

CASE STUDY ON THE COMPONENTS OF AN INNOVATIVE REGION: ÖRESUND REGION (DENMARK-SWEDEN)

Stud. urb. Andrei Ștefan SĂBĂU

e-mail: andrei.stefansabau@yahoo.com

Abstract. How can one describe the components of an innovative region? What characterizes a region as being innovative? This paper presents the close relationship between innovation and regional development in an empirical analysis of the Öresund Region (the south-western part of Scandinavia: Sweden and Denmark), arguing the role of the universities, public institutions and R&D companies in placing the Öresund Region on the map as a world-leading player in providing biotech and medical technology.

Key words: innovation, knowledge-based development, entrepreneurship, triple-helix innovation model

Note

This paper defines personal insights of the author regarding the components of an innovative region, based solely on the information obtained from the references.

1. Introduction

1.1. Innovation and regional development

The development of Silicon Valley in the last century has fascinated scholars and authors in economical and regional development. It is acknowledged that the Valley has had an unprecedented record of development and success in the production and introduction of innovative solutions that dominate the modern technology today like semiconductors, computers, software, telecommunication equipment etc. As some authors point out, Silicon Valley is only one of the regions in the world that has experienced an increase in the outflow of innovation in the last decades and it is widely considered now that innova-

tion is the driving force of regional and economical development, living standards and international competitiveness (Acs *et. al*, 2002). This is due to the fact that innovation translates in competition (among companies, among regions, etc) so the regions which are innovative develop faster: increase in foreign investments in a particular region, establishment of new companies which generates jobs, etc. In this moment one could ask why some regions are more innovative than others (Acs *et. al*, 2002)? Probably there is no clear and exact answer to this question, but there are still some general agreed elements of an “*innovative region*”, which will be presented in the next section.

The last years have seen an increasing attention given to the topic of innovation from policy makers, urban and regional analysts. This is due to the increasing interest in the relationship between innovation and regional development. It is con-



sidered on the one hand that the region is now seen as the main element of the national economical growth, and no longer the nation as a whole (e.g. the interest of the European Union and its Regional Policy and Structural Funds allocation).

OECD points this aspect stressing that in approximately half of the OECD countries less than 10% of the countries' regions have been responsible for more than 40% of their national GDP. On the other hand, Gordon and McCann speak about economies of agglomeration as the key players in determining the regional growth (Gordon and McCann, 2005). The role of these in regional development and innovation can be simply explained by the fact that people want to move where firms, thus job opportunities, are concentrated. In the same time, firms and companies want to establish in locations where they can find demand and labor market. This determines the appearance of other types of activities, concentrated in different locations (e.g. clusters), thus leading to concentration of innovation (OECD,2009). It is also acknowledged that innovation activity is determined by space and is concentrated in certain areas (Fritsch and Slavtchev, 2005). Gordon and McCann mention the role of agglomeration economies as the ones which "foster the localized learning process within the economy". Learning process, thus accumulation of knowledge, is only one element which generates innovation in a region (Gordon and McCann, 2005).

1.2. Methodology

This paper brings to the forefront the development of the Öresund Region in Northern Europe from the innovative perspective and it is divided into three sections. Based on the literature regarding innovation and regional development, the first part will present the com-

ponents of an innovative region and how are they interrelated, following in the second part with an empirical analysis of the Öresund Region: Sweden and Denmark; this part of Scandinavia is characterized as a leading innovative region in Europe, especially due to the high number of biotech and medical companies located there.

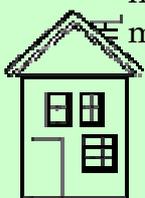
Finally, the third part of the paper will discuss from a theoretical perspective what actions should the stakeholders in the region take, for further improving the innovativeness and competitiveness of the Öresund Region.

2. The innovative regions

2.1. The concept of "innovative region"

The existence in a close physical proximity of a number of knowledge institutions (e.g. universities, research centers) along with knowledge-oriented companies in an attractive open-minded region can represent the proper environment for innovation, the driving force of growth and job creation. In order to discuss the concept of "innovative region", it is first important to define briefly the terms of "region" and "innovation".

