Master programme in Economic Growth, Innovation and Spatial Dynamics

Comparative analysis of Regional Innovation System in different types of regions: Evidence of Madrid, Basque country and Andalucía

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Abstract: Regional innovation system (RIS) is a popular concept between policy makers and researchers. Regional government create RIS policies with the aim to increase competitiveness and gain regional development. Previous research about RIS emphasize the importance of adapting the policy to a certain region based on its specifications, limitations and strengths. The research analyses three Spanish regions, Madrid, representing metropolitan region, Basque country, representing old industrial region and Andalucía, representing peripheral region. The research analysis the similarities and differences between RIS and RIS policies in the regions and linkages between the region specifications and the theoretical framework.

Key words: Regional Innovation System, Peripheral, Metropolitan and Old industrial region, Policies, Spain

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Chapter 1: Introduction

1.1. Background and aim of the study

Many authors (Cooke, 2001, Hajek, Henriques et al., 2013) see the regional development as a driving force to contribute to national competitiveness and performance. The concept of the Regional Innovation Systems (RIS) has been concern of many researchers for a longer period. This is associated with its positive implications to regional policies, and also to the increasing popularity of importance of a region within economic development (Asheim, et al., 2005, Cook & Medomovic, 2003, Cooke, 2002, Hajek, et al., 2013).

However, regions are not homogeneous. In today’s world different features and different development characterize them. All these regions aim to increase their competitiveness. Due to regional innovation policies the regions benefit form the chance to "adopt and transfer knowledge to their needs"(OECD 2010). Innovation is presented as one of the main tools to improve the performance of a nation or a region. According to Trippl and Todtling (2005) the performance of RIS in different are very strongly associated with the type of region. In regard to this they categorize three types of regions, metropolitan, peripheral and old industrial region. This types of regions are affected by different barriers therefore this effects the effectiveness of RIS. Further, these types of regions have different advantages over one another. Consequently, there are many variances between these regions. As a result, RIS policies tend to be region specific (Trippl and Todtling, 2005, Doloreux & Dionne, 2008). However, there is little known about effectiveness of RIS within these three types of regions within Spain.

Therefore the aim of this study is to analyze these three types of regions in one country in terms of RIS implications, performance and policies and observe the evidence and activity of RIS. Spain has been chosen for this study due to its very diversified conditions. Spain is a country with very different regions with very different economic and innovative performances. In this country all three types of the regions can be found including: metropolitan (Madrid), old industrial region (Basque country), and peripheral (Andalucia). Other advantage of Spain for this research is the high autonomy of the regions, which means a high decisive power for a region.

1.2. Purpose of the study

The purpose of this study is to illustrate the evidence of the RIS on the example of certain indicators already used by previous research. The thesis attempt to explore if there is an
evidence of RIS in the Spanish case, what is the character of the linkages between the main actors and how strong are these linkages. Furthermore, the thesis explores what policies have been implemented, if these policies fit to the certain region and what effect did they have. Certain indicators will be chosen to describe and analyze RIS in the regions and the innovation performance of the regions will be compared. The general data with regards to the innovation and RIS will be provided and applied to the regions and the data between the regions will be compared. The descriptive statistics used will mainly be collected from the EUROSTAT and OECD statistics to observe the evidence of RIS in these three regions and analyze them. The indicators used will include amongst others R&D data both from firms, and from the state, technology performance data, economic data, social and demographic figures and they will be organized into five categories characterized as problem areas of RIS regions in the research of Tripp and Todtling (2005).

Consequently, the RIS policies implemented in the region will be analyzed and compared to the theoretical knowledge about effectiveness of adopting RIS policies in different regions. The thesis will also describe the regional innovation policies in the three Spanish regions and see if they are addressing the theories of the three regions and how effective they are.

1.3. Aim of the study and Research Questions

The main aim of the thesis is to see the different and similar patterns in RIS in different Spanish regions and observe if the region has been an important aspect in the innovation development of region and RIS. A further aim of the thesis is to answer how the policies have been implemented, if they corresponded to the regional dimension according to the theoretical implications, and if the current policies are effective. The study will be looking at RIS in these regions from different perspective, including the barriers and problems described by Trippl and Todtling (2005), indicators presented by different researches, challenges according to Cooke (2001) or RIS policies.

The research questions ask whether the RIS in peripheral, metropolitan and old industrial region followed similar or different trends in their development, innovativeness and competitiveness. This will be drawn on the case study of Spain. The research question also asks if the RIS policies have been region specific and how effective have they been.

The hypothesis is driven by the theory of RIS and therefore it is assumed that there will be differences between the performances in different regions. The hypothesis expects that the barriers and characteristics f the regions will influence the competitiveness and innovativeness of the region. Regarding the implemented policies, there is no hypothesis
about which theories have been implemented, however the correct policies might have fostered the innovativeness and competitiveness of the region.

1.4. Thesis outline

The thesis is structured into seven main chapters, introduction, literature review, methodology, descriptive statistics and analysis of RIS, analysis of policy implications and RIS. The first chapter is introduction and its aim is to make the reader familiar with the background of RIS, introduce the aims and purpose of the thesis and state the research questions. The following chapter is literature review, which gives an overview about the main theoretical background to RIS and the previous research to RIS, it also explains the terms RIS and innovation. It is explaining the position of RIS in the innovation systems and describes the previous research of Spanish RIS. Literature review chapter also focuses on categorization of different types of regions.

Third methodology chapter follows this. The third chapter describes the methodology used in the next sections. This chapter explains which certain methodology methods and research design are chosen for the thesis and why. Apart from this, the methodology chapter discusses the data used for the thesis. The fourth chapter provides descriptive statistics with different indicators that compare the innovative and economic performance in these three regions with theoretical implications about RIS and analyze these regions. The next chapter five analyzes RIS in regions and RIS policies in these region based on the document analysis.

Chapter six is discussion and the aim of this chapter is to summarize the conclusions from previous analysis sections and compare the regions between each other and apply the theories to the case study. The last chapter conclusion aims to summarize the most important aspect of the thesis, and connect to the introduction.

The first chapter aimed to present the study and the research questions, as well as the outlines of the thesis presentation. The next chapter will discuss the literature review and previous research of RIS.

Chapter 2 : Literature Review and theoretical background

The literature review section aims to explain the term regional innovation system (RIS) and give a wider overview of this phenomenon and its position in the theories of innovation systems. It also aims to present the theoretical background to RIS in different regions together with explanation and definition of characteristics of each region. Later it discusses previous research about RIS, the policies about RIS and RIS in Spain.
2.1. What is RIS?

Regional Innovation system is a concept of economic geographers that was firstly developed by Cooke (2001). Much attention to this concept has been paid in recent years from the policy makers as well as academics (Asheim, 2004, D’Allura, Galvagno & Li Destri, 2012). Companies need to interact with other organizations, when here interaction is understood as social process which develop and open relations and linkages between these companies and organizations (Cooke, et al, 1997). The research of RIS confirmed that these companies and organizations mutually depend on their cooperation (Doloreux, 2002). These organizations represent number of different institutions or organizations, including companies, public organizations, government bodies, research institutions, etc. (Asheim, et al., 2005). The linkages and relations between these organizations contribute to knowledge transfer and therefore are important for the regional development (Doloreux, 2002). In his research from 200 Cooke defines RIS linkages through two subsystems, "knowledge application and exploitation and knowledge generation and diffusion". While knowledge application and exploitation is in most cases typical for firms, knowledge generation is associated with other institutions including research and educational institutions and universities (Cooke, 2001).

