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The Importance of Clusters for Sustainable Innovation Processes: The Context of Small and Medium Sized Regions

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TABLE OF CONTENTS

ABSTRACT 2
1- INTRODUCTION 2
2- TERRITORIAL PRODUCTIVE SYSTEMS 6
3- CLUSTERS 11
4- INNOVATION SYSTEMS 14
5- SPATIAL ECONOMICS APPROACH 19
6- CONCLUSION 20
7- REFERENCES 21

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ABSTRACT

The purpose of the current paper is to provide a critical state-of-the-art review of current research on clusters and its correlation to innovation dynamics in small and medium-sized regions. In particular, we focus on the systematization of the main concepts and theoretical insights that are tributary to the cluster overview in terms of its relevance for the sustainability of the innovation processes, knowledge production and diffusion, which take place inside small and medium-sized regions. The present working paper takes into account the initial studies on English industrial districts (in the nineteenth century), passing through the Italian industrial districts (in the 70s and 80s of the twentieth century), until the modern theories of business clusters and innovation systems. These frameworks constitute the basis of an approach to endogenous development, which gives a central role to the interaction between economic actors, the society and the institutions and to the identification, mobilization and combination of potential resources within a particular geographical area.

Keywords: “cluster”, “innovation”, “endogenous development”, “territory”.

JEL classification: E23; D23; R12

1- INTRODUCTION

The aim of the current paper is to analyse and identify the most relevant characteristics related with the role of non-market devices by which groups of closely related and complementary public and private actors, operating within a particular region, are able to increase their economic performance. The theoretical approaches and the various concepts which we highlight throughout this article constitute the basis of an approach to endogenous development, which gives a central role to the interaction between economic actors, the society and the institutions and to the identification,

mobilization and combination of potential resources within a particular geographical area. By combining several territorialized perspectives focused on geographical proximity and agglomeration economies, the present systematization intends to emphasize the key role often played by these productive systems towards the dynamics of innovation processes and the development of growth opportunities within small and medium sized regions.

The notion of "agglomeration economies" refers to the efficiency gains that might benefit production activities in a situation of proximity and that would not exist if the activities had isolated locations. Traditionally, spatial economics distinguishes between three types of agglomeration economies (Pontes, 2005):
• Economies arising from industrial concentration, in other words, the increasing returns to scale that determine the geographic concentration of production in the same establishment;
• "Location economies" resulting from the geographical proximity of independent establishments, but belonging to the same industry or sector of activity in particular;
• "Urbanization economies" that arise from the geographical proximity between production establishments belonging to different industries or sectors of activity.

According to the theoretical framework of Marshall, there are three sources of specific positive effects derived from the agglomeration of businesses that include: (1) local inputs non-tradables, (2) supply of local and specialized labour, and (3) information spillovers. The work of Alfred Marshall pointed out reasons for increased business productivity, when several companies in the same industry are located close to each other, sharing the labour market, knowledge spillovers and specialized suppliers. Subsequent theories have argued that specialization in a particular industry, carries a cumulative process of assets and advantages, which is a direct consequence of strengthening the nature of this process (OECD, 2007).
Subsequent theories have argued that specialisation in a particular industry brings with it a process of accumulation of assets and advantages (cumulative causation), implying a self-reinforcing nature in this process. Additionally, market forces tend to concentrate investments in prosperous areas which offer better access to infrastructure and human capital, lower risks and better access to markets (Krugman and Venables, 1990).

The natural advantages of a location provide the initial conditions for a cluster to start by providing a base for existing firms to thrive and attracting new firms, organisations and resources. The interaction between the existing agents and the new entrants, create dynamic effects that are based on the growing knowledge and resource base of the location and a developing horizontal and vertical linkages. This ‘resource’ starts to attract new entrants and provides strength to incumbents. Over time institutions emerge that capture knowledge, and support economic activity. These institutions can be leveraged and assisted by public support, whilst the dynamic effects are a result of individual transactions and market forces (Lowe *et al.*, 2006). In this process, clusters have become increasingly specialised and increasingly connected with other clusters providing complementary activities. Successful clusters have also significantly increased their global reach – attracting people, technology and investments, serving global markets, and connecting with other regional clusters that provide complementary activities in global value chains (Ketels *et al.*, 2008).

On the perspective presented at DG Enterprise and Industry (2007), innovation is increasingly characterised as an open process, in which many different actors - companies, customers, investors, universities, and other organisations - cooperate in a complex ways. Ideas move across institutional boundaries more frequently. According to Noronha Vaz *et al.* (2006), the transition from a closed regional environment to an open interregional system demands an evolution of economic activity from simple forms of activity branches into complex technological regimes. In such a dynamic system, technological learning, entrepreneurial strategies, coordination systems and institutions and overall regional conditions, are factors that determine firm attitudes to innovation. The traditional linear model of innovation with clearly assigned roles for basic research at the university, and applied research in a company R&D centre, is no longer relevant. Innovation can benefit from geographic proximity which facilitates the flows of tacit knowledge and the unplanned interactions that are critical

parts of the innovation process. As assumed in Nijkamp *et al.* (2007), as firms become exposed to increasing amounts of tacit knowledge, probably as a result of links with new, external partners, an emerging concept is reshaping the debate: proximity. This can be institutional, if national industrial specialization patterns are to be achieved, or geographical, if this is not the case. Face-to-face interaction between partners becomes a positive externality. Common links like language, codes of communication, conventions, personal contacts, past history, or successful informal interactions (Gertler; Nightingale apud Nijkamp *et al.*, 2007) take place, thereby increasing trust and reducing risk. This is one of the reasons why innovation occurs locally whereas its benefits spread more widely through productivity gains. Clusters may embody the characteristics of the modern innovation process: they can be considered as "reduced scale innovation systems". Successful clusters encapsulate all the activities needed to deliver a particular value to customers; they cross the traditional definitions of industries and of manufacturing versus services. They can emerge even where companies' locations are not determined by the location of markets or natural resources. Their specific nature, including their spatial coverage, differs according to technology, market conditions, and other factors that influence the geographic extent and relative strength of linkages.

The overall market potential of a functional region, i.e. its size and density, is an infrastructure phenomenon in itself. It changes in a process of very slow adjustments and provides collective market opportunities that benefit both households and firms. In growing functional regions, the location of households and firms form a self reinforcing dynamic process, i.e. a process with positive feedbacks. Over time, the (slow) formation of regional infrastructure affects the process by gradually building up the basic conditions for the household milieu and the economic milieu of firms (Karlsson, 2008). To Neto (1999) the strategies for networking and affirmation of the functional territories modify the organization and spatial and economic interrelationships of sectors and their organizations, as well as the economical specialization of the territories, by this means reshaping the comparative and competitive inter-territorial advantages. Once again Karlsson (2008), states that this approach is a resource-based theory of location and clustering (and trade). The critical resources have the character of durable capacities which consists, on the one hand, of natural resources and, on the other hand, of the supply of infrastructure in the form of facilities and networks, R&D organizations, existing production capacities with specific techniques, and the supply of different immobile labour categories. The multiple efforts to better understand the drivers of innovation have stimulated researchers to adopt the resource-based view of the firm. They have accepted the heterogeneous character of firms and their unique choices related to strategic behaviour. In this context, knowledge is recognized as a key resource for firms and other economic agents, while both codified knowledge and tacit knowledge are pertinent aspects of innovativeness (Galindo *et al.*, 2010).