Some authors mention that probably there is no clear definition of the term "region", being dependent on the field which defines it. In his article, Cook argues for some commonly agreed elements in defining a region: it is an area with determinate size, homogenous in specific criteria, it can be bordered by some kind of specific features and it presents some kind of internal cohesion. On the other hand, Tindemans points out the importance of distinguishing between the region as a pure geographical area and the region from the economical perspective, the one of cluster. In both articles,



the authors speak about clusters as the location where there is a concentration of connected firms and companies from a related industry, a dense network of economic actors, who work together and have intense exchange relations, but who are also competing (Tindemans, 2005; Cook, 2003). Even in this case one cannot neglect the common points between the two definitions, the term “concentration” referring to the “geographical proximity” between the different companies and firms.

It is commonly agreed by authors in regional development that defining the concept of innovation implies the definition of two different aspects: **product innovation** and **process innovation**. According to Cornett, product innovation could be defined as launching a new product on the market, whilst process innovation focuses on improving the process of production and how a certain product is released on the market (Cornett, 2002). Gordon and McCann define the term innovation through three common characteristics: they are *new* and *improved* products against the existing ones, which pose some kind of *uncertainty* regarding the market reaction to them (Gordon and McCann, 2005). Cook offers a more comprehensive definition of innovation by simply defining it as the development of new solutions and ideas to existing problems, new technological options along with the diffusion of these new technologies (Cook, 2003). It is important to mention that one can speak about innovation only after some time it has been released to the market. In other words, the new product is not an innovation until it makes a difference. Probably a good example in this case is the invention of the penicillin: it took time until people realized the benefits of this new medicine, thus considering it a revolu-

tionary product in the pharmaceutical markets.

2.2. The components of an innovative region

Several regional development studies explain the relation between the innovation activity and region, describing what characterizes an innovative region. In other words what are the components and how are they interconnected. In his study, Tindemans makes an interesting and comprehensive overview of the elements and the criteria which an innovative region “has to meet”. Also, Doloreux and Parto discuss the issue of the “region as a locus of innovation” by presenting some key features on what determines the innovation process to occur in a specific location.

Tindemans stresses the importance of **cooperation** and **entrepreneurship**, the need for some kind of formal and informal facilities and conditions, and nonetheless the importance of **governance** (Tindemans, 2005). In analyzing the innovative capacity of a region, the authors in regional development speak about the concept of **regional innovation system**. Giving the importance of this concept, a brief description is needed. In his study, Nilsson describes the innovation system as the foundation for innovation and describes it as the network of institutions between private and public actors who interact and initiate, import, modify and diffuse new technologies (Nilsson, 2004). In other words, the innovation system consists from different elements and relations between the. The author emphasizes the importance between different regional innovation systems, since every region has different networks between the stakeholders.

As Nilsson concludes in his study, the universities in the case of Nordic Coun-



tries played an important role in transforming the industrial structures in the regions (Nilsson, 2004). Innovation starts from the cooperation of different knowledge-based institutions (between universities, research and development centers and different companies), this knowledge-sharing process being a crucial element in the learning process, which leads to creation of innovative solutions. The importance of universities in the process of innovation and the relation between higher education institutions and regional development is widely discussed by several authors in their studies arguing about the concept of knowledge-base development and economy. The university main role in the innovation system is to supply educated and qualified work force for the companies and firms in the region. Vice-versa, universities were founded to support the development of new industries, thus companies were attracted in those locations by the qualified graduate students (Nilsson, 2004). Giving the increasing importance of knowledge-economy, the higher education institutions represent the key source in providing the needed knowledge and skills for developing new products and technology by different companies.

In the same time, Silicon Valley proved that the spirit of **entrepreneurship** is vital in creating a strong economical region, through the formation of different companies and firms which compete or collaborate on a common new product: students were encouraged to start their own companies after graduating from the Stanford University and not move on from the region for jobs to the existing companies on the east coast. This proves that encouraging the establishment of new firms is a benefit brought to the new entrepreneurs and also to the existing companies, due to the possible *win-win*

situation that can result from their collaboration. Tindemans speaks about the necessity of the facilities and conditions which need to exist to support the business development (Tindemans, 2005). In other words, mechanisms for supporting innovation, exploring new ideas, knowledge and information exchange along with good accessibility, high-end employment and high living standards represent important elements for an attractive environment where people could live and invest. Finally, the **government ability** to create an optimal environment for entrepreneurs and companies by policies aimed in supporting innovation determines the economical attractiveness of a region e.g. ensuring a good quality of the high educational system.