Regional innovation systems can be also defined as "interactive knowledge generation subsystems"(Asheim, et al., 2005), while these subsystems represent the institutions in the previous definition. The aim of RIS is to drive and promote the competitiveness of a region and regional companies (Asheim et al. 2005, Cook & Medomovic, 2003). Doloreux (2002) concludes the fact, that three aspects create the definition of RIS, first RIS being a social system, then the different actors and their interactions, systematic nature of cooperation between different actors that lead to positive effects on the region.

2.2. Regional aspect, Systems and Innovations

To analyze RIS it is important to look closer at certain aspects that create RIS, the important terms that create the RIS concept are innovations, region and systems.

2.2.1 Innovation

To understand the concept of RIS and its importance, it is essential to look closer at the concept of innovation. Innovations play a significant role in the global economy and with the increased dominance of globalization their importance only increased (European Commission, 2010). Some scholars claim that together with learning and knowledge innovations are the determinants of a companies and regions or nations success (D’Allura et al. 2012). Innovations play a key role in the concept of regional
innovation system. Although innovations are not a new phenomenon, this topic has not always been widely developed in the research before. Fagerberg (2006) associates its presence over history with human desire for improvement and development. According to the Oxford Handbook of Innovation (Fagerberg, 2006) to define innovation the difference between innovation and invention needs to be distinguished. While invention is the idea of a new process or product, innovation can be seen as a process of commercializing invention after a certain time lag. One of the most important innovation academics Schumpeter (seen in Fagerberg, 2006) views innovations as a factor that is driving the economic development and defines them as “new combinations of existing resources (Faberberg, 2006, p. 4).” Further, he emphasizes the role of entrepreneurs in the process of innovation creation.

2.2.2 The innovation systems
The Oxford Handbook of Innovation (Fageberg, 2006) describes Innovation Systems as Regional Innovation Systems (RIS), Sectorial Innovation Systems (SIS) and National Innovation Systems (NIS). NIS is the oldest concept which was firstly showed in 90s years in the work of Lundvall, Nelson and Edquist. (Cooke, et al., 1997) and this inspired the emergence of the concept of RIS (Hajek, et al., 2012). The Systems of Innovations consist of organizations and institutions. While organizations are defined as the actors in the innovation systems, institution are defined as the rules, norms and relations between these actors that drive the Innovation systems (Fageberg, 2006).

2.2.3 Region
Hajek, Henriques and Hajkova (2013) emphasize the role of a region over the state in knowledge creation and especially in the case of European union. They explain this with the spatial proximity and intense benefits from the linkages between the regional actors. With emergence of RIS concept many authors (for example Cooke, 2002) viewed this as more current and relevant then the concept of NIS that was popular before. The innovations represent an important driver of economic development and the role of region has been intensifies, as observed trend is that the knowledge and innovation is not distributed proportionally between different regions but some regions are the innovation leaders while others only follow them. The regional competitiveness might present an advantage for the dynamics and development of a performance of a region (Hajek, et al., 2013).

2.3 Different regions
The regions where RIS are present are not homogeneous and the can be represented
by a variety of different characteristic features. According to Trippl and Todtling (2005) the regions can be divided these regions into three categories metropolitan regions, old industrial regions and peripheral regions, while this frame has been supported by a number of different scholars. All regions face certain preconditions and barriers that should be considered while the RIS. However, they highlight the fact that these trends are not always relevant and multiple different characteristics and barriers can be present in different regions in the same time.

2.3.1 Metropolitan regions

The metropolitan regions are characterized as “innovation leader” and they are represented by a high competitiveness. Audretsch and Feldman (1999 in Dolereux and Parto) describe them as “the most important place for innovation” due to their high innovation potential. The metropolitan regions have highest shares in the number of patents, and R&D and are also homes of the most prominent research and university institutions. A lot big multinational companies that contribute to the innovation creation are concentrated here (Trippl & Todtling, 2006). These regions include a high number of high skilled labor and they are enabled to participate in heterogeneous systems of education that consist of vocational trainings, and other forms of learning (Fisher, et al., 2001).

However, the barrier may exists also in the case of metropolitan areas and the fragmentation of RIS, which is described as “absence of interactive learning between actors and innovation” (Doloreux & Dionne, 2008) and “weak regional networking” (Tripp & Todling, 2006).

2.3.2 Old industrial regions

The old industrial regions are represented by region that specializes into mature industries. They emerged from formerly successful regions in a certain sector by renewing and innovating the sector again. In this region, dominant are the large companies while the SMEs base is too small (Coenen, et al., 2013, Trippl & Todtling, 2006). This type of region is characterized by dominance of traditional industries and less developed modern and technology industries (Todtling, et al., 2010).

In these regions, the process innovation dominates and they usually don't have any attempts to innovate with more radical innovations. The barriers in this case are due to the locks in, overspecialized knowledge infrastructure or due to the high attention on one industry (Karlsson, 2008). These regions also face problems like less opportunities to interact with knowledge partners, less institutions in the region, or mistrust to the organization in terms of their abilities. The specialized industrial character of the region has also resulted in positive
effects including the high quality labor force, and developed cooperation with the suppliers in the industry or high competitiveness of the region (Todtling et al, 2010).

Too high attention to one industry lead to decreasing competitive advantage as they are declining in other industries. Todtling et al. (2010) suggest that one of the ways how to help the problems that these regions usually face might be emergence of a new industry for example software industry.

2.3.3. Peripheral regions

Most of the previous research have been focusing on the developed regions as the knowledge creation is more intense there (Doloreux & Dionne, 2008), however some authors (e.g. Doloreux & Dionne, 2008 or Hall & Donald, 2009 and others) aimed to explore the peripheral regions and the performance of RIS performance in less developed regions. Peripheral areas face lack of some of the conditions that more developed regions contains to perform as an innovative region. Less developed regions must often deal with fewer actors within RIS and less interactions between the actors. They also lack some essential resources, including training of the labor, technology transfer and knowledge support and the cooperation between different actors, mainly research institutions and universities and companies is not developed. Another problem they face is the insufficient number skilled labor and also less potential to entrepreneurial activities (Doloreux & Dionne, 2008, Trippl & Todtling, 2006).

Institutions consist of soft and hard institutions, while hard institutions consist of norms; culture and soft institutions are laws and regulations (Chaminade, 2011, Tripp & Todtling, 2006).

Institutions tend to be regionally important. Institutional thinness is a barrier that is mostly occurring in the case of peripheral regions. Being institutionally think for RIS means weaker organizational infrastructure, lower levels of interaction, lower innovative capacity of small and medium enterprises that create the economic performance of the region, less support organization, or lower agglomeration level (Chaminade, 2011). On the other hand the institutionally thick regions are usually regions with higher development and more innovation intensive regions, and this is represented by high number and diversity of organizations present in the RIS linkages including financing agencies, research centers; high number linkages between the players and shared values and culture that create the social identity (Chaminade & Plechero, 2012). According to Chaminade and Plecher (2012) the institutional thickness can significantly contribute to the innovativeness and competitiveness of the region.
2.4. Policies

The regional innovation policy is a state instrument that promotes innovation and aims to contribute to the regional development (Asheim, et al., 2011). Trippl and Todtling (2006) argue with number of not appropriate policies in specific regions that are following the examples of successful models such as Silicon Valley. However there can be defined different regions that require different political implications with regard to their regional specifics. In metropolitan, peripheral and old industrial regions one can identify different barriers and specifics of these regions. While choosing the best regional innovation policy it is also necessary to distinguish in the terms of sectors, as they require different approaches according to their knowledge intensity and potential (Tripp and Todtling, 2006 Niosi, 2010). Tripp and Todtling (2006) suggest that in peripheral regions the economy must be supported and improved, to strengthen the innovative performance of the region by attracting the foreign companies to invest, and to include them in the linkages, promote and improve the institutions and its role to support the regional innovativeness, and to intensify the networks between the actors. For metropolitan area, it is suggested to put a lot of attention on new radical innovation in scientific field, solve the problem of fragmentation by communication and cooperation between the actors, and position the metropolitan area in the global system of knowledge and innovation. It is proposed to establish new research centers and support creation of new start-ups, support the networks between the universities and institutions and companies. The old industrial region should aim at renewing the economy and encourage new innovations. One of the essential steps is to promote and innovate the new industries. Suggested is diversification of the economy and attract some foreign investors. The linkages should be supported and the policy makers are advised to create more recent research centers and universities that will provide currently required skills.

