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Territorial Standards for Innovation: Analysis for the Regions of Portugal

Estándares Territoriales de Innovación: Análisis de las Regiones de Portugal

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ABSTRACT

Competitiveness among regions and innovation dynamics are intimately related and depend on a solid and effective innovation system. This study aims to measure innovativeness in different Portuguese regions and to evaluate the nature of the innovation process and the relationship between innovativeness and its region of origin. To characterize the territorial innovation processes and to identify innovation patterns by regions, it analyzes their main distinctive factors, based on the Community Innovation Survey results for each region. Thus, it compares the Portuguese regions by verifying the existence of subjacent clusters and finding out the characteristics that distinguish the different groups of regions. The results point to the existence of four groups of regions, and the factors identified are related to the innovation process, namely objectives of innovation, sources of innovation, collaborative networks, triple helix performance, and obstacles to innovation.

RESUMEN

La competitividad entre las regiones y la dinámica de la innovación están íntimamente relacionadas y dependen de un sistema de innovación sólida y eficaz. Este estudio tiene como objetivo medir la capacidad de innovación en diferentes regiones portuguesas y evaluar la naturaleza del proceso de innovación y la relación entre la capacidad de innovación y su región de origen. Para la caracterización de los procesos de innovación territoriales y identificar estándares de innovación en las regiones, este artículo analiza sus factores distintivos principales, con base en los resultados de las encuestas comunitarias sobre innovación para cada región. Por lo tanto, se comparan las regio-

nes portuguesas mediante la verificación de la existencia de agrupaciones subyacentes y descubrir las características que distinguen a los diferentes grupos de regiones. Los resultados apuntan a la existencia de cuatro grupos de regiones, y los factores identificados están relacionados con el proceso de innovación, es decir, los objetivos de la innovación, las fuentes de innovación, redes de colaboración, el funcionamiento de la triple hélice, y los obstáculos a la innovación.

1. INTRODUCTION

Rapid technological changes, globalization, and a simultaneous increase in the importance of local potentialities are dominant in the global arena, so regions looking to improve their competitiveness in terms of innovation require not only a strong national system of innovation, but also a regional and even a local one. The competitive advantage of the territories does not depend solely on their endowment of national resources (capital, labor and money); it depends fundamentally on their innovative dynamic. Territories with a pro-innovative attitude, based on intangible resources such as knowledge and use of Information Communication Technologies (ICT), are without a doubt competitive territory.

In effect, competitiveness among regions and innovation dynamics are intimately related and depend on a solid and effective innovation system. On the other hand, innovation is systemic and depends on a whole collection of local actors and the interactions among them. In an economy based more and more on learning and knowledge, the systemic analysis of innovation builds a foundation for competitive advantages and includes a desire to understand the determining factors of innovation, in not only a national, regional, and local context, but also in an activity sector perspective. Thus, the objective of innovation systems is to promote the local innovative potential in the sense of strengthening and supporting competitiveness among the territories.

With the valuation of territorial dynamics, the evolution of the importance and nature of the innovation process that occurred in recent decades brought decisive implications. In fact, this approach placed innovation at the core of competitiveness and development factors, and simultaneously attributed to it a systemic and territorial quality, becoming a challenge to regional science. With the growing importance of new territorial contexts – emphasizing lower levels, particularly the regional – due to the effect of approaching political decisions on people and to make resolutions at a more efficient level, the concept of the innovation system broadened and began to be applied in the regional field of action (Pinto and Guerreiro, 2006).

The objective of this paper is, therefore, to characterize the territorial innovation processes and to identify innovation patterns by regions and analyze their main distinctive factors, based on the Community Innovation Survey (CIS) results for each

of the Portuguese regions classified in accordance with Nomenclature of Territorial Units for Statistics (NUTS) II.

The paper is organized in five points. After the introduction, point two makes a brief literature review pertaining to the innovation systems, emphasizing the importance of a regional level as a reference unit and the main dimensions that constitute a regional system of innovation. The third point describes the hypotheses to test and the utilized methodology. Point four presents the handling of data as well as the achieved results, and the last section discusses the conclusions, implications, and limitations, suggesting hints for further investigation.

2. LITERATURE REVIEW

The competitive level of regional and local territories will vary according to the behavior of their actors regarding innovation. Therefore, the concept of innovation does not always have a positive connotation. The modern sense of the concept is owed to Schumpeter (1934), who made the conceptual distinction between invention and innovation and proposed the notion of "creative destruction," whereby new products turned companies obsolete as they continued to produce the old products without adapting.

Furthermore, the process of innovation in the last few decades ceased to be a linear process, in which technology is developed directly on the basis of scientific efforts and leads the investigation followed by progressive and sequential development. By opposing the *linear model of innovation,* it ascertains, in several published works, the rise of a systematic approach through the *National Innovation Systems* (see Freeman, 1987; Nelson, 1988, 1993; Lundvall, 1992; OECD, 1997; Edquist, 1997; Guimarães, 1998; Edquist and Mckelvey (ed), 2000; Chaminade and Vang, 2006); the *Regional Innovation Systems* (see Cooke, 1992, 2003, 2008; Autio 1998; De la Mothe and Paquet, 1998; Howells, 1999; Cooke et al., 2000; Doloreux, 2003, 2004; Asheim and Gertler, 2005; Doloreux and Parto, 2005; Tödtlinng and Trippl, 2005; Trippl, 2006; Asheim and Coenen, 2006; Hájková and Hájek, 2010); *and a Cross-Border Regional Innovation Systems* (see, Trippl, 2006; Natário and Neto, 2006).

Innovation results in a system of internal interactions –*forward* and *backward linkages* (Lundvall, 1994)– between different functions and distinct actors, in which experience and knowledge are mutually reinforced and accumulated. Thus, the systematic approach provides new knowledge in the innovative and economic performance of the territories. But if the approach of innovation systems today occupies a place of distinction in the territorial dynamics of competitiveness and innovation, the precursor of this notion is List (1789–1846), who developed the first systematic and theoretical attempt relative to the national innovation systems.

Therefore, List's vision is earlier, structured, and descriptive, emphasizing the decisive role of an institutional and social context in interaction. The author also pointed to the relevance of economic conditions and the importance of knowledge regarding new technologies and their application. Although List anticipates many characteristics in contemporary debate (with different terminology) about the National Innovation Systems (NIS) – institutions of training and learning, science, technical institutes, user/producer interaction of knowledge, knowledge accumulation, adaptation of imported technology, promotion of industrial strategies, role of the government of the conducting and coordination of long-term policies for the industry and the economy, etc. – it is absurd to conceive that he foresaw every change in global and national economies.

The rise of a national innovation systems approach is only felt through the efforts of different researchers such as Freeman (1987), Lundvall (1992), Nelson (ed.) (1993), Niosi et al. (1993), OECD (1997), and Edquist (1997), when they sought to study the main factors that generated innovation and sustained national competitiveness. Freeman (1987) originally defined a national innovation system as "a network of institutions in the private and public sectors whose activities and interactions initiate, import, modify, and divulge new technologies." Dosi et al. (1988)[1] definitively developed and established the concept of the national innovation system in innovation literature. However, the greatest publications with the title Innovation Systems are owed to authors such as Lundvall (1992), Nelson (ed) (1993), Edquist (1997), OECD (1997), and Edquist and Mckelven (2000).