Along with the key elements presented above, it can be added the issues presented by Doloreux and Parto in their article. What is important is that they talk about that innovation is embedded in **social relationships**. The existence of a strong social capital within a region and **trust among the actors** involved can help companies in their reciprocal exchange relationships, thus reducing the market cost. And, as already mentioned, proximity is considered a crucial element for the innovation to occur easily (Doloreux and Parto, 2004). It can probably be said that proximity and social capital work hand in hand in the innovation system. It is considered that knowledge flow and transfer among companies of related industries within close proximity accentuates their flexibility and dynamism, leading to learning and innovation process. In other words, information and knowledge exchange occurs easily within close proximity and when social relations are well founded. For a company, this translates into low budget costs on gathering information about a new technology.





Fig. 1. The Öresund Region in Northern Europe: Denmark and Sweden - Zealand and Skåne County

3. The Öresund Region – Medicon Valley

3.1. The general context

The Öresund Region consists of Southern Sweden (Skåne County – 33 municipalities) and Eastern Denmark (Zealand and surrounding islands) and has a population of over 3.5 million (app. 25% of the total combined population of Denmark and Sweden) which is growing at a faster rate than the rest of the both countries, generating a quarter of the GDP of Sweden and Denmark combined. The newly opened fixed link between Copenhagen and Malmö in 2000 (the Öresund Bridge) formed an integrated region of the Danish and Swedish side which resulted in an increasing cooperation between universities, hospitals, companies and research institutions and high potentials of future investments of the foreign biotech companies.

Since the importance of the national borders is declining in a borderless European Union, the Öresund Region represents the example of an international region

and how two different countries complement each other in a region that has no borders.

Öresund Region hosts over half of Scandinavian's medical technology. This is due to the numerous scientist and companies from the medical industry located in the region, thus becoming a world player in the field of medical industry: biotechnology and pharmaceutical industry.

Today the region is known as **Medicon Valley**, as inspired from the IT industry region, Silicon Valley. Besides this, the Öresund Region is grouped into other five clusters from IT/Telecommunication, food industry, design industry, environmental technologies and logistic. Today, these fields represent strong sources of international competitiveness and a common objective of these six clusters is to achieve innovation and growth by cooperation among them and also cross-border cooperation between industry, universities and authorities.



Although its leading position on the world market in the biotech and medical industry, the region itself experienced a slow and disappointing start in triggering economical growth after the opening of the bridge, as LaBarca explains in her article.

In the first years after the connection, the rates of regional integration and business development were under the estimated levels, since less than 5% of the Danes and Swedes who crossed the bridge done that for recreational and leisure activities only, and not for work or educational purposes. As the author presents, this was due to the lack of a fiscal policy that would reduce the high taxes of cooperation of the two sides of the Öresund strait, so companies and businesses in the region hesitated in starting cooperation (LaBarca, 2004).

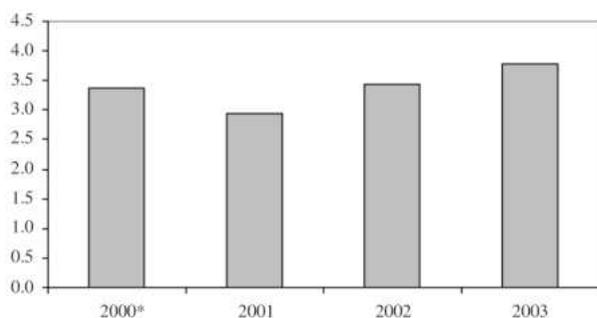


Fig. 2. Motor Vehicle Traffic Volume on the Öresund Bridge, 2000-2003 – trips across the Oresund Bridge/year (in millions) (LaBarca, 2004)

3.2. The economical and territorial context

Even before the discussions for the bridge were started, the two countries passed through significant economical transformation in the 1970s-1990s. Lundquist and Winther make a short presentation on how the economies of the two countries were affected by the appearance of the new technologies that were developed in the other parts of the world.