According to Villa and Antonelli (2009), clusters are defined by the co-location of producers, services providers, educational and research institutions, financial institutions and other private and government institutions related through linkages of different types, or as non-random geographical agglomerations of firms with similar or closely complementary capabilities (Richardson; Ellison and Glaeser apud Maskell and Kebir, 2009). The innovation-dependent highly specialized firms need universities, research institutions, and specialised suppliers of goods and services which has increased the importance of science-based clustering in high-tech economies (Tichy, 1998). Porter (1998c, p.197) gives us an instrumental definition of the cluster concept which will serve as the guiding thread of the problem assumed in this article:

> *"Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (for example, universities, standard agencies, and trade associations) in particular fields that compete but also cooperate."*

There is huge diversity among clusters: they differ in terms of their stage of development along the cluster life cycle; some are networks of SMEs, some are organized around key anchor firms, and yet others have developed around universities. Even though they are studied under many different labels the terminological diversity cannot hide the fact that the cluster phenomenon as such has attracted increasing attention during last years. It is widely accepted that technological change underpins a

global economy and that geographic location and concentration is of foremost importance for regional development and competitive advantage (Porter apud Lowe *et al.*, 2006). Much of the recent literature on clusters focuses on the incremental processes of innovation and learning within selected growth regions and clusters, offering "snapshots" of regional success rather than considering the capacity of particular clusters to sustain growth over time by successfully adapting to economic change (Chapman *et al.*, 2004).

In OECD (2007) is stated that the circulation of knowledge in the form of an innovation system is therefore one of the key potential benefits of clustering. It is now believed that diffusion and spillovers are the mechanisms that link R&D with growth, not simply levels of R&D investment. Therefore, if the research results are not spread around the economy, then public support to research becomes significantly less productive. On this matter, Neto (2008) assumes that public policies aimed at creating territorial processes of innovation and at strengthening competitiveness, and consequently towards economic development and to the fostering of business, increasingly rely upon intervention models that are based on a coordinated action in a given local context, comprising five major strategic areas:

1) Strong investments in infrastructure projects with direct economic relevance, particulary the development of science parks, technopoles or other industrially-oriented spaces, while territorial contexts conducive to the development of territorial processes of cooperation and interaction in various dimensions, such as public-private, private-private and public-private, and to the development and transfer of technology;

2) Initiatives directed to support the development of localized groupings of companies, particulary through the implementation of measures that facilitate the development, in the local context, of actions or initiatives to increase the collective efficiency and encouraging the development of joint initiatives involving the most relevant public and private agents located there;

3) Actions to encourage the strengthening of the research-industry connections, through relationships between 'producers' and 'consumers' of knowledge and technology, in order to create a territorial context favourable to the transfer and implementation of technology and knowledge;

4) Actions and regulation to encourage the development and sophistication of procedures and models of governance, aiming: the creation of a territorial context favourable to entrepreneurship and to the development of economic activity, the strengthening of the collective efficiency of the territory and the increasing of local and regional competitiveness;

5) Actions to promote the ability for relationship from each territory and respective agents at different scales, so that they can be included on the inter-territorial transnational circuits of marketing and distribution and transfer of technology.

A regional knowledge and innovation system has been defined as a dynamic and evolving constellation of actors shaped by the knowledge embedded in organizational systems and embodied in associated technological systems (Choo and Bontis apud Cooke *et al.*, 2007). Some recent studies have suggested that the diffusion of knowledge is most effective if organised as an interactive system, which many countries lack. Technology and innovation are not created in isolated organisations but in favourable environments, where competent organisations and skilled individuals interact in a constructive and complementary way to assimilate existing knowledge and generate new ideas, products and production processes. It has been argued that firms and research centres of expertise/excellence play a dual role within a region, both creating (or co-creating) knowledge and absorbing knowledge from outside the region. Optimizing the potential contribution to regional development of a region's knowledge stock, however, will require complementarity between the regional knowledge base and the requirements of regional firms (for example, Gunasekara apud Cooke *et al.*, 2007).

The concept of clusters has evolved over time and this process has been indebted to many other theoretical frameworks, some precursors, while others are subsidiary or complementary of the cluster approach.

2- TERRITORIAL PRODUCTIVE SYSTEMS

Marshall (1890) was the first pointing to the peculiar "industrial atmosphere" of certain industrial concentrations in which firms are immersed, noticing the intangible dimensions of localisation, as evidenced in his famous comment about the secrets of industry being in the air, that stimulates “more vitality than might have seemed probable in view of the incessant change of techniques”, referring to Sheffield's cutlery industry in the nineteenth century as a prototypical example of this peculiar industrial organisation (but he did neither very much elaborate on this idea, nor on its social foundations). Marshall (1920) introduced the concept of "industrial district" referring to the industrial concentrations of the nineteenth century in Europe and stressed that industrial production gains efficiency with the concentration of several industrial units in a specific location, mentioning the mutual influence between the social and the economic systems. According with this author an “industrial district” is a concentration of large numbers of small businesses of a similar kind in the same locality. Agglomeration economies are associated with the cost savings to a business resulting from the proximity to markets and to inputs (supplies, labour force etc.). More specifically, as additional firms locate in the same geographic area, the lower the cost of production that can be achieved from suppliers competing for business, a greater specialization of supporting firms, and a specialized labour force. Furthermore, the greater the number of firms located in an area, the greater the overall market to which a business can sell its goods or services. Due to those observations, this author made a distinction between internal and external economies of scale (Marshall, 1920). When a company reduces costs and increases production, internal economies of scale have been achieved. External economies of scale occur outside of a firm, within an industry. A given company, operating under constant returns to scale, can benefit from external economies derived from the positive externalities produced by other businesses in the region, i.e. external economies of scale (Chipman, 1970). Thus, when an industry's scope of operations expands due to, for example, the creation of a better transportation network, resulting in a subsequent decrease in cost for a company working within that industry, external economies of scale are said to have been achieved. With external economies, all firms within the industry will benefit. Marshall believed that limits to internal economies existed, that managerial and organizational problems would eventually lead to *internal diseconomies* that would increase costs. Therefore, he believed that long-run increasing returns were likely to be caused by external economies. The economies of location often play a central role in many urban and regional economic models, as well as in models of spatial product cycles.

Many analyses take Marshall’s SME-dominated industrial district model as the basis for the definition. More recent definitions try to integrate some of the key concepts of this SME-based manufacturing cluster model with a broader field of application. They incorporate, among other concepts, the emergence of clusters in services, the rapid growth and evolution of clusters in high-tech sectors, the increasing prominence of multinational and internationally-networked enterprises in clusters, and the input of public and private institutions. In studies of innovative clusters, the OECD has noted the importance not only of firms but also knowledge-producing agents and customers (OECD, 2007).
The changes in the functioning of capitalist economies following the exhaustion of the Fordist model of accumulation and growth prevailing until the 70s of the twentieth century, lead to the emergence of a new model of production system (flexible specialization) that emerged in the "industrial districts" of the so-called "Third Italy". The designation, given by Arnaldo Bagnasco in order to indicate the emergence of a new macro-region that led to the breakdown of the traditional dualism between the developed North of Italy ("First Italy") and the late South ("Second Italy"), was driven by successful experiences of small and medium enterprises in traditional industries mainly located in the regions of Emilia-Romagna, Friuli-Venezia Giulia, Veneto, Trentino-Alto Adige, Marche, Tuscany and Umbria. The peculiarities that characterize this model of decentralized industrialization refers to the existence of local productive systems, characterized by small firms and the complex relationship between them and the local community. Bagnasco (1977) modified the classical distinction between the rich North and the poor South, introducing a new model: the so called *Three Italies*. This approach singles out three different socio-economically homogeneous geographical areas:

• The north-western Industrial Triangle with a macro-urban system based on the cities of Turin, Genoa and Milan;
• The south of Italy and the islands;
• The central and north-eastern area with many medium-sized cities ("Third Italy") characterised by: collaborative relations between workers and owners based on industrial districts (networks of small and medium-sized firms); cooperation rather then competition between firms based upon flexible, computerized machinery; and skill (or craft) intensive. The economic miracle of Italy in the 1970's, during which small and medium sized enterprises (SMEs) started contributing substantially to the economic development and welfare in Italy, has initiated a large stream of theoretical work focusing on the competitive advantages of being located in industrial districts.
It was Becattini (1979) who first linked these production systems locally defined to the concept of Marshallian "industrial district". Becattini (1992) has made several important contributions to our knowledge about industrial districts based on Marshall's reasoning. He defines the "industrial district" as a "(…) *socio-territorial entity which is characterised by the active presence of both a community of people and a population of firms in one naturally and historically bounded area. In the district, unlike in other environments, such as the manufacturing towns, community and firms tend to merge*". Thus, Becattini extended Marshall's analysis of the purely economic effects of agglomeration to a broader perspective, to include the social, cultural and institutional foundations of local industrial growth. He also associates the idea of "industrial atmosphere" elaborated by Marshall to what he calls "belong feeling" – i.e. the tendency he recognised in the districts' communities to identify themselves with the district. In other words, the population living in the district's area seems to feel part of the productive system. The industrial atmosphere mentioned by Marshall is very likely the outcome of coexistence in the same area of an industrial system and of a society grown around and because of the industry. In the Marshallian industrial district the concentration of firms in a geographic area determined the growth of villages of workers within the industrial area (Tappi, 2001).

Following the concept of "industrial district" numerous other investigations appeared, focused on the study of productive organizations, which despite not being confined to the socio-economic framework of the Third Italy and having their own particular assumptions and specifications that led to new designations, reflect, however, territorial phenomena of similar nature. The "productive" approach involves establishing territorial productive systems at the local or regional scales.

The "Growth Poles" (Perroux, 1955), which show a strong geographical identification, because they are products of agglomeration economies generated by the industrial complex led by motor industries, as the author has observed in industrial concentrations around Paris (France), and Germany, along the Ruhr Valley. The notion underlying this concept identifies a growth pole as an industry or perhaps a group of firms with an industry in terms of what he called *abstract economic space*, based on the notions of external economies, agglomeration and linkages. It refers to the concentration of highly innovative and technically advanced industries that stimulate economic development in linked businesses and industries. This pole is often characterized by a key industry around which linked industries develop, mainly through direct and indirect effects. The expansion of this key industry implies the expansion of output, employment, related investments, as well as new technologies and new industrial sectors. Perroux's observation and belief was that concentrations of economic forces would develop in areas that could provide the material and infrastructural resources necessary for the establishment, sustenance, and growth of key industries. As Perroux (1955) asserts, innovation does not appear everywhere nor at the same time. It appears in specific places where it brings about changes in the methods of production and therefore of consumption, where it changes production standards and from where it is diffused. Perroux puts the diffusion of innovation in the context of a process which brings into conflict production and consumption practices induced by innovation on the one hand with, on the other hand, a community's potential to adapt to them. However, Jacques Boudeville and other interpreters of Perroux's growth pole concept replaced "economic space" with geographic space, an idea that was readily adopted by regional planners and economic geographers, and more recently in the works of theorists of the new economic geography.

The "Territorial Production System" (Brun, 1985; Crevoisier and Maillat, 1989), a model that sees the territory as able to create specific and differentiated resources through the pre-existing. The concentration and agglomeration of activities within a territory produce externalities. According to Maillat (1996), "(...) *externalities are neither given nor spontaneous, but are the result of a construction in which the actors are able to act on their development and guide them.*". It is not enough that companies are located near each other, they must also interact, build networks and partnership relations, exchange information and know each other. This involvement facilitates the development of innovations, the creation and introduction of new technologies. Crevoisier (1996) argues that the isolation and resultant non-communication of these firms, causes this system to lack the necessary exchange relations required to generate the interactive learning for regional specific endogenous resources development and therefore provides only passive support for the location of branch activities. Maillat (1996) states that systems of horizontal integration consist of small independent and specialized firms, each cultivating numerous relations across the region as a part or the whole of their production chain in a horizontally integrated manner. The territorial production systems is made up of companies, regional socio-professional associations, local and regional authorities, universities and laboratories, schools, individuals, technical culture, know-how, technological training, research institutions and market relations, where companies work together with associations, public authorities, universities and individuals in a unique way to understand situations, problems and opportunities. The innovative activities, through R&D and knowledge creation, foster technological change which creates opportunities for further investments in productive capacity. This strategic role of knowledge underlies increasing investments in R&D, education and training, among other intangible assets, which have grown more rapidly than physical investments in most countries as the policy agenda has put emphasis on the innovation and knowledge-creating capacity (Fernandes and Noronha Vaz, 2005). This involvement facilitates the development of innovations, as well as the creation and learning of new technologies. Therefore, this environment comprises a combination of intentionality and unintentionality, because regional development can result from economic programs and political plans, which are aggregated according to a complex process (Brun apud Crevoisier and Maillat, 1989). With these systems, a flexible balance of competitive and cooperative forces (inter-firm complementarities) rather than the dominance of a single player coordinates the various production stages. Hence their development rests exclusively with the regional firm itself and can be hindered by gaps in the value-added chain, i.e. lack of relations with the market or gaps in research.

The "Local Industrial Systems", through which Colletis *et al.* (1990) advocate a notion of local productive system more comprehensive than the "industrial district", since the vectors of social cohesion are not restricted to the communitary spirit of the districts, but are also the result of business relations, technological culture, research policy, etc... In other words, it is the fact local relations with "production purposes", to use the expression from Courlet and Pecqueur (1990), encompass and presuppose not only flows of commodity character, but also non-market flows of formal or informal nature, that gives these conditions a relative autonomy of operation, sufficient to justify the identification of territorialized productive organization logics. This flexibility is based: on small-sized production units; on the density of links between them; on the rapid reaction time of companies, when faced with new internal and external conditions in the area (Courlet, 2000); and also on institutional proximity, which insures the social cohesion of local productive systems, resulting from a collective action logic grounded in local conventions and institutions created and shared by the actors. The interest shown in territorialized productive organizations does not simply account for a geographical phenomenon but above all highlights the territorial dimension of development and innovation processes. For instance, the territorial impact of economic changes in a heightened competitive context has served to (re)activate interplay between local actors whose ambition is to support and strengthen innovation within regions. The main premise of these works is that spatial proximity leads socio-economic actors to value their territorial identity and, consequently, to adopt local governance based strategies in order to unify the action of the productive actors and businesses. Organizational proximity is characterized by a dual dimension. The first dimension refers to a proximity of similarity or of common references (Pecqueur, 1989): the condition and the result of these processes are the construction of a *territorial cognitive patrimony*. Colletis and Pecqueur (2005) define patrimony here

as being composed of the memory of past successful situations of coordination, of the trust that has developed on that basis, as well as of potentially complementary specific cognitive resources (which are likely to be combined with a view to solving future productive problems). According to Serrano (2007), the memory of the agents and the public administration about themselves and about the territory, can be understood in terms of formal memory (institutionalized, organized, documented) or in terms of informal memory (collective and individual memory, non-systematic and undocumented), so it should be allowed the emergence in the territory of forms and solutions to share and construct this memory. The territorial memory must be part of a territorial system of construction and storage of memory, and will allow territories to make informed decisions about previous events and decisions (Serrano *et al.*, 2005). The second dimension refers to the frequency and the quality of interactions among separate organizations (external co-ordination between organizations). In the wake of the work done on Italian industrial districts, numerous studies have been conducted that have made it possible to identify similar forms of localized productive organizations. This framework leads growth models to include space as an economic resource and as an independent production factor, a generator of static and dynamic advantages for the firms situated within it – or, in other words, an element of fundamental importance in determining the competitiveness of a local production system.

