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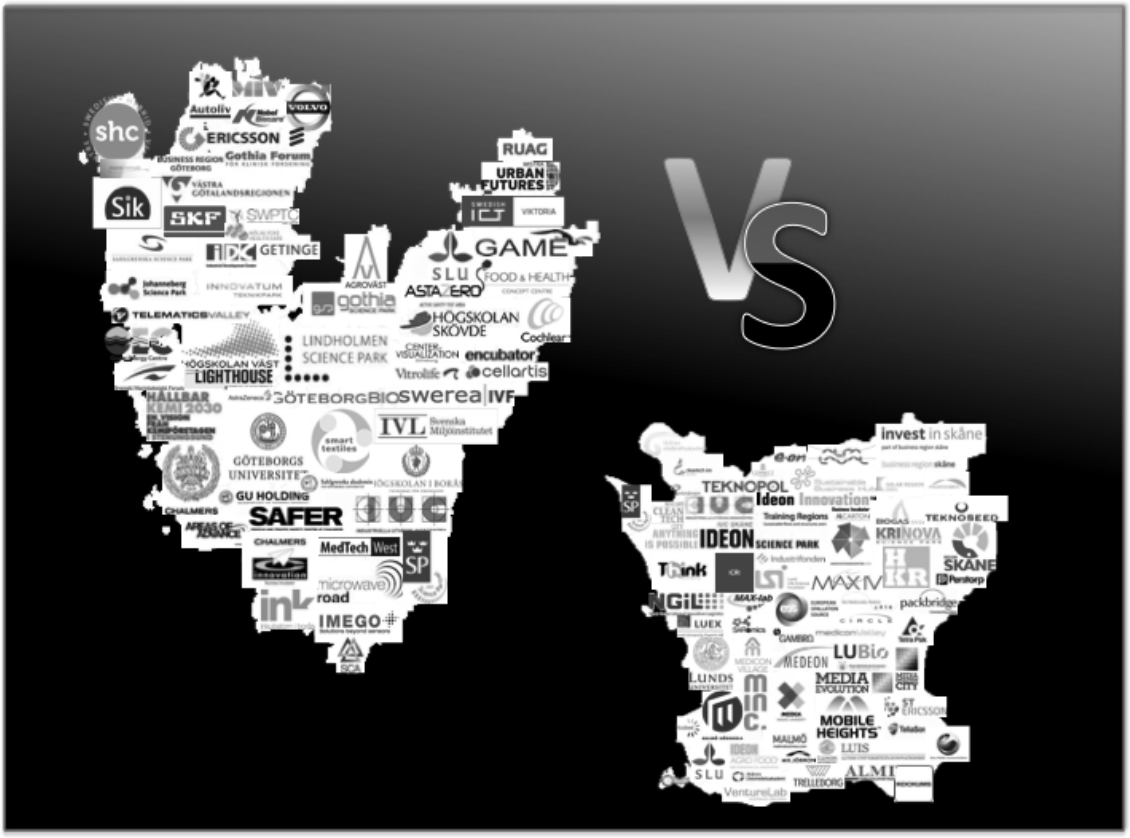

A Comparative Study of Two Regional Innovation Systems

- The Case of Skåne and Västra Götaland

Master of Science Thesis [Management and Economics of Innovation]

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Abstract

This thesis presents a comparative study of the innovations systems of Skåne and Västra Götaland. The aim is to address the questions how the two systems differ, what similarities they share, and how they can improve. An objective is also to provide the sponsor-company PwC with more knowledge about both innovation systems and some of their most important sectors. In-depth case studies have been made, using a survey, focus groups, interviews and secondary data as data collection methods. In addition to this, a model for data collection for evaluations of regional innovation systems has been developed and is presented in the thesis.

First of all it is important to highlight that Skåne and Västra Götaland have extensive knowledge infrastructures in place, are doing very well in innovation scoreboards and can be found ranked among the top innovative regions in Europe. Although the two regions' innovation systems are functioning in a similar way, a few differences and similarities have been found especially interesting for analysis. For example, despite that the regions have extensive knowledge infrastructures in place, structures such as the support systems are seen as slightly inefficient, suffering from messiness and communication deficiencies. One major difference between the two regions is found in the life science sector, where the one in Västra Götaland seems to suffer from both fragmentation and lock-in.

The two regions further differ in industrial structure, where Västra Götaland has a heavier industry and larger companies than Skåne. Although the region benefits from the large companies, which in many cases are foreign-owned, it is stuck in a risky situation being too dependent upon them. The difference in industrial structure is further evident in a much larger research institute sector in Västra Götaland. The research institutes' roles in Sweden can however be questionable if universities successfully manage adapt matrix-organizations that opens up for better industry collaboration. Universities further need to find new ways of collaborating with smaller companies, which often do not have enough resources and tend to have problems finding an entry.

Finally, it seem like there is a higher degree of enthusiasm in Skåne, which is much due to the upcoming establishments of ESS and MAX IV. Skåne's body of authority is operating more top-down and seems more actively driving innovation issues than its counterpart in Västra Götaland. There are better collaboration and network opportunities in Skåne, which partly seems to be due to better coordination around cluster organizations.

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1 Introduction

Considering regional development from an innovation system perspective has become increasingly important as competition in the global marketplace has become fiercer (Cooke, Uranga, Extebarria, 1997; Doloreux, 2002). It is today widely agreed that innovation, knowledge, and learning is core in economic development. It is fostering competitiveness both at a firm level as well as a regional and national level (Tödtling and Trippl, 2005). Innovation processes and activities have become much more dependent on relationships and interaction between different actors (Cooke et al., 1997; Smedlund, 2006). This puts the pressure on policy makers to strengthen the innovative milieu so that cooperation is facilitated and promoted (Cooke et al, 1997). But in order to develop relevant policies, the innovation system in question needs to be evaluated. However, due to its significant complexity, it is not a simple task to get a comprehensive view of what an innovation system looks like (Tödtling and Trippl, 2005). This study attempts to explore that complexity in Västra Götaland and Skåne - two Swedish regions with comparable population sizes that encompass a number of high-technological clusters.

This study is assigned by PricewaterhouseCoopers, which have strong competence and skills in consulting activities related to regional development. Their interest lies in gaining more insight and knowledge in the regional innovation systems of Skåne and Västra Götaland and to understand how they differ from an academic viewpoint. Moreover, they want to enlarge their understanding of how policies in the particular innovation systems might need to be redirected for the future.

1.1 Background

An innovation system can be described as involving "all the important economic, social, political, organizational, institutional and other factors that influence the development, diffusion, and use of innovations" Edquist (2005, p.182).

Research on innovation system has a strong focus on interaction and knowledge exchange between actors (See for example Asheim and Isaksen, 1997; Cooke, et al., 1997) – the literature on innovation *processes* was in the beginning focused on linear models, but has adopted the understanding of innovation being an iterative process that depends on how actors interact (Kline and Rosenberg, 1986). As early work as that of Schumpeter (1939) showed that innovation is dependent on new combinations of knowledge.

Early research on innovation systems has focused on the national level (See Freeman, 1988, Lundvall, 1988; Nelson, 1988; Edquist 1997). This is still relevant in the field, but the interest in regional development (Stoper and Scott, 1995; Scott and Stroper, 2003) and innovation systems has lately increased (See for example Cooke, 1992; Cooke et al., 1997; Autio, 1998). According to Tödtling and Trippl (2005) the shift towards a regional focus is based on a number of reasons:

- Regional systems have different specialization patterns and innovation performance[1].
- Knowledge spillovers are often spatially bounded[2]
- Tacit knowledge, which is important in innovation processes[3] requires personal, trust-based interactions facilitated by geographical proximity[4]
- Policy competences and institutions are partly bound to subnational territories[5]

Although a widespread agreement about the importance of a regional perspective on innovation systems, there is an opposing point of view questioning the existence of regional innovation systems. Bathelt (2003, p.797, cited in Asheim and Coenen, 2005) argues that ”to assume that such small-scale systems exist bears the risk of underestimating the importance of those institutions which are negotiated and defined at the level of the nation state”. Tödtling and Trippl (2005) do however state that research on regional innovation systems do not neglect the importance of neither national, nor international, technological or sectoral factors. Local networks are not regarded as sufficient where the market place faces international competition and accelerating technological change. Ideas, knowledge, and technology must therefore also be sourced from outside the regional boundaries (Bunnel and Coe, 2001; Camagni, 1991; Mytelka, 2000; Oinas and Malecki, 1999, 2002, cited in Tödtling and Trippl, 2005). Furthermore are the dynamics of innovation systems shaped by national and European policy actors and organizations (see figure X) (Tödtling and Trippl, 2005).

1.2 Purpose

The thesis aims to compare the innovation systems of Skåne and Västra Götaland and to analyze what similarities and differences there are. It further attempts to see how the both systems can improve. The first research question concerns the both regional innovation systems:

RQ1. *What general important similarities and differences can be found between the innovation systems in Skåne and Västra Götaland?*

The second research question is based on the first one, but requires a more narrow focus on the region’s clusters:

RQ2. *What differences and similarities can be traced to the clusters?*

The third looks for what improvements in the innovation systems that can or should be made.

[1] (Breschi, 2000; Howells, 1999; Paci and Usai, 2000).
[2] (Anselin et al., 1997; Audretsch and Feldman, 1996; Bottazzi and Peri, 2003).
[3] (Gertler, 2003; Howells, 2002),
[4] (Maskell et al., 1998; Morgan, 2004; Storper, 1997).
[5] (Cooke et al., 2000)

RQ3. *How can the innovation systems in Skåne and Västra Götaland improve?*

1.3 Scope and limitations

The scope of the study concerns the regional level of innovation systems. It includes "All the important economic, social, political, organizational, institutional and other factors that influence the development, diffusion, and use of innovations" (Edquist, 2005, p182). Due to time limits, this thesis cannot include all aspects of regional innovation systems. Thus, although regional innovation system includes linkages to national as well as international innovation systems, it has to exclude these areas. The study also includes a cluster perspective, although some clusters have been less looked into than others due to time limits.

Delimitations are further made regarding firms involved in the system: The focus lies on research-based firms mainly in medium-high and high-tech industries (see definition in appendix IV). Service-oriented, knowledge-based firms as well as such without academic tradition are however mentioned briefly.

1.4 Disposition of the report

Chapter 1 Introduction provide the reader with the background to the study and of the theory. Purpose, research questions as well as scope and limitations are presented.

Chapter 2 Method describes what research design and methods that have been used for collecting and analyzing data.

Chapter 3 Theoretical Background gives a review of relevant literature in the field. It is based upon a model that structures the chapter into five parts that relates to the different subsystems and aspects of innovation systems.

Chapter 4-10 Empirical Findings provides the results from the data collection. It starts with an outline of the Swedish innovation system (chapter 4) and an overview of the regions' innovation performance as well as a description of the most general actors (chapter 5). Thereafter the functionality of the both regions' innovation systems is described (chapters 6-7), followed with a presentation of the clusters (chapters 8-9). Finally, the survey results are presented (chapter 10).

Chapter 11 Analysis/Discussion part I analyzes and discusses the main empirical findings in relation to the theoretical background.

Chapter 12 Analysis/Discussion part II concerns the thesis' contribution to the theoretical framework in the field. Here a model for data collection for evaluations of regional innovation systems is presented.

Chapter 13 Conclusions

Chapter 14 Suggestions for further research

2 Method

This chapter describes the research design and methods chosen for answering the research questions. Several methods have been used for catching different aspects of the innovation systems and different types of actors' perceptions. These are outlined below.

2.1 Research design

The research design provides a framework that guides the execution of the collection and analysis of data (Bryman and Bell, 2011). Chosen is a combination of case studies and comparative design, which are described below.

2.1.1 Case studies

Case studies are used in order to investigate the innovation systems and clusters/sectors in Västra Götaland and Skåne. This research design is chosen because it allows in-depth empirical studies of single cases. It suits the study well since it has to deal with the great complexity that innovation systems imply. For the same reason, this is a widely used research design in business research (Eisenhardt and Graebner, 2007; Bryman and Bell, 2011).

The disadvantage of using a qualitative approach such as a case study is that the external reliability is rather weak since it is difficult to replicate such a study (Bryman and Bell, 2011). There are however some quantitative measures included, which strengthen the external reliability somewhat in this particular study. Internal reliability can be strong if there is more than one observer and if there is a high degree of inter-observer consistency (Bryman and Bell, 2011). Being only one making this study is thus a disadvantage in terms of internal reliability. Internal validity is usually an advantage of case studies since in-depth studies over a longer period of time tend to ensure a high level of congruence between concepts and observations (Bryman and Bell, 2011). Although this attempts to be an in-depth study, the complexity of the field studied might need it to be studied during a longer period of time than what has been done. The complexity of the study makes the external validity somehow questionable. This is however usual when using case studies since it is difficult to generalize the findings across social settings due to small samples (Bryman and Bell, 2011). The external validity is however enhanced by the use of a survey that includes a larger number of respondents.

2.1.2 Comparative design

In order to weight the cases against each other and seek explanations for similarities and differences, a comparative cross-regional design is used. This research design implies that the study has to use more or less identical methods for the sake of comparing the cases. Thus, one needs to be careful when choosing data so that it is comparable. The type of data that has been collected is presented below, in "Research methods". The comparative type of design enhances the quality of the study since it provides a greater awareness and

deeper understanding of the contexts (Bryman and Bell, 2011). Doloreux (2002; 2004) elucidate the importance of comparison for the understanding of innovation systems. It also improves the construction of theory since comparison of cases puts the researcher in "better position to establish the circumstances in which a theory will or will not hold" (Bryman and Bell, 2011, p.66).

2.2 Research methods

The research method chosen is a mixed-methods approach, i.e. it includes different types of research method – in this case both qualitative (interviews, focus groups, secondary data analysis) and quantitative (questionnaire and secondary data analysis). The different research methods aim to collect different type of data and to create a comprehensive picture of the innovation systems. The attempt is to create a picture on the innovation systems based on different type of actors' perspectives. Another advantage using multiple research methods it that it allows for cross-checking of results, something that is called *triangulation* (Bryman and Bell, 2011). The research methods are outlined below.

2.2.1 Survey

In order to deal with the very large number of firms and their different perceptions of the innovation systems, self-completion questionnaires are used. This is the most efficient research method when gathering data from a large number of individuals (Bryman and Bell, 2011).

An advantage using self-completion questionnaires is the absence of interviewer effects on the answers, i.e. when the characteristics of the interviewer affect the answer people give. However, this also means that the questions have to be precisely formulated in order to avoid misunderstandings (Bryman and Bell, 2011). Thus, Bryman's and Bell's (2011) guidelines for designing questionnaires have been used. The authors further recommend a pre-test in order to identify and reformulate poorly formulated questions. This was however not possible since the sample was so small that it did not allow for losses to a pre-test. The risk of getting too few responses was large. Thus, the total sample was needed for the main survey. The survey has however been looked over by a number of persons, including the supervisor of this thesis, and contact-persons at PwC. Moreover, several of the questions have been used by well-known researchers in the area, as mentioned below.

Questions and likert-scales. Constructs chosen for the survey derive from core concepts and items presented in literature. The questions mainly relate to collaboration, the perception of availability of different innovation promoting means, barriers for innovation and support-taking, etc. Similar questions have been used by for example Tödtling and Kaufmann (1999; 2002), Doloreux (2004), and Rye (2002). In difference to those, this survey uses likert-scales which serves as multiple indicator measures. It allows the researcher to make finer distinctions since one get access to a wider range of aspects of the concepts. Since the response rate usually is negatively affected the longer or larger the survey looks (Bryman and Bell, 2011), some of the desired questions and sub-

questions had to be left out – only the most interesting ones have been included. Furthermore one question, where likert-scale options seemed excessive, was reduced to Yes/No answers in order to reduce the 'heavy' look of the survey.

Sampling and population. In order to conduct the sample, a register over the population was needed. A number of member-organizations, which possess such registers, were contacted but none were willing to hand out any data. Thanks to PwC making available resources, data on the population could be ordered from UC. The data ordered for each company was company name, e-mail address to accountable, number of employees, age of the company, its location, etc. The three latter have been used in the analysis of the survey results when comparing different categories of companies' responses. It was also aspired to compare different sectors' responses. Data on what sectors the companies belonged to could not be ordered other than their industry-code, which for most of the companies was "721900 - Other scientific and technological research and development". Instead, the wanted information had to be searched for at the Internet – something that was rather time-consuming, but turned out very well.

Companies in the population were ones that had R&D expenses reported in their accounting. This was the best way of targeting "innovative companies". Another way is to gather a population that includes knowledge intense companies with a certain share of employees with higher education. Using this method and only including ones in certain industries would have been preferable. This was however not possible, since SCB, which posses this type of information, has strict rules for handing it out. The request was therefore ejected. The disadvantage using the population with R&D expenses is that companies who report their accountings elsewhere than in the region are excluded. Thus, the population was smaller than what was expected. Therefore, no sampling of the population was made – the survey had to be sent to as many as possible. Another problem of the population data was that e-mail addresses were only available for a few of the companies. Thus, considerable time was spent on finding e-mail addresses to the companies. About 400 were found searching on the web. The ones that could not be found were only small companies with 0-1 employees, a category that dominated and was well represented among the respondents anyway.

Web survey. A web survey-format was chosen where the sampled respondents were invited by e-mails to a website where the questionnaire could be found and filled in. Thereafter, the answers were automatically downloaded into a database that logged them before the collective data finally was retrieved. This format was used since it facilitates coding and saves considerable time that otherwise is associated with larger samples. Another advantage is that it reduces the likelihood of errors in the processing of data (Bryman and Bell, 2011).

Comparison. The survey was sent to 621 companies. 155 responded. Out of them, some had to be sorted out due to only answering the first three questions. Remaining were 135,

76 from Västra Götaland and 59 from Skåne. The number of respondents in this survey is slightly higher than that of Doloreux (2004), which compared the innovation systems in Ottawa and Beauce in Canada. It is further comparable to the SMEPOL survey used by Tödtling and Kaufmann (2002), but much smaller than that of Tödtling and Kaufmann (1999) which used data from the European REGIS-project's database, and Fritsh and Franke (2004). Since the According to Edling and Hedström (2003) and Black (1999) a size of over 30 respondents is sufficient for statistical data analysis. Thus, the number of respondents in this survey is large enough when comparing responses of Västra Götaland with those of Skåne. It is however balancing on the edge when further divided into subgroups. Aspired comparison between several subgroups (such as between 4) had to be either clustered or analyzed in a different manner. Regarding the sectors, a majority of all responses came from Life Science. The sector category was therefore divided into "Life Science" and "Other sectors". Number of employees was categorized into 0-1 and ≥2 employees and age of the company into 0-7 and ≥8 years since these were the only possible categorizations that could be made without making the categories comprise too few respondents.

The data on the companies' locations has been utilized to find each company's 'distance from knowledge hub'[6]. These have been calculated at the website hitta.se and serve for analyzing whether or not proximity matters. The respondents could however not be divided into 'close' and 'distanced' as aspired since there was not enough respondents situated far enough (in this case ≥30 km) from a knowledge hub. Instead it was analyzed in another way since the data can be ranked ordered and thus allows for another method to be used. Since the data on 'number of employees' and 'company age' have the same characteristics, these have also been analyzed in that way.