Danish economy started a period of downturn beginning with 1973. The low-technological content of the Danish exports were seriously declining in the international markets and competition with USA and Japan. The real crisis began to be felt in the 1980s and a reason for this was the difficulty in implementing the new technologies like CAD, CNC, CAM that were designed to speed up the production process and make it more efficient, because of the lack of qualified and trained personnel for the new machines. Although this period of declining continued and the unemployment continued to rise, this was seen as a period of transformation and restructuring of the economy. The two authors point out the increasing number of companies from other industries that started to establish in Denmark (and especially in the Copenhagen region): companies from the pharmaceutical sector, electronics equipment and business and producer services. It's been recognized that this process of restructuring continues even today.

On the other hand tough, Sweden experienced between 1970s and 1990s an impressive growth in research-intensive industries that lead to almost a double in the exporting amount. As Lundquist and Winther explain, almost all the companies and business in this industry between 1980-90s decided to establish themselves in the Stockholm region, since here they were able to find qualified labor force and an appropriate environment for future development. This lead to a high concentration of the industries in this part of the country and to a higher development rate of this region in comparison to the other parts of Sweden, in other words to a "Swedish monocentric 'Stockholm-driven' innovation system" (Lundquist and Winther, 2006).



A key element characterizing the region is its political-administrative configuration. The Danish side of the region consists of the national capital and the Greater Copenhagen Metropolitan Region, whilst the Swedish side represents the geographical periphery of the country, Malmö being the third largest city in Sweden with the capital of Stockholm situated 600km north-east of Skåne. Despite this and the differences in legislation between the two countries, Öresund Region manages to situate itself the third in Europe after London and Paris regions that attracts foreign investment in the field of biotechnological and medical research.

After the slow start in business establishment in the region, beginning with 2002 the levels of economic growth and integration got closer to the originally predicted. It was admitted by the citizens of both countries the importance of the cooperation between the two sides of the Öresund strait: 72% of the people in Skåne and 65% of those in Zealand were convinced and believed in the future integration of the region (LaBarca, 2004). In this circumstances, between 2001 and 2003 the leading players in business and scientific communities in the region took a series of initiatives which resulted in the creation of the Öresund Science Region, a platform for the development of Danish and Swedish clusters; this new platform helped in strengthening the cooperation between the region's industries in biotech and medical industry, IT/Telecommunication, food and design industry, environmental technologies and logistics.

3.3. The main factors stimulating the innovativeness of the Öresund Region

As already mention, the Öresund Region, known as the Medicon Valley, is a bi-

national cluster of life science companies and industries, which compose one of the worlds' leading regions in the medical technology. The region's universities have a strong background in biological and medical research, resulted also in Nobel Prize winners. The fast development since mid 1990s of the dense cluster of universities, hospitals and companies within life-science in Medicon Valley demonstrates the dynamism of the region and the innovative environment that helped it to become what it is today.

The entrepreneurial climate existing in the region is expressed here by the large number of start-ups in the life science industry between 1997 and 2005. In this period, 118 new companies in the bio-tech industry were founded here.



Fig. 3. Increasing number of biotech and medical companies in Medicon Valley since 1997 to 2005. (Åberg, 2006)

The Medicon Valley's innovative environment is the result of at least 15 years of development:



- 100 biotech companies, 25 pharmaceutical companies and 100 medical technology companies. These focus on research and development;
- App. 40,000 employees in the private life science sector;
- App. 10,000 researchers in the private and public life science sector;
- 12 universities (5 in the medical education) with more than 150,000 students (45,000 study life science);
- App 2,600 life science PhD students in the Copenhagen and Lund Universities
- App. 7,000 life science graduates every year
- 32 hospitals, from which 11 are university hospitals
- 7 science parks with focus on life science: CAT Science Park, Copenhagen Bio Science Park, Ideon Science Park, Krinova Science Park, Medeon Science Park, Scion DTU, Symbion Science park.
- 6 incubators, from which 2 focus on life science: COBIS incubator, DTU Symbion Innovation, Ideon Innovation, Lund Bioincubator, Medeon Incubator and Teknologisk Innovation.
- More than 50 contract research organizations and contract manufacturing organizations

As it has been admitted, if the size would be the only factor in the regional growth, the Öresund Region and its 3.5 million inhabitants located within a 100km radius probably would have never become the global player that it is today. As it's been presented in the theoretical section the innovativeness of a region is determined primarily by factors like the qualified and educated work force, the accessibility and good communication, the political factor and the social factor (lifestyle of the citizens). All of these had a contribution in the development of the region.