The "System Areas" (Garofoli, 1994), in which the author established a classification for the system of small businesses, according to their nature more or less systemic in three categories: areas of specialization, local production systems and system areas. In areas of productive specialization, the enterprises share the same product or production phase, being this the only kind of relationship between them, in a direct competition environment. In the other side, local productive systems are considered a higher level because the increase in horizontal relationships between enterprises. The latter type was considered by Garofoli as the most developed kind of specialization areas of small businesses and their main feature is to depend on endogenous conditions for its own reproduction, ie, they reached such a level of inter-relationships between the different players that were able to produce the majority of the means necessary for their own development: business, capital, skilled workers and also local technology are productions internal to the system itself. The system area have been defined (Garofoli, 1981 and 1983) as an area of specialised production where a closely tied interdependence between small businesses is formed around a dominant sector, ie, each system-area contains a high number of small firms producing the same goods or specializing in different stages of the production process, thus complementing each other. Within this productive area, an interwoven relationship is formed that includes businesses, unions and local government. The face to face relationship between operators creates an informal information system that facilitates the diffusion of professional, technological and business knowledge. This further specification is much strongly related to the interactions between economy, society and environment. In this scheme a set of endogenous variables are identified: exploitation of the local resources; control of the accumulation process at a local level; innovation control; inter-sector and intra-sector productive interdependencies. The pattern is divided into a number of 'structural characteristics': high labour division; high specialisation in enterprise and environment sectors; variety of the local economy actors; a widespread informative system; the 'persistence' of the knowledge; the 'face to face' relationship diffusion.

The "Technological Districts" of Antonelli (1986) that requires the simultaneous presence, in the same territory, of scientific potential linked to the production system based on driving companies, which gives it a capacity for technological and economic polarization. Antonelli (2000) also notes that the simple agglomeration is not a sufficient condition for the formation of concentrations of technological innovation and the dissemination of relevant technological spillovers, it also requires a set of communication channels that allow players to benefit from knowledge of collective nature. Increasing returns can take place within technological districts and clusters where qualified interactions among connected innovators make it possible to take advantage of the modular indivisibility and cumulativeness of technological knowledge. The notion of technological district (Antonelli, 1986) may be viewed as a development of the marshallian concept of industrial district, which focuses on the role played by large firms and cities in the technological growth of a region. It is possible to see how the exchange of know-how between external and internal firms becomes indispensable for the growth of a competitive system in which the ability to innovate is no longer at the level of the firm but at a

local level where each player plays a role in deciding the competitive strategy. Antonelli (2000) studied collective knowledge communication in technological districts. He concludes that "agglomeration is not a sufficient condition for a clustering of technological innovation and a diffusion of technological externalities". The firm needs to have communication channels to accumulate technical knowledge and eventually to introduce technological innovation. Antonelli illustrates his argument by reference to technological systems and complementarities, irreversibility, and collective knowledge; by examining the role of learning and technological communication as key factors in defining the rate and direction of change within technological systems; and by identifying technological districts and clusters within a theoretical framework which values local externalities, irreversibility, and endogenous structural change.
The notion of technological district (Antonelli, 1986) is created from the coexistence in an urban area of:
a) a system of inter and intraindustrial relations including the tertiary and financial sectors which will accelerate the diffusion of innovations and the introduction of incremental innovation;
b) the scientific park and therefore the concentration of sufficient research and development activities to offer economies of scientific technological union
c) the industrialising pole, therefore the area's ability to receive and absorb leading firms and to provide the conditions in which innovation is encouraged and spread throughout the area.
Antonelli (2000) elaborated an integrated framework demonstrating that localisation is conducive to innovation because agglomeration and proximity create an environment where interdependent knowledge bases can be exchanged through a variety of relationships based on trust. In this context, the conditions and features of various communication processes are key factors in explaining the clustering effect and the rate of innovation.

The concept of "Innovative Milieu" developed by the Group de Recherche Européen sur les Milieux Innovateurs (GREM), formed in 1986 with the aim of studying the interactions between innovation and territory in France. For them, a company is not an isolated agent for innovation but rather belongs to a milieu with innovative capacity (Moulaert and Sekia, 2003). In it, in addition to the innovative capacity being strengthened, the uncertainty is minimized and efficiency improved. Cooke *et al.* (2007) mention that innovative milieux, high-tech regions and knowledge based city regions are expressions of such asymmetries and knowledge monopolies. These regions and areas should not be understood, however, as a result of only geographical proximity and regional features, but, in the sense of Amin and Cohendet (2004), as nodes where various kinds of knowledge communities and networks intersect. To Maskell and Kebir (2009), in contrast with the Porterian focus on competitiveness, neglecting issues related to the uneven spatial development, the Innovative milieu approach concerns with matters related to technology, organization and, more significantly, with the territory. Together, these three elements are seen as constituting an initial located context without borders, in the strict sense, but showing a certain degree of unity in terms of specific and identifiable behaviour.
Romijn and Albu (2002) consider the Innovative milieu as a region in which small companies with innovative capabilities are leveraged, in the first place, due to local contacts with businesses, agencies, institutions, that can provide additional resources to their own, but it can be more difficult to promote a "community of interests" shared between these small business in (semi-) competitive activities or around a customer base. Already Neto (1999) refers to the concept of "network-territories", which do not depend on the territorial contiguity, because they're based on a complex mesh of nodes, whose contacts with the real space are only located on a few points of the concrete space, competing with other overlapping networks in the same area of economic influence. Camagni (1991) defines Innovative milieu as a whole, or a complex network mainly of informal social relationships in a limited geographical area, often determining an external "image" and a specific internal "representation", along with a sense of belonging that increase local capacity for innovation through synergic and collective learning processes.
The Innovative milieu approach is much broader in its scope than Marshall's and Porter's cluster theories, being based on a set of relationships that develop spontaneously within a given geographical area, generating a localised dynamic process of collective learning, that involve: 1) a set of actors, who are independent enough to make strategic choices when managing material and immaterial resources, 2) a learning dynamic that reveals the ability of stakeholders to adapt to changes in the

environment, 3) a organizational logic, according to which the various actors cooperate to innovate and develop commercial and noncommercial networks (Maillat *et al.*, 1993). According to Fernandes, Noronha Vaz and Nicolas (n.d.), clusters are centered around extensive spatial structures of interaction that, based on network technologies, can lead to regional innovation networks, ie non-geographic networks of cooperation neither sectorally confined.
Together, they act as a mechanism to reduce uncertainty in the process of innovation (Camagni, 1995). Maillat *et al.* (1993) states that an Innovative milieu stimulates the development of know-how, as well as training, development and vitality of innovation networks. Again Maillat (1998b) elaborates on the Innovative milieu:

> *Facilitates mutual understanding, collaboration, dissemination and exchange of information, and allows the development of trust relationships. Creates conditions for the occurrence of a climate of mutual opening and for the dissemination of know-how without any risk of unilateral appropriation, since the actors share a common work ethic and a common desire to cooperate.*

3- CLUSTERS

Globalisation has, somewhat paradoxically, strengthened the role of clusters and furthered their development. Companies face increasing choices for locating their activities in places that provide the best business environment for their specific needs. Specialization in clusters is clearly not the only driver of regional prosperity. In terms of locational factors, the pure size of economic activity is another candidate suggested in the literature. There are two varieties of this argument. One approach argues that crosscluster spillovers are more important than within-cluster spillovers, so that absolute size instead of relative specialization matter most. Another approach goes further and argues that absolute size allows for heterogeneity, i.e. the absence of specialization, and that this heterogeneity is critical for 'creativity' (Florida; and Jacobs apud Ketels, 2008). Both of these models suggest the emergence of a very unequal world, i.e. a few prosperous large regions (core) and many poor small regions (periphery). The cluster model instead is consistent with a world where all regions of similar fundamentals can reach similar levels of size and prosperity if they develop different specialization patterns. The more markets globalise, the more likely it is that resources will flow to more attractive regions, reinforcing the role of clusters and driving regional specialisation. In this process, clusters tend to become increasingly specialised and increasingly connected with other clusters providing complementary activities (Villa and Antonelli, 2009).