The statistical tool selection is dependent upon what type of data that is to be processed as well as what type of analysis that is to be made. 11 of the 12 main questions (variables) have ordinal scale data, and one dichotomous. When comparing two groups (like Västra Götaland and Skåne or life science and others) of this type of data one can use the Chi-square (Chi2) method since it is a non-parametric method. In difference to many other methods measuring significance, it does not depend on calculations of the mean, which should not be made when dealing with ordinal data (Alreck and Settle, 1995; Black, 1999; Bernard 2000; Edling and Hedström, 2003; Eliasson, 2010). However, instead of suggesting Chi2 for both sets of ordinal data, Black (1999) and Bryman and Bell (2011) state that one can use Spearman's rho, which is a method that ranks data. But the fact that it ranks data and that one set of ordinal variables in this case is categorized into only two groups, the use of Spearman's rho loses its accuracy. Therefore, the Chi2 has been used.

[6] The knowledge hubs are Lund, Malmö, Kristianstad, and Helsingborg in Skåne and Göteborg, Borås, Trollhättan, and Skövde in Västra Götaland. These have been chosen since they all have HEI's.

As mentioned above, 'number of employees', 'age', and 'distance from knowledge hubs' have characteristics that make them possible to rank order – they have interval/ratio variables. Since the likert-scale options are ordinal variables with more than two options, one can use Spearman's rho for bivariate analysis as suggested by Bernard (2000) and Bryman and Bell (2011). This method allows the researcher to see if there are correlations between the respondents' characteristics and their answers as well as correlations between the respondents' answers (Bernard, 2000).

For each question, Chi2 has been used to compare responses between:

- Skåne and Västra Götaland
- Sectors:
    - Life Science in Skåne and Life Science in Västra Götaland
    - Other sectors in Skåne and Other sectors in Västra Götaland
    - Life science and Other sectors (total)
    - Life Science and Other sectors (Skåne)
    - Life Science and Other sectors (Västra Götaland)
- Employees: as for sectors but for 0-1 and ≥2 employees
- Age: as for sectors but for 0-7 and ≥8 years

For each question, Spearman's rho has been used to find correlations between:

- Responses and companies' number of employees
- Responses and companies' ages
- Responses and distances from knowledge hubs

The Chi2 test was made using Excel. The calculations were made manually since there was no function for it in the program. The chi2 value (x^2) is calculated as follows:

$$X^2 = \Sigma^R_{r=1}\Sigma^C_{c=1}(f_{obs}-f_{exp})^2/f_{exp}$$

where the two sums indicate that the formula is calculated for all cells. f_{obs} is the observed frequency (number of respondents from the survey) and f_{exp} is the expected frequency. It is calculated for each cell. For example, for the cell in row number 1 and column 2, the expected frequency is calculated:

$$f_{exp(r=1,\, c=2)} = f_{obs,\, sum(r=1)} * f_{obs,\, sum(c=2)} / f_{obs(total)}$$

where $f_{obs,\, sum(r=1)}$ is the sum of observed frequencies of row 1, and $f_{obs(c=2)}$ is the sum of the observed frequencies of column 2. $f_{obs(total)}$ is the total observed frequencies, summed by all cells.

Whether or not there is a significant difference between the two groups value, one can determine by analyzing the chi2 value in relation to the critical value. The critical value is found by calculating the degree of freedom:

$$\text{Degree of freedom} = (\text{number of rows} - 1)*(\text{number of columns} - 1)$$

After that, one can easily look for the critical value in a table where critical values are presented according to their degrees of freedoms and p-value (in this study a p-value of 0,05 has been used). The critical value for a 2x3 matrix (comparing for example Skåne and Västra Götaland in respect to three different responses) is 5,99. If the chi2-value is bigger than this, there is a statistical significant difference between the two groups. A value lower than the critical indicate no statistical significance.

Spearman's rho was calculated using Excel as well as Matlab. The latter was used to calculate ranked means for the ties – something that is much more time-consuming using excel, where it has to be made manually. Calculation of spearman's rho (ρ_s):

$$\rho_s = 1-(6\Sigma d^2)/n(n^2-1)$$

where n is the number of pairs observed and d is the difference in the ranks of each pair (Bernard, 2000). As for the Chi2 test, the analysis of Spearman's rho is made by comparing it to the critical value. For n>30, the critical value of Pearson's r should be used (Welkowitz, Cohen, and Even, 2006). If spearman's rho is bigger than the critical value, there is a correlation between the two groups. If lower, there is no correlation. The closer to 1 and -1, the more positive and negative respectively is the relationship (Bernard, 2000).

2.2.2 Semi-structured interviews

Semi-structured interviews have been made in order to collect data from the academia and the public sector in each region. Since the functionality of the innovation systems is an area that is rather unexplored in relation to its complexity, the questions were designed to be quite open-ended. The open-ended format allows the researcher to take in the interviewees understanding and 'level of knowledge' of issues and allows for 'unusual' responses and replies that the researcher has not contemplated. The semi-structured character of the interviews relates to the series of similar questions that have been used for most of the interviewees, allowing for comparison between different interviewees' responses. In this type of interviewing the researcher typically vary the sequence of questions and has latitude to ask further questions in response to what are seen as significant (Bryman and Bell, 2011)

The interviewees were sampled due to their convenience after a review of secondary data in form of reports, information on websites, etc. Some of them were ones who could not participate in the focus groups. All interviewees are persons in more or less leading positions, known for having good overview of the innovation systems.

Although the sector-chapters from the beginning were planned to be brief and to only comprise secondary data, interviews had to be made in some cases to gain better insight. Still, some of the sectors are mentioned without much detail or depth. Due to time constraints, other 'more important' chapters had to be prioritized.

2.2.3 Focus groups

One focus group in each region has been held in order to gain insight about what challenges there are and what improvements have to be made in the innovation systems as well as what elements are perceived important.

Gibbs (1997, cited in Peterson and Barron, 2007, p.140) state "focus groups are a great way of finding out a group's shared understandings, perceptions, feelings, and common knowledge about a topic and exploring the degree of consensus". In line with this, Bryman and Bell (2011) state that the advantage of discussing things in a focus group is that it brings the understanding of an issue to a higher level by having interviewees interacting and arguing for and against each other. In order to gain new, and sometimes unexpected, insight it is important to stimulate discussion. The disadvantage of focus groups is that they are difficult to organize in terms of different persons' time schedules, they are time-consuming to transcribe, difficult to analyze due to a vast amount of data. Moreover, the researcher has less control over proceedings than in individual interviews since more persons are involved and due to the risk of group effects including individuals who "hog the stage" as well as reticent speakers. The degree of involvement therefore needs to be delicately balanced (Bryman and Bell, 2011), which is not an easy task for an inexperienced moderator. Thus, preparation has become important.

The focus group participants were sampled due to their convenience since persons with good overview of the systems were needed for the tasks. 6 persons in Skåne and 4 ones in Västra Götaland in more or less leading positions participated. According to Morgan (1998a, cited in Bryman and Bell, 2011), a typical group size is 6 to 10. Wilkinson (1999a: 188, cited in Bryman and Bell, 2011) suggest that one should invite more persons since a major problem using focus groups is that people agree to participate but do not turn up. To the reduce the risk of having too few showing up, 13 persons in Skåne, and 11 in Västra Götaland were invited. 9 persons in Skåne and 8 in Västra Götaland agreed to participate. Out of them, 2 persons in each group notified a few days before that they could not come and could not find stand-ins. In addition, one person in Skåne and 2 in Västra Götaland did not show up on the day as agreed. Thus, 6 in Skåne and 4 in Västra Götaland respectively were finally participating. Morgan (1998a, cited in Bryman and Bell, 2011) do however state that small groups are recommended when participants are likely to have a lot to say on the topic. In this aspect, the group of 4 would therefore not have to be a disadvantage.

The issues explored in the focus groups related to what elements of the innovation systems the participants found the most important, what challenges there are, and what

changes have to be made. A method using sticky notes has been employed. Peterson and Barron (2007, p.141) have found in their research that using sticky notes is "a particularly useful addition to focus groups for generating information, checking understanding, and grouping and sorting ideas". It is also " an effective way of actively engaging the more reticent participants in a discussion". For each of the tree questions it was planned that the participants first would write their answers on sticky notes, then present their notes to the others and thereafter group the different notes. Finally there would be time for discussion. This was a rather structured approach which included many steps. Thus, a very precise schedule was made in order to deal with time. Although very well planned, the timeline could not be held in the focus group with 6 participants. The presentation-step was found to be planned too tightly, so the participants widely exceeded the timeframe although interventions asking them to be short were made. Sadly, this affected their time for discussion so that very little discussion could be made. In retrospect, only one main question would have been preferable since the participants were very enthusiastic and willing to discuss and intervene with each other. Thus, for the second focus group, the one in Västra Götaland, the first question was removed since it was less important than the two other. Both this and the fact that it was only 4 participants helped to give more room for the presentations of their answers and discussion.

As suggested by Bryman and Bell (2011), the participants were informed that no one was going to be referred to in the text (although they were going to be included in the references) in order for them to feel free expressing their thoughts. The focus groups were moreover recorded and transcribed. Using sticky notes, transcription was greatly facilitated.

2.2.4 Secondary data

Since the research area is broad and complex, a lot of different type of data had to be collected and analyzed. If only using primary data collecting methods much of the data would not have been possible to collect within the time limit of this thesis. The disadvantage using secondary data is that one has no control over data quality (Bryman and Bell, 2011). Thus, only 'reliable' and well-known sources have been used in this study. Secondary data has not only served as a complement but also been used for comparison with primary data for familiarizing with the area before designing interview questions.

3 Theoretical framework

This chapter begins with an overview of the concept of regional innovation systems. Key elements will be presented shortly. Thereafter the different elements will be more elaborated on in the subsequent subchapters.

3.1.1 Structure of regional innovation systems

Autio (1998) introduces an illustration of how regional innovation systems can be modeled. It is made up by two subsystems; the knowledge generation and diffusion subsystem, and the knowledge application and exploitation subsystem. In addition, Tödtling and Trippl (2005) includes a third subsystem; the regional policy subsystem. These subsystems are further embedded by local interactions and socio-institutional settings (See figure 1).

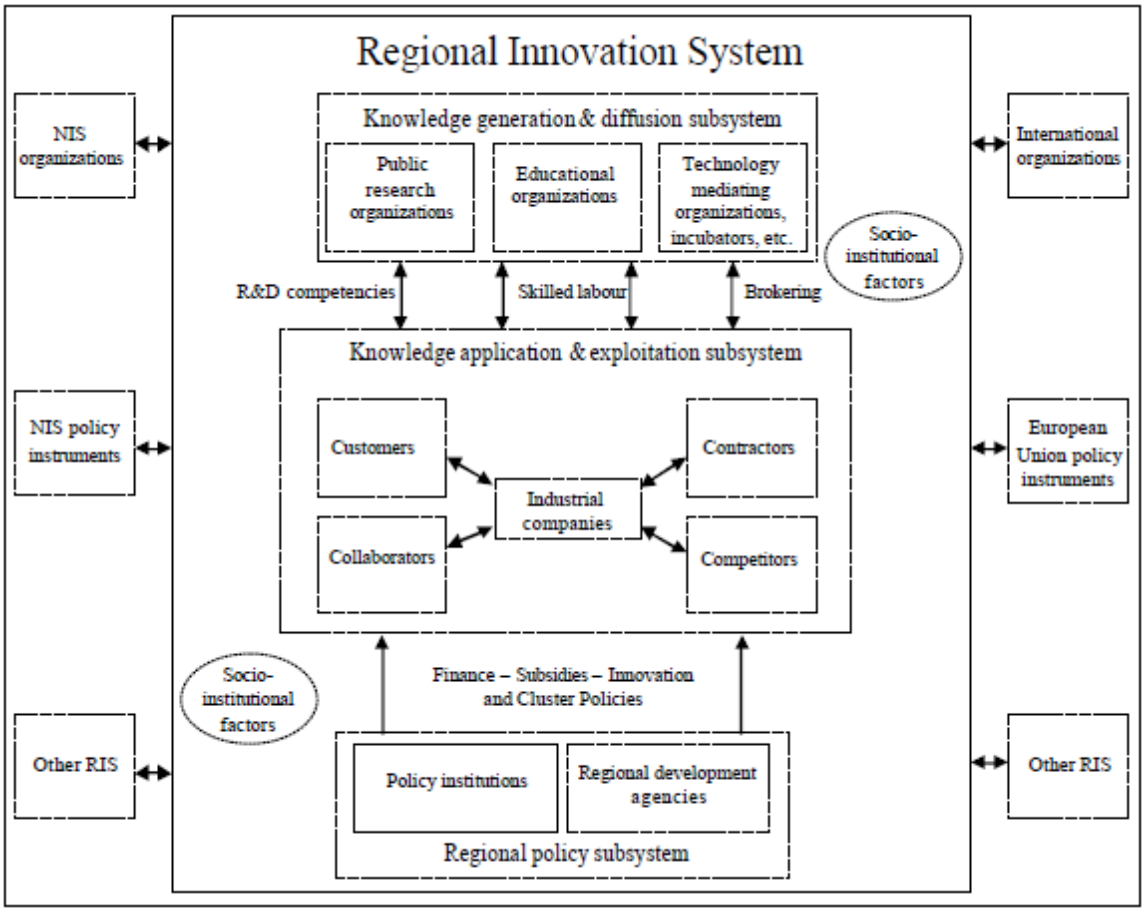


Figure 1. Key elements of regional innovation systems. Source: Trippl (2006) (modification of Autio (1998).

The knowledge generation and diffusion subsystem, also called knowledge infrastructure (Trippl, 2006), is the "physical and organizational infrastructure needed to support innovation" (Doloreux, 2002, p. 248). It is made up by both public and private organizations that are engaged in the production and diffusion of knowledge, expertise,

and skills. The *knowledge application and exploitation subsystem* (or the business dimension), on the other hand, encompasses all companies involved in the system (Autio, 1998, Tödtling and Trippl, 2005; Trippl, 2006). Actors that are engaged in policy formulation and implementation make up the *regional policy subsystem* (Trippl, 2006). At the heart of innovation systems are *local interactions* (the relational dimension). These are key for securing a steady flow of knowledge, human capital, and resources. *Socio-institutional factors* are formal institutions such as laws, regulations as well as informal institutions: values, practices, and routines (Tödtling and Trippl, 2005; Trippl, 2006).

As mentioned, regional innovation systems interlink other regional-, national-, and international innovation systems, for example by the inflow knowledge and expertise, but also by multi-level governance (Autio, 1998; Tödtling and Trippl, 2005; Trippl, 2006).

3.2 Knowledge generation and diffusion subsystem

The knowledge generation and diffusion subsystem (the knowledge infrastructure) is the "the physical and organizational infrastructure needed to support innovation" (Doloreux, 2002, p.248). It comprises all organizations engaged in generation and diffusion of knowledge, skills, and expertise (Trippl, 2006). The academia, industry and public sector are all represented. The actors can be modeled as a 'triple helix' (see figure 2) where the overlapping areas illustrate interaction points (Etzkowitz and Leydesdroff, 2000). A modified version is provided by PwC (2005), which includes non-government organizations as well as enthusiastic citizens – transforming it into a 'penta helix'.

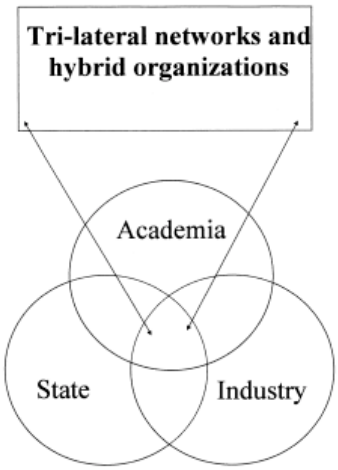


Figure 2. The Triple Helix Model of University – Industry – Government Relations. (Etzkowitz and Leydesdroff, 2000, p. 111)

The organizations in the innovation system are often called "intermediaries" since they transfer knowledge within the region (Smedlund, 2006). Muscio (2010, p.183) states "the emergence of intermediaries has been central in bringing university research to market". They aim to support innovation creation, diffusion, and collaboration (Inkinen and Suorsa, 2010) and do this by for example promoting collaboration between key actors in the region, ensuring that regional strategies are consistent and up to date, forming regional forums for knowledge sharing, generating national and international links and networks, making the region attractive for entrepreneurs, attracting anchor tenants to the region, and providing support for SMEs (Smedlund, 2006). There are frameworks that divide the knowledge infrastructure into several categories related to their functions. For example Autio (1998), supported by Tödtling and Trippl (2005) divides it into four main types of organizations: public research organizations, technology mediating organizations, educational organizations, and workforce mediating organizations. Doloreux (2002) divide it into three parts: innovative support structures, knowledge diffusers, and production, coordination of

knowledge (including education). It is however not clear-cut how to categorize actors in the knowledge infrastructure since the different parts often overlap. I have therefore chosen to divide it into two broad categories: the first one encompasses production and coordination, and diffusion of knowledge, and the second covers the innovation support system.

Doloreux (2002) categorizes one part of the knowledge infrastructure "production and coordination of scientific and technological knowledge as well as education and R&D with respect to technology". Examples of such agents are universities, R&D institutions, research institutes, and national laboratories (Doloreux, 2002), competence centers, contract researchers (VINNOVA, 2006), and research-oriented companies (Edquist, 2005). Knowledge transfer from universities to industry is often in form of recruitment of university graduates, personnel exchanges, joint research, contract research, consulting, patents and publications, licensing, spin-off companies, industry funded laboratories and other facilities, and informal contacts, meetings, and conferences (Muscio, 2010). It is however also important to note that universities have a much wider role than "just" educating students and transfer knowledge to industry. They also contribute to the development of the regional innovation systems by delivering advice to politicians and policy makers, informing general public debates. Indirect effects of HEIs' presence are for example in terms of reputation of world class research, regional branding, attraction of high-tech companies, etc. (Caniëls and van den Bosch, 2011). Usually research institutes/government laboratories perform a significant part of countries' R&D and knowledge transfer and thus play a major role in innovation systems. This is however not the case in Sweden where their role is, to a higher degree, put on by universities (Edquist, 2005, VINNOVA, 2006).

In a study of US R&D laboratories Crow and Bozeman (1998, cited in Bozeman, 2000) found that university laboratories are more focused on basic research than what government laboratories are. The latter are instead more concerned with technology development (applied research) than the former. Concerning technology transfer as well as publishing of scientific research, the difference was only minor. Bozeman (2000) states that government laboratories have a better ability to perform interdisciplinary team research, which is often problematic at universities since the latter are rather rigid in their organizational structure: "organized as they are on the same disciplinary lines as they have been for the past 50 years" (Bozeman, 2000, p.635). The most important difference is however the presence of students at universities, which serves as transfer agents of technology from universities to industry and government.

Borysiewicz (2012) argue that the strongest economic effects are gained if universities deal with both basic and applied research. The reason is because the applied research made by the industry today is based on yesterday's basic research. Down-prioritizing of applied research will therefore bare consequences of technology lagging behind in the future. Borysiewicz (2012) is doubtful to leaving the applied research to research

institutes. He refers to Cambridge which has developed a range of support functions (innovation offices, science parks, incubators, and subsidies) that are aimed for promoting start-ups from scientific findings. Moreover, the fact that the university possesses knowledge from many different sources and from many different domains means that knowledge can be combined in a variety of new ways, resulting in interesting interdisciplinary innovation. Today there are more than 1400 high-tech companies in Cambridge, many of which derive from the university.