The educational environment located here is one of the sources of the innovations in this region. Linda Nielsen (former rector of Copenhagen's University) explains the region's **bottom-up approach** in the development process: the establishment of the Öresund University was geared in offering the new companies the educated graduates they needed in their businesses, in other words they have access to talent. Öresund University is a collaboration between the region's 12 Universities (both on Danish and Swedish side) comprising of more than 150,000 students. Within these, the two largest universities in Scandinavia, Lund University and University of Copenhagen, along with other universities in life science education, house more than 45,000 students. Ample public and private founding in Research & Development accounts for results in the biotech field (Online brochure). Nielsen emphasizes the role of the "triple-helix" concept as the integration model for the region: the co-operation between universities and research institutes, private companies and the public sector authorities. Of course, from the theoretical point of view we can speak in this case about a "double triple-helix", referring to individual co-operation between the elements in both countries.

The proximity stands as an important asset for the future development of the region; therefore the access to talent is determined also by the high mobility existing within the area and the connection with the other parts of the world. Copenhagen Kastrup Airport is Northern Europe's largest international airport having direct connections with over 120 destinations in the world. Good infrastructure is an asset in the cooperation and communication of the companies.



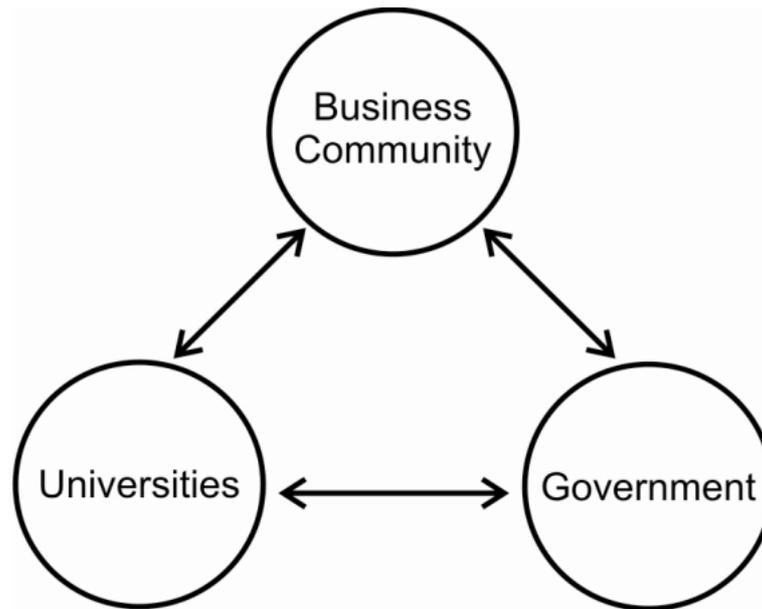


Fig. 4. A dynamic interplay – The Triple Helix Model (Nilsson, 2004)

The opening of the bridge (rail and highway) allowed new opportunities for business to develop, which were not depended on scheduled ferries crossing the strait. The continuous improvement of the infrastructure demonstrates the dynamism and demand for further bridge traffic. The new rail development project in Malmö (the Citytunneln project) is aimed in improving and increasing the flow in the rail connection between the Öresund Bridge and southern Sweden. This will result in faster journey times between the two cities.

Historically, the political cooperation between Eastern Denmark and Southern Sweden is characterized by strong trade links between the two, thus the idea of the region exists for long time before the existence of the fixed link. As this paper presented above, the region consists from two nations, therefore one can say that there is no common governing body.

The governments of the Countries collaborate on different levels to offer the appropriate business and innovative environment for the companies established

there, and especially to make it accessible to its citizens. The Öresund Science Region is one result of the initiatives of the political leaders from the two countries. The first political cooperation started in 1993 by setting up of the Öresund Committee, working on eliminating the administrative boundaries between Sweden and Denmark. In the same time, the Greater Copenhagen Authority administrates the “Öresund Network”. The network has the task to co-ordinate the overall communications and marketing of the region.