The learning localised effects mentioned above are central for the existence of industrial clusters with a local basis (Markusen, 1996; Cooke, 2001). This localised learning that companies may benefit consists essentially of technological spillovers, originated from dominant or innovative companies, to the followers (Markusen, 1996; Maskell, 2001). These knowledge spillovers are very important for growth because it is understood that they create increasing returns to scale since, according to the theory of endogenous growth, endogenization of technical progress will be based, in most models, albeit some exceptions, in the consideration that increasing stock of knowledge is the real engine for growth.

The cluster creation process, although not linear, can be described as adaptive and of self-organizing nature. These processes involve entrepreneurs, as well as policy makers, and they contribute to the establishment of support functions and governance, as well as tangible and intangible infrastructures, often with the aid of public funds. This implies that either the cluster or a specialized region, created as a result of the activities of entrepreneurs, tend to be unique due to its particular history (Krugman, 1991b) and as such difficult to imitate (Feldman and Martin apud Karlsson, 2008). Depending on the success achieved by entrepreneurs, their activities will be able to strengthen the regional economic environment, including its institutions and its capital, in parallel with the increase of possibilities to take advantage of economies of scale, both internal and external, as well as the establishment of new

businesses (Karlsson, 2008). Successful clusters not only create their own resources, institutions and potential, but are also able to attract resources, such as financial capital, labour and entrepreneurs from other functional regions. However, there is no guarantee that the clusters that have developed well in the early stages, will continue to do so subsequently. From the moment entrepreneurs start their business and acquire resources and market potential, they become a crucial factor in the dynamic process of formation and development of the cluster. Very often, new companies are created in places where entrepreneurs live and where they established commercial and social networks, along with the access to a market of potential customers, as well as to a potential supply of inputs.

This is the background for the works of Porter, Markusen, Gordon and MacCann, on clusters, and Krugman on the new economic geography. The organization of economic activities into a cluster is advocated by several authors, including Gordon and McCann (2000), as the territorial configuration more suited to stimulate the processes of learning and knowledge creation. According to Porter (1998b), clusters are a form of spatial organization consisting of geographic concentrations of companies and institutions inter-linked in a particular area, and that includes on its organization a series of industries and other entities linked to each other. They include, for example suppliers of specialized inputs such as components, machinery and services, as well as providers of specialized infrastructure. Clusters also often extend downstream involving commercialization channels and customers and laterally to complementary industries and related activities. Finally, many clusters include governmental and nongovernmental institutions, particularly universities, polytechnics, professional associations, of business and trade, which have a decisive role in the overall level of competition observed in the market and that can add value to the industry. Porter states that a cluster is the full manifestation of the functioning of the "diamond" economy, in which proximity (understood as the placement of companies, customers, and suppliers) amplifies all the existing pressures to innovate and improve economic performance.

The traditional analysis of location and clustering emphasizes the relative abundance of resources 'trapped' in a functional region (Ohlin apud Karlsson, 2008). This approach is a resource-based theory of location and clustering (and trade). The critical resources have the character of durable capacities which consists, on the one hand, of natural resources and, on the other hand, of the supply of infrastructure in the form of facilities and networks, R&D organizations, existing production capacities with specific techniques, and the supply of different immobile labour categories. According to the best-known taxonomy of innovating firms, clusters can be categorised as: 1) *science-based*; 2) *scale-intensive*; 3) *supplier-dominated*; or 4) *specialised suppliers* (Pavitt apud OECD, 1997). Each type has its own characteristics as regards predominant forms of knowledge flows. For the *science-based clusters* (*e.g.* pharmaceuticals, aerospace), direct access to basic research and to public research institutes and universities is important to complement their own research activities. These sectors are highly R&D- and patent-intensive and tend to exhibit closer collaboration with the public research sector. *Scale-intensive clusters* (*e.g.* food-processing, vehicles) tend to establish links with technical institutes and universities without performing much research on their own; their innovative performance depends on their ability to import and build upon science developed elsewhere, particularly with regard to process improvements. *Supplier-dominated clusters* (*e.g.* forestry, services) tend to import technology mainly in the form of capital goods and intermediary products; their innovative performance is largely determined by their ability to interact with their suppliers as well as extension services. *Specialised supplier clusters* (*e.g.* computer hardware and software) are R&D intensive and emphasize product innovations, generally working closely with each other, customers and users.

Jacobs and de Man; Rosenfeld apud Borghi *et al.* (2010) provide a list of criteria that are useful in identifying a cluster, including the geographical or spatial dimension of economic activities; vertical and horizontal relations between industry sectors; the use of common technology and inputs; the quality of the network or cooperation with "active channels for business transactions, communication and dialogue, that share specialized infrastructure, labour market and services". The analytical precision regarding varieties of clusters has evolved markedly since the pioneering intervention of Markusen (1996), who identified five types of industrial district:

- Marshallian – small firms, localized investment links, preferred suppliers, labour market loyalty, flexible work regime.
- Marshallian (Italianate variant) – with added cooperation, design intensive work and collective institutions plus local government support.
- Hub and spoke – structured around one or few dominant firms supporting the regional cluster, while suppliers and other activities spread around the hubs like the wheel spokes. In a hub-and-spoke cluster, inter-firm collaborations usually occur only between hub and non-hub firms, and the terms of cooperation are in many cases set by the hub firms. Collaborations between smaller firms are rarely seen as the smaller ones are usually very focused on benefiting from the large anchor.
- Satellite platform – largely consists of a congregation of branch facilities of externally based multiplant firms. In many cases, a satellite platform cluster emerged when certain local or national policies were developed to create a favourable investment environment for externally headquartered firms.
- State-anchored – the local business structure in this type of clusters is dominated by the presence of one or few large public or non-profit entities, such as universities, public research institutions, or military bases. The key public entities are typically surrounded by smaller firms/organizations, thus forming a structure similar to a hub-and-spoke cluster.

According to Andersson *et al.* (2004) clusters are inherently idiosyncratic in nature, with different applications of the concept suiting various situations. However, collecting all the contribution of several authors regarding the cluster, seven elements can be adopted as key for the notions:
i) *Geographical concentration*: firms locate in geographic proximity due to hard factors, such as external economies of scale, as well as soft factors such as social capital and learning processes;
ii) *Specialisation***:** clusters are centred around a core activity to which all actors are related;
iii) *Multiple actors*: clusters and cluster initiatives do not only consist of firms, but also involve public authorities, academia, members of the financial sector, and institutions for collaboration;
iv) *Competition and co-operation***:** this combination characterises the relations between these interlinked actors;
v) *Critical mass***:** is required to achieve inner dynamics;
vi) *The cluster life cycle***:** clusters and cluster initiatives are not temporary short-term phenomena, but are ongoing with long-term perspectives, and finally;
vii) *Innovation*: firms in clusters are involved in processes of technological, commercial and/or organisational change.