The innovation support system is made up by all organizations that aim to support innovative SMEs. The support is often in terms of provision of general information, advice (Hassink, 2002), and financing (Tödtling and Kaufmann, 2002). Vonortas (2002, p.4, cited in Smedlund, 2006, p.210) states "Frequently, the most useful type of assistance to SMEs is not technological but more general business oriented such as locating and approaching the customer, achieving a steady cash flow, developing relationships of trust, accessing finance, managing the firm effectively, and training the employees". In this aspect, incubators play an important role. They aim to develop a milieu for start-ups to grow by assisting entrepreneurs with for example management support and the development of financial, technical, and commercial networks. In Sweden, incubators are often collocated with science parks (VINNOVA, 2004). Other examples of actors that make up the support system are business developers, mentors, patent offices, agents for juridical advice (VINNOVA, 2006), chambers of commerce, employers' unions, banks, universities, and training centers (Saxenian, 1994 cited in Smedlund, 2006), science parks, technopoles, innovation support agencies, community colleges, and initiatives to support clustering of industries (Hassink, 2002), etc. University-based organizations that support the commercialization of academic research are called technology transfer offices (TTOs). Their focus lies on helping researchers with IPR-issues, but the objectives and organization of TTOs can vary (Muscio, 2010).

In a study made in Upper Australia the authors found that the most common reasons for not taking advantage of innovation support is lack of information regarding support opportunities (64% of all companies) and costly application procedures and project documentation (40%). Interestingly companies claiming they were not in need for any support were mostly very small ones (Tödtling and Kaufmann, 2002).

3.3 Knowledge application and exploitation subsystem

The knowledge application and exploitation subsystem is made up by firms, their clients, suppliers, industrial partners, and competitors. Networks and constellations of these are often called 'clusters'.

Clusters can be defined as "geographically proximate groups of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities" (Porter, 2001, p.53). Thus, a cluster can include different types of

industries, but an industry may not only be related to just one cluster. Clusters can moreover be composed of several *subclusters*.

Central in cluster-theory is that productivity and innovation are positively affected in clusters due to important synergies that stem from different organizations' commonalities, complementarities (Porter, 1998; Porter, 2001), and interdependences (Rosenfeld, 1997). Porter (1998, p.81) states "A cluster allows each member to benefit *as if* it had greater scale or *as if* it had joined with others without sacrificing its flexibility". The synergies produced are often a result of personal relationships, face-to-face communication and close networking between individuals and institutions. As Padmore and Gibson (1998, p.672) put it "A cluster is a concentration of firms that prosper because of their interaction". This leads us to one of the other main concepts of clusters, i.e. that of proximity, which entails that interaction and communication is greatly facilitated by short distances between actors (Rosenfeld, 1997; Porter, 1998). Agglomerations therefore often have higher concentration of R&D activities, patenting and major product innovations (Tödtling and Trippl, 2005).

The *emergence* of a cluster can often be traced long back historically. Some clusters arise as a result of local demands for addressing certain problems. Other clusters grow out of prior, related ones, and yet others result from one or two innovative companies that stimulate growth in new directions. Clusters can also arise from chance events such as a country's choice to locate a certain test or research facility in an area. Cluster *growth* is often a result of a self-reinforcing cycle, where it triggers the formation of new specialized suppliers and service providers, specialized training, infrastructure, new investment in research, etc., which in turns increases the cluster's visibility and prestige. This results in increased market opportunities and falling entry barriers, which triggers new business formation. As a cluster grows it also gains enhanced influence over public and private institutions and policy. The growth rate is often especially high in intersecting areas since diversity tends to stimulate innovation. Clusters most commonly *decline* because of technological discontinuities - when sudden new technological paths render prior technologies and knowledge irrelevant. Shift in demand is another factor that can trigger decline. Internal mechanisms are however as destructive to clusters as external mechanisms are. Examples of such internal mechanisms are group-thinking that hampers new ideas, restrictive rules and regulatory inflexibility, and different kinds of restraints to competition (Porter, 1998; Porter, 2001). Old industrial areas with a predominance of mature industries and externally controlled companies are usually less innovative. They often have a stronger focus on incremental and process innovation than radical and product innovation. The former type is also often more present in peripheral areas than in agglomerations where the latter type is more common (Tödtling and Trippl, 2005). Rosenfeld (1997) states that "branch plants and large corporations undermine the value and sustainability of clusters". He means that clusters can become too dependent on a few big firms which can exercise significant power over for example small subordinate suppliers. There is also the risk of the large corporations leaving their communities and

clusters of different reasons, for example moving to places where costs are lower or because of being acquired.

3.3.1.1 Size matters

A study made by Tödtling and Kaufmann (1999) revels that small firms (with less than 50 employees) tend not to interact much externally in the innovation process, except from with customers within the region. On the one hand the result is regarded as surprising since small firms has limited resources and thus would be in need of partners with complementary assets. On the other hand, small firms do have fewer innovation activities and do seldom know about potential partners or supply of innovation support. It is notably that innovation support activities like technology transfer do not seem to reach small firms, which actually are their main target. Medium sized companies (50-200 employees) are more integrated to the innovation system, both in term of interactions with other firms and to support organizations. They are also interacting more with actors on a national scale. Large firms do however have most external linkages in the innovation process, regional, as well as national and international. Although interacting within a larger space, they are more intensively linked to universities, research organizations, technology transfer and training in the region than small and medium sized firms (Tödtling and Kaufmann, 1999).

3.4 Regional policy subsystem

This chapter begins with a short description of the actors that make the regional policy subsystem. The chapter is thereafter divided into two parts: Innovation policy and Governance. The former concerns policy issues such as the smart specialization concept and policy recommendations related to different regional barriers. The latter concerns the governance of regional innovation systems and deals with such things as modes of regional autonomy, top-down/bottom-up initiatives, and the role of the regional government.

Actors in the regional policy subsystem include public authorities and regional development agencies as well as other actors engaged in the development and implementation of policies and strategies for the innovation system and its clusters (Trippl, 2006).

3.4.1 Innovation policy

Regional innovation policy has during the last decades experienced "a shift from firm-centered, incentive-based, state-driven, and standardized regional economic development policies to bottom-up, region-specific, longer term and plural-actor policies" (Amin, 1999, cited in Hassink, 2002). There has been an increased recognition of the importance of knowledge diffusion. This has also gained much focus in the innovation policy literature (Pyke, 1994, cited in Hassink, 2002; Lorenzen, 2001; Fritsch and Franke, 2004), which is centered on the creation of knowledge infrastructure and institutions that supports such

things as knowledge generation and diffusion, learning, and communication (Lorenzen, 2001).

It is however difficult to provide general policy advice that can be implemented in all types of innovation systems. Lorenzen (2001) writes "The diversity of the dynamics of the existing localized learning systems and the structures and institutions that support them means that it is difficult to give general policy advice". In "One size fits all? Towards a differentiated regional policy approach" Tödtling and Trippl (2005) state that recommended innovation policies often are designed in an undifferentiated manner, ignoring important regional differences. Strengths and weaknesses in different areas are not sufficiently taken into account. Instead of following 'best practices', policies need to be designed to fit the innovation systems' specific conditions (Lorenzen, 2001; Hassink, 2002; Tödtling and Trippl, 2005; Henning, Moodysson, and Nilsson, 2010).

Although no innovation system is the other one alike, there might be certain conditions that can benefit from some more general type of advice. For example, Isaksen (2001) has identified three major regional barriers and obstacles for the functioning of innovation systems, which all require different type of intervention. These are outlined in subchapter 3.4.1.2 below.

3.4.1.1 Smart specialization

One more general type of policy recommendation that has gained much attention lately is the one of *smart specialization.* It is a concept embraced by the European Association of Development Agencies, which argue that regions should focus on what they are world leading in: "It pays off to focus efforts on a few areas rather than spreading resources over many" (EURADA, 2011, p.7). Emphasizing smart specialization strategies means focusing public resources on a few activities/industries that have strong competitive advantages and that allow regions to differentiate from their neighbors' or their competitors' areas. The report "Directory of "Non-nonsense" Activities To Build S^3-minded Regions" (EURADA, 2011) further explains that "most regions look to the same sectoral priorities (biotechnology, nanotechnology,…) to sustain growth though they have little assets and chance to be world leaders" (EURADA, 2011, p.7). Strategies that allocate resources to those sectors where one always will be a laggard are inefficient. Instead, resources should be focused on a region's most promising areas of comparative advantage, e.g. existing and emerging clusters, cross-sectoral activities, eco-innovation, high value-added markets or specific research areas. Thus, public funds and resources can be used more effectively if focusing on a few promising key priority areas rather than allocating resources thinly across many (EURADA, 2011).

In line with the concept of smart specialization, Porter (1998) put forth the importance of "building on local sources of uniqueness": "Finding areas of specialization normally proves more effective than head-on competition with well-established rival locations" (Porter, 1998, pp.89-90). He does however warn for abandoning less advantageous

clusters. He states "the aim of cluster policy is to reinforce the development of *all* clusters. This means that a traditional cluster such as agriculture should not be abandoned; it should be upgraded. Governments should not choose among clusters, because each one offers opportunities to improve productivity and support rising wages. Every cluster does not only contribute directly to national productivity but also affects the productivity of *other* clusters" (Porter, 1998, p.89).

3.4.1.2 Regional barriers

There are three major *regional barriers* and obstacles for the functionality of innovation systems: organizational thinness, fragmentation, and lock-in (Isaksen, 2001; Doloreux, 2002; Tödtling and Trippl, 2005). *Organizational thinness* is often present in peripheral regions encompassing a low number of firms, lack of relevant other regional actors, and lack of a knowledge infrastructure capable to support collective learning. Regions with organizational thinness often have difficulties building organizations that stimulate firms' innovation activities. Yet other regions may encompass relevant actors but have problems forming a functioning innovation system. In these so-called *fragmented regions*, interaction between actors is hampered (Isaksen, 2001). Usually the link between universities and firms is weak, but also the one between firms, except from customer-supplier relationships. The lack of networks and interactive learning results in less formation of new firms and less development of new technologies than what can be expected (Tödtling and Trippl, 2005). This is especially the case in more established and internationalized industries such as automotive and chemicals. Newer sectors seem to be better at developing innovation networks (Schamp, 2001, cited in Tödtling and Trippl, 2005). In regions that suffer from *lock-in*, innovation systems exist but they are too closed and their networks too rigid[7]. Institutional, social, and cultural lock-in of business behavior is often a result of homogenous thinking and/or of path dependency, which characterizes historically strong innovation systems (Isaksen, 2001) and old industrial regions (Tödtling and Trippl, 2005). These types of regions are overspecialized in mature industries which experience decline. Large firms often dominate the innovation systems and their R&D activities are primarily focused on incremental and processes innovations. Knowledge generation and diffusion is however often highly developed, but tends to reach large firms better than small ones (Tödtling and Trippl, 2005). The regions often run into severe adjustment problems when technological trajectories and global economic conditions change. Instead of trying to adapt to the new settings, politicians and labor unions sometimes wrongly protect and subsidize declining industries (Isaksen, 2001). Such political lock-ins where public and private key actors have strong and symbiotic relationships hamper industrial restructuring (Grabher, 1993, cited in Tödtling and Trippl, 2005).

Regions with *organizational thinness* can often benefit from policies that help to link the regional firms to relevant national and international knowledge resources and firms. Thus, broker organizations play an important role for such regions. Policies should also

[7] Functonal lock in (Grabher, 1993)

be pointed at attracting and retaining innovative firms as well as skilled labor. Polices in *fragmented regions*, however, should be focused on improving the institutional infrastructure as well as developing and strengthening regional networks (Isaksen, 2001; Tödtling and Trippl, 2005). University-industry partnerships are supported by, for example establishing research centers. Moreover, the support infrastructure needs to be strengthened especially in areas with a low degree of new firm formation (Tödtling and Trippl, 2005). Isaksen (2001) recommends that firms and knowledge organizations should be invited and collectively engaged in formulating regional innovation strategy, creating collaboration nodes as well as bridges between firms and technological and knowledge resources. In order to break path dependency, regions characterized by *lock-in* need to encourage transition to new sustainable fields and to renew traditional networks as well as stimulating new ones (Isaksen, 2001; Capello, 2002; Tödtling and Trippl, 2005). Rebuilding the knowledge bases, policies needs to focus on renewing the innovation infrastructure so that relevant research centers, collaboration nodes, support organizations, technology transfers, the right labor supply, etc. back up business activities in new fields. In this way, diversification, modernization, spin-offs, and new firm formation are stimulated. Foreign investments (Isaksen, 2001; Tödtling and Trippl, 2005) and a higher degree of external networking (Capello, 2002) might also be needed in order to strengthen the innovation system with complementary knowledge (Isaksen, 2001; Tödtling and Trippl, 2005).

This subchapter is probably best finished by referring to Cooke's (1995, cited in Rosenfeld, 1997) conclusion: "regional industrial policy can be judged successful if, over an extended period of time, it can show that it learns and is able to move forward - from the framework of opportunities offered within declining industries -into new industries and new processes".

3.4.2 Governance

Depending upon the policy-making actors' degree of regional autonomy they can have very powerful roles in shaping innovation systems (Tödtling, and Trippl, 2005). Some contributive factors are decentralization, strong regional institutions and governance, trust relationships, and strong commitment of regional political leaders (Atkinson, 1991, cited in Hassink, 2002).

Cooke et al. (1997, p.481) state "A region's capacity to mobilize its innovative resources is linked to the regional government's budgetary availability". They distinguish between three types of *spending capacity*. Regions which have little autonomy to direct their own innovation systems are said to have *decentralized spending*. In these cases the central governments design the policies and channel their resources through the regions. In difference to regions with decentralized spending, regions with *autonomous spending* are free to design their own spending policies. They therefore have greater capacity to, by themselves, direct efforts in innovation. Even greater autonomy do regions with *taxation authority* have. The taxation authority enables regions to actively carry out innovation

policies through both public spending and the fiscal system. They can for example benefit innovative firms and institutions by reducing their taxes (Cooke et al, 1997; Cooke, 2001).

Smaller countries may however not be as much in need of a regional level of governance as larger countries are (Cooke et al, 1997; Hassink, 2002). Bigger countries with many SMEs and strong economic inequalities are generally more in need for regionalized innovation support systems (Hassink, 2002). In for example UK and France, studies indicate that innovation systems tend to be less efficient when controlled from the national government (Cooke et al, 1997).

Concerning cluster promotion, the public and private sectors can be involved to different degrees. Promotion that are funded by and stem from the public sector are called to be governed *top-down*. *Bottom-up* initiatives, on the other hand, come from the private sector. This latter type refers to self-organization of clusters where companies are "upgrading" their clusters by collective action and 'cluster governance'. Although a distinction between the two, it should be noted that top-down initiatives also require involvement from the private sector in activating, designing, and implementing its initiatives, as well as bottom-up initiatives often need some type of encouragement, small participation, or acceptance by the public actors. The two different types of cluster promotion are favorable depending on settings. Bottom-up promotion is better suited in regions and clusters where the knowledge infrastructure is more developed. It is a favorable type of promotion especially when it comes to supporting interaction and collaboration among companies. It is said to promote stronger motivation among cluster members (Fromhold-Eisebith and Eisebith, 2005). Furthermore, companies are better at identifying obstacles, constraints and opportunities that may arise. They are also said to be better at implementing the initiatives. Yet another benefit is that possible political content is reduced (Porter, 2000). Top-down initiatives, on the other hand, are initially better where "regional structures show a lack of material assets and entrepreneurs, and where actors have so far been operating isolated from each other" (Fromhold-Eisebith and Eisebith, 2005, p.1265). In these settings, top-down initiatives can provide companies with a larger number and range of contacts. Fromhold-Eisebith and Eisebith (2005, p.1266) do not recommend a simultaneous combination of the two types of initiatives since it "bears the danger of counterproductive rivalry of different cluster coordinators, a mal-coordination of efforts, and a clash of (private against public) cultures that irritate firms". They do however also state that such combination can result in complimentary, but that depends on the personalities involved.

EURADA (2011) elucidate the importance of smart specialization strategies not being imposed top-down. Rather, identification of promising areas as well as obstacles to innovation should be made in collaboration with firms, research centers, and universities.

3.5 Local interactions

Relationships and local interactions are at the heart of innovation systems. It is through these learning and absorption of knowledge take place (Asheim and Isaksen, 1997; Edquist, 2005; Asheim and Coenen, 2005a), and eventually innovation and economic value rise (Capello, 2002). Fritsch (2002) states that it is not the elements in a region that determines the efficiency and output of an innovation system, rather it is the density, interaction, and quality of the system's networks that make a difference. The importance of interactions are for example put forth in studies that have shown that between 62% and 97% of all product innovations are made in collaboration between firms and other organizations (Asheim and Isaksen, 1997; Edquist, 2005; Asheim and Coenen, 2005a).

Transfer of *tacit* knowledge is especially dependent on close interpersonal and inter-firm relations. Its embeddedness in for example production practices and know-how makes it much more "stickier" than *codified* knowledge (McKinnon, Cumbers, and Chapman, 2002; Cooke et al., 1997). The "stickiness" makes proximity play a critical role for tacit knowledge transfer to take place (Fritsch, 2002; Fritsch and Franke, 2004; Capello, 2002; Tödtling and Trippl, 2005; Fallah and Ibrahim, 2004). Moreover, transfer of tacit knowledge seems to take place to a higher degree in agglomerations than in peripheral areas (Tödtling and Trippl, 2005; Fritsch, 2002). It is also more present in specialized areas "where sectoral homogeneity leads to high local interactions" (Capello, 2002, p.182). Transfer of tacit knowledge can be intentional as well as unintentional. The latter is in form of knowledge spillovers. Like intentional knowledge transfer, knowledge spillover can also be an effect of relationships and interaction, but then unintentionally (Fallah and Ibrahim, 2004). Medium for knowledge spillovers are for example cooperative relationships, publications, purchased goods and services, and the inflow of workers form universities into firms as well as the fluctuation of employees between different employers (Fritsch, 2002). Asheim and Coenen (2005a) argue that "sticky" knowledge is an important means for competitive advantage among regions internationally. Fritsch and Franke (2005) do however state that there is no evidence for knowledge spillovers' positive impacts on innovation processes and economic development. Instead, they state that there is a widespread understanding among researchers that the spillovers can have such notable impacts.

Asheim and Coenen (2005a; 2005b) state that innovation processes of firms and industries depend on what *knowledge base* they make use of. They distinguish between two types; synthetic and analytical. *Synthetic knowledge bases* refer to incremental innovation processes which are based on the application of existing knowledge. This is often the case in engineering-based industrial settings where R&D generally is less important and products are made in small series, for example in specialized advanced industrial machinery, plant engineering, and shipbuilding. Here, tacit knowledge is highly important since knowledge mainly results from experience and learning-by-doing. *Analytical knowledge bases*, on the other hand, are present in science-based settings that rely heavily on scientific knowledge and R&D. Innovation depends on the creation of new

knowledge and is thus of a more radical nature. Companies do also tend to collaborate more with research organizations.

3.5.1 Three types of regional innovation systems

Related to different modes of interaction, Asheim and Isaksen (2002) and Asheim and Coenen (2005a) distinguish between three types of regional innovation systems. In the first one, t*erritorially embedded regional innovation system* "firms base their innovation activity mainly on localised learning processes stimulated by social and cultural proximity without much interactions with knowledge organisations" (Asheim and Isaksen, 2002, p.83). Innovation is primarily based on synthetic knowledge. In difference to the first one, *regionally networked innovation systems* involve public–private cooperation. The system is strengthened by R&D institutes, vocational training organizations, etc. and has therefore a more planned character. The supporting infrastructure helps to counteract lock-in. This is more or less an ideal type of regional innovation system. In this system synthetic knowledge bases exists, but there is a much higher degree of reliance on analytical knowledge bases than what it is in the former type of innovation system. In *regionalized national innovation system* however, firms rely more on national and international innovation systems since cooperation with other actors mainly take place outside the region (Asheim and Isaksen, 2002; Asheim and Coenen, 2005a).