Lundvall (1992) and his collaborators introduced the concept of a National Innovation System, relating it to a new understanding of the knowledge and innovation agreed upon in an interactive analysis. Subsequently, knowledge is prominently a social and interactive process, for which it is necessary to consider the cultural and institutional context. Initially, an innovation system was considered as the elements and relations that interact in the production, diffusion, and utilization of new and economically useful knowledge, which is embedded within the national borders. A broader definition was presented afterward, considering all the parts and aspects of the economic structure and the institutional organization that affect learning/knowledge, as well as its search and exploration (Lundvall, 1992). Lundvall (1992) explicitly emphasizes the non- organizational elements. In this sense, five fields can be used to distinguish national systems: i) the internal organization of the companies; ii) the inter-company relationships; iii) the role and expectations of the public sector; iv) the institutional organization of the financial sector; and, v) the intensity and organization of research and development (R&D).

1 The first person to use the expression *National Systems of Innovation* was Lundvall (1988), suggesting it as a title for Part V of Dosi et al. (1988), being used in many chapters of this book.

Systemic analysis of innovation also was considered by Nelson (1988), who approached the public and private nature of technology and the role of private enterprises, governments, and universities in the production of new technologies. This is centered in the production of knowledge and innovation and regards the innovation system in a strict sense, whereas Freeman (1987, 1988) highlights the interaction between the system of production and the innovation process. Nelson (1993) presented a new spirit designated *tech-nationalism*, in which the technological capacities of the companies were the key to competitiveness ability, in a national scope, and may be developed through national action and help the political activity relative to commercial, technological, scientific, and industrial policies. In this context, the NSI encompasses the set of institutions whose interactions determine the innovative performance of the national companies, which at the same time are considered attractions to announce promises by the governments and to allow sustainable economic growth.

According to Lundvall (1992) and Nelson (1993), the innovation system, regardless of the country, describes the institutions and organizations, the networks, and the interrelationships among them that participate in the creation of innovation. This approach substantiates the active *user/producer relationships of innovation* (Lundvall, 1988). It was only with the work of Edquist (1997) that the conceptual issues associated with the approach in innovation systems were raised and assorted, as well as their relation with innovation theory and the understanding of their dynamic. In effect, Carlsson (1995) defends an evolutionary approach associated with a conceptual institutional/organizational structure, as well as the cognitive/cultural aspects of social and economic change. On the other hand, to Nelson (1993), a technical change is an evolutionary process that generates innovation. Lundvall (1992) suggests that innovation is a ubiquitous phenomenon in modern economy. In practically all parts of the ongoing process of learning, searching, and exploring, the results are new products, new techniques, new forms of organization, and new markets.

Therefore, by starting from the premise that the *NIS approach isn't a formal theor*y, Edquist (1997) seeks to investigate the relationships among various innovation theories, in the expectation of contributing to its ascension to theoretical *status* and making it more formal, coherent and rigorous. Thus, the approach of innovation systems requires the description, comprehension, and exposition of the innovation process, as well as all the important factors[2] that influence and are decisive to innovation (Edquist, 1997).

2 Economic, social, political, organizational, institutional, and other factors that influence development, dissemination, and use of innovation, as well as the relations among these factors (Edquist, 2001:225).

The concern in improving the collection of empirical data, which allows one to understand and to evaluate the national systems of innovation, was also the target of the publications by OECD (1994, 1997). In this sense, the STI journal (1994) was created, concerning the national innovation systems and the legislative policies that affect them. With the 1997 publication, OECD attempted to improve the comparability of studies among countries, encouraging the analysis of innovation systems through the use of similar indicators relative to their input to knowledge. It also directed the specific analysis to increase the understanding of certain types of input to the national system of innovation, namely the human resources flux, institutional linkages, industrial *clusters,* and innovative behavior of the business.

The publication comes from the principle that innovation systems may be analyzed to different levels: *sub-regional, national, pan-national, and international.* Although the national level may be considered the most relevant due to the specific role of the nations, the interactions to create an environment to innovate, the flux and collaborations of international technology have come to be of growing significance (OECD, 1997:8). In 2000, Edquist and Mckelven edited two volumes relative to *Innovation Systems: Growth, competitiveness, and employment,* in the sense of providing topics of innovation system under several angles and contrasting with the theoretical perspectives. The authors presented various attitudes relative to national, regional, and sector approaches to the systems of innovation, reflecting on its importance to growth, competitiveness, and employment.[3]

According Edquist (1997), in several approaches, the common characteristics of the systems of innovation were:

- Innovations and learning at the center
- Holistic and interdisciplinary
- A historic perspective is natural
- Differences between system and non-optimality
- Emphasis on interdependence and non-linearity
- Encompasses product technologies and organizational
- Institutions are central
- Conceptually diffuse
- Conceptually frameworks rather than formal theories

3 In the ascension of innovation systems, one can't neglect the contribution of Patel and Pavitt (1994) sketching a global view of the innovation systems for the main countries of the OECD. In 1999, Pavitt published *Technology, Management and Systems of Innovation***,** with many articles that reflect the technological nature of knowledge, the particular traits of innovation management, and the systems of innovation.

However, due to the rise of internationalization, Lundvall (1992) expresses arguments related to the study of innovation systems from a national point of view. At the same time, Nelson and Rosenberg (1993) opt for the sector point of view, questioning studies conducted from a national point of view. Carlsson (1995), on the other hand, goes for the sector point of view, but relative to the technological systems in specific areas.

His study is set by the technological areas, and may include several types of industry, concluding that the national innovation systems may be supranational, national or sub-national (regional and local) and may at the same time be sector ones within fixed regions. Thus, the Innovation Systems may be studied from a supranational or subnational (regional and local) point of view.

In the 1970s and 1980s, the objective of technological policy was to increase national competitiveness. However, these goals were expanded to regional innovation policies to promote national and regional development. Therefore, in the sense of modernizing the national economy, strategies of regional progress were studied and developed, relative to the capabilities of innovation and the R&D activities in the regions, and policies of regional development were drawn up a result.

Nonetheless, in the decade of the 1990s, the policies of regional innovation were influenced by discussions of national innovation systems. Therefore, in order to accompany the approach of the systems, the concept of the Regional Innovation System (RIS) emerges. Thus, when the concept of NIS is applied to regional development, the concept of RIS may be identified as a subsystem of NIS (Chung, 1999). This approach reflects the growing importance of regions in science and technology, business and economic activities, as well as the specific features of the region: the economic structure, the technological infrastructure, and the system of regional support.

The regions also have distinct governance traits and cultural specificities that make them singular and unique. Therefore, the innovation system at a regional level or *regional innovation system* allows greater formatting and adapting of national policies to the regional circumstances. Once there is greater proximity among the different actors and a greater cultural homogeneity, the intensities and dynamics of innovation are more dissimilar among regions than nations.