Many structural properties of clusters are mentioned in the definitions and descriptions in the cluster literature. These are presented as either constitutive or complementary and can also be used to characterise clusters. The identification of clusters across geographies however remains difficult. Structural properties of a cluster may include, according to Sydow *et al.* (2007):

- Sophisticated local customers and downstream-industries
- Competitive related industries
- Suppliers of complementary goods and services
- Capable locally-based specialized suppliers of goods and services
- Accessible financial services
- Innovative core companies and original equipment manufacturer (OEM)
- Locally-based competitors
- Sophisticated local labour market
- Involvement of the local education system
- Research and development and knowledge transfer infrastructure
- (Trade and labour) associations
- State actors and regional economic development
- Critical mass of organizations

Gordon and MacCann (2000) have elaborated on three models of clusters: 1) The model of "pure agglomeration," in which there is no cooperation between the companies, since they operate in an

atomized way in a competitive environment. In these cases, clustering is explained by the fact that companies want to minimize transaction costs in order to become more competitive and there is no trust between companies or long-term relationships; 2) The model of "industrial complex" in which location of resources and their uses are the driving forces of concentration. They are characterized by stable and long-term relations among companies; and 3) The model of "social networks" in which the clusters are analyzed primarily in terms of local networks of interpersonal relations of trust and institutional practices involving partnerships.

4- INNOVATION SYSTEMS

Aydalot (1986) put the hypothesis of the relevant role played by local milieu as incubators of innovation. Other authors (Maillat *et al.*, 1990) define innovation network as an evolutive way for organizing innovation processes, not structured on a hierarchical manner or on market mechanisms, which allows the continued development of collective learning process resting on new type of synergistic combinations of "know-how" held by different partners. Noting that the company is not an isolated innovator, but is part of an environment that leads him to act, the established hypothesis is that the local milieu has a determinant role as incubator of innovation, ie, it acts like a prism through which circulate the incentives for innovation and the latter is consolidated on the ground. Plus, as Tödling and Trippl apud Noronha Vaz and Nijkamp (2009) explain, in peripheral regions the major barriers for innovation are: the low level of R&D and innovation due to the dominance of SMEs in closed and traditional industries, weakly developed firm clusters, few knowledge providers and a weak endowment of innovation support institutions. Such hindrances to innovate are related to the institutional context and the characteristics of the environment in which firms are embedded. The existence of a great variety of situations makes clear that differentiated policies of innovation are required, strengthening the arguments in favour of regional or local innovation systems.
Several authors, like Perrin (1989), emphasize that the territorial proximity facilitates contacts and exchanges between enterprises, consolidates and coordinates the work market in a wider area and gives cohesion to the cultural elements. The past of the territories, their organization and collective behaviour, the consensus that structure them, are the main components of the innovation (Aydalot, 1986), being the territory defined as the way a group is established under a natural environment, which, in the context of the organization and location of its various activities, establishes and enforces the conditions for language-communication and collective learning, that is, the cooperation that creates organizational and technical rationalities (Perrin, 1992). Once, as stated in Leeuwen *et al.* (2010), from the perspective of local communities and circuits of proximity, the vulnerability of a globalized world adds uncertainty and lack of trust to individual decision making, because a great deal of the economic game is defined by unknown international decision makers, the territory is assumed as a critical element: considering the milieux as innovation incubators, they do not correspond to areas perceived as a simple support for economic activities, since each milieu presents itself as a configuration of actors and elements, not only economic, but also sociocultural, political and institutional, having specific modes of organization and regulation (Maillat and Perrin, 1992). Ratti *et al.* (1997) by comparing regions with similar environments of market and technology, in identical sectors, noted that these could have very different developments (strong growth in some cases, declining in others), which could only come from factors within the territory.

Cooke *et al.* (2007), quoting Choo and Bontis, define a regional knowledge and innovation system as a dynamic and evolving constellation of actors shaped by the knowledge embedded in organizational systems and embodied in associated technological systems. It has been argued that firms and research centres of expertise/excellence play a dual role within a region, both creating (or co-creating) knowledge and absorbing knowledge from outside the region. Optimizing the potential contribution to regional development of a region’s knowledge stock, however, will require complementarity between

the regional knowledge base and the requirements of regional firms (Gunasekara apud Cooke *et al*., 2007).
For instance, the evidence suggests that, in general terms, spillovers and productivity benefits are probably greatest from publicly funded basic research which contributes to the related public knowledge stock. The heart of this issue lies in the fact that from the standpoint of its impact on regional development, the nature of knowledge, clearly, can not be considered isolated. Instead, a systemic view, more contextualised, is needed, since it reflects the provision of knowledge and their specific characteristics, as well as the different absorption capacities on the part of potential users of knowledge and effectiveness of knowledge transfer processes.

According to OECD (2007), the research concerning the sources of advantage in terms of improved productivity of the factors associated with clusters, has focused mainly on the movement of people and knowledge, in generating innovative ideas and into the development of new products and technologies. In the past, the academic work undertaken in this area, considered knowledge as a public good and technological progress as an exogenous factor to the economic system, equally affecting all businesses, regions and countries. However, the latest evolutionary theories have challenged this basic concept, recognizing that the generation, adoption and diffusion of new technologies is a complex process, and, therefore, endogenous to growth models (Romer, 1990).
Drucker (2002) says that systematic innovation means monitoring *seven sources* for innovative opportunity. The first four sources lie within the enterprise, whether business or public-service institution, or within an industry or service sector. They are therefore visible primarily to people within that industry or service sector. They are basically symptoms. But they are highly reliable indicators of changes that have already happened or can be made to happen with little effort. These four source areas are:
• *The unexpected—the* unexpected success, the unexpected failure, the unexpected outside event;
• *The incongruity—between* reality as it actually is and reality as it is assumed to be or as it "ought to be";
• *Innovation based on process need;*
• *Changes in industry structure or market structure* that catch everyone unawares.
The second set of sources for innovative opportunity, a set of three, involves changes outside the enterprise or industry:
• *Demographics* (population changes);
• *Changes in perception, mood, and meaning;*
• *New knowledge,* both scientific and nonscientific.
The lines between these seven source areas of innovative opportunities are blurred, and there is considerable overlap between them.

To Porter (1998a) the technology strategy is a firm's approach to the development and use of technology. Although it encompasses the role of formal R&D organizations, it must also be broader because of the pervasive impact of technology ou the value chain. Because of the power of technological change to influence industry structure and competitive advantage, a firm's technology strategy becomes au essential ingredient in its overail competitive strategy. Innovation is one of the principal ways of attacking well-entrenched competitors.
Since long ago, companies face and have to solve the need for remote resources, optimizing the spatial configuration of their supply and/or production network. These solutions are particularly suitable when the resource is a variable factor of production, manpower or explicit knowledge (e.g. a foreign technology 'closed' in a machine). But, in many cases, these factors have left or are leaving of being strategic, as all companies in a variety of sources, have or will have equal access to them (also as a result of globalization). On the other hand, the location and even the nature of the critical technology for an industry, usually stable, cease to be so. This can occur in a technological discontinuity, in a migration of skills from one region to another, in the evolution of a product, or even in the convergence of industries (e.g. computers, communications and contents). As pointed out by Furtado (2004), the concept of innovation to market represents a kind of innovation closer to the original idea of Schumpeterian innovation. Considering the impact on the pattern of competitiveness and on the accumulation of technological capability in the company responsible for its promotion, it can be

classified as an innovation qualitatively superior to those that are only new to companies but not for the market. In contrast, pioneering innovations that are only so for companies, are closer to the Schumpeterian concept of technological diffusion (or absorption).