3.6 Socio-institutional factors

Socio-institutional factors are both in form of "hard" formal institutions (laws, regulations, etc.) and "soft" informal institutions related to cultural settings, such as behavior, values, routines, attitudes, etc. (Trippl, 2006). They shape the way individuals, groups, and organizations behave and interact with others (Cooke, 1997; Edquist, 2005; Trippl, 2006). Tödtling and Kaufmann (2002, p.700) list three main functions of institutions related to the innovation process: "First they reduce uncertainties, e.g. through standards or the provision of information. Second they regulate conflict between various actors and give rules for cooperation. Third, they provide incentives for innovation by granting economic and other rewards (e.g. through the protection of patents for a certain time)".

In a culture people acquire, evaluate, codify, and evaluate information in a distinct way. Sweeney (1995, cited in Cooke et al., 1997, p.488) state that people are "quickly responsive to types of information which are perceived to be significant" and they "quickly communicate it in a very easy and cost-effective manner". Thus, the efficiency of an innovation system is largely affected by the culture in the region. A region showing positive cultural attributes is well equipped to develop its innovation processes regardless its financial infrastructure's characteristics. Such positive attributes are for example culture of cooperation, trust, quest for consensus, existing interface mechanisms, university linked to the productive system (Cooke et al., 1997). A shared vision and leadership is central when aiming for collective competitiveness. It is advantageous if the

companies think of themselves as a part of a bigger system and if they together plan for the future and share goals and visions (Rosenfeld, 1997; Rosenfeld 2002). Porter (2001) also underlines the importance of cluster awareness among the members since it enhances the willingness to coordinate activities that help to improve the business environment. Negative attributes that hamper an innovation system's efficiency are in form of competitive culture, individualism, dissension, and 'not-invented here'-mentality (Cooke, 2001).

4 The Swedish Innovation System

This chapter aims to give a short overview of the Swedish innovation system since it is closely interlinked with the regional innovation systems. It will furthermore elucidate some characteristics and trends, which also apply to Skåne's and Västra Götaland's innovation systems.

The Swedish Innovation System is characterized by its dependence upon the public sector. The Öresund Science Region (2007, p.14) writes "the State has an overall responsibility to ensure that Sweden develops new knowledge, as well as makes use of it". The main public actors can be divided into four categories (see figure 3). The first refers to *general policy making* actors involved in the development of official strategies, guidelines, laws, and legislations. The second provide *financing and policy support* for innovation activities and R&D. Actors in this category are for example the Swedish Research Council (VR) and the Swedish Agency for Innovation Systems (VINNOVA). The third is *performers of R&D*, such as HEIs (Higher Education Institutes) and research institutes. The fourth one is constituted by actors that foster *commercialization and entrepreneurship*, such as science parks, incubators, Almi, and the National Agency for Economic and Regional Growth (Tillväxtverket).

The state allocates research funds either directly to the HEIs and institutes, or through research councils and sectoral research agencies. Local authorities and county councils (regional councils in Västra Götaland and Skåne) do also allocate funds. They are moreover concerned with policy making and in the "creation of an environment suitable for innovation and the exploitation of new technologies" (Öresund Science Region, 2007, p.16). The three research councils, VR, FAS, and Formas, allocate funds to the universities where the scientists themselves decide the direction of the research. Mission oriented research funds are provided by VINNOVA and sectoral-based agencies. The foundations KKS and SSF provide additional resources for strategic R&D. Moreover, the Research Policy Council (RPC) and the Innovation Policy Council (IPC) provide support and advice in policy issues, and ITPS provide analysis and policy evaluation. At the universities, technology transfer offices promote innovation. They help researchers with idea development and give advice and guidance in questions regarding commercialization. Besides this, the universities have holding companies that commercialize R&D and promote knowledge transfer.

The Swedish innovation system has four key bodies that support commercialization and entrepreneurship (Öresund Science Region, 2007). The Swedish Agency of Economic and Regional Growth aims to "strengthen regional development and facilitate for enterprise and entrepreneurship" (Swedish Agency of Economic and Regional Growth, 2012). Its work include, among other things, modeling of regulations, capital supply, information, counseling, cluster policies, etc. Almi provides SMEs with innovation support such as business development counseling and financing. It is regionally organized and is partly

owned by the national government and regional and local bodies. Innovationsbron is more concerned with research-based and knowledge-intensive ideas. It is operating at a regional level, but has a national strategy. Its support is in form of financing, business support as well as promotion of collaboration and networks. Industrifonden, on the other hand acts more like a private venture capitalist (Öresund Science Region, 2007), investing in SMEs in the growth phase or with growth potential (Industrifonden, 2010).

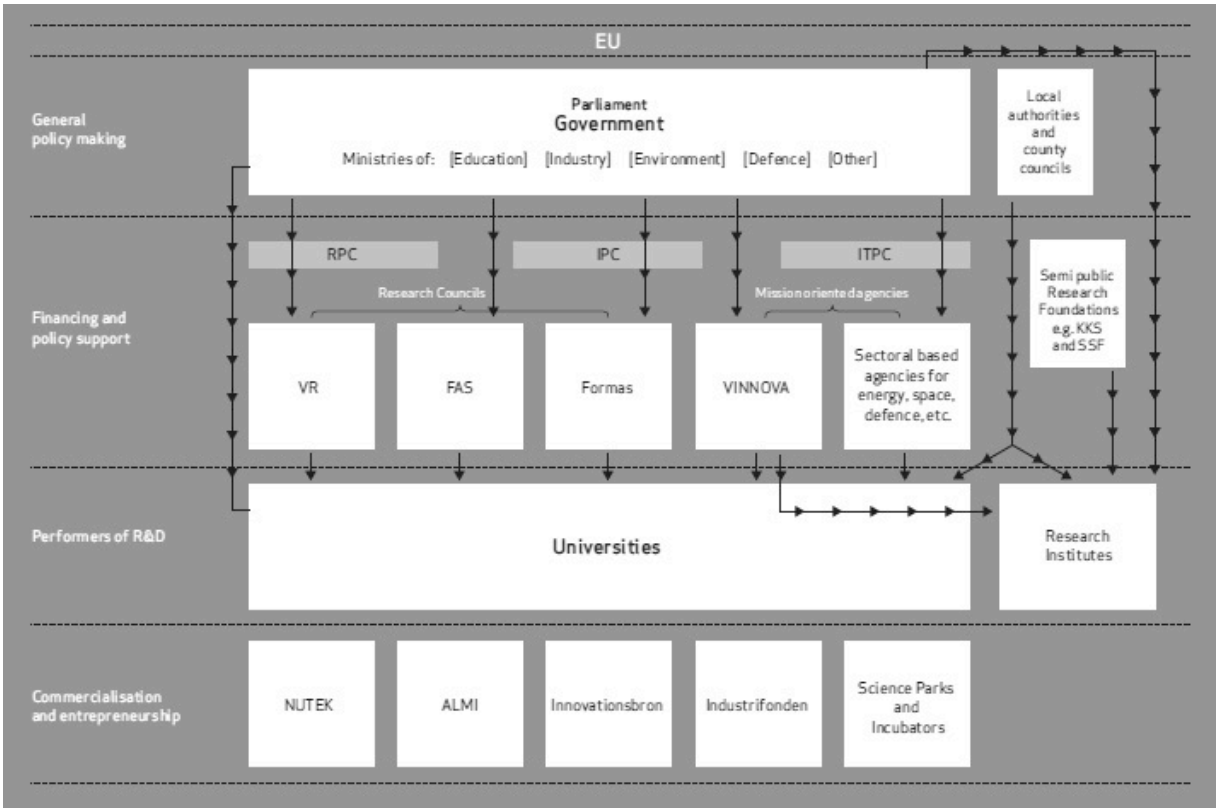


Figure 3. Main public and semi-public actors in the Swedish innovation system (Öresund Science Region, 2007).

4.1 Notes on the Swedish innovation system

Below are shortly presented some characteristics of and notes on the Swedish innovation system. These are worth mentioning since they are shared also at a regional level.

Research institutes and teachers' exception. The Swedish innovation system is characterized by an institute sector that is marginal from those in other countries. This means that the universities instead have to take a bigger role performing applied research (Öresund Science Region, 2007; Lundvall, 2008). Another characteristic of the Swedish innovation system is that it applies the 'teachers' exception', meaning that the researchers keep the intellectual property right of their inventions (Öresund Science Region, 2007). Philipson (2004) believes that this is inefficient arguing that university-based inventions should not rely on single researchers to commercialize. The researchers are researchers and are not suited for the entrepreneurship that the commercialization process requires. Instead he would like to see a model that is often utilized abroad where the universities own the patents, but stand for the commercialization and award the researcher with 30-40% of the profit. Skarin (2012) thinks that researchers should have the right to own

their results, but that there should be some type of obligation for commercialization. The researchers should either commercialize it themselves or letting the technology transfer offices do it. He thinks that it is a pity if the findings do not come into use: it is after all the taxpayers' money that has been invested.

Challenge-driven innovation. Due to global challenges such as climate change, pollution, resource depletion, heath issues, etc., VINNOVA has been given the responsibility to implement a new innovation strategy aiming at addressing such challenges (Swedish Government, 2012a). Four broad categories are assigned extra promotion; Sustainable and Attractive Cities; Health, Wellbeing, and Medical Care; Competitive Industry[8]; and Information Society 3.0[9] (VINNOVA, 2011a).

Regulations and taxation. Sweden has during the past years had a relatively high corporate taxation, above OECD- and EU-average (see figure 4). However, in the budget Bill 2012, the Swedish Government proposed a decrease of the taxation from 26,3% to 22%, and thereby ends up below the averages. The government argues that the corporate taxation plays a significant role for companies' decision for future investments and localization and thereby affects the production and employment in the country (Swedish Government, 2012b).

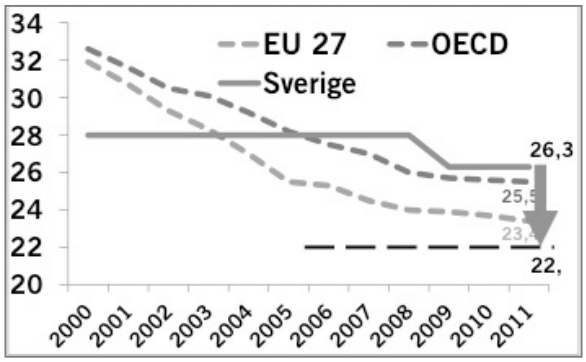


Figure 4. Corporate taxation. (Swedish Government, 2012b)

Incubator support. When a company in the Swedish innovation system applies to an incubator, it also has to apply for financing. The two applications are however separate from each other, since the incubators only provide workspaces and advice: financing has to be applied for elsewhere, for example at Innovationsbron, Almi, or VINNOVA. The financing and incubator support do however both come from public funds. The company goes through two tough selection processes separately to reach support that originates from the same source. Frostberg (2012) believes that this is rather inefficient and complicates things for the companies. Instead he argues for an adoption of the Danish 'innovationsmiljøer', where financing, workspaces, and advice are collocated from day one.

[8] Promotion goods and services, which are sustainable and contribute to Swedish competitiveness.
[9] ICT

5 Overview of the regions from an innovation perspective

This chapter aims to bring an overview of the regions from an innovation perspective, before presenting the functionalities of the innovation systems. The chapter starts with a review of Skåne's and Västra Götaland's performance in terms of some innovation related factors based on data from the Regional Innovation Scoreboard (European Union, 2012), the World Knowledge Competitiveness Index (Huggins and Izushi, 2008), and Center of Strategy and Competitiveness (2012). This review aims to provide an overview of the status of Skåne and Västra Götaland in relation to regions that exhibit similar characteristics. The regions benchmarked are ones that, in similarity to Skåne and Västra Götaland, are categorized as 'knowledge hubs' in Europe by OECD. Through Ajmone Marsan and Maguire (2011, p.14) OECD define 'knowledge hubs' as "regions with the highest wealth levels and best performance on science- and technology-based innovation-related indicators, such as R&D and patenting". Here, they are called 'innovative European regions'. Diagrams on their performance related to different factors mentioned in this chapter are found in Appendix II and III. Later in the chapter, general actors in both systems are presented in order to gain an understanding of what structures are in place in both regions (See also textbox 1 and 2 for descriptions of the regions' local knowledge hubs).

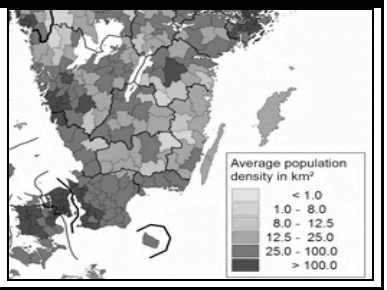
	Area	Population	GDP per Capita	Population Density
Skåne	11 000 km²	1,2 millions	26831 €	
Västra Götaland	24 000 km²	1,6 millions	29462 €	
Source	SCB, 2012	Region Skåne, 2010; VGR, 2012c	(2011) Center for Strategy and Competitiveness, 2012	

Table 1 and Figure 5. The figure illustrates the average population density and originates from Nordic Centre for Spatial Development (2011).

Skåne and Västra Götaland have comparable population sizes, but the former has an area twice as large, making Skåne more densely populated (table 1). As seen in figure 5, the populations of the two regions are more concentrated around their larger cities, Malmö, and Lund, Helsingborg in Skåne and Göteborg, Borås and Trollhättan in Västra Götaland.

When it comes to employment, Västra Götaland performs average of the Swedish regions. Skåne has however a historically low employment rate. Although some progress in the rapid growth years 2006-2007, Skåne has not changed it's position as the worst performing region in Sweden. This is much due to the region's high immigration inflows during the last years. The employment rates in Sweden were however among the highest of the OECD-countries before the crisis (OECD, 2012). When looking at economic activity rates from 2008 (labor force as % of working age population), Västra Götaland is performing next best among the innovative European regions, closely followed by Skåne

(Huggins and Izushi, 2008). Among these regions, Västra Götaland and Skåne lie in the middle segment regarding employment in knowledge intensive services and medium-high/high-tech manufacturing (European Union, 2012). Figure 6 gives an overview of some major industries in the regions and their share of the total number of employees. Comparing this with the technology intensity definition found in Appendix IV (OECD, 2011), it is seen that high-tech and medium-high-tech industries are well represented in the regions.

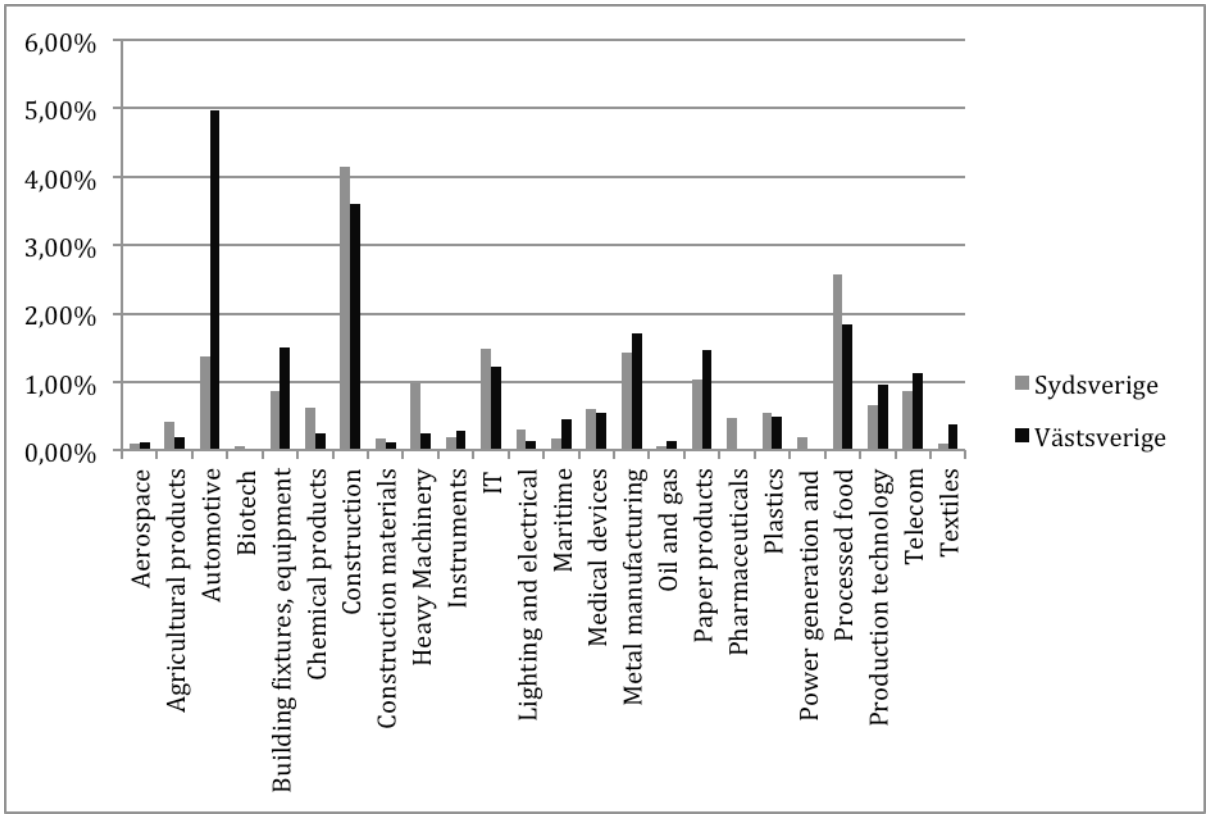


Figure 6. Number of employees in each sector (Center for Strategy and Competitiveness, 2012) divided by total number of employees in 2010 (SCB, 2012). [10]

The elements in the paragraph above are factors contributing to a region's innovative performance (European Union, 2012), knowledge intensity, and competitiveness (Huggins and Izushi, 2008). Analyzed with some other factors in the Regional Innovation Scoreboard 2012 (European Union, 2012), Skåne scores amongst the highest in the 'innovation leader' segment. In difference, Västra Götaland

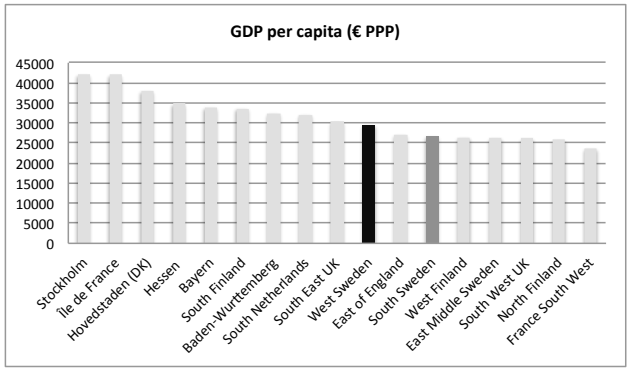


Figure 7. GDP per capita (€ PPP). Diagram based on data from Center of Strategy and Competitiveness (2012).

[10] Number of employees is for Sydsverige and Västsverige, whereas total number of employees is for Skåne and Västra Götaland.

has slipped down from the 'high' to the 'medium' category of the 'innovation leader' segment. In the World Knowledge Competitiveness Index 2008 (Huggins and Izushi, 2008), Västra Götaland ranks 16th in the world, and Skåne 36th (second and seventh respectively of the innovative European regions). Dividing this with GDP per capita, the regions score fifth and 13th in the world. In terms of contribution to national GDP growth, OECD (2012, p.46) states "despite the growing importance of Stockholm, the contributions of both Skåne [12%] and Västra Götaland [17%] remain relatively very high". Figure 7 shows GDP per capita.