However, Cook and Medemovic (2003) alarm that there are certain limitation that policy makers need to face, they usually need to follow national strategies as well as supranational strategies, to certain extend and also the regional innovation policies are not well established in the practice yet. They suggest to focus on present industrial strength, to focus on both firm and supply side, and to choose what support (national, supranational) is important to be present together with regional.

2.5. RIS in Spain

There is a high evidence of research that has been focusing on different regions of Spain. From 1970s the regions started to play more significant role in the terms of innovation policy,
however this is still supported by the national level initiatives and regulations. Regional institutions supported the enterprises with a higher share of R&D (usually 50%), however this is mostly concentrated in bigger regions. A lot of regions have dedicated attention to the Universities and scientific performance. A high attention of the policy is focusing on technology transfer, human resources, and research. A lot of attempts were adopted to support networks between private and public sector and a lot of both private and public initiatives to support innovation and knowledge transfer raised (Fernández Esquinas, 2011). The high diversity between the policies of different Spanish regions led to significant heterogeneity between the regions and their RIS (Fernández Esquinas, 2011). This confirms also the European Commission (2012) that claims that Spain is a region with a very heterogeneous performance of the regions looking at economic performance and also innovative performance. Spain faces lack of functioning institutions and it suffers from fragmented national policy (Fernández Esquinas, 2011). Buesa (2006) after analyzing the Spanish case in RIS based on four quantitative indicators (importance of universities, civil service, innovative firms and productive environment) also concludes that the regions differ in their innovative and technology performance and the policy makers must take this into the account.

2.6. Indicators in previous research

Previous research of RIS has been analyzed in different ways due to heterogeneous academical and national background of the authors (D’Allura, et al. 2011). D’Allura (2011) have summarized the previous research in Social Science Citation Indexes and came to the conclusion that the wide research has been developed from 24 foundational papers, while between the period 1990-2009 there have been 211 contributions of different authors. The research about RIS have been presented in two ways, using a qualitative approach as case studies or with the quantitate analyses of statistical data (Hajek, et al., 2012). To analyze the innovative performance of a region a variety of indicators is presented. One of the most frequent is R&D capacity of the region and the GDP to see the economic performance. The research of Almeida, Figueiredo and Silva (2011) is using some technological and development indicators, including GERD, BERD, and knowledge intensity in different sectors, and patent activity. According to this, they can observe the differences between more and less developed regions, and compares the less innovative Spanish and Portuguese regions with Stockholm, that has been placed to be the most innovative European region (European Innovation Scoreboard, 2006) and link this to the institutional and RIS policy implications in these regions.
Chapter 3: Methodology

In this chapter, the method in which this study has adapted to is presented. The chapter discusses the chosen methods, data and research design and justifies these choices for the purpose of the thesis. The empirical chapters are represented with the analysis and the case study. There will be presented three case studies, RIS in Madrid, Andalucía and Basque country. The case study aims to illustrate the examples of different regions in regards to RIS, the barriers, and RIS policies to generalize the regional aspect of RIS and provide analytical view of these regions. The thesis provides descriptive statistics with chosen indicators and more analytical section presenting the case study results. This study combines qualitative an quantitative approach to provide the results and conclusions to its research questions.

3.1. Descriptive statistics

For the first part of analysis descriptive statistics will be used to compare the regions outlined above and link the concepts in the statistics to the theories. The descriptive statistics will combine approaches used by different authors (Buesa, et al. 2010, Tripl and Todtling, 2006, Buesa and Heijs, 2008) with chosen indicators available on regional level for the case of Spain to compare the performance of the regions, identify the problems within the different areas and link them to the theoretical problems in certain regions. Some Problem dimensions of the concept of Tripl and Todtling (2006), (see Chapter 2) will be a frame for applying different indicators combined with socio economic settings, or indicator from European Scoreboard, 2011.

Some of the differences in RIS in the regions must be analyzed from a more qualitative perspective therefore the information from government or OECD and EU reports about the regions will be used. In the later section a more qualitative approach will be used. First, the chapter analyses the barriers in the regions and compares them with theories. Further, the information from OECD and European Commission report will be used to link the current regional policies to the theoretical background. The method of case study will be applied on each of the regions.

3.2. Data collection and justification of the case study choice (categorization of the regions)

For the purpose of the thesis secondary sources will be used and this data will be collected from databases and official documents and reports; OECD and EUROSTAT mostly, but also European Commission, Statistics Spain, European Scoreboard amongst others. The secondary sources available for this study are coming from relevant as previously mentioned databases
and reports. The limitations of the secondary sources are associated with more limited availability of RIS indicators on regional level.

For analysis of the regions, three different Spanish regions with unequal development and characteristics in economical-social and innovation performance have been chosen. These include Madrid, Basque country, and Andalucía. The regions have been categorized in a NUTS 2 category according to the European Commission. NUTS means nomenclature for territorial units for statistics, and mentioned NUTS 2 category is characterized as basic region for the application of regional policies. This is the middle category between NUTS1 (major regions) and NUTS 3. Both Basque country and Andalucía contain number of small regions in the category of NUTS 3. The NUTS 2 level regions that will be used as case study are Comunidad de Madrid (later referred as Madrid), País Vasco (later referred as Basque country) and Andalucía (later referred as Andalucía).

In the OECD statistics, two regions are characterized as large regions, Basque country ES21, and Andalucía ES61, while Madrid, ES30 is characterized as metropolitan region. To provide an overview of a national example, some statistics of Spain in general will be provided to see how the regional values vary from the national average.

Below is presented table 1. This table presents the graphical figuration of the concepts, indicators and sources chosen for the descriptive statistics. The concepts as described the chapter 2 compares the regions within RIS. The indicators represent what will be used to support the concepts. The sources represent where the data were retrieved. This chapter described the methodology and research design of the thesis. The next Chapter 4 presents the empirical analysis, the graphical figuration of the descriptive statistics followed by the analysis and comparison of the regions.
<table>
<thead>
<tr>
<th>CONCEPT</th>
<th>INDICATOR</th>
<th>SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-economic Settings</td>
<td>GDP</td>
<td>EUROSTAT</td>
</tr>
<tr>
<td></td>
<td>Employment rate</td>
<td>Statistics Spain</td>
</tr>
<tr>
<td>Firms and regional clusters</td>
<td>Number of firms</td>
<td>Statistics Spain</td>
</tr>
<tr>
<td></td>
<td>Size of companies</td>
<td>OECD</td>
</tr>
<tr>
<td>Innovation activity</td>
<td>Innovation potential of a region</td>
<td>EUROPE SCOREROAD</td>
</tr>
<tr>
<td></td>
<td>R&amp;D expenditures</td>
<td>OECD</td>
</tr>
<tr>
<td></td>
<td>In total, as % of GDP, in business sector by government, non profit higher educational sector</td>
<td>OECD</td>
</tr>
<tr>
<td></td>
<td>R&amp;D personnel and researchers</td>
<td>OECD, EUROSTAT</td>
</tr>
<tr>
<td></td>
<td>Patents intensity</td>
<td>OECD</td>
</tr>
<tr>
<td></td>
<td>SMES innovative in house</td>
<td>European Innovation Scoreboard</td>
</tr>
<tr>
<td></td>
<td>SMES collaborating with others</td>
<td>European Innovation Scoreboard</td>
</tr>
<tr>
<td></td>
<td>Technological product or process innovators</td>
<td>European Innovation Scoreboard</td>
</tr>
<tr>
<td></td>
<td>Non-technological (marketing or organizational) product or process innovators</td>
<td>European Innovation Scoreboard</td>
</tr>
<tr>
<td>Knowledge generation and diffusion</td>
<td>Employment in technology and knowledge-intensive sectors</td>
<td>EUROSTAT</td>
</tr>
<tr>
<td></td>
<td>Total intramural R&amp;D expenditure (GERD)</td>
<td>EUROSTAT</td>
</tr>
<tr>
<td>Education, Human labor</td>
<td>Tertiary education as % of labor force</td>
<td>OECD</td>
</tr>
</tbody>
</table>
Chapter 4: Descriptive statistics, Analysis of the regions