The Nordic Countries are renowned for their social welfare, this having an impact on the overall quality of life of the citizens and people working there. Free education in both countries represents a motivation for teenagers to follow the educational programs of the Öresund University, thus having high chances for a future job in the region and the balance between family life and work-place within the companies translates into motivated employees. As explained by Cristina Glad, executive vice-president BioInvent in Lund, the region attracts many people



due to the available workforce and its comfortable and enjoyable life style.

4. Supporting future innovation in the Öresund Region

As it was shown in Denmark's case, changes in the political and international markets context lead to significant transformation and restructuring of its economy, thus being able to compete again after periods of downturn. In this moment, one could ask some questions regarding the future development of the region: how to support developing of innovation and new knowledge? It is possible to create a regional brand to increase the attractiveness of the region? How to create new science networks and clusters in the region? Probably finding answers to these questions and suggesting solutions or initiatives for further support of innovation in the Öresund Region should be the subject of another paper based on detail analyses of the current situation on how the region is working today and what is the development trend. From a theoretical perspective though, Denmark's case presents a clear **lesson**: adapting to the changes in the international market (e.g. to the new technologies and manufacturing processes) represents the key to remain competitive in the world's markets, with further development opportunities.

As it was clearly demonstrated the result of the new bridge in boosting the cooperation between the companies in Denmark and Sweden, further improving physical connections within the region will lead to encouragement for new cooperation, especially in the northern part of the region. A new physical link between the "neighboring" cities of Helsingör in Denmark and Helsingborg in Sweden will close the infrastructure circle around the strait. Therefore, a tun-

nel connecting the two cities will make a reality the initial plans of connecting the two countries in that location. This suggestion is based on the idea of "**proximity which encourage innovation**".

Therefore, staying in line with the world technologies should ensure future competitiveness in the region and in the world. The R&D funds from public and private sources should therefore focus also on the new technologies which are currently being developed in other parts of the world e.g. clean technologies, nanotechnologies. The base for further research and innovation in the nanotechnology industries is well established in the Öresund Region (*Nano Öresund, 2006*). Nanotechnology and science research is done in three of the regions' universities (Lund University, University of Copenhagen and Technical university of Denmark) and also in the RisÖ National Laboratory research center. Giving the increasing interest of the markets in this new field, the region should take advantage of this solid base of research and education that it already has, and not lose its present role and asset.

As in the case of the public awareness of the importance of collaboration between the two sides of the Öresund strait, supporting innovation in the region has to be acknowledged not only by the politicians or entrepreneurs, but also by the citizens as the engine for the regional development, job creating, etc. Supporting strategic partnerships with other innovative regions in Europe would consolidate its positions as a world player. The National Governments of the two countries and especially the European Commission would play a major role in this process by offering the conditions and possibilities for encouraging the knowledge exchange between different parts of the continent.



The idea behind this action is the overall declining position of Europe in the field of innovation against other parts of the world. In achieving this, Öresund Region must be perceived as a whole, as a single strong business and innovative environment, and not a division of smaller clusters of various industries.

5. Conclusions

Continuing the promotion of the Öresund Region as an integrated area between two Countries with high perspectives on growth and innovation will further increase the economy of Sweden and Denmark, strengthening their position within European Union.

This paper focused on discussing the status of the region as a world player in providing innovative solutions for the biotech and medical industry, after London and Paris metropolitan regions. It has been shown that besides this, clusters from other industries located there provide the region a competitive advantage in IT/Telecommunication, food industry, design industry, environmental technologies and logistic. The discussion was based on the theoretical aspects on the concept of “innovative region”, arguing that a series of components/stakeholders have a crucial role in promoting a region as an environment of innovation. The main stakeholders are the ones forming the concept of “triple-helix”: universities and research centers, private companies and initiative from the public authorities.

The background of the region in medical education, along with the large number of universities and political will between the governments of the two countries put the basis for an environment where foreign companies are attracted to invest in, and develop further.

The case of the Öresund Region is the good example of a European region and cooperation between two countries in achieving a common goal. Despite the lack of natural resources and the pericentral position regarding the European Union core and high opportunities for future innovative development, Sweden and Denmark managed to find solutions to place the region on a map, betting on the **single natural resource** at their disposal, the human brain. As Håkan Pettersson, PhD in Biochemistry at Lund University explains in an interview, “*The brain is the only natural resource in the Öresund Region*”.

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