The interactive process perspective of organizational innovation has gained popularity in recent years for investigating the nature of the innovation process, examining how and why innovations emerge, develop, grow and end. This perspective describes innovation as a complex process (not static), produced by interactions between structural influences and the actions of individuals, which occur simultaneously. The term "interactive process" has been used to describe the activities within and between companies (Edwards, 2000). According to Giget (1997), the innovative process is not deterministic and does not follow a set formula, it is socially constructed by the actors involved or interested in the generation of innovation and, therefore, must be understood as a series of interactions and exchanges between researchers, users , technicians, scientists, governments, companies, which are the innovation network. Noronha Vaz *et al.* (2006), state that the organization's capacity to learn can be seen as related both to factors which are internal to the firm, such as the knowledge of the entrepreneur and skills of the workforce gained through earlier experience, and to external aspects such as interactions with suppliers, customers, industry associations and public support bodies. Thus, the interactive view of innovation is the basis for many conceptual constructions, related to the innovative process, which considers the increase in complexity, the importance of knowledge sources external to the organization and the intra and inter-relationships, fundamental for successful innovation.

Increased innovation is about improving one's competitive position through product, service, and process innovations (von Krogh *et al.* apud Back *et al.*, 2005). Innovation is not an isolated process of companies, it's rather the result of a collective process, which is complex, interactive and systemic in nature, with several institutional actors in a given territory, comprising capture, creation and diffusion of knowledge. The systemic analysis of innovation builds the foundation for competitive advantage in an economy increasingly based on knowledge and learning, and has the ambition to understand the determinants of innovation at national, regional and local levels, and could also extend across borders (Natário *et al.*, 2005). Innovations are mostly based on procedural knowledge and cultural conditions which are not easily imitable by competitors. Procedural knowledge is knowledge that has something to do with the generic innovation processes. Such a process consists of different phases, such as concept development, evaluation and selection of alternatives, and development of prototypes (Nonaka and Takeuchi apud Back *et al.*, 2005). Cultural conditions encompass shared values and modes of behaviour within the company (von Krogh *et al.* apud Back *et al.*, 2005). For larger companies with many business units, the challenge is to leverage their procedural knowledge to develop different innovations throughout the company and thus achieve a sustainable competitive advantage.

Störh (1987), among others, argues that the innovative capacity of an innovation system (national or regional) depends not only on the quantitative effort on R&D and on its technological infrastructure (where we highlight the scientific and technological parks, the specialised training centres, technological transfer entities), but also on the production of externalities resulting from interactions between different actors (private and public), since innovative activities require an innovative environment where staff exchanges, scientific and technologic knowledge, specialised services and innovative impulses, are assumed as important. Noronha Vaz and Cesário (2008) also refer the importance of macroeconomic conditions as an input to firms' attitudes towards innovation, particularly factors related to regional growth, such as regional productivity, household expenses or labour force qualification, were associated to certain forms of innovation, independently of the behavioural patterns followed by the firms.
The endogenous focus on development, along with the decentralization of productive processes, influence the innovation policies when it is time for determining the protagonists of the same, and so, after they had focused more on large companies, will be the small and medium-sized companies who will become the key objective of the intervention as the gradual approximation of regional and local administrations to business agents tends to favour the design of interventions best suited to the needs

of regional and local entrepreneurs (Störh, 1988), which enhances the importance of factors such as proximity and geographical boundaries for innovation systems.

As economic activities become more knowledge-intensive, a large and growing number of institutions with specialised expertise of very different kinds are now involved in the production and diffusion of knowledge. The determinants of success of enterprises, and of national economies as a whole, are ever more dependent on their effectiveness in gathering and utilising knowledge from these institutions – whether they be in the private sector, public sector or academia. Moreover, each country has its own institutional profile depending on the governance regime for enterprises, the organisation of the university sector and the level and orientation of government-funded research (OECD, 1997).

In the same vein, Planque (1991) states that the spatial proximity reinforces the socio-cultural proximity, forming formal and informal networks, whose effects on local capacity to innovate is indisputable, and Lundvall (1992) adds the notion of institutional innovation as an important factor towards the flexibility of innovation, since in his opinion the two most important dimensions that together define an innovation system are the production structure and institutional framework. Again Lundvall (1992), proposes that an innovation system consists of elements and relationships that interact in the production, dissemination and use of the new economic knowledge, while for Cooke (2001) and Asheim and Gertler (2005), due to the systemic and interactive nature needed for the development of knowledge, technology and innovation, there is a strong tendency for the clumping of development in a defined geographic area. According to Storper and Scott (1995), physical proximity is important whenever all transmission and exchange of information, goods, people and work, have high degrees of complexity, irregularity, uncertainty, unpredictability and a non-coding nature.

There are different views in the understanding of a knowledge economy, as has been pointed out by Smith apud Cooke *et al.* (2007). The first is that *knowledge as an input* is becoming quantitatively and qualitatively more important than before. This is reflected in an increase of knowledge related investment, such as R&D, education, software and information technologies, as observed for example, by the OECD apud Cooke *et al.* (2007). Another perspective reflects the idea that *knowledge as a product* is getting more important than in the past. Theories on firm performance emphasise the innovative process, notably the quality of factor inputs such as education, the positive rivalry between firms that drives innovation, and the structures/institutions that support innovation (Porter, 1990). This new economy takes a distinct paradigm of earlier decades, mainly based on the following (Neto, 1999):

- The new economy is a knowledge economy, knowledge of markets and economic agents;
- The new economy is a digital economy, information comes in digital format;
- The new economy has virtual features, virtualization;
- The new economy is based on the disintermediation and convergence;
- The new economy is based on networking;
- The new economy is based on innovation, in which the human imagination is the main source of value;
- The new economy is the economy of globalization, of the independence of time and space.

The role of geographical proximity has been discussed in the literature concerning regional innovation systems, as well as the related with knowledge spillovers. In addition to the proliferation and sophistication of the hypotheses concerning the interaction and information management, merit particular attention the reference to changes produced (actual or potential) in terms of accessibility and geography of the economic and institutional relationships worldwide (Neto apud Fermisson, 2005). The proponents of the view that proximity offers innovation advantages in itself, begins in relatively recent times with Jaffe (1989), who highlights the role of geographical proximity, generally in industries where these spillovers are more prevalent, that is, where the industrial R & D, university research and skilled labour are more important. These types of industries have a higher propensity to concentrate spatially (to cluster) innovation activities comparatively to those where knowledge externalities are less relevant. The argument here was that R&D in particular constitutes a public good

in locations where it concentrates and that this is sufficient to cause firms to concentrate in proximity to such knowledge spillover opportunities to access them as free goods in advance of competitors.

Innovation and entrepreneurial behaviour is, as a consequence, heavily impacted or influenced by proximity conditions. While proximity is important for knowledge transmission and entrepreneurial effort, scale or agglomeration forces further amplify its effects. Therefore, large, well-integrated and relatively wealthy urban agglomerations are seen as locations where knowledge transmission is likely to be highest, *ceteris paribus*, and consequently, locations of greatest entrepreneurial action (Karlsson *et al.*, 2006). Knowledge spillovers occur when a firm creates knowledge and that knowledge produces external benefits ("spills over") onto other firms. Knowledge spillovers represent a positive externality in that the socially optimal level of knowledge is not created because innovative firms do not take into account the effect of their knowledge production on other firms. The result of knowledge spillovers is that spending on R&D will be below what is socially optimal, providing possible justification for government policies to increase innovative activity. By looking at the evolution of art capitals one needs to gain insight into the origin of creativity clusters and why some clusters overtake other clusters. This question is of utmost importance for policymakers seeking to overtake other regional clusters as firms have a strong incentive to locate in pre-existing clusters to take advantage of the high level of knowledge spillovers (Karlsson *et al.*, 2004). Also Audrescht *et al.* (2006) argue that entrepreneurship resulting from knowledge spillovers tend to be located geographically close to the sources that currently produce the relevant knowledge.