This chapter presents indicators and concepts of RIS graphically in descriptive statistics and further analyzes them. Five problems from Trippl and Todtling article scheme is incorporated into the concepts together with socio economic settings indicators, and the indicators are based on the research of Trippl and Todtling (2005), Buesa and Heijs (2008), Buesa (2010) and European Scoreboard of Regional Innovation System (2012 provided by European Commission.

These indicators have been chosen due to theirs relevance to the aim of the thesis and also due to their availability as regional data. They are presented for the case study of three Spanish regions Madrid, Basque country and Andalucía. The descriptive statistics in tables 2, 3 and 4 present the comparison between these three regions followed by the analytical section.

In the section below each concept is described and analyzed based on the descriptive statistics and policy reports explaining the results.

Table 2: Socio economics factors, Firms and regional clusters and Innovation activity in Madrid, Basque country and Andalucía
<table>
<thead>
<tr>
<th>Concept</th>
<th>Indicator</th>
<th>Madrid</th>
<th>Basque country</th>
<th>Andalucía</th>
<th>Source</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Socio economic factors</strong></td>
<td><strong>Total number of population</strong></td>
<td>6 387 82</td>
<td>2 128 39</td>
<td>8 286 38</td>
<td>OECD</td>
<td>2012</td>
</tr>
<tr>
<td></td>
<td><strong>GDP in million EUR</strong></td>
<td>183,291,720</td>
<td>62,780,008</td>
<td>138,300,676</td>
<td>National Statistics of Spain</td>
<td>2013</td>
</tr>
<tr>
<td></td>
<td><strong>GDP per capita</strong></td>
<td>28,915</td>
<td>29,959</td>
<td>16,666</td>
<td>National Statistics of Spain</td>
<td>2013</td>
</tr>
<tr>
<td><strong>Firms and regional clusters</strong></td>
<td><strong>Numbers of firms</strong></td>
<td>496,003</td>
<td>153,709</td>
<td>471,521</td>
<td>National Statistics of Spain</td>
<td>2013</td>
</tr>
<tr>
<td></td>
<td><strong>Size of companies</strong></td>
<td>Majority SMES</td>
<td>Majority Microcompanies</td>
<td>Majority Microcompanies</td>
<td>OECD (Andal. 2010)</td>
<td></td>
</tr>
<tr>
<td><strong>Innovation activity</strong></td>
<td><strong>Innovation performance</strong></td>
<td>Follower</td>
<td>Follower</td>
<td>Modest</td>
<td>European Innovation Scoreboard</td>
<td>2011</td>
</tr>
<tr>
<td></td>
<td><strong>R&amp;D expenditures total in million of national currency (convert to EURO)</strong></td>
<td>3 854.77</td>
<td>1 305.63</td>
<td>1 726.77</td>
<td>OECD</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td><strong>R&amp;D expenditures total as a % of GDP</strong></td>
<td>2.05%</td>
<td>2.03%</td>
<td>1.21%</td>
<td>OECD</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td><strong>R&amp;D expenditures performed by the business sector in million of national currency</strong></td>
<td>2 098.23</td>
<td>982.28</td>
<td>619.49</td>
<td>OECD</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td><strong>R&amp;D expenditures performed by the business sector as a % of GDP</strong></td>
<td>1.52 %</td>
<td>1.52 %</td>
<td>0.43 %</td>
<td>OECD</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td><strong>R&amp;D expenditures performed by the government sector in million of national currency</strong></td>
<td>1 063.35</td>
<td>78.63</td>
<td>382.96</td>
<td>OECD</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td><strong>R&amp;D expenditures performed by the government sector as a percentage of GDP</strong></td>
<td>0.57%</td>
<td>0.12%</td>
<td>0.27%</td>
<td>OECD</td>
<td>2010</td>
</tr>
</tbody>
</table>
Table 3: Innovation activity in Madrid, Basque country and Andalucía, continuing

<table>
<thead>
<tr>
<th>Concept</th>
<th>Indicator</th>
<th>Madrid</th>
<th>Basque country</th>
<th>Andalucía</th>
<th>Source</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation activity</td>
<td><strong>R&amp;D expenditures performed by the higher education sector in million</strong></td>
<td>1260.7</td>
<td>93.23</td>
<td>454.03</td>
<td>OECD</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td><strong>R&amp;D expenditures performed by the higher education sector as a percentage of GDP</strong></td>
<td>0.37%</td>
<td>0.36%</td>
<td>0.51%</td>
<td>OECD</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td><strong>R&amp;D expenditures performed in private and non profit sector in million of national currency</strong></td>
<td>1.52 %</td>
<td>1.52 %</td>
<td>0.43 %</td>
<td>OECD</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td><strong>R&amp;D expenditures performed in private and non profit sector in 2010 as a percentage of GDP</strong></td>
<td>1 063.35</td>
<td>78.63</td>
<td>382.96</td>
<td>OECD</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td><strong>R&amp;D personnel total as % of employment</strong></td>
<td>3.0</td>
<td>2.9</td>
<td>1.5</td>
<td>OECD</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td><strong>Total R&amp;D personnel and researchers NUTS 2 regions percentage of active population</strong></td>
<td>2.44</td>
<td>2.71</td>
<td>1.07</td>
<td>EUROSTAT</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td><strong>PCT patent application per million inhabitants</strong></td>
<td>63.7</td>
<td>63</td>
<td>21.8</td>
<td>OECD</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td><strong>PCT patent application count</strong></td>
<td>423.6</td>
<td>119.4</td>
<td>209.1</td>
<td>OECD</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td><strong>SMES innovative in house</strong></td>
<td>0.21</td>
<td>0.40</td>
<td>0.20</td>
<td>European Innovation Scoreboard</td>
<td>2011</td>
</tr>
<tr>
<td></td>
<td><strong>SMES collaborating with others</strong></td>
<td>0.28</td>
<td>0.43</td>
<td>0.12</td>
<td>European Innovation Scoreboard</td>
<td>2011</td>
</tr>
</tbody>
</table>
### Table 4: Innovation activity, Knowledge generation and Education in Madrid, Basque country and Andalucía, continuing