The importance at the regional level, as an adequate measure of analysis to encourage the territorial dynamics of innovation, has been emphasized in several works regarding the regional innovation systems (Cooke, 1992, 2003, 2008; Autio 1998; De la Mothe and Paquet 1998; Howells 1999; Cooke et al., 2000; Doloreux, 2003, 2004; Asheim and Gertler, 2005; Doloreux and Parto, 2005; Tödtlinng and Trippl, 2005; Trippl, 2006; Asheim and Coenen, 2006; Hájková and Hájek, 2010; Capello and Lenzi, 2011). Effectively, according to Trippl (2006), there are several reasons to emphasize the importance of the regional level:

- The innovation activities exhibit a very distinct geography. It became evident that these activities are not evenly distributed across the regions. Several authors demonstrated that there are differences among regions by accounting for their specialized standard and innovative performance (Howells, 1999; Breshi, 2000; Douloreux, 2004; Vang et al., 2007).
- The spillovers of knowledge are localized and those that assume a crucial role in the innovation process are delimited to certain geographic areas (Bottazzi and Peri, 2003).
- The tacit knowledge and relations based on trust. Despite the growing tendency to codify knowledge, it is the tacit knowledge (Polanyi, 1966) that assumes an important role which leads to innovation. The exchange of tacit knowledge presumes trust and personal contacts and is facilitated by geographic proximity (Storper, 1997; Morgan, 2004).
- Political competences and institutions. In the governance of innovation, the sub-national territories strongly differ in their available institutions set in terms of political decisions (Cooke et al., 2000; Goodwin et al., 2006).

Prior to these considerations, Trippl (2006) proposed five dimensions or crucial subsystems for a regional innovation system:

- *Dimension creation and dissemination of knowledge or infrastructure of knowledge:* This is related to every kind of organization dedicated to producing and putting out knowledge and to development competences and skills. The key actors are institutions of public investigation (investigation centers, technology licensing centers), as well as educational institutions (universities, polytechnics, graduating institutions) and workforce organizations.
- *Dimension application and exploitation of knowledge*: This reflects the entrepreneurial dimension and the negotiations of the regional innovation system. It encompasses the companies, the clients, the suppliers, the competitors, and the industrial corporation partners, in other words, the industrial clusters in the region.
- *Dimension of regional policies*: This includes public authorities, regional development institutions, and other political agents involved in the formulation and implementation of innovation policies and cluster strategies.
- *Dimension of local interactions*: In the ideal case, there are different kinds of relations within and between the dimensions of RIS which facilitate the continuing flow of knowledge, physical and human resources. The interactions and intensive processes of local knowledge exchange are at the center of the regional dynamic originating activities of systemic innovation.

– *Dimension of the cultural and institutional factors in the region*: Both the formal institutions (laws, regulations) and the informal (values, practices, schedules) are given emphasis in the formation of RIS. The institutions form the behaviors of the actors and the relations among them. Behavioral standards, values, schedules, cooperation culture, and innovation attitudes are key factors in the distinction of institutional endowment in the region.

The RIS still highlights the importance of knowledge exchange and international specialists through extra-local contacts in the regional companies and knowledge providers (Oinas and Malecki, 2002; Maskell et al., 2006) and also in governance and its multilevel characteristics, which may push innovation dynamics to different territorial levels. The interaction among organizational and regional cultures, relative to innovation and venture choices, began to be explored with the regional innovation systems (Cooke, 2008) combining the "varieties of capitalism," "venturing system," (Cooke et al., 2007), and production (Cooke, 2008). For Jerome and Jordan (2010), the new regional systems require novel structures that align with salient goals, strategies, and cultural values. The RIS has been analyzed in terms of different varieties of innovation, relative to the localized, hierarchic, and linked governance system of innovation.

Moreover, the innovation systems at the regional level require specific needs of the community and, by principle, have greater probability of mobilizing the community and the different regional actors to participate in this process as a way of attending to their needs. The RIS, by this perspective, may be a good political concept to *generate, implement, and operate adequate efficient sector innovation systems in the region* (Chung, 1999).

The concept of RIS has no generally accepted definition, although it is typically understood to be a set of interacting private and public interests, formal institutions, and other organizations that function according to organizational and institutional arrangements and relationships conducive to the generation, use, and dissemination of knowledge (Hájková and Hájek, 2010) and appropriation of innovation (Chung, 1999). Asheim and Gertler (2005) define the RIS as the institutional infrastructure supporting innovation within the production structure of a region.

In a broader perspective, the set of actors and organizations (companies, universities, investigation centers) are systematically dedicated to the development of innovation and interactive learning through common institutional practices (Doloreux and Bitard, 2005). More recently, the regional systems of innovation contemplate the triple helix approach, like an exclusive engine (Leydesdorff 2011). For Leydesdorff and Zawdie (2010) the triple helix concept seeks to determine the existence of clear differences among the constituting regions of each European country.

Hence, the regional innovation system represents the institutional infrastructure available in the region to promote and sustain a regional dynamic of innovation. This

is an instrument to create external economies and promote competitiveness among firms and regions.

It can be a component of a regionalized system of national innovation; in other words, it is part of the productive and institutional structures located in the regions but functionally integrated into the NIS ("top-down" approach), and/or it is constituted by parts of the institutional structure and production that are territorially integrated and rooted in the region ("bottom-up" approach) (Asheim and Isaksen, 1997). But for an innovation system to be effective, it requires interaction – between the regional governance system and also national entities – the academy, industry, and the people established in them.

The regional innovation system, as suggested by Pinto and Guerreiro (2006), reflects the systemic vision with the concentrated presence of four types of resources: i) territorial resources: location, natural, and human; ii) intangible resources: tactical knowledge, codified knowledge, and culture network; iii) institutional resources: companies, institutions, entity of R+D+I (research, development and innovation); and iv) relational resources: institutional networks, knowledge networks, merchant networks. However, at the network level, these integrate both the region's internal context and the external contexts, showing clearly a reality that is rather territorialized. Besides, the RIS is not self-sufficient and is included in the national and European systems. Furthermore, its efficient operation relies on perfect coordination and integration with the other system levels.

Therefore, the innovation system of a regional level or regional system of innovation enables a larger format and adaptation of national policies in regional environments since there is greater proximity among the many agents and a greater cultural homogeneity, and also because the intensities and the dynamics of innovation are sometimes more disparate among the regions than the nations. As stated by Frykfors and Jönsson (2010), this regional vision of innovation in some countries has a recent character deriving from the global competitive situation itself, namely the allocation of funds based on regional criteria.

3. HYPOTHESIS

The RIS can be understood as the set of actors and organizations (companies, universities, investigation centers) that interact to develop innovation. The innovations do not arise solo inside a firm, but the potential of their conception is related to the process of learning determined by firms' relationship to its environment (Hájková and Hájek, 2010).

The focus on regions as the best geographical scale for an innovation-based learning economy stresses the importance of regional resources in stimulating the

innovation capability and competitiveness of firms (Jerome and Jordan 2010). The focus on regional innovation systems lies in the fact that the factors that the national innovation systems theory identifies as important, such as the framework, the nature of inter-firm relationships, learning capability, R&D intensity, and innovation activity all differ significantly across regions (Matatkova and Stejskal, 2011).