Figure 8 and Figure 9. Public and Business R&D expenditures as percentage of GDP per capita. Diagram based on data from European Region (2012)

Another important factor for a regions innovative performance is R&D expenditure. In terms of *public* R&D expenditures, both regions perform medium well in relation to their counterparts (see Appendix II). Regarding *business* R&D expenditures, the both regions perform a little better. Looking at the public R&D expenditures over the last years, both regions have experienced a decrease since 2006, Västra Götaland significantly more than Skåne (see figure 8). Skåne's business R&D expenditures have increased whereas Västra Götaland's have decreased (figure 9). In 2005, Västra Götaland had the highest business R&D expenditures per GDP, well above the other regions. The lion's-share derived from the region's larger companies (See figure 10). Whereas the large companies' expenditures exceeded the national average almost twice, the expenditures within small and medium-sized companies lied underneath. The large companies' expenditures in R&D in Skåne were also well above the average. The small and medium-sized companies' amounts were however more comparable to the national average.

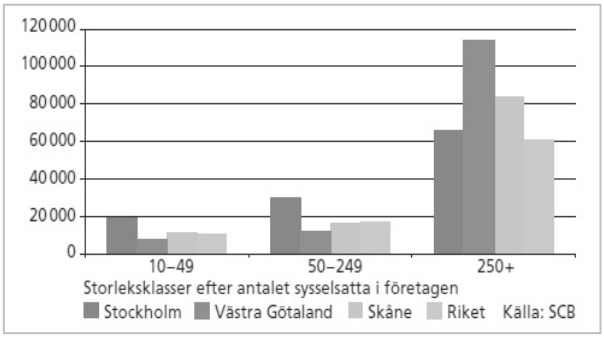
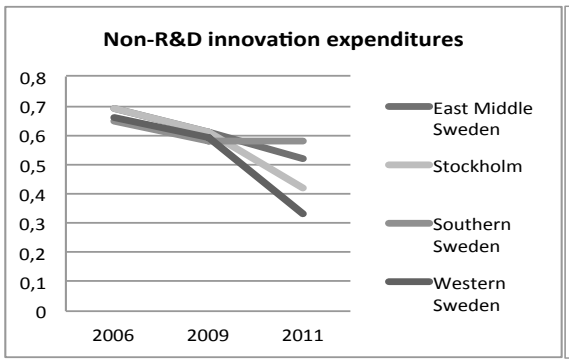


Figure 10. Business R&D expenditures per employee – distributed over company size (VGR, 2008).

Non R&D innovation expenditures as percentage of total turnover (such as acquisition of patents and licenses, and investment in equipment and machinery) are much higher in Skåne than in Västra Götaland, which performs worst among the innovative European

regions. There is an average decrease of six percentages in non R&D expenditures since 2006 among the 17 benchmarked regions. The decrease is however most significant in Västra Götaland (33 percentage decrease), with Stockholm closely following. Skåne, on the other hand has only experienced a 'minor' decline of seven percentages (see figure 11 and 12).



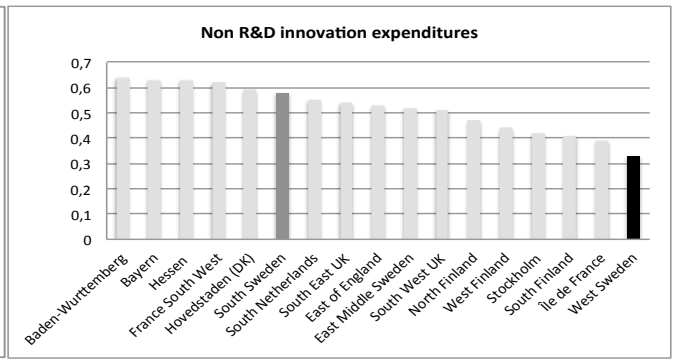


Figure 11 and Figure 12. Non-R&D innovation expenditures for SMEs as percentage of total turnover. Diagrams based on data from European Union (2012).

Both regions perform similarly and around the average among the innovative European regions regarding many of the factors. Examples include labor productivity, mean gross monthly earnings, per capita expenditure on private, and secondary education (see Appendix III) (Huggins and Izushi, 2008), SMEs innovating in-house, and technological as well as non-technological innovators (see Appendix II). Whereas both regions have a similar share of SMEs innovating in-house (of all SMEs), about 10% more innovative SMEs in Skåne declare they collaborate with others (figure 13) (European Union, 2012). This stands in contrasts to a survey made by the Swedish Agency of Economic and Regional Growth (2012), where Västra Götaland has a few percentages more SMEs collaborating with others. The survey was however asking *all* SMEs, not only the innovative as is the case in the Regional Innovation Scoreboard 2012. When it comes to public-private co-publications, Västra Götaland stands out among the four Swedish innovative regions and performs next best among the innovative European regions.

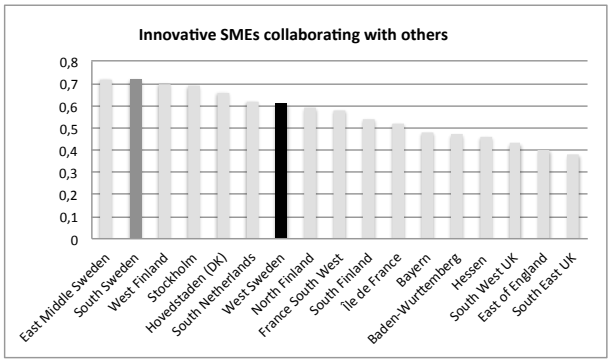


Figure 13. Innovative SMEs collaborating with others as percentage of all SMEs. Diagram based on data from European Union (2012).

One of the differences between the two regions found in the Regional Innovation Scoreboard 2012 that stands out extra is SMEs' sales of new-to-market and new-to-firm sales (as % of total turnover). Here, Skåne performs very well, whereas Västra Götaland performs worst of the innovative European regions (figure 14 and 15). Despite a decrease since 2009, Västra Götaland did neither perform well in 2006.

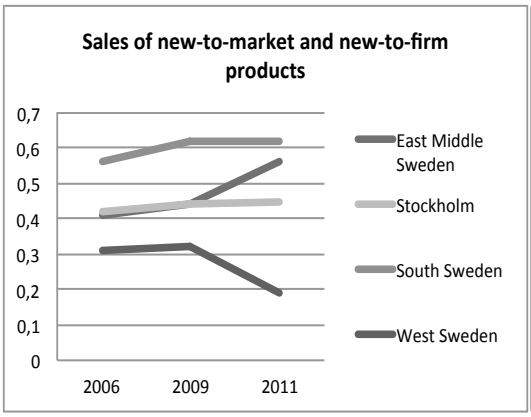


Figure 14 and Figure 15. Sales to new-to-market and new-to-firm products of SMEs as percentage of turnover. Diagram based on data from European Union (2012).

Availability of venture capital. Among the OECD countries, Sweden has the third highest share of venture capital as percentage of GDP (See Appendix V)(OECD, 2011). Looking at its distribution in the country it is however concentrated to Stockholm. As seen in figure 17, its presence in Stockholm is almost 3 times greater than in Göteborg, and 4,5 times greater than in Malmö-Lund. Still, Västra Götaland and Skåne score high in terms of private equity per capita among the innovative European countries, but again well below Stockholm (see figure 16).

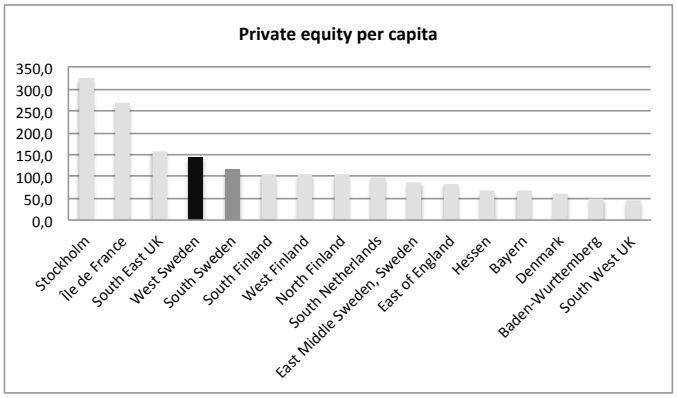


Figure 16. Private equity per capita such as venture capital and start-up investments. Diagram based on data from Huggins and Izushi (2008)

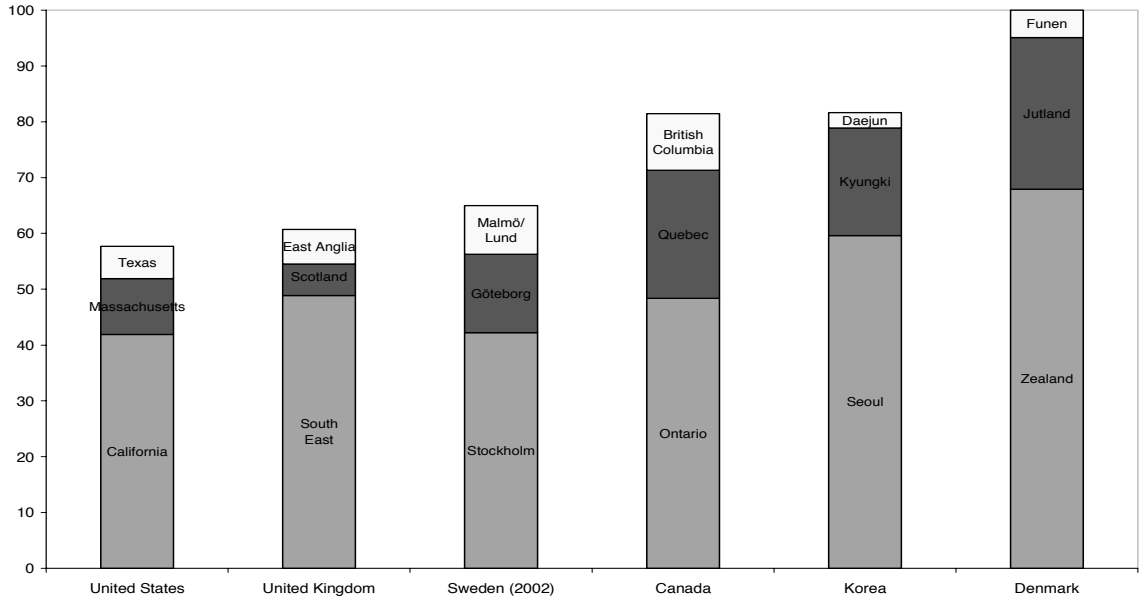


Figure 17. Regional concentration of venture capital investment as % of total (selected OECD countries 1999-2001) Source: OECD (2003)

The interviewee Morgan Skarin (2012), CEO at Encubator at Chalmers states that there are too few venture capitalists not only in Västra Götaland and Skåne, but the whole Sweden and Europe. He believes this is due to poor return on investments in Europe compared with for example United States. Skarin (2012) explain that the low availability of venture capital has impeded the use of offensive strategies, and instead resulted in mediocre outcomes. He also believes that the availability differs between industries, for example ICT and social media in Silicon Valley attract more venture capitalists, much due to high development rates. He further mentions that it can be due to different mindsets. In United States one invest higher sums and things happen faster than in Europe where the risk willingness is much lower and where one 'takes shorter steps forward'. Skarin (2012) states that it might be so that Europe has been subject to sub-optimization: one has tried to minimize the risks so much that one has starved companies (only receiving spoon-feeding) which had potential to become large.

Skarin (2012) refers to Israel as an interesting example of how to change the trend. In Israel, the state invited risk capitalists and offered them to match all capital that they invested along with the possibility to acquire the state's shares for a certain amount. This was a lucrative deal for the venture capitalists whose activity has intensified and in return benefited the country. The prize they paid on the other hand, were that many of the companies were brought to United States by American venture capitalists and were introduced on Nasdaq. Skarin (2012) believes that a similar agreement and a change of the taxation would attract more venture capital to Sweden or Europe for that sake. He is however doubtful about whether such a strategy would be considered to be implemented and explains that it might be too radical for the Swedish mindset which is centering around carefulness.

Textbox 1. Knowledge Hubs in Skåne

The most knowledge intensive areas in Skåne are Malmö and Lund in the South West, Kristianstad in North East, and Helsingborg in North West. The South East region is not brought up here since it cannot be regarded as particularly knowledge intensive. It has a small labor market and a low degree of education and is mainly focused at agriculture, fishing, and art (Region Skåne, 2009).

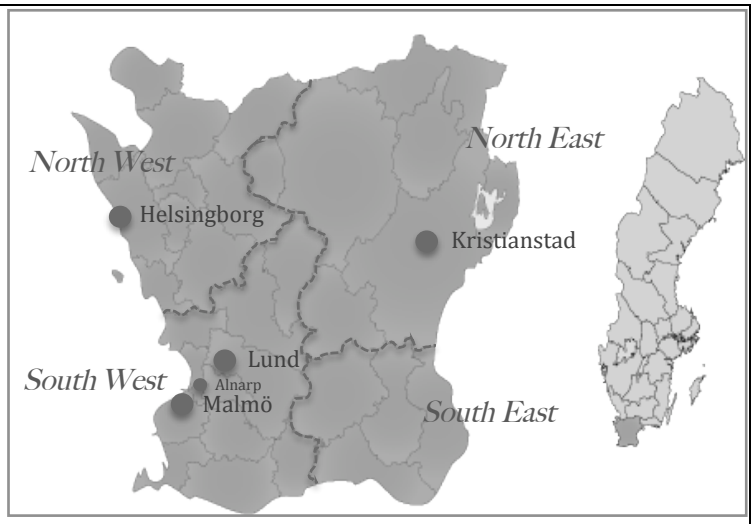


Figure 18. Map of Skåne. Author's modified version based on template from Regionfakta (2012)

South West. The South West region of Skåne, and in particular Lund and Malmö, is the most expansive and research intensive area in Skåne. Lund has one of the biggest universities in Sweden, i.e. Lund University (LU). LTH is the Faculty of Engineering of the university. It focuses on areas such as life sciences (biotechnology and food), physics (laser physics, optics and nanotechnology), mathematics, process technology, construction, and cleantech. The university is the host of the synchrotron radiation research facility MAX-Lab for advance x-ray investigations in multiple scientific areas. The laboratory is today constructing a next generation synchrotron facility, MAX IV. In addition, a neutron spallation, ESS, will be built in close proximity (Börjesson, 2012). In Lund is also Ideon Science Park situated, which focuses on mobile telecommunication, IT, life science, and cleantech. It was the first science park in Sweden, starting 1983 as a result of major shutdowns in textile- and shipbuilding industries with the arising need for better knowledge transfer from the university to the industry to secure growth. Today Ideon has a science park, business promoting projects, and three incubators. Close to Ideon lies newly established Medicon Village, which partly serves as a business park, offering workplaces and laboratories. It further houses an incubator and will be the home to the research institute Life Science Foresight (Medicon Village, 2012).

A majority of the most important knowledge hubs and actors in Malmö are located in close proximity of each other in the newly built district, Western Harbor. New media, life science, and cleantech are some of the profile areas of Malmö (Malmö Business, 2012) as well as of Malmö University (Malmö University, 2012). The university was established 1998 and has today about 25 000 students. In the Western harbor is also the incubator and business park MINC located, which primarily focusing on digital design and ICT (MINC, 2012), and Sustainable Business Hub, a cluster organization for the cleantech sector (Simonsson, 2012). Within Life Science, the city hosts a science park and incubator, Medeon (Medeon, 2012).

Located between Malmö and Lund lies SLU Alnarp, the Swedish University of Agricultural Sciences, which focuses on research within landscape planning, horticulture, and agricultural sciences (SLU LTJ-fakulteten, 2012).

North East. Kristianstad University, located in the northeast of Skåne, is partly focusing on health sciences, environmental and natural sciences, and engineering (Kristianstad University, 2012). Connected to the university is the science park, Krinova, which is focusing on food, health, and sustainability (Krinova, 2012).

North West. Helsingborg is the biggest city in the north west of Skåne. Here lies Lund University Campus Helsingborg, which is focusing on service management, strategic communication, software development, etc. (LU Campus Helsingborg, 2012).

Textbox 2. Knowledge Hubs in Västra Götaland

Västra Götaland has six universities distributed over all four sub-regions. The two biggest, University of Gothenburg and Chalmers University of Technology are situated in Göteborg.

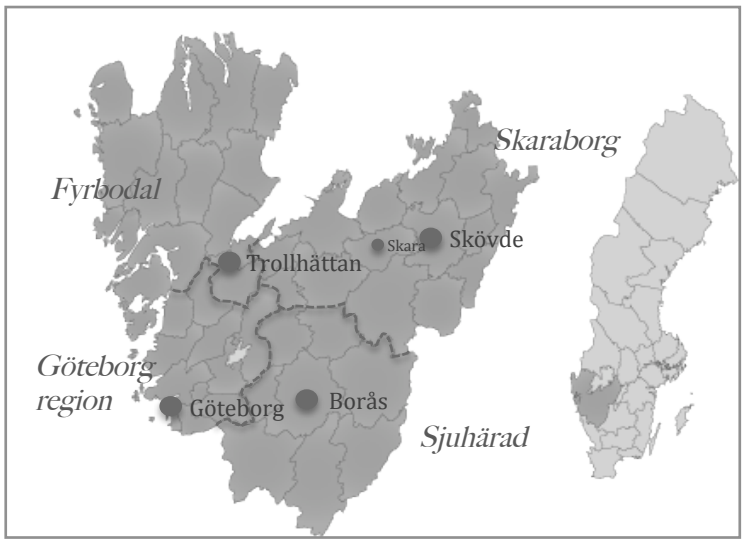


Figure 19. Map of Västra Götaland. Author's modified version based on template from Regionfakta (2012)

Göteborg. The University of Gothenburg is one of the biggest universities in northern Europe (38 000 students and 5 900 employees) and has a particularly broad profile. Especially five areas are put forth; health, culture, environment, democracy and urban development, and knowledge formation and learning (University of Gothenburg, 2012). Chalmers University of Technology has 11 000 students and 2 500 employees. It is specializing in technological areas and is especially putting forth following "areas of advance"; energy, material science, nano science and nano technology, production, transport, life science, ICT, and built environment (Chalmers, 2012).

The science parks in Göteborg are tightly linked to the universities as well as the public and private sector, both by ownership and research activities. They all have different focus areas: Lindholmen Science Park is specializing in ICT, such as mobile internet, intelligent vehicles and transportation systems, and modern media and design (Lindholmen Science Park, 2000), Johanneberg Science Park focuses on such things as urban development, energy, and material/nanotechnology (Johanneberg Science Park, 2011), and Sahlgrenska Science Park on Life Sciences (Sahlgrenska Science Park, 2012).

Sjuhärad. Sjuhärad, where Borås is the region center, is best known for its competence in the textile industry. University of Borås is through the Swedish School of Textiles in Borås housing education in the textile area and spans everything from fashion to the technological textiles (see smart textiles) (University of Borås, 2012). Two other areas that are strong in Sjuhärad are Trade and Logistics (in particular E-commerce) and cleantech (waste refinery) (Invest in Sjuhärad, 2012).

Fyrbodal. Trollhättan is one of the biggest cities in Fyrbodal. It is well known for its competence in production technology, mainly in the automotive area, with a focus on environmentally friendly solutions. The major research in the area is made at University West (University West, 2012) and at the science park Innovatum Teknikpark. The latter is also focusing on green vehicles, alternative fuel, and green energy and is housing an incubator (Innovatum, 2012). Trollhättan is moreover well known for its profile within film, an area that is not considered in this thesis.