<table>
<thead>
<tr>
<th>Concept</th>
<th>Indicator</th>
<th>Madrid</th>
<th>Basque country</th>
<th>Andalucía</th>
<th>Source</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation activity</td>
<td><strong>Technological product or process innovators</strong></td>
<td>0.33</td>
<td>0.49</td>
<td>0.27</td>
<td>European Innovation Scoreboard</td>
<td>2011</td>
</tr>
<tr>
<td></td>
<td><strong>Non-technological (marketing or organizational) product or process innovators</strong></td>
<td>0.40</td>
<td>0.32</td>
<td>0.32</td>
<td>European Innovation Scoreboard</td>
<td>2011</td>
</tr>
<tr>
<td>Knowledge generation</td>
<td><strong>Employment in technology and knowledge-intensive sectors by NUTS 2 regions</strong></td>
<td>2736</td>
<td>875</td>
<td>2626</td>
<td>EUROSTAT</td>
<td>2012</td>
</tr>
<tr>
<td></td>
<td><strong>Total intramural R&amp;D expenditure (GERD) by NUTS 2 regions 2011 (Euro per inhabitant, Eurostat)</strong></td>
<td>590.8</td>
<td>652.8</td>
<td>199.7</td>
<td>EUROSTAT</td>
<td>2011</td>
</tr>
<tr>
<td>Education</td>
<td><strong>Tertiary education as % of labor force in 2010 (OECD)</strong></td>
<td>45.6</td>
<td>51.3</td>
<td>28.1</td>
<td>OECD</td>
<td>2010</td>
</tr>
</tbody>
</table>

### 4.1 Socio economic factors

As previously mentioned in work of Hajek et al. (2013) socio economic factors reflect important aspect of innovation performance of region. The figures show very good economic position of Madrid and Basque region and their position of the leading Spanish regions, as well as worse economic performance of Andalucía justifying her position of peripheral economic.
**4.2. Firms and regional clusters**

Table 5: Firms by size in Basque country and Andalucía

<table>
<thead>
<tr>
<th>Type of company</th>
<th>Basque country in 2010% (OECD, 2013)</th>
<th>Andalucía In % in 2008 (OECD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro companies</td>
<td>93.3%</td>
<td>95.06 (51.57% self employed people)</td>
</tr>
<tr>
<td>Small size</td>
<td>5.6%</td>
<td>4.31</td>
</tr>
<tr>
<td>Medium size</td>
<td>1</td>
<td>0.55</td>
</tr>
<tr>
<td>Large companies</td>
<td>0.2%</td>
<td>0.08</td>
</tr>
</tbody>
</table>

The descriptive statistics presents the number of companies and its size in the analyzed regions. The table shows that in both regions of Andalucía and Basque country, micro companies dominate the business environment, however the trend is stronger in Andalucía than in Basque country. Comunidad de Madrid region does not provide this data, however according to OECD (2010) the share of large companies is higher compared to other Spanish regions. The same trend is observed concerning the jobs, as while the major providers of jobs in other regions are SMEs, in Madrid they contributed only to 30\% of job creation (OECD, 2010).

Corresponding with the theories, Madrid has most developed and large clusters in Spain. (European Commission, 2014) The most developed clusters include biotech, aeronautics, life science but also financial and creative cluster(OECD, 2007). OECD report (2010) states that Andalucía, as is confirmed by the theory of peripheral region, is missing the dynamic cluster, which mostly reasoned by small share of bigger companies in traditional sectors, while "the high tech based development have been overemphasized” (OECD, 2010). However there are initiatives about improvement the clusters mostly organized by regional organizations. In Andalucía the most important clusters include aeronautics, biotech, ICT, or food industry (OECD, 2010).

The old industrial regions tend to be too focused on manufacturing industry and this results in “too strong clustering” (Tripl and Todtling, 2005, p. 1210). The Basque region has invested in cluster development with the aim of regional development. Basque country has evolved its policies to support clusters from 1990s and the aim was to increase competitiveness of the region. The policies led to creation of 12 clusters, and Basque Technology Network that has been incorporated into RIS and increasing linkages between
public and private institutions in the period 2001-04.
In 1991 a detailed study of Basque clusters have been conducted and the results showed 50 clusters, while afterwards they presented that nine of the clusters are internationally competitive (OECD, 2010; OECD, 2007).

4.3. Innovation activity
European Innovation Scoreboard (2012) divides the European region between 4 different categories; Leaders, Followers, Moderate and Modest according to their innovation performance. Spain in average is a moderate follower, however Madrid and Basque country both happened to be Followers while Andalucía was assessed to be one modest innovator. Both Madrid and Basque country remained stable in the status over last years, however Andalucía decreased from being a moderate innovator in 2009.

Looking at the R&D spending of the three regions, there is a very significant difference between Madrid and Basque country compared to Andalucía. This trends agree with the theoretical framework about different regions, where metropolitan region provides higher R&D expenditures mostly due to the large companies and headquarters located there as Madrid (OECD, 2010), while Basque country has a very high R&D spending, it is on same level as metropolitan region which is due to innovation policy of Basque region fostering the innovation mostly within companies. However, as the theory predicts the innovation in Basque region mostly consist of incremental innovation (OECD, 2011).

Looking closely to specific areas of R&D funding, we can see that while both in Madrid and Basque country the R&D investments are largely provided by firms in Andalucía the investments of higher educational institutions are higher compared to both other region but also to private investments in Andalucía.
RIS in Andalucian region suffers from very low contributions from private sector, and therefore is limited to public sources. The linkages between universities and companies are very low which is one reason of low involvement of private sector in RIS and knowledge generation coming more from the companies. In the case of Basque country, on the other side a low attention only have been dedicated to universities as one of the actors of RIS, while the companies have been involved on the RIS strategies (OECD, 2010; OECD, 2013).
Some indicators follow the research and report of European Innovation Scoreboard including the four indicators SMES innovative in house, SME collaborating with others, technological product or process innovations and non technological (marketing or organizational) product or process innovators. The values are between 0-1 while the lowest performing region would score 0 and
The highest performing region would score 1. We can see that as is typical for old Industrial region Basque country was more involved in technological process or Product innovation while other regions innovated more in non technological innovation, e.g. marketing or organizational. Regarding the SME, Andalucía was the region showing higher value for innovating in house, while Madrid and Basque country tend to collaborate with others.

4.4. Knowledge generation and diffusion

The statistics illustrates the number of employees working in technology or knowledge intensive industry. It also shows GERD (total intramural R&D expenditure and points how the value Madrid and Basque is higher compared to Andalucía.

Knowledge generations and diffusions category aims to analyze the university/research organizations. Madrid has a very high number of researchers and the region has 48 research institutions of 121 research institutes in Spain belonging under CSIC (Consejio Superior de Investigaciones Scientíficas – Spanish National Research Council), however as OECD (2008) states that the links to industry and business are not sufficient, as is also a case in general for the metropolitan region.

The Andalucían research has done a significant development (OECD, 2010). The number of research groups has more than doubled from 90s years, and in 2007 it was about 2000 research groups in Andalucía. Currently, 39 research institutes out of 121 institutes under CSIC is present in Andalucía, which is quite high considering that metropolitan region of Madrid has only 10 more (OECD, 2010; RETA, 2010;).

Interestingly, Basque country had not seen universities as a innovation creator and for longer time their innovative activities were largely focused on companies. Their later policies already incorporated universities as a innovation actor. Basque country has an environment for good research as apart from three universities has Basque Excellence Research Centers and Cooperative Research Center. However the cooperation of universities is limited and the region is facing problems with small incentives for researchers (Martínez Grenado, et al., 2012).

