboard were presented in the local focus groups and they have been found coherent with participants' knowledge and experience of their cluster.

Discussion and Conclusion

In this paper, the concept of competitiveness from an ecological perspective was illustrated and a scoreboard to measure cluster competitiveness was presented. Additionally, the scoreboard was tested on a sample of seven clusters located in Emilia Romagna.

The literary review has shown that non-evolutionary theories have a different perspective about competitiveness. However, it is clear that it is necessary for a concept that goes beyond a static comparison of performance between places is needed to understand entirely the

meaning, it is not the simple sum of local firms performance nor a weighted disaggregation of the national economy, and the lack of a detailed conceptual framework negatively affect its application in policy-making.

The evolutionary concept of competitiveness is based on the observation that the development of Information and Communications Technology (ICT) and knowledge economy has changed the competition and perspective at the meso-level. In the current economic paradigm the local competitiveness seem to be based on the capacity to attract, withhold and transform into local value the potential embedded in highly mobile and versatile global resources, such as knowledge and talent. The use of an evolutionary framework to study local competitiveness implies to focus on the cumulative, localized and interactive nature of knowledge creation and learning at local level.

The perspective adopted in this paper is not only evolutionary, but also ecological. An ecological perspective on the concept of local competitiveness is proposed and used in this paper. The concept of ecology is not new to the strategic and managerial literature. It identifies a specific stream of literature aiming to prove that the evolution is not an outcome of organizational change, but market selection. The most important point in an ecological perspective is the selection process. Traditionally, the Darwinistic mechanism of selection is used. However, a non-Darwinistic mechanism of selection appears to be more appropriated because it considers the network of reactions and feedback that every change, endogenous or exogenous at the system is implied. Taking this perspective, an ecological definition of local competitiveness could be given as follows:

The capacity of a local system to match a high level of social connectivity and individual autonomy. Where autonomy is defined by the positive freedom namely, as the availability of knowledge.

The scoreboard is strongly based on the concept of local competitiveness in an ecological perspective and has the objective to evaluate the competitiveness of a cluster and help in policy-making. It has structured on two economic levels (micro and meso) made by three matrices. Every matrix is useful to understand a competitive strength or weakness of the cluster.

The empirical analysis conducted on seven clusters of Emilia Romagna using the scoreboard has shown that it could improve the understanding of the competitive factors of the cluster. Additionally, it allows to make a hierarchy of policy objectives.

This research has some limitations. The first is that our benchmarking tool focuses exclusively upon firms. However, the quality of the practices adopted by the local institutions is also important. Furthermore, it is also important to know how these local institutions and associations have tried to support local firms—through funds devoted to stimulate innovation, internationalization and so forth. Therefore, future research will try to expand the current framework in order to include the assessment of the quality of the local institutional infrastructure. The second is that the clusters studied belong to the same regions. An evaluation of a cluster located in other regions with this scoreboard is needed to test its validity in a cross-cultural context. The third is related to the questionnaire.

An improvement of the questionnaire is necessary in order to shorten it and limit the need of an interviewer to collect data. Finally, a better statistical analysis of the index used to build the matrix could be useful.

Notwithstanding the limits and need of future research, the scoreboard has shown to be useful as a tool to enhance the understanding of local competitiveness and improve the governance and the strategic planning of local system. ■

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