Skaraborg. The major industries in Skaraborg are food and food technology, automotive, and wood processing (Invest in Skaraborg, 2012). The region does however also have strength in IT which is a major research area both at the University of Skövde and Gothia Science Park. The University of Skövde is specializing in IT, virtual systems, and systems biology (University of Skövde, 2012). It does also collaborate with Gothia Science Park and its incubator on intelligent automation and computer games for training, learning and information (Gothia Science Park, 2012). Whereas Skövde is the "IT-mekka" of Skaraborg, the neighboring city Skara is the whereabouts for research and education in agriculture, food, and health, which takes place at SLU Skara - the Swedish University of Agricultural Sciences (SLU Skara, 2010).

5.1 General actors

In order to give an idea of the functions of the innovation systems, this section provides an overview of the most general actors. Overarching actors, support for idea development and start-up close to the academia, and support especially for existing companies are presented. More sector/cluster-specific actors and support functions are found in the sector-chapters.

The regional authority in Skåne and Västra Götaland are Region Skåne and Västra Götalandsregionen (VGR) respectively. In difference to Västra Götaland, Skåne has an advisory body for innovation, Skåne Research and Innovation Council (FIRS), and a cooperative forum for innovation, Sounding Board for Innovation in Skåne (SIS). Both are made up by actors from Region Skåne, academia, municipalities, collaborative arenas, and private sector (FIRS and SIS, 2011), i.e. a diverse group of actors to ensure appropriation of the research and innovation strategy (OECD, 2012).

Some of the supporting organizations exist in both regions, for example CONNECT, Invest, Business Region, and the Chamber of commerce. Some provide different kind of support for business development, others work with marketing of the regions' strengths, promote networking among actors and carry out political lobbying in the interest of the private sector (See table 2).

Table 2. General actors

General actors			
	Skåne	**Västra Götaland**	**Function**
Business support, projects for industry development, marketing of regional strength	• Business Region Skåne • Helsingborg Business Region • Malmö Business	• Business Region Göteborg	Business support, projects for industry development, marketing of regional strengths, and offer help for potential investors
	• Invest in Skåne	• Invest in Sjuhärad • Invest in Skaraborg	Market regional strengths, and offer help for potential investors
Chamber of commerce	• Handelskammaren i Sydsvenska företags intresse	• Västsvenska handelskammaren	Political lobbying in the interest of the private sector, support networking between actors, offer education in business development
Support network	• CONNECT Skåne	• CONNECT Väst	Promote networking among actors in the region
Export council	• Exportrådet	• Exportrådet	Export council
Funding and advice	• Innovationsbron • Industrifonden • Teknopol • Teknoseed • Almi	• Innovationsbron • Industrifonden • Chalmers Invest • Almi	Funding and advice

All universities in Skåne and Västra Götaland offer support for idea development and start-up in form of advice and guidance for commercialization and help in fund raising. They are for example provided resources for this by the Ministry of Education and Research through what is called 'Innovationskontor' (innovation offices), which were established 2010. There is one such office in Skåne, Innovationskontor Syd, and one in Västra Götaland, Innovationskontor Väst. These are hosted by Lund University and Chalmers respectively, which are given the responsibility to supply the other universities with resources (Innovationskontor Väst, 2012). The latest research and innovation proposition (Swedish Government, 2012a) declared that also the University of Gothenburg will come to host one. In addition to this, there are a number of incubators, some closer to the academia than others, and focusing on different technological areas. Support especially for idea development and start-up is found in table 3 below.

Table 3. Support especially for idea development and start-up

Support especially for idea development and start-up			
	Skåne	**Västra Götaland**	**Function**
Technology Transfer Offices	• LUIS • Innovationskontor Syd	• Forsknings- och Innovationsservice (GU) • Innovationskontor Väst	Business advice and guidance for scientists
Business support for students	• Drivhuset • VentureLab • Futurum Creative Centre	• Drivhuset	Business advice and guidance
Incubators	• Ideon Innovation • LIFT Incubator • Lund Life Science Incubator • Cleantech inn Sweden • MINC • THINK Helsingborg • P.U.L.S. • Rampen (Krinova)	• Chalmers Innovation • Encubator • GU Holding • Inkubatorn i Borås • Framtidens Företag • Gothia Science Park Inkubator • Innovatum Teknikpark • Sahlgrenska Science Park • Brewhouse Incubator	Business assistance and start-up service in form of incubator programs for selected companies

Support aimed for existing companies (table 4) are in terms of product and process development, marketing activities, fund raising advice, etc. and is for example offered by IUC, IDC, and Industriell Dynamik. The research institutes, on the other hand offer research. Lund University has a similar function through Lund University Experts (LUEX) (Lund University Experts, 2012) and Chalmers through Chalmers Industriteknik (Chalmers Industriteknik, 2012).

Table 4. Support especially for existing companies

Support especially for existing companies			
	Skåne	**Västra Götaland**	**Function**
Industrial development centers	• IUC Skåne	• IUC Sjuhärad • IDC West Sweden • Industriell Dynamik	Offer business support for existing companies
Research institutes	• SP	• SP • Swerea IVF • Viktoriainstitutet • Imego • IVL Svenska Miljöinstitutet • SIK Institutet för Livsmedel och Bioteknik	Provide contract research
Academic contract research	• LUEX	• Chalmers Industriteknik	Provide contract research
Science Parks	• Ideon • Krinova • Medeon	• Lindholmen Science Park • Johanneberg Science Park • Sahlgrenska Science Park • Innovatum Teknikpark • Gothia Science Park	Applied research collaboration

6 The Functionality of Skåne's Innovation System

This chapter aims to bring an understanding of how the innovation system in Skåne functions. Data has been collected through interviews and a focus group of people in leading positions highly active in the innovation system as well as through other reports and a seminar, on how to strengthen the innovative capacity in the region, hosted by PwC. The chapter is structured as follows: First the Knowledge Infrastructure is examined, thereafter a review of the Governance and Policy of Skåne's innovation system is provided and lastly, Relational and Socio-Institutional Aspects in the region is elucidated including the cross-border collaboration with the Danish side of the Öresund region.

6.1 Knowledge infrastructure

The focus group (2012) gave notice of the support system as quite confusing and unclear for both support-takers and involved actors. This has also been elucidated by Region Skåne in 2009, where it described a system that did not function as a coherent network. The actors do not understand their own roles in the system and do not communicate their business models on their websites. The actors' different roles overlap, which results in inefficiency of resource utilization. Although a diversity of actors is seen as positive, there is a risk that each actor gets too small and cannot reach a critical mass in its business to make maximum use of invested money and the large number of actors can lead to unhealthy competition and territorial thinking (Region Skåne, 2009). It was also noticed that many actors are not used to refer the clients to others (Daal et al, 2009).

This inefficiency was further elucidated 2010 in Sydsvenskan, which found that there are about 80 different organizations in Skåne's innovation system that support inventors and start-ups. The interviewee, accountable at Innovationsbron Syd, explained that the high number of actors comes from that financing is made in project form since there is an unwillingness to provide operational funding. By mapping the flows of money in the system, Sydsvenskan found that "the money that gets into the system is sent around among the actors themselves" (Ström, 2010, p.4).

Region Skåne (2009) states that the availability of venture capital is difficult to assess but the interviewee Therese Friman (former K Nilsson) (2012), project leader of TITA at Region Skåne, adds that it is ambiguous; some companies perceive there is a lack whereas others do not. However, there is a general lack of support in the growth phases: It is recognized that almost all support-actors are focusing on the early development phases and very few on the growth phases. Many of the smaller support-actors have too little capital available to support companies in the growth phase and to build a proper competence base internally (Region Skåne, 2009).

Coordination of the system was mentioned as one of the most important challenges, both by the focus group and by the interviewee Per Eriksson (2012), president of Lund

University. The focus group highlighted the need for a structure of the knowledge infrastructure that is easier to grasp and to access. Its contexture with all different actors and support functions is today too confusing not only for support-takers, but for all actors involved. Collaboration must be in place in order to successfully coordinate the system and its different constituents. One of the participants mentioned "understanding of what problems and opportunities there are" as an important element. The participant further stated that one has to ascertain what the system should address in order to successfully coordinate and manage it. Exploring weaknesses and where the system fails is essential. The interviewee Maria Korner (2012), interregional coordinator at Region Skåne, states that Region Skåne is trying to deal with the problem by coordinating the system around three wider areas - smart materials, health, and sustainable cities. The interviewee Maria Gerling-Gerdin (2012), Business Developer at Region Skåne and former researcher at Lund University, adds that it tries to arrange the actors so that they do not sprawl in all directions.

The focus group highlighted the importance of creating time and places for meetings - it is after all meetings and collaboration between actors that drives innovation systems. Both the focus group and the PwC-seminar participants called for meeting places where interdisciplinary collaboration can arise. It was explained that combining two or more fields has great potential to yield new interesting innovations. It is thus important to create arenas where different actors that normally do not interact can meet and work on new projects. This type of collaboration needs to exist not only on a regional level, but also on a national and international level. It must be easier to access other actors, not only for research collaboration, but also between different types of actors, e.g. better possibilities for researchers to access support actors and advisors.

6.1.1 Knowledge Creation and Generation

The interviewee Stefan Bengtsson (2012), president of Malmö University and former First Vice President at Chalmers, states that in difference to Västra Götaland, the universities in Skåne (especially Malmö University) are more focused on and have come longer in social innovation. Social innovation implies finding solutions to societal problems such as finding new ways of dealing with the increasingly ageing population and the fact that more people thereby are becoming more ill.

When it comes to industry collaboration, the interviewee Lars Börjesson (2012), Vice President at Chalmers and chairman of ESS and MAX IV perceives that there are fewer meeting places and spots for industry interaction and collaboration at Lund University than what it is at Chalmers. Research at Malmö University is more closely linked to the industry and society in terms of social innovation (Bengtsson, 2012) and IT and its application (Börjesson, 2012). This has however much to do with the characteristics of the areas. In other areas like social sciences and humanities it is not as accepted to collaborate with the industry as it is in technical disciplines where it is natural to diffuse research findings. Both Bengtsson (2012) and Börjesson (2012) think that the higher

share of smaller companies in Skåne might be shown in shorter and faster types of academic collaboration since these do not have the resources to invest in long-termed collaboration. Bengtsson (2012) mentions the industry collaboration at the research center MEDEA, at Malmö University, is more short-termed - the center is built on a platform where companies can 'come and go'. He further believes that smaller and younger universities might be better in the contact with smaller companies since the former are more flexible and do not have the same heavy structures and rigid decision-making as the larger universities. Both Bengtsson (2012) and Börjesson (2012) think that time to productification is shorter in Skåne than in Västra Götaland because of a higher share of service innovation, which share the characteristics of neither requiring much research nor investments. Bengtsson (2012) therefore believes that the time-frames in the systems in Skåne and Västra Götaland are different - incubation and collaboration might be shorter – but the basic structures are similar.

6.1.2 ESS, MAX IV, and Research Institutes

The neutron and x-ray radiation facilities ESS and MAX IV present unique opportunities for Skåne and the whole of Sweden. They will provide world-leading research which, if efficiently diffused in the innovation system, can result in new businesses and innovations. They will moreover contribute to profiling Sweden as a world-leading center for high-technological research, and indirectly result in an increase in knowledge and competence within Skåne. There will also be built an entirely new district in Lund in the area between the two laboratories: the Science Village which will become a district where science, innovation and businesses meet. There will also be a Science Exhibition Center for the general public (Börjesson, 2012). Close to the area, Centrala Brunnshög, there will be built a district for stores and other functions needed, containing a market place, streetscape etc. (Lund municipality, 2012). These districts as well as the most important knowledge centers in Lund, ESS, MAX IV, Medicon Village, Ideon, and LTH, will be situated in close proximity to each other within an area that is called the "Knowledge Road". The close proximity is expected to facilitate knowledge exchange and diffusion (Tyréns, 2011).

Textbox 3. Effects of ESS and MAX IV in numbers

- 5000-6000 visiting scientists annually…
- … whereof 2000-3000 guest researchers*
- 800 employees
- 3000 employees in supplier businesses for maintenance
- 6000 accommodations to be built annually

Source: (Tyréns, 2011). *(ESS, 2012)

Although ESS and MAX IV are magnets for research-intensive companies (Gerling-Gerdin, 2012), the facilities will only assign the industry about five percent of the time. There are a numbers of reasons for this, for example: such facilities are first and foremost aimed for science; the path from basic research to applied research is time consuming and requires large resources; and companies have very little experience working with such facilities (Oxford Research, 2012). Börjesson (2012) do however state that experience at other similar facilities show that about 30 percent of the total scientific use is for collaborative

work between academia and industry and additionally five percent is restricted use by industry. Hence, ESS and MAX IV are expected to become used by the industry in a similar proportion.

In order to best take charge of the both laboratories, the TITA-project was established 2010. It was a cooperative project involving actors from the academia, ESS, MAX IV, and Region Skåne that aimed to explore how to maximize the societal benefits and how to capture spin-off effects from ESS and MAX IV (Tyréns, 2011). On the question of how to best take charge of the knowledge that will be generated in the two laboratories, Friman (2012), project leader of TITA, explained that it is more complex than just starting up a new science park - there needs to be support systems. It is difficult for companies to know what possibilities there are to use the laboratories and how to interpret results. Due to their complexity, some platform between the knowledge generation and the industry will be needed. Much of this will be managed through Lund University, so its contact with the industry will be of outmost importance for enabling efficient knowledge diffusion. For future success Friman (2012) highlights the importance of open dialogues and effective collaboration. In order to build a creative and innovative environment around ESS and MAX IV, all actors need to be involved, be open, and cut all territorial thinking. Friman, Gerling-Gerdin, Simonsson, Bengtsson, and Börjesson (2012) do all highlight the importance of the establishment of research institutes or other types of intermediary organizations around ESS and MAX IV in order for the industry to approach the facilities and take charge of the research that will be produced. Gerling-Gerdin (2012), adds that an institute can serve as a meeting place for the research made at the two facilities, where new insights can be gained from combining results. In line with Friman (2012) she further highlights the importance of good collaboration between the research institutes and the universities. From other cases in Sweden it has been shown that this is a point where most system fails. The result are shown in deficient knowledge at the institutes. In conjunction with the establishment of SP [(RISE, 2012)], the institute and Lund University has therefore worked with creating a close connection.

6.2 Knowledge Application and Exploitation

Gerling-Gerdin (2012) believes that the lack of research institutes has been negative for the region. She explains that especially smaller companies often have difficulties approaching the universities and that there often is a clash in communication. The institutes are better suited to serve them and navigate them to the right person. This is often deficient at the universities where it is difficult to enter and to find the right person. She further states that this is often not the case for bigger companies since they usually have established contacts with researchers at the universities. However, Bengtsson (2012) and Börjesson (2012) state that institutes often are targeted to large companies since smaller ones do not have the resources and time frames that are needed in order to use institutes. They believe that the absence of institutes in Skåne is due to historical weaker demand for such, which in turn is due to the lower presence of larger companies than in for example Västra Götaland. Bengtsson (2012) states that the research institutes

have clear roles in innovation systems and without them the innovation systems probably need to compensate for it somehow – for example by the universities taking on their roles. He mentions MEDEA as having structures similar to those of research institutes since research at the center is made in close collaboration with companies. Gerling-Gerdin (2012) states that there has been a function at Lund University where single researchers took on missions from companies. An entity for contract research was established at Lund University (LUEX, 2012) in 2012 (121.nu, 2012). Gerling Gerdin and Börjesson (2012) think that other structures like a higher number of small research-based consultants might have arisen as a result of the lack of research institutes. Three well-known companies are Saromics, Collodial Research, and Galecto Biotech, which serve as intermediaries that the industry (as well as scientists) employs to get use of MAX Lab. Börjesson (2012) states that the establishments of research institutes might hinder the start-up and development of such companies since it brings somewhat 'unfair' competition partly subsidized by the government. The presence of research institutes might therefore become contra productive in the sense that they hinder growth at the same time as they are aimed at developing growth of knowledge-based companies. They do furthermore to some extent compete with the universities, which in the Swedish system are supposed to also deal with applied research and innovation. Although he is not sure whether their presence are certain in the Swedish system he is confident that a similar function will be needed in order to make use of research findings at ESS and MAX IV.

6.3 Governance and policy

6.3.1 Governance

Skåne, as well as Västra Götaland, has an extended responsibility for regional development and growth as well as a taxation authority that comes with its transition from county to region (Region Skåne, 2012). The European Commission (2012b) considers Skåne's level of regional autonomy as relatively high. OECD (2012) on the other hand, states that despite the region's extended responsibility, it still has "relatively limited powers and have little own resources to conduct innovation policies on their own" (OECD, 2012, p.118).

On a seminar hosted by PwC (2012), a leading regional politician (PwC-seminar participant 1) put forth that there is a problem that proposals from the regional level seldom get implemented when presented to the national government. This was explained that it is due to the fact that the national government does not see the regional effects on a national level, for example does Skåne's GRP not show in the national GDP. Neither does Friman (2012) believe that the national government see the region's potential contribution to Swedish growth. She further believes that this is due to a clash in communication between the two levels.

Both Bengtsson (2012) and Börjesson (2012) think that there is a strong political willingness towards innovation in Region Skåne. Börjesson (2012) perceive Skåne's

innovation system as younger than Västra Götaland's and sees a high degree of enthusiasm and an innovative spirit. He states that Region Skåne is working more top-down than VGR in that it is more actively initiating and driving things in the region as well as involving other actors. Bengtsson (2012) states that the creation of an innovation strategy for the region was an initiative that came from Region Skåne, which has involved the academia and other actors to jointly form it. Gerling-Gerdin and Korner (2012) also believe that Region Skåne is very driving in many initiatives and they explain that there is a danger in that since the other actors can become used to always having Region Skåne driving things and therefore not initiating things themselves.

Henning et al (2010) and the European Commission (2012b) recognize that the development of the innovation system and the clusters within the region in many cases has been in collaboration between public and private organizations. Although satisfactory in clusters like Mobile Heights, where "big companies help small", OECD (2012, p.162) point at a need for more private sector involvement. Gerling-Gerdin and Korner (2012) states that this is something that Region Skåne is very much aware of and wish that the cluster organizations will become the main initiators, as indicated above.

6.3.2 Innovation policy

Region Skåne has during the past five years produced, co-produced and commissioned several analyzes about Skåne's innovation system. Gerling-Gerdin and Korner (2012) explain that this is due to Region Skåne's decision to become the most innovative region in Europe year 2020. Bengtsson (2012) and Börjesson (2012), believe that it is a preparative effort in order to take maximum charge of ESS and MAX IV. Gerling-Gerdin (2012) does however claim that this has nothing to do with ESS and MAX IV: these reports have been produced separately from the TITA project. Korner (2012) explain that the many analyses are a result of criticism from the industry that there are too many actors in the support system. The analyses therefore aim to map all actors in order to improve its coordination. There is also a general interest from the chairman of Region Skåne, Pia Kinnhult, and the organization's department of innovation system.

As a result of gained insight from various analyzes made, Skåne Research and Innovation Council (FIRS) the Sounding Board for Innovation in Skåne (SIS) (2011) present six strategies for strengthening Skåne's innovation capacity (see textbox 4). In a similar report they especially put forth the need to promote innovation that address global challenges, service innovation, and interdisciplinary innovation. Skåne's innovation policies adhere to the most advanced policy thinking according to OECD (2012), which also state that it "appears as a frontrunner in terms of building a regional innovation policy" (OECD, 2012, p.83). Some of the advantages mentioned are the adoption of the smart specialization concept as well as the involvement of the academia and industry in policy formulation, for example through their participation in FIRS and SIS. OECD further mentions the involvement of Centre for Innovation, Research and Competence in the

Learning Economy (CIRCLE) at Lund University as a great contributor to Skåne's policy intelligence.