4.5. Education, Human labor

Looking at the data, it is clear, that the percentage numbers of population with tertiary education are heterogeneous between the regions. There are 69 public Universities in Spain, 6 of them are in Madrid, (Fundacionpara el conocimiento Madrid, 2008), 10 are in Andalucía (RETA, 2010) only one in Basque country (OECD, 2011).
The reason of very high number of students in Basque country is associated with the focus on manufacturing and later technology innovations that resulted in a need of the employees for the created jobs. Therefore a region with a very high number of educated population predominantly in technical areas (OECD, 2011). Basque region is providing education on both university level and as a vocational Training (Martínez-Granado, et al., 2012). Andalucian Technology Network, RETA (2010), states that the numbers for Andalucía are following positive trends in increase of students on tertiary education level however a high lost of potential students has been connected with the dominance of tourist industry and services, where then tertiary education is no required. The vocational trainings receives a lot attention in Andalucía, there is also 11 vocational schools providing education in tourism and services. The vocational schools are attended by approximately 95000 students (RETA, 2010; Martínez Grenado, et al., 2012).

Prominence of the universities might be considered as a noticeable factor in this case. Looking at the global university rankings, QS World University Ranking, ARWU (often known as Shanghai Jiao Tong) ranking, Times Higher Education World University Rankings ( Cairns, 2013), CWTS Leiden and Webometrics Ranking. For better illustration, we have a shorter look on the first three of them. In ARWU ranking, in 2014 Madrid has two universities (best 300 and 400 universities) while Basque region has one university in top 500, University of the Basque country and Andalucía has one university ranked in best 400, University of Granada (ARWU, 2014). In Times ranking, Autonomous University of Madrid is the only ranked from the three regions as 300-350 (Times Higher Education World University Rankings, 2013).

In QS ranking Universidad Autonomña Madrid has been ranked in first 200 in 2013 and University Complutense Madrid has been ranked shortly after and Universidad Carlos III de Madrid after 300. The first Andalucian university is University of Granada (ranked as 500 to 550), followed by University of Sevilla (QS ranking, 2013).

Looking at the rankings, the place always belonged to the universities in Barcelona in Catalanian autonomous region. As the theory says, mainly the metropolitan regions host the most prominent research institutions and universities.

4.6 Networks

Madrid networks are developed and organized. Madrid network comprise of different members, including universities, research entities and companies. There are over 700 actors cooperating. They are organized in 12 clusters, including some emerging mainly representing technology areas and services (e.g. biotech, renewable energies, aerospace, financial center of Madrid, tourism, health and wellness etc.) and five technology parks.
OECD report (2007) shows evidence that the enterprises-universities linkages still need to be fostered as they are not sufficient.

Andalucía suffers from weak networks between public and private institutions. Marchese and Potter (2010) state that even the large and innovative Andalucían firms with resources have very limited contact with research institutions and universities. However, the usual problem with peripheral regions is often associated with organizational thinness (Trippl and Todtling, 2005) and in the case of Andalucía the regional government provides a variety of instruments to support the cluster and linkages between private and public organizations (OECD, 2008; European Commission, 2014).

Chapter 5: Case studies of regional innovation systems and policies in Spain

In this chapter the reader is presented with the case studies of the regional innovation policies recently adopted in Madrid, Basque country and Andalucía, together with characteristic of the regions and its regional innovation systems looking back at the indicators and analysis in previous chapter. The data used for this analysis comprise mostly of policy reports of OECD, European union bodies. The methods and policy in the field of regional innovations and compared to each other and they are also compared with the idea region based on the typology. Their effectiveness is analyzed and linked to the indicators presented in the previous chapter.

The regions in Spain are autonomous, they have their own regional governments that have rights to create, support and finance regional innovation policies. The Spanish government provide the regional governments with some support and advice, mainly coming from Spanish National Research Council, CSIC, and as well as financial funds (OECD, 2013).

5.1. Case study Madrid (Metropolitan region)

5.1.1. General overview of a region and its RIS specifics

Madrid is a metropolitan region it is categorized as the metropolitan region by number of statistical and economic sources. This region is characterized by economic and innovative success (OECD, 2010). However this region itself has its limitations and barriers, comparing the values with Spain, Madrid is showing very high values, although Spain is mostly on the bottom of EU average in economic and innovation indicators. (Eurostat, 2013). The regional policies aim to promote the innovation however not all of them were successful. R&D expenditures in 2010 were 2.05% in Madrid, while the value for Spain is only 1.33%.
Although the Lisbon target for 2010 was 3%, the average in 2010 was 2.01% so slightly below the performance of Madrid (Eurostat, 2013). Looking at the specific numbers of R&D expenditures, Madrid has provided R&D expenditures of 1.52% in business sector, while EU average was 1.24%. The government sector provided 0.5 % of GDP as R&D expenditures in Madrid, which was a high value compared to other two regions, and also EU average that was only 0.27%. The higher education R&D expenditures of 36% were low in the Madrid region compared to other regions, and also EU average that was 0.49% (Eurostat, 2013). Madrid performs as an innovative region with a high value of GERD, relatively high number of R&D personal, however according to European Scoreboard 2012 Madrid is ranked as a second category, following innovator, not innovation leader.

According to European Commission (2014) Madrid is considered as a region with high investment commitment to innovation, especially investments from public administration and companies.

Regarding the human capital, most of the best Spanish researchers are based in Madrid (OECD, 2007). Also Madrid is a home of 15 universities, some of them belonging to most prominent in the region. According to European Commission (2014), Madrid owns one of the most potential technology and science clusters in Spain, and its investments were aimed at innovations in technology (European Commission, 2014) and OECD sees Madrid as accurate region for some of clusters including biotech, aerospace, electronics, or banking. According to OECD the most important clusters include aerospace, financial cluster, logistics cluster, the creative cluster, the life science cluster (32% of the firms, 61% of national turnover, and 50% of national employment make the life science cluster in Madrid the biggest in Spain) (OECD, 2007, p. 92).

Clusters have a different character then more metropolitan regions clusters, they have “hub and spoke ” character, the cluster are not based on number of SME collaborating but include also medium and large sized companies with more international character (OECD, 2007). The clusters have developed network with a number of various actors collaborating, as an example can serve a life science cluster where the actors included are 4 universities, 8 research centers, 6 hospitals, 24 large biotech and pharmaceutical companies and two corporate associations (OECD, 2007).

Despite the higher innovation activity compared to other Spanish region Spain is at the level of the highest metropolitan innovators. OECD proposes some of obstacles resulting in limitations for innovation in the region of Madrid. Although the Madrid universities belong to the most prominent in the region, they and the educational system face some problems that need space for improvement. The last reform was focused on the problems like too low autonomy of teachers, discrimination of
teachers recruitment, coordination of university management and strengthening the university-private linkages (OECD, 2007). Another problem is the limited financial incentives for researchers in public institution that might lead to lower productivity (OECD, 2007). Moreover, the managerial environment does hesitate to cooperate and support the public organizations and university therefore the linkages between the private and public institutions need to be more supported (OECD, 2007).

5.1.2. RIS Policies in Madrid

Looking at the administrational aspect of the regional innovation policy, the highest RIS policy making body in Madrid is the Economy and Treasure Regional Ministry that creates innovation policies in cooperation with institutions from the region of Madrid including Economy Statistics and Technological innovation General Office, Regional Ministry of Education, Industry, Energy and Mines General Office, and Environment, urbanism and Territory Regional Ministry (European Commission, 2014).

One of the most important strategies is IV Pricit the Plan for Science and Technology. Trippl and Todtling (2005) mention the importance of integrating strategic position of metropolitan region in the RIS plan, while IV Pricit aims “to transform Madrid into a main core within the EU knowledge regions ” (European Commission, 2014).