A new paradigm for innovation development therefore must be envisioned in order to take advantage of the region's particular strengths while recognizing the limitations and challenges of scale (Jerome and Jordan 2010). The cities and regions where new forms or organization of production have emerged, and in which they have been progressively imbedded, are territories where trust and reciprocity between individuals and the organizations stimulate cooperation as well as economic exchange (Vázquez-Barquero, 2006). A region is an administrative area with a geographical delimitation, defining macroeconomic characteristics for activities of production, distribution and consumption (Noéme and Nicolas 2004). A region can be defined geographically as a network of organizations that interact with innovative outputs of regional firms on a regular basis. Alternatively, a region can describe the cultural aspects of the region, homogenous in terms of specific criteria and possessing some kind of internal cohesion (Doloreux and Parto, 2004; Jerome and Jordan 2010).

This study aims to measure regions' innovativeness patterns in different Portuguese regions and to evaluate the nature of the innovation process and the relationship between innovation standard and its region of origin. To characterize the innovation processes of regions and to identify innovation patterns by regions, the following dimensions or groups of factors were considered: the level of involvement, commitment, and interest in innovating as firms' objective; the coordination of innovation activities; the type of information sources to innovate; the relationships in a collaborative network; the cooperation with institutional actors and the performance of triple helix (University, Government, Firms); and the level of difficulties and obstacles assessed by the firm to innovate. Thus, the territorial standards of innovation are conditioned by the specific characteristics of each territory based on these five dimensions.

The first hypothesis in this work seeks to emphasize the influence on the degree of involvement, commitment and interest in innovating as a firm goal in the territorial dynamics of innovation. The general recognition associated with the importance of innovative behavior of the firms in their performance in competitive terms and, as a consequence, in territorial dynamics by the increase of the efforts related to the intensifying of innovating activities and identifying behavioral standards of involvement and commitment in these activities (Vaz and Cesário, 2003; Doloreux, 2004).

There are significant differences in firms' objectives that have been subjacent to the development and introduction of innovations. They differ from company to company, according to the sector, the size, and its attitude to innovate (Conceição and Ávila, 2001; Natário and Neto; 2006). Thus, the objectives and reasons which

lead the companies to introduce innovations influence the territorial processes of innovation and are diverse.

One important aspect to know is related to the objectives associated with the motivation to introduce innovation. This commitment may be translated by the set of creative activities undertaken in the firm to increase knowledge and its use in new and improved applications (products, processes), in other words, the R&D activities (intramural).

It also can be measured by the amount of innovation expenditures made at the company (level of R&D expenses – intramural). Furthermore, it translates the first dimension or subsystem of a RIS as defined by Trippl (2006): generation of knowledge or infrastructure of knowledge, which has to do with all types of organizations which are committed to production and diffusion of knowledge, within their capabilities and skills. The first hypothesis is thus formulated as:

H1: The firms' innovation objectives have a positive influence on the regional dynamics of innovation.

There is an ever-increasing level of information available to support innovation. But the best way to access to this information does not satisfy, in itself, the need for knowledge by decision-makers. Multiple internal and external sources which can support the foundation of new ideas, their applicability and relevancy tend to vary according to their own characteristics (Freire, 2006).

The sources of information are important to innovate, once they result in suggestions or contribute to innovation projects or contribute to the implementation of innovations. The importance of these sources has been highlighted in several community innovation surveys (CIS).

These sources may adopt a more formal configuration (specialized studies, surveys to clients/market studies, etc.) or a more informal character (request or claims of customers, suggestions of suppliers or partners, etc.). Although the formal sources of information sustain the natural evolution in the long run, it is the informal sources that frequently open truly different perspectives. In view of these considerations the following hypothesis has been established:

H2: The sources of information have a positive influence on the regional dynamics of innovation.

Another important aspect in firms' innovative performance, and subsequently in the territories where they are located, is the structure of innovation activities: individually, in cooperation, or resorting to specialized companies. In effect, according to firm strategy, it is possible to find many modes of developing innovations.

Collaboration with other specialized firms and consultants, as well as the behavior in networks to innovate, are modalities that present many benefits: sharing of risks and costs that the innovation entails; access to new and different markets; the obtaining of additional fundamental resources for innovation; access to information, skills, and specialists; and reducing development time for innovations (Von Stamm, 2005).

Therefore, the innovative dynamics of the company, and subsequently of the region, in the sense of encouraging/developing innovating activities requires efficient and proactive coordination of the relationships with "companies of the sector." In the face of these considerations, a second hypothesis has been established:

H3: Collaborative networks have a positive influence on the regional dynamics of innovation.

In the regions, the artificial creation of the environment/milieu, through technological parks, and cooperation among the many local agents and their network linkages, take on particular importance in the promotion of regional innovation (Landabaso, 1997).

The relationships have been pointed out in many studies as an efficient way to promote innovation in one region (Bramanti, 1999; Doloreux, 2004; Henttonen, 2006; Vang et al, 2007; Etzkowitz, and Zhou, 2007; Cooke, 2008; Alfonso-Gil and Vazquez-Barquero, 2010). For Etzkowitz and Zhou (2007), collaborations in specific projects at the micro-level constitute the base to achieve regional innovation. The collaborations couldn't be are not sufficient to create a macro-oriented and force to lead innovation. A region also needs the organization of innovation resources to form a scale or scope economy.

In effect, to analyze the territorial dynamics of innovation, Doloreux (2004) studied firms' innovating activities, in particular the cooperation of external sources of knowledge in terms of partnerships in the development of innovation processes and their forms of cooperation for innovating activity. The relationships in a network of cooperation facilitate the production and transmission of the flux of information, determining the firm' innovative performance and influencing the territorial innovation process (Grabher (ed), 1993).

According to Trippl (2006) the networks, partnerships, and cooperation reflect the second dimension of the RIS – knowledge exploitation, which reproduces the corporate dimension and the business in the regional innovation system, encompassing the companies, their clients, their suppliers, their competitors and their partners of industrial cooperation, plus the fourth dimension of the RIS – the dimension of local interactions, types of relationships within and between the RIS that facilitate continuous exchange of knowledge and the processes of knowledge transferring.

The basis of regional development requires a well lubricated Triple Helix (University, Government, Firms) (Etzkowitz, and Zhou, 2007), which acts as a facilitator for the emergence of dynamics of innovation throughout an overarching innovation community (Frykfors and Jönsson, 2010). The interaction between the helixes benefits the production and sharing of knowledge and influences innovative performance. In the face of these considerations, the following hypothesis was established:

H4: The triple helix performance has a positive influence on the regional innovation processes

The lack of full financial support by the public entities is often pointed out as an obstacle to the development of innovations – particularly, small and medium firms, which characterize the Portuguese reality, regarding financial elements present relative disadvantages comparing to large firms. In response, the governments and European Union developed measures and forms of support to encourage innovation in these organizations (Avermate et al., 2006; Riding and Haines 2001).