Textbox 4. Skåne's six strategies for strengthening its innovation capacity:

1. **Develop systemic leadership:** this priority is notably addressed by the creation of two advisory bodies, the FIRS and the SIS.
2. **Broaden the sense of what innovation is – include more people:** this relates to a broadening of the innovation concept to encompass social innovation and ensure a more inclusive strategy covering the whole region. The goal of strengthening innovation culture and right attitudes to innovation and change in the broad population is well present in the strategy.
3. **Streamlining the support structure for innovation:** this priority addresses the identified weaknesses in the business support infrastructure, which needs to become more integrated, visible and effective.
4. **Developing new innovative areas and creative environments:** this item targets the core of the action of the region to support innovation, i.e. promoting platforms where actors within and across different clusters can exchange and discover new opportunities for innovation.
5. **Developing international co-operation:** this priority targets regional participation in global research and innovation networks, the opening up of "innovation arenas" to outside actors and the creation of international strategic alliances and cross-border co-operation, notably within Öresund.
6. **Strengthening innovation capacity in existing industry and public sector activities:** besides the classical challenge of university-industry co-operation, this priority addresses the need for SMEs to co-operate amongst themselves and with larger companies, to improve a variety of skills, as well as the role of the public sector as a driving force for innovation.

(OECD, 2012, p.113-114)

In order to secure future competence supply, FIRS and SIS (2011) as well as the participants at the seminar (2012) put forth the importance of promoting the region as an attractive place to live and work in for foreigners. The region should not only offer good education- and research milieus, but also attractive surroundings including cultural activities (FIRS and SIS, 2011). One also has to facilitate not only for single persons but also for families to move to the region. Such things as availability of international schools and kindergartens are vital (PwC-Seminar, 2012).

The importance of making the region attractive for companies was also highlighted at the PwC-seminar (2012), not only to keep these already present in the region, but also to attract new ones. Lowering the taxes for companies was highlighted. PwC-seminar participant 2 (2012), founder of one of the larger companies in the region, stated that especially small companies are inhibited by the high taxation: Growth is impeded and the region gets unattractive for international actors. When asked what the region should compete with, the person wanted to revise the question to "How can the region facilitate [for the companies]?". PwC-seminar participant 2 (2012) explained that it is not worth telling the companies what strategy they should use or what they should focus on, the companies will only do what is profitable for them, so the only thing the region can do is to facilitate for them, building an infrastructure and an institutional landscape where the companies can prosper.

6.3.3 Funding

In 2011, the public budget for Skåne's innovation system (excluding research at universities and institutes of technology) was approximately 1 015 million SEK. 50% derived from national contributions, 18% from European, and 14% from regional contributions. OECD (2012) notes that Region Skåne's contribution of only 140 million SEK makes the regional authority only be able to act as a facilitator in the system. It also makes the region relatively dependent on good alignment with national and EU priorities.

The interviewee Per Eriksson (2012), president at Lund University, and former director general at VINNOVA, thinks that the financial system should be better at addressing the needs of the regions. Today, regions have to compete against each other for money from VINNOVA, which to some extent is good, but it may be difficult for a national agency to fully understand the particular regional conditions and needs. It further obstructs regions to invest in new areas. Eriksson (2012) therefore suggests that the regions should have their own financing bodies with a function similar to that of VINNOVA.

The focus group pinpointed the importance of long-termed financing. Too often public and private financers are impatient and want results/returns to come rapidly. But when it comes to innovation and research, one has to have a more long-termed perspective. This is true for both funding of single ideas as well as for collaboration projects involving several actors. The participants moreover wanted to see alternative ways of funding. The type of funding made in Medicon Village, where the revenues gets reinvested in research and innovation, was put forth as a good example. It was also called for more philanthropic funding, and for national cooperation for attracting international resources.

The short-termism of funding was recognized as a problem also by Region Skåne (2009). There is a lack of operational funding, meaning that many actors rely on project funding (funding for 1-2 years). This has resulted in much of the overlap in the system that was previously mentioned. It also leads to lock-in of resources and decreased flexibility to act on changes in the environment as well as problems employing the right competence. Gerling-Gerdin (2012) thinks that this type of funding is a trend and will change. She sees project funding in Region Skåne as a big disadvantage since one instead of doing things in-house have to rely much on consultants who do not have the same insight as people who have been working with something for a long time.

6.4 Local interactions and socio-institutional factors

6.4.1 Culture and attitude:

All participants in the focus group put forth culture and attitude as one of the most important ingredient of the innovation system. They all agreed that a culture and attitude that encourage innovative activities, collaboration, and cooperation, are crucial for making the innovation system prosper. Important constituents mentioned were a high degree of communication and knowledge sharing between different types of actors.

Because of its central role as a knowledge diffuser, the willingness of the academia to collaborate is of outmost importance for enhancing the innovation climate. The openness of the academia is not enough just by itself, but the private sector also needs to be embedded by a culture and attitude of desire to innovate and to develop. Openness to change, to new ideas, and to other actors was therefore mentioned as one of the major constituents for a positive culture and attitude within the innovation system. Both the focus group and the seminar participants mentioned the need for political willingness and courage. They called for a higher speed in the political processes and a daring from politicians to make decisions - politicians as well as venture capitalists and other private financers need to dare investing in new ideas and untested opportunities and committing to them.

There was a common perception among the participants in the focus group that in order to create an advantageous culture and attitude for innovation, it is essential to create a shared vision and strategy for innovation that can be accepted and embraced by all actors. This is however not a simple task due to incomprehension among actors about their different agendas, objectives and interests. Scientists, companies, financers, and politicians all have different agendas and "speak different languages". This creates a clash in the communication between them that impede the dialog as well as the potential to collaborate. The challenge lies in opening up the dialog between them and making them understand each other. Eriksson (2012) states that this needs to be addressed by encouraging a higher degree of mobility and interaction between the different actors. It could for example be addressed by some kind of program that supports mobility. This problem does however also need to be addressed in the education at universities and colleges. The educational system needs to prepare the students for future interaction with people in different sectors and industries by making them aware of the different actors' conflicting agendas. Moreover, people need to be encouraged to not only think about what others can do for oneself, but also start thinking about oneself can do for others, how one can contribute to the collective. This is something that people in leading position should encourage and stimulate (Eriksson, 2012).

6.4.2 Collaboration

Gerling-Gerdin (2012) states that communication and cooperation among the leaders from the public sector, academia, and industry has advanced during the last years. Due to some major obstacles and crises, they have learnt to find a way of jointly solving problems. The first major awakening came after Skåne lost its chance to get an institute for communicable disease control, which instead went to Solna. Skåne's effort of attracting the institute was a failure with three different bodies driving the issue and without ability to find consensus. After that, FIRS was established in order to cooperate and unite around shared goals. The shutdown of Astra Zeneca in Lund has also contributed to learnings on how to jointly cope with crises. Then, when Sony announced they were in trouble, there was an organization for solving such things. Per Ericsson, Pia

Kinnhult, and Mats Helmfrid directly started to talk and assigned the cluster organization Mobile Heights the mission to deal with the issue.

There is a general perception that the triple helix collaboration on the leading levels is well functioning. PwC-seminar participant 2 (2012) compares it to 'the old days' when no such thing existed. Both Friman (2012) and PwC-seminar participant 3 (2012), business developer at a large construction company, mentioned that cooperation in the lower, operational levels often is poor. PwC-seminar participant 3 (2012) states that people in the operational levels do not know how to get in contact and that cultural clashes makes it difficult for them to interact. Friman (2012) states that they are usually less open and there is often territorial thinking, which is shown in an unwillingness to share ideas. She refers to the usage of ESS and MAX IV, which have become a prestige-issue among the researchers who are so eager to get use of them so that it prevails the need to cooperate. She does however state one needs not to forget that it also takes time and energy to cooperate. PwC-seminar participant 4 (2012), senior advisor at a large consultant company, thinks that the higher levels must take responsibility to "open up" for interaction among people in the operational levels. To this, PwC-seminar participant 1 (2012) added that one has to start inviting other actors in order to not get trapped in silos. People have to start taking the initiative to networking, not waiting to get networked (PwC-seminar participant 4, 2012). There is also a need for more collaboration between larger and smaller companies. In line with the proposal above, this can be stimulated by encouraging top-management and other strong persons to engage in interactive activities. Lock-in and inertia can only be avoided by a high degree of collaboration, openness, and interdisciplinary interaction (Focus Group, 2012).

Research collaboration. It is mainly big companies and ones that are developed from research at the universities that are involved in academic research collaboration. It is more difficult to attract SMEs to join, and especially ones that come from industries where the educational level is low and where a "tradition" to collaborate with HEIs is lacking. Those are more interested of using them as suppliers of competence (Region Skåne, 2009).

The focus group highlighted the problem with actors' conflicting agendas in collaboration. For example, companies' purposes behind taking part in research collaboration are often different from the universities'. This is also something that was found by Region Skåne (2009), which noticed that the clash between the agendas were particularly large between universities, which have long knowledge production process, and SMEs, which are used to short time frames. In this aspect, Region Skåne (2009) put forth the need to develop new forms of collaboration, and suggest that a possible interface could be to better get use of consultants serving as knowledge diffusers.

On the leading levels, there are also underlying differences in way of thinking that can become a problem if not properly managed, or an asset if taking advantage of their

complementing nature. For example, Region Skåne is more concerned with lobbying, strategy, and influencing in fund-rising, whereas the universities are more short-termed - they want money instantly and are not dealing so much with strategic fund-rising for the future.

6.4.3 The Öresund collaboration

There is a general disappointment about the 'Öresund collaboration' among the actors in Skåne. The collaboration has not developed the way that was hoped, and in many cases it has not added much. Gerling-Gerdin, Korner, and Friman (2012) believe that this is mostly due to cultural clashes. The Danes are more business-minded - they tend to reason much more around what different decisions yield in incomes - probably because the nation has a tradition in trade (Simonsson, 2012; Börjesson, 2012). They also have a totally different style and technique when it comes to negotiations - Danes are much tougher and sharper than Swedes. One example of a complete failure of negotiation with the Danes is the agreement of the tax system: Swedes who work in Denmark pay tax to Denmark and Danes who work in Sweden also pay tax to Denmark. This agreement shows a weakness in Swedish negotiation (Friman, 2012).

Consensus does not apply in Denmark - the boss simply decides (Gerling-Gerdin and Korner, 2012). They have a hierarchical centralized structure, whereas the Swedish model is flat and decentralized (Gerling-Gerdin and Korner, 2012; Bengtsson, 2012; Börjesson, 2012). Gerling-Gerdin and Korner (2012) do however think that the Danes are not only tougher, but also untrustworthy: they can promise things without keeping it. Swedes are more credulous and serious. Gerling-Gerdin adds that Danes can be quite unreliable, for example before starting the TITA project, the Danes turned down the Swedish offer to participate in the project. One month after TITA had started, the Danes sent an application to the Swedes asking if they wanted to participate in a similar project. This example also shows how deficient the communication between the two parties is. The interviewee Per Simonsson (2012), Vice President at Sustainable Business Hub and former project leader in the Öresund Committee does however not think that the problems of collaborating are due to the cultural differences. Rather, he believes it is due to national border barriers (also mentioned by Gerling-Gerdin and Korner (2012), Bengtsson (2012) and Börjesson 2012)) such as different laws, tax- and insurance systems that complicate the collaboration of common projects and the existence of boundary operators. Bengtsson (2012) does for example state that it is hopeless to have programs together with Danish universities because of the regulations. There is also a lack of interest in the Öresund collaboration from the Swedish government - they do not see the possibilities there are. Thus, Region Skåne has been left with all work itself (Simonsson, 2012; Bengtsson, 2012). Moreover, the Swedish government has been quite passive mobilizing efforts to inform Swedish companies about the possibility of ESS and MAX IV in difference to its Danish counterpart (Friman, 2012)

The problem of collaborating and national boarder barriers has resulted in shutdown of both the Öresund University and the collaboration platform Öresund Science Region. At present, the Öresund Committee is reviewing the different collaborations that still exist in order to better understand how it can be improved (Gerling-Gerdin, and Korner; Simonsson, 2012). All collaboration are not malfunctioning -it seems like collaboration around more narrow areas work better, for example in ICT which still has its collaboration platform Öresund IT, food which is very active under Food Best, and material science in Öresund Material Innovation Community. Gerling-Gerdin and Korner (2012) think that due to better personal chemistry than between for example Swedish and Danish public authorities, these collaborations are working well.

Furthermore, the companies in Skåne have not used the opportunity of the wider market that the Öresund region entails. In this aspect the Danish companies are much more active (PwC-seminar participant 1, 2012). PwC-seminar participant 2 (2012) states that the problem is that the Swedes only are feed with information from a national and regional level, and do therefore not know what is going on in Denmark.

Not to forget, the Öresund collaboration was initiated with great enthusiasm and was very dynamic in the beginning. Despite major problems due to cultural clashes and border barriers, Bengtsson and Börjesson (2012) think that collaboration over the boarder can come to flourish if better learning how to collaborate and taking advantage of each others' strengths. The both regions have much to learn from each other.

7 The functionality of Västra Götaland's Innovation System

As the previous chapter but for Västra Götaland, this chapter aims to bring an understanding of how the innovation system in the region functions. Data has been collected through interviews and a focus group of people in leading positions highly active in the innovation system as well as through other reports. The chapter is structured as follows: First the Knowledge Infrastructure is examined, thereafter a review of the Governance and Policy of Västra Götaland's innovation system is provided and lastly, Relational and Socio-Institutional Aspects in the region is elucidated.

7.1 Knowledge infrastructure

In 2008 FBA made an examination of the innovation system in Västra Götaland. They found that there exist a wide range of supply for support and services for companies and innovators to make use of, but they also found that it was difficult for the single innovator to overview. The support-takers generally had problems knowing which actor to turn to for a certain need. For this matter they concluded that the system needed to be better coordinated and more clear in its information about what support there exists (FBA, 2008). Today, 2012, the support system is still seen as too messy. A majority of the interviewees mention this as a major problem. The focus group states that the different actors' roles are not very clear, which might confuse their target groups. The interviewees Marika Hellqvist Greberg and Sophia Litsne (2012), at the departments of Research and Development and Business Development at VGR, state that it is in particular small companies coming from outside the academic world that have problem understanding the support system and how to get use of it. VGR has therefore created the support program FOU-kortet especially for targeting this group. Through the program, SMEs can get support to develop their ideas through the use of for example the institutes and academia. Hellqvist Greberg and Litsne (2012) state that this has been highly appreciated and successful. Also the interviewee Jan Grahn (2012), director of Chalmers ICT Area of Advance, mentions the program as one of the best supportive efforts in the region. Hellqvist Greberg and Litsne (2012) state that it is sometimes a problem to reach out with information about support to companies, especially small ones without the academic tradition. They have noticed that the companies tend to only absorb the information if VGR is physically present and communicate it. Sending out brochures does not help - companies need to see a person talking about it live.

The messiness and overlaps of the support system is a result of organic development (Grahn, 2012; Hellqvist and Greberg, 2012). From the beginning people have worked with different type of support and have had different roles in the system but after time started up new initiatives and organizations - especially in the academia - which thereby has resulted in the system's overlaps. Thus, the messiness is a result from highly engaged individuals wanting to improve functions and filling new arising needs (Bengtsson, 2012; Hellqvist and Greberg, 2012; Börjesson, 2012). The interviewee Stefan Bengtsson (2012),

President of Malmö University and former Vice President at Chalmers, states that this is the same type of development as in Skåne. The interviewee Lars Börjesson (2012), Vice President at Chalmers and Chairman at ESS and MAX IV, agree but adds that it seems to be more organizations - and with less clear roles - in Västra Götaland, especially when it comes to cluster organizations. Many of the interviewees point at the need for better organization as well as consolidation. Grahn (2012) agree with this and refer to an evaluation that was made of Chalmers's innovation system a few years ago where the evaluator concluded that the 'letting-thousand-flowers-flourish' concept is not sustainable. It is very easy to start something new, but much more difficult to shut something down (Hellqvist Greberg and Litsne, 2012; Grahn, 2012). Hellqvist Greberg and Litsne state that VGR has tried to approach this issue, but the fact that so many parties finance the system makes it difficult to organize. VGR does only have control over the initiatives and organizations that are financed by itself. They further state that the interest of starting new initiatives has been very high and they have had to reject many ideas. In this aspect they work preventative to avoid additional overlaps. They do however, in conjunction with other interviewees, state that overlaps might not only be inefficient, but can actually be beneficial too if it leads to healthy competition among the support-providers resulting in continuously improving services. They further state that there is a general hype around innovation systems, "everybody want to have their own innovation systems", all municipalities want their own incubators, and many want their own science parks. Many do not understand how to use the support structures, how things are built up, and that it needs a critical mass to start for example a science park. In this case, VGR direct them to collaborate with some of the established ones. Concerning science parks, Grahn is not sure that having as much as three ones only in Göteborg is very efficient. He believes that it would have been better with only one science park in order to get rid of much of the overhead created by having three different managements. Instead, he mentions Ideon in Lund as noble model for science parks.

Business support. In the report made by FBA (2008), the need for better business-oriented competence is illuminated, especially by the academic actors. It states that there is a demand for guidance and counseling by persons with experience from the private sector and from different types of industries (FBA, 2008). Hellqvist Greberg and Litsne (2012) state that VGR has worked with this issue through its 'incubator strategy' in which a certain quality is required. One of the focus group members states that too many ideas get lost on their way in the innovation process. Here lays a great challenge figuring out how to improve the process so that more ideas manage to be channeled all the way.

Gap between support phases. Many of the interviewees point out that there is no need for more business support. Rather, capital is needed. The study from 2008 identified a gap between the early development phase and later phases where companies more easily can attract larger amounts of financial resources. In this aspect companies with good growth-potential risk to not be able to further develop or grow their companies. It was therefore recommended in the report that Västra Götaland should aim at attracting more

venture capital to the region, but also expand the supply of support services for companies in the growth phases, e.g. coaching and mentoring (FBA, 2008). Today, 2012, several interviewees believe it still is a problem. Hellqvist Greberg and Litsne (2012) do however claim that the gap somewhat has been bridged, much due to Almi's new fund, Almi Invest, which is especially targeting that group. Morgan Skarin (2012), CEO at Encubator thinks that the problem can be mitigated after the consolidation of Almi and Innovationsbron, which have been aimed for different phases while often disregarding the valley of death. Hellqvist Greberg and Litsne (2012) state that the companies' hunger for more financing never can get saturated. Many do not understand that VGR cannot just give them money. How VGR can facilitate for them in their innovation efforts is instead through platforms for collaboration such as those at the science parks.

Skarin (2012) believes that Västra Götaland has a good structure concerning financing: Conditional loans to new companies, equity loans to the incubators (which can get loans in exchange to a part of the profit), and operating grants to the ones that goes in line with regional policies. The interviewee Björn Larsson (2012), business developer and investment manager at GU Holding, thinks that companies' problems to attract money are linked to a general difficulty of approaching investors. Thus, companies need to be better at networking with potential investors and partners before they ask for money.