Innovation Regional Plans for the period 2009 and 2012 are aimed at fostering strategic innovation programmes in high technology sectors, aerospace ICT and biotechnology; support of high technology SMEs that would strengthen networks with different actors of knowledge transfer; and organizing the different activities and programmes within RIS on public level that would lead to high economic efficiency (European Commission, 2014).

Recently, Madrid has no general R&D and innovation plan, however the European Commission (2014) claims the region continues with its innovation activity in accordance with the previous policies and plans and foster their goals. OECD (2007) proposes that the region of Madrid would need a qualitative improvement of the SMEs, increasing their involvement on product innovation an adapt the universities more to the economic environment.

5.2. Case study Basque country (Old industrial region)

5.2.1. General overview of the region and summary of RIS

Basque country is defined as old industrial region (for example Kauffman and Todtling, 2000, Ache, 2000), however due to its policy in longer period of last year the economy is rather diversified. Basque country has a long tradition of manufacturing industry including metal, machine tool, electronics or automotive industry, and currently industry accounts for
at about 30% and construction at about 9% while services accounted for 60% of GDP (Churiaque, 2008 and Obregon, 2012). As it presents the first table, the region is very prosperous with a very high GDP that represents higher number than the GDP average. Basque region shows lots of indicators, which are not corresponding with the theories, and it is showing little limitations in the terms of innovation performance. As is typical for old industrial regions, the large enterprises should be dominant, this is no longer case of Basque region as the majority of enterprises are micro companies (OECD, 2011). Basque country has very high innovation potential that has been confirmed by European Scoreboard presenting this region as follower. Also most of the R&D as a percentage of GDP is showing strong values very comparable and similar to Madrid. Only indicator showing lower values for Basque country is the R&D in the government sector. R&D personnel is also showing values similar to Madrid and the percentage number of population with tertiary education is very high, even higher than in Madrid. A high contribution to the private investments into R&D are characterized by cooperatives, that are frequent in the Basque business environment (OECD, 2013). In the case of product and process technological and non technological innovation, Basque country is showing a trend, that is according to the theories present in old industrial regions, so that there is a dominance of technological innovation. This can be observable on the tables, as both Madrid and Andalucía have higher values for non-technological innovation.

5.2.2 RIS policies in Basque country

The innovation support in Basque country has a long tradition. From its existence as a autonomous government the region has financed the innovation strengthening, however the activities had a focus on incremental innovation and technology innovation. The innovation reforms in Basque region are very specific, and they have different characters as is usual. The innovation focus was aimed at industry and manufacturing. There we can see also in the table in previous chapter that percentage of population with tertiary education is significantly higher compared to other two regions. This is due to the need of specialized technical education in the technology and manufacturing industry (OECD, 2013). This led to a negative effect as well, the Basque region, as the policies Basque region have not paid enough attention to university role in the innovation process. This can be visible while comparing two public organizations, Department of Education, University and Research and Department of Innovation, Tourism and Commerce, both belonging under Basque Council for Science, technology and Innovation, form that the second one was more involved on financial contribution to RIS in Basque country (European Commission, 2014; OECD, 2013).
The Basque region as other Spanish regions has a high autonomy to establish the strategies for regional innovation systems development through their regional agencies. The most important governmental body of the region is Basque Council for Science, Technology and Innovation (OECD, 2013). This plan aims to integrate more radical innovation and new sectors, one of its main focus in on university education and research.

One of the recently most crucial plans forming the strategy of Basque region is Science and Technology Innovation Plan aiming to achieve its goals by 2015 (OECD, 2013). This plan presented nine main targets. They aim to focus more on high added value technology and science sectors, create innovative companies that have a place in global competition, create innovation in technology and science that will lead to development of public services, promote social innovations. Other goals are aiming at internationally recognized Science and Technology System, supporting talents, transforming the region into attractive innovative environment, promote interest in science and technology around citizens, and new process of funding (OECD, 2013).

As other regions also Basque country creates its innovation policy through some regional organizations and institutions. To the most important belong Basque Innovation Agency, Society for Industrial Promotion, or Department of Economic Development and Competitiveness in Basque country (European Commission, 2014). Currently, the social dimension is considered as very important and many development agencies is suggested to be incorporated as a goal in RIS policies. Basque region is presenting this goal in the document as well, attempting to improve the social dimension by adopting the relevant RIS policies (OECD, 2013).

5.3. Case study Andalucía (Peripheral region)

5.3.1 General overview of a region and its RIS specifics

Andalucía is a highly populated region located on the south of Spain. It is the second largest region in Spain that comprises of eight provinces, Almeria, Cordiz, Cordoba, Granada, Jaen, Huelva, Malaga and Sevilla (RETA, 2010). Andalucía is showing some of the characteristics of peripheral region not only due to its lower economic performance represented by lower level of GDP compared to two other region, but also in other indicators. As the theory expects the peripheral region of Andalucía comprises of majority of micro or small enterprises and according to OECD (2010) Andalucian Technology network, RETA, sees a lot of the orientation to the innovation of the region based on the implementation of the Lisbon Strategy. Andalucía lacks the entrepreneurial culture and support of entrepreneurship in the business environment which should be supported by the policy (2010). Moreover the companies in Andalucía tend to be very little internationally oriented
and the R&D generation of the private sector is low (OECD, 2010; RETA, 2010). Looking at the values of Andalucía’s R&D, the total values together with partial statistics of business, government sector, in most cases Andalucía is showing approximately twice lower values compared to the other two more developed regions which is associated with very low linkages between the private actors. However, surprising is the value of R&D contribution in the higher education organizations, where Andalucía presented much higher values that the other regions. The RIS policies place the universities and research institutions on an important place and although they lack to develop their collaboration with public sector, they contributed to connect the universities with innovations (OECD, 2010).

Looking at the R&D personnel and researchers Andalucía has much lower share than the other research and a very big difference can be also observed in the evidence of patents per 100 inhabitants where Andalucía has approximately three times lower share of patents compared to the other regions. Although percentage of tertiary education is another indicator showing the worse conditions of peripheral Andalucía compared to other regions, Andalucía incorporates also different vocational trainings and the number of tertiary education students significantly increased. Observing the innovation activity values of European Innovation Scoreboard we can see that while Madrid and Basque country are showing the trend of SMEs more collaborating with others than innovation in house, in the case Andalucía, opposite trend is present. This can indicate weak networks and collaborating between SME companies.

As can be seen in the descriptive statistics in previous chapter, Andalucía is a big region with a high potential but so far it had not reached the development as other two regions and also it is below EU or Spanish average. However, some indicators are showing positive trends, highlighting that Andalucía even overcame other two regions. In Andalucía the most important clusters include aeronautics, biotech, and ICT. The economy in Andalucía has a tradition in agriculture, and the primary sector is linked with 5 technology centers dedicated to agriculture mostly. Three technology sectors are dedicated to secondary industry, mainly agro alimentary, metal chemicals, etc. (RETA, 2010).

Andalucía has 10 public universities and high number of research institutes University of Grenada and Sevilla are globally recognized in international rankings. Apart from the university education there are offered at about 99 vocational trainings aimed at tourism and services that represent most emerging sectors. There is a high number of technical courses within all offered courses in Andalucía (38% of all offered courses). OECD report (2010) states that the Andalucian universities created a well working scientific production, however during the knowledge creation there has not been sufficient transfer and exchange of this knowledge. Apart from this, OECD suggests to enlarge the role of students within
the research, especially in the technology field. Other problems recognized by the regional government are the low innovativeness and entrepreneurial spirit of the university programmes and learning. The current policies are aimed at this problem as well (OECD, 2010).