Other barriers usually cited as reasons to not innovate are the external obstacles associated with economic and market factors and the internal obstacles associated with knowledge factors, combined with the fact that those innovations seem unnecessary since there already are previous innovations or a lack of searching for those innovations. The difficulties firms felt which absence of search/market for innovations may influence the attitude toward innovation. In view of these considerations, the following hypothesis was put forward:

H5: Firms' innovation inhibitors influence the regional dynamics of innovation

4. METHODOLOGY AND RESULTS

The main source of data used to evaluate the regional capabilities of innovation in Portugal was the Community Innovation Survey[4] Database for 2006, which integrates seven Portuguese regions at NUTS II levels (Nomenclature of Territorial Units for Statistics).

4 This database was established by the Office of Planning, Strategy, Assessment and International Relations / Ministry of Science, Technology and Superior Education. Despite their limitations, once it doesn't cover the mechanisms of production, capture, distribution, absorption and application of knowledge, the 3rd generation indicators of Godinho (2007) in which the innovation systems are based on, the use of CIS relies on the fact it makes available data of the Portuguese regions by NUTS II disaggregation level, which makes it impossible to for the OECD indicators to be acquired.

Although there are no administrative regions in Portugal, the regional innovativeness can be assessed using the NUTS II level. Also, the edition of the European Regional Innovation Scoreboard (RIS) provides a comparative assessment of innovation performance across the regions of the European Union and Norway.

As the regional level is important for economic development and for the design and implementation of innovation policies, it is important to have indicators to compare and benchmark innovation performance at regional level. Such evidence is vital to inform policy priorities and to monitor trends (Hollanders et al., 2009). Also, Capello and Lenzi (2011) used this concept to analyze Territorial Patterns of Innovation in Europe and which regions innovate.

The methodology employed to analyze the data was a cluster analysis, since it is appropriate to aggregate the regions based on their registered level of innovation. Therefore, in the first step, a cluster analysis is performed in order to group the regions based on input and output sides of the generation of innovation (patent request, registry of industrial design; and trademarks). We used a hierarchical clusters analysis employing the within group linkage method and the Euclidean distance as measure.

The distinction between these innovation enablers and the relevance to regional dynamics construct (used in clustering) relies on the work of Hollanders et al. (2009), which seeks to identify the level of innovation in order to test its dependency on enabler factors, but also see if it translates into output factors. In a second step, the analysis examined whether the clusters previously identified can really be interpreted as different modes of innovation, applying a multiple means comparison, as suggested by Gonano and Canali (2004).

As analytical dimensions, we used the objectives of innovation, the sources of information, the collaborative networks, as well as the Triple Helix performance and the obstacles felt by the company in the process of innovation.

As measurements of these variables, we considered the performance of "R&D activities" and the "level of R&D expenditures" as measures of the commitment and interest in innovation within the firms' objectives. In what follows, similar to Cohen and Levinthal (1990), Rodosevic (2004), Avermate et al. (2006), and Coto-Millán, et al. (2011), the article looks beyond R&D to understand innovation capacity. Radosevic (2004) used the R&D expenditures (% GDP) as the supply of R&D and to analyze the innovation capacities of the Central and East European Countries in the enlarged EU.

Avermate et al. (2006) utilized R&D activities as a variable to reflect the innovativeness. Public R&D expenditures and business R&D expenditures also are used to obtain the synthetic index of the Technological Capital by Coto-Millán et al. (2011). R&D capability is important not only to generate new knowledge, but also as a mechanism to absorb it (Cohen and Levinthal, 1990; Radosevic, 2004).

The sources of information were assessed in accordance with the variables: "clients or consumers" that reflects the *user/producer relationships of innovation* (Lundvall, 1988) and the informal networks (Von Stamm, 2005) to acquire information to innovate. The collaborative networks have been evaluated as a function of the relationships with "competitors and other firms in the sector" in what follows (similar to Fritsch and Lukas, 2001; Fritsch, 2001; Becker and Dietz, 2004; Fritsch and Franke, 2003).

The cooperation of innovation activities was analyzed in relation to "consultants, R&D companies, associations and/or technological centers." The cooperation of various institutions, organizations and clusters, completes regional innovation system and it is incorporated in relations as layers of RIS by Matatkova and Stejskal (2011).

The level of obstacles felt by firms was evaluated through the "absence of search/market for the innovations." In what follows, similar to Doloreux (2004), barriers associated with the lack of internal technological information and marketing capability are obstacles identified by firms in their study.

Applying the aforementioned methodology of cluster analysis, four groups (See Table 1 and attachment 1) of regions were obtained: cluster one, with medium high innovation, composed of Lisbon and North regions; cluster two, with high innovation, includes the Center and Alentejo regions; cluster three, with medium low innovation, aggregates the Algarve and Madeira region; and cluster four, with low innovation, comprises the Azores region.

TABLE 1
CLUSTERS' CONSTITUTION

	Medium High Innovators	High Innovators	Medium Low Innovators	Low Innovators
Patent Application	3,50	7,50	1,00	1,00
Industrial Desgin Registration	2,00	2,00	4,50	1,00
Trademarks Registration	20,00	21,00	11,00	13,00

Having conducted the grouping of the Portuguese regions in accordance with the innovation indicators, we then proceed to verify the significance of mean differences among groups, regarding the explanatory variables considered, using ANOVA analysis (See Table 2). The results show that all indicators used to measure innovation were significant.

TABLE 2
ANOVA ANALYSIS: INDICATORS SIGNIFICANCE OF CLUSTERS CLASSIFICATION

	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df	Mean Square	df
Patent Application	16,90	3,00	1,00	3,00	16,90	0,02
Industrial Desgin Registartion	3,74	3,00	0,17	3,00	22,43	0,01
Trademarks Registration	45,81	3,00	0,67	3,00	68,71	0,00

Considering the results shown in Table 3, there are overall means differences among the groups in the variables considered, according to the measurements used, based on the F test result and its statistical significance.

TABLE 3
ANOVA ANALYSIS: MEAN DIFFERENCES AMONG GROUPS IN EXPLANATORY VARIABLES

		Medium High	High	Medium Low	Low		
Variables	Measurements	Innovators	Innovators	Innovators	Innovators	F	Sig.
Dimension	Number of employees	40	9	1	1	15,4	0,025
Objectives	R&D activities	50	46	50	26	49,3	0,005
	R&D expenses	29	21	20	2	24,4	0,013
Information	Clients or consumers	11	10	4	2	9,1	0,051
Collaborative Networks	Competitors and other firms in the sector	10	8	0	25	46,7	0,005
Thm Performance	Public R&D laboratories and Institutions	3	9	0	0	87,9	0,002
Obstacules	Lack of demand	6	7	4	4	7,0	0,072

Using the dimension of the firms as a control variable, the results show that firms in cluster one are much larger than those in the remaining clusters. However, companies in cluster two have higher innovation indicators.