In this context, several authors advocate and investigate the existence of Regional Innovation Systems (RIS) (including Cooke, 1995), which are defined by Cooke *et al.* (1998) as systems in which companies and other organizations are systematically involved in learning interactions, through a regional cooperation network, institutionally formed. The RIS, according to Asheim and Isaksen (1997), as part of a regionalized National Innovation System (NIS), encompasses parts of the productive and institutional structures located in the regions, but functionally integrated in the NIS ("top-down" approach), and / or parts of the institutional and productive structure, that are territorially integrated and implanted in the region ("bottom-up" approach). The economic success of each country, region or locality shall depend on its ability to specialize in the effective and dynamic comparative advantages arising from its collection of attributes and skills for continued promotion of innovation. In addition to this stock, competitiveness, focused on the innovative process, will depend on two dimensions: the business ability to promote research and development, and identifying new products or processes that ensure the economic success of the company, as well as local capacity to learn in order to create an atmosphere of change and progress, the so-called "learning regions" (Asheim, 1996). It should be noted that in the "learning regions", the public sector is far from being a passive actor. Florida (1995) points out, for example, the significance of the productive supporting infrastructures, involving incentives for the creation and operation of networks, training of human resources, as well as communications, whose implementation requires an essential initiative from the state. Further, the role of the public sector goes beyond the purely infrastructural level, because its action as a catalyst of interactions between members of the innovation system is often of great importance, since for the genesis and success of research and development activities are equally important other key elements, such as the quality of the bonds and the presence of local synergies (Morgan, 1997). Neto (2006) states that the requirements of competitiveness and innovation, coupled with the increasing transnationalization and digitization of the economic relationships at a global scale, constitute a new challenge that demands for national governments and local and regional territories and their political-administrative organs, an innovative type of response regarding the definition of territorial planning strategies. The following characteristics are recognized as essential for RIS (Poruchnyk and Brykova, 2006):

- An organizational structure comprising companies and leading participants in the innovation process;
- Inter-corporate interrelationships, namely an intense interaction among the business sector and other organizations;
- A role for the state and state innovation policy;
- An institutionalised financial structure;

- Activity and funding of R&D (according to a ratio involving private and state sectors);
- An industrial structure (comprising average sized companies, an efficient competitive environment, primary industrial sectors, etc.);
- A territorial organizational structure (urbanization, availability of regional production net-works) and a scale of inter-regional agglomerations (innovation clusters, spinoff enterprises[1] and spillover effects);
- A level of openness and integration into the global production system, an ability to attract external resources of development;
- Historical specificities, cultural rules and traditions affecting economic activity.

5- SPATIAL ECONOMICS APPROACH

It's almost exactly 20 years since the publication of the monograph *Geography and Trade* by Paul Krugman (1991a), which most people consider the beginning of a new genre of research, often described as the 'new economic geography'. It differs from traditional work in economic geography mainly in adopting a modelling strategy that exploits the same technical tricks that have played such a large role in the 'new trade' and 'new growth' theories; these modelling tricks, while they preclude any claims of generality, do allow the construction of models that - unlike most traditional spatial analysis - are fully general-equilibrium and clearly derive aggregate behaviour from individual maximization. The defining issue of the new economic geography is how to explain the formation of a large variety of economic agglomeration (or concentration) in geographical space. Agglomeration or the clustering of economic activity occurs at many geographical levels, having a variety of compositions.
The early work on economic geography were almost exclusively based in the spatial standards for production, expressed in terms of "physical" income (weight or volume) of the most outstanding products in international trade. It was called the "trading geography". In recent years, especially since 1955, the theory that forms the core of economic geography is the one associated with industrial situation, which includes the study of the location of all types of economic enterprises. This branch of geography is useful for a more efficient planning and economic management.

The new economic geography identifies three major agglomeration economies, namely:
- Availability of manpower
- Existence of suppliers
- Knowledge spillovers

and concludes that the three forces identified above promote the clustering of industries in certain areas, and therefore if these forces are predominant clusters, inevitably, will develop. Innovation and development of these three kinds of economies helps feed the development of clusters, according to the spatial theory. Krugman (1991a) seeks to explain the localisation of industrial production. Following Alfred Marshall (1920), he identifies three reasons for localisation:
- Labour market pooling: sectoral and geographical concentration creates a pool of specialised skills benefiting both workers and firms.
- Intermediate inputs: where enterprises cluster they can support more specialised local suppliers of inputs and services.
- Technological spillovers: clustering facilitates the rapid diffusion of know how and ideas.

Krugman's subsequent discussion can be summed up in two points, one analytical and one empirical. First, the above three factors remain the key forces which explain clustering today, but they need to be modelled to sharpen the analysis (which he does). Second, the relevance of doing so is underlined by

[1] Spinoff enterprises are defined as associated firms promoting the process of exchange of information and transfer of technologies through different channels of interactive learning.

the fact that clustering is common in both high-tech and low-tech sectors of the United States and other advanced countries. One could add that the same applies to developing countries.
The new economic geography is concerned mainly with the reasons why the various economic activities occur in the places where they occur. This theory is within the limits of geography, economics and economic history. Understanding them is more related to geography rather than economy, because it focuses more on location than in the economic conduct of man and in economic theory.

According to Fujita *et al.* (1999), producers prefer to opt for locations that have good access to major markets and supply of goods which they need. However, a certain area that for whatever reason has already a substantial concentration of producers tends to offer a large market (through the demand that both producers and their workers produce) and a wide range of inputs and consumer goods (made by producers who are already based there).

The big result in Krugman (1991b) was precisely the model's implication that the geographical structure of the economy depended on a few key parameters: transportation costs, economies of scale, and factor mobility. In Fujita *et al.* (1999) this approach is described as resting on four propositions:
1. Transportation costs, or more broadly transaction costs across distance, play a crucial role in shaping international and interregional trade. In contrast to traditional trade theory, and even traditional urban economics, we argued that distance matters.
2. The interaction of market size with increasing returns plays an important role in determining the location of production. It's argued that some kind of home market effect, as opposed to localized resources or more amorphous externalities, was at least one major explanation both of differences in population density and localized specialization.
3. A cumulative process in which large markets attract production, which increases the size of markets, leads to agglomeration – and possibly to multiple equilibria. Much of the excitement surrounding the new economic geography came from its suggestion that historical accident might play a major role in shaping the location of production, and also that cities and regions might be subject to discontinuous change.
4. The same processes that shape economic geography within countries also shape international trade.

6- CONCLUSION

It's our perspective that the various concepts of local economic systems highlighted above, provide conditions for the creation of real economic value, offering potential forms and development trends that may have a positive influence on regional competitiveness, due to their capacity to generate cooperation and to stimulate the interaction and cross fertilization in a context of internal competition and strong competitive indigenous environment.

Local productive and spatial economics systems can be viewed as condensed forms for organization and institutional coordination in a territorial level, with the capacity to promote growth and innovation, for optimizing the use of knowledge spillovers and suitable for the creation of learning organisations, and so they must be considered as a positive influence on the competitiveness, performance and development of regional economies.

At any rate, the importance of the "proximity" element in the concepts of "cluster", "milieu", "district" or "functional region" is undeniable. The externalities that arise from these "complex ecosystems" provide an integrative knowledge milieu and an innovative environment quite favourable for the territorial agglomeration of interdependent enterprises. Although they can't be seen as a panacea likely to solve all sorts of development inefficiencies that can affect a particular region, once their success also relies, among others, upon socio-cultural factors and public support policies which are not always

available, they provide a multilevel framework much suitable for the implementation of territorial endogenous growth processes.

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