OECD (2010) presents key weaknesses of Andalucía to strong and efficient RIS. The weaknesses are represented by low labor productivity, insufficient supply chains and marketing channels in the industrial sector and low competitiveness of the productive sector that is caused mainly by less entrepreneurial tradition and motivation as well as small orientation of Andalucía companies to international markets (OECD, 2010). RETA, Technology Network of Andalucía (2010) conducted a survey between the regional innovation agents (including private sector agents and public sector agents) and they presented results of the barrier in the innovation field they were facing. The most frequently faced barriers were difficult access to international markets, limited interactions between universities and companies, limited number of staff with qualified skills, little incentives for collaboration between innovation actors, limited innovation awareness, difficult financing innovation, and “lack of cutting edge knowledge on new technologies” (RETA, 2010). Also The region of Andalucía is realizing its limitation of insufficient entrepreneurial culture in the region and on universities (OECD, 2010). One of the most emerging barriers to successful RIS in Andalucía are very limited linkages between companies and universities in Andalucia. The networks are not very developed and they face barriers in collaboration (OECD, 2010). This results in limited funding, which result in the need of the Regional Government of Andalucía and European union to fund the development of regional innovation policies. Andalucía has profited of more than twelve million EUR as a contribution from European structural funds to improve the development of the region and move towards more developed regions (OECD, 2010).

Although Andalucía faces number of limitations however usual organizational thinness is not present as the regional government is very involved in creation of new strategies and plans and their achieving.

### 5.3.3. RIS policies in Andalucía

The region has a complex group of organizations on the top of it is Regional Government of Andalucía (OECD, 2010). The main governmental body is Regional Ministry of Economy, innovation and Science, which cooperates with other Institutions, including Andalucian Technology network RETA, Innovation and Business Development Agency of Andalucía (IDEA), Venture Capital Investment and Venture and Venture Capital Management of
Andalucía (INVERCARIA), The Technology Corporation of Andalucía (CTA), the Andalucían Foundation for Innovation and Knowledge Dissemination, Andalucian Agency of Knowledge AAK) and others (Crespo and Pieto, 2010, European Commission, 2014).

An important role within the realization of RIS policies plays the strategic plans. To the most recent belong Research and Innovation Strategy for Smart Specialisation (RIS3), the Andalusian Innovation Strategy this project mainly connect its vision with entrepreneurship development in Andalucía and education and training, sustainability. Apart from other goals, they promote increased R&D in agroindustry and nutrition, renewable energy, digital economy etc. It is a plan for time period between years 2013 and 2020 and knowledge generation and its usage, support of innovative and entrepreneurial environment in research institutions, universities and business organizations, supporting knowledge exchange, support of involvement of private companies on knowledge system represent its main goals (European commission, 2014).

The instruments of the regional governments in Andalucía include Andalucía Plan for Research, Development and Innovation, PAIDI, which coordinated the different regional projects in the field of R&D and innovation and Innovation and Modernization Plan for Andalucía, PIMA. This two instruments are interlinked together.

PAIDI has a number of goals mostly aimed at innovation and SMEs. It supports the linkages between universities and companies (one of the goals where they collaborate together with PIMA), PAIDI is focusing on four actors as a center of RIS in Andalucía comprising of technology parks, research institutions and universities that are seen as knowledge generators, knowledge transfer organizations, and support organizations. PIMA aims to spread innovation around Andalucía, and make the economy more competitive. PIMA also foster cooperation between private and public sector and support research (European Commission, 2014, RETA, 2010).

Andalucía has prepared a base for the high importance of university and its role in RIS already earlier. The attempts of Regional Government of Andalucía included also creating university as a research capacity in each province of a region. There has been increase from 1990s in the number of universities (four new universities) followed by obvious increase in the students number. The OECD suggest that this increase has a high potential to result in new innovation and entrepreneurship stimulation (OECD, 2010). The OECD (2010) promotes sectorial unemployment data that lead to conclusion that increased attention of graduates to science and engineering would be beneficial for the region. Policy interventions in Andalucía have been complex and intensively aiming at reaching the targets. The next chapter provides summarizing of the thesis together with discussion about RIS in the three
regions and conclusion.

**Chapter 6 : Conclusions and discussions**

This chapter aims to discuss the results of the thesis, summarize the conclusions and address the questions ask in introduction. Looking back at the first chapter the aim of the thesis was to compare three types of region, metropolitan region, peripheral and old industrial region in the terms of RIS and linking them to the theoretical framework about RIS in different types of regions. To come to the results the thesis provided descriptive statistics that compared the regions based on a variety of indicators. Then other evidence of the regions were three case studies of these regions showing the RIS characteristics and trends in the regions and the regional innovation policies implemented in these regions.

The main aim of the research was to observe the similarities and differences between the regions in RIS as well as the policies and see if there are similar patterns as in provides the theory about metropolitan, peripheral and old industrial region. The three regions are significantly different in the indicators and in the indicators, Andalucía was mostly showing lower values compared to other regions and justified its position of a peripheral region. On the other hand, Basque country conformed its competitiveness and focus on innovation by performing similarly to metropolitan region of Madrid with very high value. The region of Madrid was performing good in a lot indicators, however the indicators did not reach the level of most innovative European metropolitan regions. The innovation activity presented by R&D showed that the innovations are generated from different sectors in different regions, while the highest expenditures of companies on R&D was coming from Madrid and Basque region.

It is very interesting to see that all regions in a certain aspects agree with the theoretical framework and the policies that have been applied show some different patterns with some recommended strategies corresponding to the theory.

Madrid is the most developed region belonging to the metropolitan region. Madrid shares a lot similar patterns with the theory. Madrid is the most innovative and competitive region of Spain, it has high contribution to the R&D mostly due to large companies that have headquarters in the region. Madrid also have a lot research potential and skilled labor (European Commission, 2013 OECD, 2010).

Basque country is a case of old industrial region. The economy of Basque country was involved in manufacturing, and they put a lot attention to innovations, however more in a
form of technology and product innovation. In last years, Basque region depends also on services and its innovation initiatives have more knowledge and research focus. They placed the universities as the innovation agent, as previously their attention has been more aimed at companies and private sector.

Andalucía as a case of peripheral region is doing very well. The clusters in SMEs are weak, the most crucial problems are the poor linkages between public and private organizations. A lot of R&D came from higher education organizations, and Andalucía is not suffering from institutional thinness as they have a complex regional policy plans, strategies. Looking at the policies and plans implemented the regional government choose different strategies and focus on slightly different aspects of RIS. All regions have complex regional governments collaborating with number of public and private organizations. The research provides evidence how important adopting the policies to a certain type of region is. While Madrid region has a main aim to reach the and become innovation leader, Basque country has a complex group of targets still with a high focus on science and technology innovation. Also the national dimension is important to mention, some problems have been identical in all regions, e.g. low incentives for researchers in public institutions. OECD report (2011) about RIS highlights the current tendencies of policy maker to promote and create a regional innovation policy that have a social aspect. All three regions, metropolitan, old industrial region and present the positive social effects as one of its goals for upcoming regional innovation plans (European Commission, 2014).
A very positive fact is the three regions seems to be on a good path with their regional innovation policies as have been acknowledged by also OECD, RETA or other institutions.
LIST OF REFERENCES


Coenen, L., Moodysson, J., & Martin, H. (2013). Renewal of mature industry in an old industrial region: regional innovation policy and the co-evolution of institutions and technology (No. 2013/7). Lund University, CIRCLE-Center for Innovation, Research and Competences in the Learning Economy


RESA, 2010. SURVEY ON INNOVATION ANDALUSIA, SPAIN. European Regional Development Fund. Infolink