In relation to the firms' objectives, it can verified that the R&D activities and the level of R&D expenses differs significantly and that the first, second, and third clusters show higher means levels of expenses and much higher levels of activities than cluster four, although a little lower number of activities than others clusters. Thus hypothesis one is not rejected.

Observing the information sources, there also are significant behavior differences among clusters. Once again, companies in regions within clusters one and two show higher levels of information exchange than those in the remaining two clusters. Therefore, hypothesis two arguments are not rejected.

In terms of collaborative networks, there also are significant differences among the clusters, with companies in cluster four showing higher values of collaborative

networking with companies in the same sector. This, however, contradicts hypothesis three since higher levels of networking are not associated with more innovation. Thus, hypothesis three is rejected.

From the results obtained regarding the triple helix performance, it can be inferred that regions in cluster one and two have higher level of association with cooperating public R&D laboratories and institutions. This result led us to not reject hypothesis four.

The indication of main innovation obstacles shows that firms that innovate more are the ones with higher concerns. This reinforces the idea that other firms are still not aware of the problems due to the lower level of involvement in the innovation process, and consequently provides evidence that the type of obstacles to innovation varies among Portuguese regions due to firms' stage of awareness and involvement in the innovation process, which allows not rejecting hypothesis five.

5. DISCUSSION AND CONCLUSIONS

Considering the purposes of this work, we may conclude that the overall objectives were reached, since it was possible to identify how the different regions behave in terms of innovation. This differentiation was obtained by considering a set of innovation indicators that verify the effective capacity to register and protect the innovation level and not only the importance attributed to innovation by companies.

This work contributes to theoretical knowledge improvement at two levels: first regarding the variables that influence the process of innovation, advancing measures for the diverse components of a system of innovation, namely objectives, networking information, triple helix performance, and obstacles; and second, allowing comprehension of the innovation levels of companies in different Portuguese regions.

Four of our five hypotheses were confirmed by the results concerning the various components of the innovation system and showed the study's relevance in understanding the innovation differences based on territorial standards.

The results show that more innovative regions have companies that are engaged in more innovation activities, with higher expenses levels, thus having clearer objectives. They also obtain information directly through clients and consumers and are associated with public R&D laboratories and institutions to develop innovation, and are more aware of obstacles than companies from other regions.

On the other hand, companies in less innovative regions have fewer R&D activities and lower expenses; have less coordination with other companies and consulting firms; don´t search information through clients or consumers; and don´t associate very much with public R&D laboratories and institutions. Therefore, they evidence a more basic form of innovation, which is common in earlier stages of the innovation

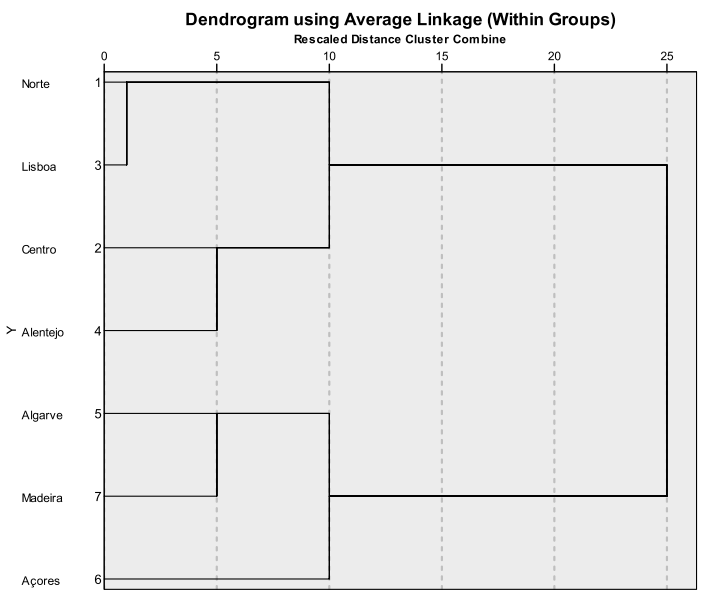
process, and have a reduced idea of the inhibitors of innovation behavior.

For managers, this result suggests that there is a relationship between a greater degree of innovation and the level of investment in R&D, reinforcing the idea of the necessity of a high degree of commitment and dedication to the process in order to obtain results. It also implies that clients and consumers are a source of information, and that a connection with public R&D laboratories and institutions reinforces the need for a more open innovation approach.

The resulting implications in terms of innovation policies that arise from this study are centered in the need to promote regional innovation systems and policies that support and sustain open innovation projects, especially those that arise from spin-offs with universities and polytechnics. The importance of this open innovation also appears to be associated with the connection to the clients, as key elements of information in the innovation process.

The experience of regions where companies have greater results shows that these connections could be stimulated through funding policies that promote the development of relationships and association with two special stakeholders: universities and clients.

ATTACHMENT 1
DENDROGRAM



The limitations of this work are in some way related to the level of aggregation in which some key elements of the innovation process were treated. These facts result from the data available, which suggests the need for further research based on reports with more disaggregated data or gathered by firms' inquiries.

Future research could depart from the analysis of specific cases to identify the detailed dynamics of the process. Another aspect that needs future research is the relation between innovation and regional economic specialization, verifying if this aspect is correlated with innovation levels and if it means that there is less innovation or simply other types of innovation.

REFERENCES

ALFONSO-GIL J. and VAZQUEZ-BARQUERO A. (2010) "Networking and innovation: lessons from the aeronautical clusters of Madrid". *International Journal of Technology Management*, 50, (3/4), 337- 355.

ASHEIM B. and COENEN L. (2006) "Contextualising Regional innovation Systems in a Globalising Learning Economy: On Knowledge Bases and Institutional Frameworks", *Journal of Technology Transfer*, 31, 163-173.

ASHEIM B. and GERTLER M. (2005) The Geography of Innovation, in FAGERBERG J., MOWERY and D. NELSON R. (Eds) *The Oxford Handbook of Innovation*, pp. 291-315. University Press, Oxford.

ASHEIM B. and ISAKSEN A. (1997) "Location, Agglomeration and Innovation: towards Regional Innovation Systems in Norway?", *European Planning Studies*, 5 (3), 299-330.

AUTIO E. (1998) "Evaluation of RTD in Regional Systems of Innovation" *European Planning Studies*, 6 (2), 131-140.

AVERMATE T., VIAENE J. and MORGAN E.J. (2006) The Allocation of Public Support to Small Food Firms in Belgium, Ireland and UK, in VAZ T.N., MORGAN E.J. and NIJKAMP P. (Eds.) *The New European Rurality, Strategies for Small Firms*, pp.205- 218. Ashgate.

BECKER, W.; DIETZ, J., (2004). "R&D cooperation and innovation activities of firms-evidence for the German manufacturing industry", *Research Policy*, 33(2) 209-223.

BOTTAZZI L. and PERI G. (2003) "Innovation and Spillovers in Regions: Evidence from European Patent Data", *European Economic Review*, 47, 61-74.

BRAMANTI A. (1999) "From Space to Territory: Relational Development and Territorial Competitiveness", *Revue d'Economie Régionale et Urbaine*, 3, 633-654.

BRESCHI S. (2000) "The Geography of Innovation: a Cross-industry Analysis", *Regional Studies*, 34, 213-229.

CAPELLO R. and LENZI C. (2011) *Territorial Patterns of Innovation in Europe,* paper presented at 51st ERSA 2011 Congress (European Regional Science Association Congress) theme: New Challenges for European Regions and Urban Areas in a Globalized Word, Barcelona, Spain de 30th August-3rd September 2011. ersa11acfinal01902

CARLSSON B. (1995) The Technological System for Factory Automation: An International Comparison, in CARLSSON B. (Ed.) *Technological systems and economic performance: the case of factory automation*, Boston, pp. 441-475. Kluwer Academic Publishers, Dordrecht and London.

CHAMINADE C. and VANG J. (2006) Innovation Policy for Asian SMEs: An Innovation Systems Perspective, in VANG, J. and YEUNG, H. (Eds.) *Handbook of Research on Asian Business*, Edward Elgar, Cheltenham.

CHUNG S. (1999) Regional Innovation Systems in Korea, in 3rd International Conference on Technology and innovation Policy: Assessment, Commercialisation and Application of Science and Technology and Management of Knowledge, The University of Taxas at Austin, USA, 30 August - 2 September 1999.

COHEN W. M. and LEVINTHAL D. (1990) "Absorptive Capacity: A New Perspective on Learning and Innovation", *ASQ,* 35, 128-152.

CONCEIÇÃO P. and ÁVILA P. (2001) *A Inovação em Portugal: II Inquérito Comunitário às Actividades de Inovação*, Celta Editora, Oeiras.

COOKE P. (1992) "Regional Innovation Systems: competitive regulation in the new Europe", *Geoforum*, 23, 365-382.

COOKE P. (2003) *Strategies for Regional Innovation Systems: Learning Transfer and Applications*, United Nations Industrial Development Organization, Policy Papers, UNIDO, Vienna.

COOKE P. (2008) "Regional Innovation Systems, Clean Technology & Jacobian Cluster - Platform Policies", *Regional Science Policy & Practice*. 1 (1), 23-45.

COOKE P., BOEKHOLT P. and TÖDTLING, F. (2000) *The Governance of Innovation in Europe*, Pinter, London.

COOKE P., DE LAURENTIS C., TÖDTLING F. and TRIPPL M. (2007) *Regional Knowledge Economies*, Edward Elgar, Cheltenham.

COTO-MILLÁN P., PESQUERA M.A., CASARES-HONTAÑÓN P. and DE CASTRO, P. (2011) "Serempathy: A New Approach to Innovation. An Application to Forty-Six Regions of Atlantic Arc Countries". *Journal of Knowledge Management, Economics and Information Technology*, 6, 1-26.

DE LA MOTHE J. and PAQUET G. (1998) *Local and Regional Systems of Innov*ation, Kluwer Academic Publishers, Boston.

DOLOREUX D. (2003) "Regional Innovation Systems in the Periphery: The Case of the Beauce in Québec (Canada)", *International Journal of Innovation Management*, 7 (1), 67-94.

DOLOREUX D. (2004) "Regional Innovation Systems in Canada: A Comparative Study", *Regional Studies*, Vol. 38.5, 481–494, July 2004.

DOLOREUX D. and PARTO S. (2005) "Regional Innovation Systems: Current Discourse and Unresolved Issues", *Technology in Society*, 27 (2), 133-153.

DOLOREUX, D. and BITARD, P. (2005) "Les Systèmes Régionaux D'innovation: discussion critique", *Géographie Economique Société*, 7, 21-36.

DOLOREUX D. and PARTO S. (2004). "Regional innovation systems: A critical review", (www.ulb.ac.be/soco/asrdlf/documents/RIS_Doloreux_Parto.pdf (5 July 2005).

DOSI G., FREEMAN C., NELSON E., SILVERBERG G. and SOETE L. (Eds) (1988) *Technical Change and Economic Theory*, Pinter Publishers, London and New York.

EDQUIST C, and MCKELVEY (Eds) (2000) S*ystems of Innovation: Growth, Competitiveness and Employment* (Vol 1-2), Edward Elgar Publishing Limited, USA.

EDQUIST C. (2001) Innovation Policy- A Systematic Approach in Archibugi, D; *Learning Economy*, pp.220-238, University Press, Oxford.

EDQUIST C. (ed.) (1997) *Systems of Innovation: Technologies, Institutions and Organizations*. Pinter Publishers, London and Washington.

ETZKOWITZ H. and ZHOU C. (2007) *Regional Innovation Initiator: The Entrepreneurial University in Various Triple Helix Model*s, paper presented in Triple Helix Conference VI in Singapore. available at http://www.nus.edu.sg/nec/TripleHelix6/SingaporeConferenceThemePaper050107.pdf.

FREEMAN C. (1987) *Technology Policy and Economic Performance: Lessons from Japan*, Pinter Publishers, London.

FREEMAN C. (1988) Japan: a New National System of Innovation? In DOSI G., FREEMAN C., NELSON E., SILVERBERG G. and SOETE L. (Eds) *Technical Change and Economic Theory*, pp. 330-348. Pinter Publishers, London and New York.

FREIRE A. (2006) *Inovação: Novos Produtos, Serviços e Negócios para Portugal,* Editorial Verbo, Lisboa.

FRITSCH M. (2001). "Cooperation in regional innovation systems". *Regional Studies*, 35, 297-307

FRITSCH M. and FRANKE G. (2003). "Innovation, regional knowledge spillovers and R&D cooperation". *Research Policy*. 33 (2) 245-255.

FRITSCH M. and LUKAS R (2001)"Who cooperates on R&D". *Research Policy*, 30, 297-312;

FRYKFORS C.O. and JÖNSSON H. (2010) "Reframing the multilevel triple helix in a regional innovation system: a case of systemic foresight and regimes in renewal of Skåne's food industry", *Technology Analysis & Strategic Management*, 22(7), 819 - 829.

GODINHO, M. (2007) "Indicadores de C & T, inovação e conhecimento: onde estamos? Para onde vamos?" *Análise Social* Vol. XLII (182) 239-274.

GONANO S. and CANALI G. (2004) Interregional Comparison of the Territorial Systems, in Vaz, T, N; Viaene; J.; Wigier, M. (Ed). I*nnovation in Small Firms and Dynamics of local Development* , pp.62-78. Scholar Publishing House,Warsaw.

GOODWIN M., JONES M. and JONES R. (2006) "Devolution and Economic Governance in the UK: Rescaling Territories and Organizations", *European Planning Studies*, 14 (7), 979-995.

GRABHER G. (Ed) (1993) *The Embedded Firms: On the Socio-Economics of Industrial Networks*, Routledge, London.

GUIMARÃES R. A. (1998) *Política Industrial e Tecnológica e Sistemas de Inovação,* Celta Editora, Oeiras.

HÁJKOVÁ V. and HÁJEK P. (2010). "Analysis of Regional Innovation Systems by Neural Networks and Cluster Analysis". *Communication and Management in Technological Innovation and Academic Globalization*, 46-51.

HENTTONEN K. (2006) *Innovation in Complex Networks – the State –of-the-Art and propositions for Further Research*, paper presented in The Innovation Pressure, International ProAct-Conference, Tampere, Finland. 15-17 March.

HOLLANDERS H.; TARANTOLA S. and LOSCHKY A. (2009) *Regional innovation Scorecard*, *PRO INNO Europe* and INNO Metrics.

HOWELLS J. (1999) Regional systems of innovation?, in ARCHIBUGI, D., HOWELLS, J., MICHIE J. (Eds) *Innovation Policy in a Global Economy*, pp. 67-93. Cambridge University Press. Cambridge.

JEROME L.W. and JORDAN P.J. (2010) *Building an Institute for Triple-Helix Research Innovation*. University Clinical, Education and Research Associates (UCERA) University of Hawai'i.

LANDABASO M. (1997) "The Promotion of Innovation in Regional Policy: Proposals for a Regional Innovation Strategy", *Entrepreneurship & Regional Development*, 9 (1) 1-24.

LEYDESDORFF L. (2011) *The Triple Helix, Quadruple Helix, …, and an N-tuple of Helices: Explanatory Models for Analyzing the Knowledge-based Economy*? (http://www.leydesdorff.net/list.htm).

LEYDESDORFF L. and ZAWDIE G. (2010) "The triple helix perspective of innovation systems". *Technology Analysis & Strategic Management,* 22(7), 789-804.

LIST F. (1942) *Sistema Nacional de Economia Política*, Fondo de Cultura Económica, México.

LUNDVALL B. (ed.) (1992) *National systems of Innovation - Toward a Theory of Innovation and Interactive Learning*, Pinter Publishers, London.

LUNDVALL B.A. (1988) Innovation as an Interactive Process: from User-Producer Interaction to the National System of Innovation, in DOSI G., FREEMAN C., NELSON E., SILVERBERG G. and SOETE L. (Eds) *Technical Change and Economic Theory*, pp.349-369. Pinter Publishers, London and New York.

LUNDVALL B.A. and JOHNSON B. (1994) "The Learning Economy" *Journal of Industry Studies*, 1, pp. 23-42.

MASKELL P., BATHELT H. and MALMBERG A. (2006) "Building Global Knowledge pipelines: the role of temporary clusters", *European Planning Studies*, 14(8), 997-1013.

MATATKOVA K. and STEJSKAL J. (2011) *The Analysis of the Regional Innovation Systems – Czech Case*, paper presented at 51st ERSA 2011 Congress (European Regional Science Association Congress) theme: New Challenges for European Regions and Urban Areas in a Globalized Word, Barcelona, Spain de 30th August-3rd September 2011. ERSA2011_paper_00061.

MORGAN K. (2004) "The Exaggerated Death of Geography: Learning, Proximity and Territorial Innovation Systems", *Journal of Economic Geography*, 4, 3-21.

NATÁRIO M.M.S and NETO P.A (2006) "Os Processos Territoriais de Inovação: a Abordagem dos Sistemas de Inovação e a Perspectiva Transfronteiriça", *Estudos Regionais*, 12, 5-28.

NELSON R. (1988) Institutions Supporting Technical Change in the United States, in DOSI, G., FREEMAN C., NELSON E., SILVERBERG G. and SOETE L. (Eds) *Technical Change and Economic Theory*, pp.312-329. Pinter Publishers, London and New York.

NELSON R. and ROSENBERG N. (1993) Technical Innovation and National Systems, in NELSON R. (Ed.) *National Systems of Innovation – a Comparative Analysis*, pp.3-21. Oxford University Press, Oxford.

NELSON R. (Ed.) (1993) *National Systems of Innovation – a Comparative Analysis*, University Press, Oxford.

NIOSI J., SAVIOTTI P., BELLON B. and CROW M. (1993) "National Systems of Innovation: in Search of a Workable Concept", *Technology in Society*, 15(2), 207-227.

NOÉME C. and NICOLAS F.M. (2004) The processes of technological learning and co-operation in small firms, in VAZ, T, N; VIAENE; J.; WIGIER, M. (Ed). *Innovation in Small Firms and Dynamics of local Development*, pp.122-162. Scholar Publishing House,Warsaw.

OECD (1994) "Systèmes d'Innovation et Politique Technologique", *Revue Science Technologie Industrie*, 14, Paris.

OECD (1997) *National Innovation System*, OECD Publications, Paris.

OINAS P. and MALECKI E. (2002) "The evolution of technologies in time and space: from national and regional to spatial innovation systems", *International Regional Science Review*, 25, 102-131.

PATEL P. and PAVITT K. (1994) "Nature et Importance Économique des Systèmes Nationaux D'Innovations", *Revue Science Technologie Industrie*, 14, 9-35.

PINTO H. and GUERREIRO J. (2006) "As Dimensões Latentes da Inovação: o Caso das Regiões Europeias", *Estudos Regionais*, 13, 83-101.

POLANYI M. (1966) *The Tacit Dimension*, Routledge and Kegan Paul. London, UK.

RIDING A. and HAINES G. (2001) "Loan Guarantees: Costs of Defaults and Benefits to small Firms", *Journal of Business Venturing*, 16, 595-612.

RODOSEVIC S. (2004) **"**A Two-Tier or Multi-Tier Europe? Assessing the Innovation Capacities of Central and East European Countries in the Enlarged EU". *JCMS* Volume 42. Number 3. 641–666.

SCHUMPETER J. (1934) *The Theory of Economic Development*, MA Harvard, University Press, (Reproduced, New York 1961), Cambridge.

STORPER M. (1997) *The Regional World*, The Guilford Press, New York.

SUNDBO J. (1998) *The Theory of Innovation: Entrepreneurs, Technology and Strategy*, Edward Elgar, Cheltenham, UK.

TÖDTLING F. and TRIPPL M. (2005) "One size fits all? Towards a Differentiated Regional Innovation Policy Approach", *Research Policy*, 34, 1203-1219.

TRIPPL M. (2006) *Cross-Border Regional Innovation Systems,* Published Online (http://epub.wu-wien.ac.at).

VANG J., COENEN L.., CHAMINADE C. and ASHEIM B. (2007) Universities, Regional Innovation Systems and the Bangalore Experience: Towards a Contextual and Evolutionary Perspective, in CHEN J., XU Q., WU X. (Eds.) *Managing Total Innovation and Open Innovation in the 21st Century*, Proceedings of the 5Th international, pp.884-888. Symposium on Management of Technology (ISMOT'07), Zhejiang University Press, China.

VAZ M. and CESÁRIO M. (2003) Padrões Comportamentais dos Empresários face à Inovação: o caso das PMEs do Sector Agro-Alimentar Localizadas no Alentejo Central e Oeste, paper presented in X Encontro da APDR 26-28 Junho, Évora.

VÁZQUEZ-BARQUERO A. (2006) *Emergence and Transformation of Clusters and Milieus*. IKINET meeting, Madrid, May 6.

VON STAMM B. (2005) *Managing Innovation, Design & Creativity*, John Wiley & Sons Ltd, England.