7.2 From Knowledge Creation and Generation to Application and Exploitation

Compared to LTH, Chalmers works more interdisciplinary. The university did for example create eight so-called Areas of Advance a few years ago. These are cross-disciplinary areas in which Chalmers has particular strength and wants to promote interdisciplinary research and innovation. The organization is best understood as a matrix-organisation, where the vertical sections represent the different disciplines, and the horizontal (crossing) sections the Areas of Advance. Before their creation, Chalmers had made efforts initiating interdisciplinary collaboration, for example by so-called 'initiative seminars', which spanned different important areas. These were well aligned to the 'Strategic Research Areas' which the Swedish government had decide to invest in, so Chalmers gained a large share of the research budget. The major funding gave the interdisciplinary efforts a kick-start and resulted in the Areas of Advance. The organization was also an effort to facilitate for industrial and societal collaboration - more spots for interaction and collaboration have been initiated – and to make the university easier to access for companies and the society as a whole. The Areas of Advance have become a success and other Swedish universities are now in the loop of creating similar structures (Börjesson, 2012).

Västra Götaland has a heavier type of industry and larger companies[11] than Skåne. These larger companies have much longer time frames than smaller ones and can make much bigger investments in R&D, which typically results in longer academic collaboration. Longer time frames in respect to innovative activities are also related to heavier

[11] See Appendix VI for statistics on both regions' 20 largest companies

industries, which are more common in Västra Götaland, since such industries often deal with product innovation, which is more time consuming than service innovation (Bengtsson, 2012). Bengtsson (2012) thinks that average incubation time in for example Chalmers Innovation or the incubator at Sahlgrenska Science Park probably is longer than what it is in the incubator MINC in Skåne, which to a high extent focus on service innovation. He believes that the different innovation processes affect the innovation systems in some way – not sure how, other than in different time frames - but that the basic structures are similar.

Research institutes. The heavier type of industry and larger companies in Västra Götaland than in Skåne is further an explanation for the presence of research institutes in the region (Bengtsson 2012; Hellqvist Greberg and Litsne, 2012; Börjesson, 2012). Hellqvist Greberg and Litsne (2012) believes that it is also much due to successful lobbying by Chalmers, but Börjesson (2012) states that Chalmers has not been the driving actor in the issue, it is rather governmental efforts and a market-need for contract research that has been key to their establishments. He explains that although the institutes are important collaboration partners, they are also to some extent competitors since universities in the Swedish system also engage in applied research and innovation.

Bengtsson (2012) states that due to their largeness and complexity, research institutes often work best with large companies. Working with SMEs, research institutes faces the same problems as the universities – smaller companies are unsure about their future and have very little resources to invest and short of time for meetings. There is however also companies that are so big and have so large R&D departments that they do not need research institutes. One example where the institutes have down-sized because this is seen in the life science sector where none of the larger research institutes have pharmaceuticals or medicine on their agendas other than marginal. Although these companies can afford doing everything in-house, Bengtsson (2012) believes that this might come to change - open innovation will become increasingly important to stay competitive.

Hellqvist Greberg and Litsne (2012) are confident that the research institutes paly an important role in the system since they are made for working with companies in the interface between product development and research. There are however some functions at the universities that have similar roles, for example some departments like Material and Manufacturing Technology that have very close collaboration with the industry and Chalmers Industriteknik, which performs contract research (Bengtsson, 2012).

7.2.1 Some very big companies

The fact that Västra Götaland has some very big companies is seen as a resource: Smaller companies can get use of them when jointly participating in research and innovation collaboration in for example science parks; presence of bigger companies result in new job creation due to their need of subcontractors - their demand drive innovation at their

subcontractors (Hellqvist Greberg and Litsne, 2012); and they are a source of skilled labor wherefrom smaller companies can hire personnel says Skarin (2012).

Unfortunately, many of the bigger companies are also foreign owned, resulting in an uncertainty of their future presence in the region. Hellqvist Greberg and Litsne (2012) explain that it is easier to shut down a plant in a region that the owners do not have any personal linkage to. If the trade unions where their main offices lay are strong, the risk of loosing is particularly high. What happened to GM-owned SAAB in Trollhättan is a very recent example of the risk having large foreign-owned firms in the region. VGR is therefore keen about finding investors "who invest with their heart", and not going overseas to find those that just want to make money fast.

What happens in Trollhättan now after the shut-down of SAAB, which resulted in a major loss of jobs, is that Innovatum has been given resources from VGR to increase its incubator support for new start-ups and idea development. This has already yielded some new companies. Hellqvist Greberg and Litsne (2012) hope that this event can be transformed into something fruitful, as it did when the ship-building business closed in Göteborg many years ago: Göteborg do not build ships any longer, but is designing most of them as well as making components for the industry (more on this can be read in the sectors-chapter).

7.3 Governance and policy

As Skåne, Västra Götaland has an extended responsibility for regional development and growth as well as a taxation authority that comes with its transition from county to region (Hellqvist Greberg, 2011). The European Commission (2012a) considers Västra Götaland's level of regional autonomy as relatively high. OECD (2012) on the other hand, states that despite the region's extended responsibility, it still have "relatively limited powers and have little own resources to conduct innovation policies on their own" (OECD, 2012, p.118)

In difference to Skåne, Västra Götaland does not have a regional innovation strategy (Hellqvist Greberg and Litsne, 2012). One of the focus group members mentioned this as a major deficiency. The person explained that the many different levels involved in the system not always follow the same path. Along with a vague 'strategy' this confuse the actors. There is a need for a clear regional innovation strategy so that all actors know what broader context they act in and so that they can gather around a shared goal. All focus group members highlighted the importance of this. One person stated that one has to gather the right actors to develop such a shared goal. It is important to enlighten each actor's different undertakings and commitments so that they know what their contributions add to the collective. The focus group moreover called for a regional strategy that is linked to the national. One person stated that one has to have a shared agenda for the whole Sweden, asking what *Sweden* has to do to stay competitive. The global competition is too fierce to be stuck in regional thinking.

Hellqvist Greberg and Litsne (2012) states that VGR has been working in line with an innovation strategy, but which is not written down. They state that instead of documenting every thing, they are more active in implementation but think it is a shame since it does not show as much as in Skåne. They explain that Region Skåne is very good at promoting its region. They do however believe that all analyses made lately about Skåne's innovation system will serve as a basis for some type of transformation planned. VGR made an extensive analysis of its innovation system in 2008 (see FBA, 2008). Hellqvist Greberg and Litsne (2012) states that it is unnecessary to make new analyses more often than every five year since it takes time to implement efforts and the system does not change that fast. They state that VGR is confident with its way of working and the system is not in need of any major changes, so producing a lot of analyses is not prioritized.

The innovation strategy that VGR is following has three focus areas: Entrepreneurship, Small Innovative Companies, and Knowledge Intensive Innovation. To promote entrepreneurship, VGR works with pre-seed and seed capital, supports incubators and schools of entrepreneurship, and attitudes towards entrepreneurship from early ages. Small innovative companies are provided support through industrial development centers, research institutes, universities, and different innovation platforms. In terms of knowledge intensive innovation, VGR focus its promotional effort on a number of sectors (Hellqvist Greberg, 2011) through smart specialization (Hammarström, 2012), triple helix collaboration, international positioning, and public procurement (Hellqvist Greberg, 2011). Triple helix collaboration is mainly promoted by supporting science parks (Hellqvist Greberg and Litsne, 2012).

The focus group highlights the importance of finding a balance between top-down and bottom-up governance. One person states, "If you govern to hard, it becomes undemocratic. The governance of the innovation system is in need of a certain degree of freedom so that it is allowed to flourish". It was called for more diversity in the system. Hellqvist Greberg and Litsne (2012) state that VGR, the academia, and the private sector are much involved in the innovation policy. There are plenty of occasions where they meet and where VGR listens to their needs. VGR also have continuous meetings with the academia's First Vice Presidents, which Bengtsson (2012) state is the closest structure to something like FIRS in Skåne. Hellqvist Greberg and Litsne (2012) further state that initiation of new innovation promoting projects and other initiatives typically come from cluster organizations and the science parks. Since these have knowledge about what is needed VGR let them come with suggestions based on some criteria and thereafter chose to finance what they seem to be suitable and interesting. VGR simply set the frame and other actors decide the contents. Hellqvist Greberg and Litsne (2012) highlight the importance of the science parks upon which VGR to a large extent rely: They have good knowledge about how VGRs money best can be utilized and keep high quality in what they do.

Bengtsson (2012) states that both VGR and RS are actively working with innovation issues – it is prioritized in their agendas. He believes that it is a result of the extended responsibility and greater autonomy that came with the transition from counties to regions, but it can also be a 'large city phenomenon'. The politics is however a little more distanced from innovation issues in Västra Götaland than what it is in Skåne but the regional development unit in VGR is more active in coordination of meetings and meeting places and are more operationally close in its way of working. He does however also state that there are no *major* differences. Börjesson (2012) thinks that Region Skåne has a more active top-down way of working than VGR but that the universities and industry are more active driving things in Västra Götaland than in Skåne. The 'Five Clusters' (more of this in the sectors-chapter) is for example an initiative which the universities are more actively driving.

FBA (2008) recognizes there is a problem initiating too many short-termed projects - it is not only inefficient since every project needs a certain time before it is up and running, but also problematic for the involved to dare go 'all in' since they do not know if the projects will get more money to continue. The focus group also put forth the short-termed perspective as a problem. One person states, "When dealing with innovation one has to have a long-termed perspective and be patient. Let success mature, there is a big risk being too impatient to see results". Hellqvist Greberg and Litsne (2012) are aware of the problem with short-termed financing but state that it is different today than in 2008 - today most of the financing is in form of operational funding and a minor part in project-form.

One person in the focus group especially put forth supply of competence as a challenge for the innovation system in Västra Götaland. The quality of the elementary education needs to be improved and one has to be better at attracting competence. Skarin (2012) thinks that it is important to put forth the region as an attractive place to work and live in. He also mentions communications such as high-speed trains as important factors in terms of proximity. In this aspect Västra Götaland has a major disadvantage since it is difficult to access both globally and continentally (Business Region Göteborg, 2007). Due to this, the possibility for closer collaboration with Oslo is not as good as what it is between Skåne and Copenhagen. Areas especially interesting for collaboration are found in oceanography, life science (Bengtsson, 2012), and chemical process industry (Börjesson, 2012) some of which certain collaboration already can be found. The distance does however matter. Although one builds high-speed trains and motorways, the distance is still too large in order to create an integrated cross-border innovation like Öresund (Bengtsson, 2012; Börjesson, 2012). However, Börjesson (2012) mentions that the two regions would probably better align culturally than what is the case in Öresund.

7.4 Local interactions and socio-institutional factors

Hellqvist Greberg and Litsne (2012) state that the entrepreneurial culture is different throughout Västra Götaland, in particular between the Göteborg region and Sjuhärad. The

Göteborg region has a traditional industrial structure where the inhabitants usually do not start their own companies, but rather chose to work at some of the big companies, for example at Volvo, Astra Zeneca, Ericsson, and SKF. It also has a much stronger tradition in trade. In Sjuhärad, on the other hand, there are a lot of family-owned companies and it is much more common to start your own business. When it comes to Fyrbodal and Skaraborg, there are a bit of both worlds: one part that is more like Göteborg, and another part on the countryside where people are self-employed but less innovative since it is mainly composed by farmers.

As a result of some severe industrial crises, the actors in Göteborg have been forced to get together and jointly work on how to manage the situations in order to survive. This has resulted in a tradition of close collaboration. Hellqvist Greberg and Litsne (2012) believe that this is what happens in Skåne right now after the shutdown of Astra Zeneca. When one is stuck in an urgent situation one has to force collaboration, a new ability to collaborate develops and one can better manage future crises. They think that it is more important for regions such as Västra Götaland and Skåne to develop a culture of close collaboration since the national authority often turn its back on them, letting them manage their own crises. They state that it is different when there is a crisis in the Stockholm region: "then suddenly it is a national concern". They refer to the shut-down of Astra Zeneca in Skåne, which Skåne had to manage all by them selves, without help from the national level, and compare it to the shut-down in Södertälje where national support gets mobilized to help the region, when claiming that "Astra Zeneca is shutting-down in Sweden", forgetting the only location where they still operate, i.e. Mölndal. Hellqvist Greberg and Litsne (2012) explain that this is typical for the Swedish government and further refer to the crisis some years ago in the automotive industry, which is a national concern but is managed as a regional one when it is not in the Stockholm region. They think that crises in Stockholm are higher prioritized as a result of proximity: for example, people at VINNOVA know people at Astra Zeneca in Södertälje. The crises appear different when it is in another region that the people in Stockholm are not as connected to. Although bitter for the lack of interest from the national level, Hellqvist Greberg and Litsne (2012) state "it is sometimes better fight from below since one therefore always have to be a little bit better".

A study made by OECD (2010) indicates that the innovation system of Västra Götaland is a well functioning system: "A few regional innovation systems in Sweden are currently the source of some of the best practices in OECD countries. Västra Götaland is particularly noteworthy. … Västra Götaland has become a closely integrated functional region based on a tightly knit social fabric which has facilitated the development of knowledge networks and platforms among local universities, research bodies, businesses, and regional authorities (*e.g. Open Arena Lindholmen).*" (OECD, 2010, p.97). Hellqvist Greberg and Litsne (2012) also believe the triple helix collaboration works well but it is not completely flawless: actors' different goals can sometimes complicate collaborative efforts. The focus group highlighted the need for a shared goal as one of the most

important things to work with: “there is a need for a common effort, everybody should contribute” says one and continues “not until one is really exposed one is prepared to compromise and start collaborating with others” in order to form the shared goal that is needed to getting hold of the situation. This is linked to what has been mentioned above, and the person also refers to the crisis at Astra Zeneca and the one in the automotive industry. The focus group believes that actors need to collaborate better between different segments - today, it is still too inexistent. Too many are stuck in their silos, which is inefficient and confuse the clients. They think that it is important that the innovation strategy develops to better encourage collaboration. One of the focus group members state “one has to identifying interdependencies and connections - one has to see that one is dependent of others and cannot make it alone just by one self”.

8 Sectors in Skåne

Region Skåne put forth the region's strengths as comprised by six sectors, these are: life science, ICT, food, moving media, cleantech, and risk and security (Region Skåne, 2009). Out of these, life science, information and communication technology (ICT), and food are identified as key strengths by the European Commission (2012b). The sectors mentioned by Region Skåne (2009) as well as material science, logistics, packaging are said by FIRS and SIS (2011) as important for the future. Material science is a so-called 'enabling area' upon which most technological areas are based. Thus, the establishments of ESS and MAX IV are expected to have widespread effects upon Skåne's sectors (Friman, 2012).

This chapter deals with life science, ICT, moving media, functional food, packaging, cleantech, and risk and security[12]. The selection is based upon the strengths put forth by Region Skåne, FIRS and SIS, the European Commission, and the universities in the region. It should be noted that these sectors do not act as separate units since there are plenty of overlaps and interfaces uniting them.

8.1 Life science

The life science cluster in Skåne has almost the same amount of pharmaceutical as medtech companies. A characteristic of the pharmaceutical sector is that it encompasses many small companies founded by scientists at Lund University and spin-offs from the larger pharmaceutical firms. Medtech is described to be the life science sector in Skåne that is the most internationally competitive. One of the great advantages are said to be that the companies are closely interacting with the hospitals and universities to develop new products (Henning et al, 2010).

The cluster is predominantly located in the southwest of the region where the main university hospitals and universities are found (Region Skåne, 2009). In 2009 it was the second largest life science region in Sweden with 6000 employees, after Stockholm-Uppsala and Västra Götaland (Göteborg) (VINNOVA, 2011b). Skåne is however also part of a bigger life science cluster, namely that of Öresund, which is also including parts of Denmark. It is an internationally strong cluster which is almost comparable with the ones in Boston and San Diego. The Öresund life science region is mainly promoted by the member organization Medicon Valley Alliance (MVA). In Skåne, this is the biggest and most important actor with aim to strengthen the life science sector (Henning et al, 2010). It aims to build networks, organizing events and seminars, creating an overview of issues of importance in life science, and conducting analyses (MVA, 2012a). It was established 1997 by Lund University and Copenhagen's university. Thereafter it has also been supported by public actors for regional development as well as three large pharmaceutical companies. Today, it has approximately 300 members (MVA, 2012b). It further has a non-governmental structure, which is seen as a positive feature for a cluster organization (Cooke, 2010).

[12] Packaging as well as Risk and Security will only be outlined shortly.

Coenen et al (2004, cited in Henning et al, 2010) state that Medicon Valley cannot be considered an integrated cluster, but rather a part of two separate innovation systems. It is further stated that only a small part of the companies of Skåne is involved in knowledge transfer with Danish actors. Moreover do the both countries have key strengths in different areas, the Swedish side in medtech and the Danish in pharmaceutical. The companies in the two countries also differ in terms of origin. Companies in Skåne are mainly founded by scientists at the universities as stated above, whereas the Danish companies often are spin-offs from bigger companies. They do therefore have different knowledge-networks, which could be a hinder for cross-boarder interaction. Finally, the differences in culture in the two countries are highlighted as obstacles to interaction (Löfgren, 2008, cited in Henning et al, 2010). At the Future of Swedish and Danish Life Science-seminar (2012) the importance of collaborating and acting as a cohesive Öresund region was elucidated in order to respond to the increased global competition. Competing alone against China, US, Singapore etc., when only having a population big as a mid-sized Chinese town is not sustainable. Instead of 'reinventing the wheel' and putting time and money on competing on their own, the Nordic countries should make a joint effort and aim for economies of scale. It is moreover crucial to secure the region's attractiveness, without for example satisfactory supply of high competence, Big Pharma will move out (Future of Swedish and Danish Life Science seminar, 2012). One person at the Life Science Investment Day highlighted the importance of a landscape where SMEs can grow and flourish since they after all are the "backbone of the economic future and main drivers of innovation in medicine" and refers to the European Commission (2012c) which further states that the SMEs are "usually among the first to respond to emerging challenges and seize new market opportunities". Many ideas on how to better compete were brought up on the Life Science Investment Day and the Future of Swedish and Danish Life Science Seminar (2012) for example to engage more in open innovation, not only focus on the molecule but also on the package, dosage form, and prize, focusing more on global challenges such as the increasingly ageing population (Life Science Investment Day, 2012), and dare thinking outside the box: preventative medicine might be the next 'disruptive technology'. It is also important that the society encourage entrepreneurs and the next generation, for example by highlighting success-stories and celebrating and rewarding entrepreneurship (Future of Swedish and Danish Life Science seminar, 2012).

It is relatively easy to start up a company, but thereafter it gets problematic – bureaucracy, high taxation, and the risk involved with hiring people due to difficulties of firing were pointed out at the Future of Swedish and Danish Life Science seminar (2012) as obstacles for growth. It was further stated that the Swedes are good at science but bad at diffusing new technologies, much due to too much regulation that delays the process. Another large obstacle mentioned for the life science innovation system in Skåne is the lack of venture capital (Henning et al, 2010; Life Science Investment Day, 2012). Companies involved with the development of untested pharmaceuticals, as well as those with long development periods are especially dependent on its supply. The availability is below other regions in Europe. Henning et al (2010) believes that it is possible to attract

more venture capital to the region if it markets itself as a part of the internationally competitive Öresund life science region. At the Life Science Investment Day (2012) it was said that the availability of venture capital is only satisfactory in the very early stage. In Europe, companies can only attract small funding in difference to US where one can get larger sums at once which enables the companies to concentrate on the business instead of hunting investments (Future of Swedish and Danish Life Science seminar, 2012). It is moreover a problem that it is difficult to attract international investors to the region since they want to partner-up with local investors, which are missing (Life Science Investment Day, 2012). One person exhorted to rethink the whole VC-structure and referred to Israel where they intervened and built it the way they wanted it. Except from more radical actions, the interviewee Björn Larsson (2012), business developer and accountable for investments at GU Holding, who also was present at the seminar, stated that the companies need to be better at approaching the investors before asking for money.

In March 2010, the biggest pharmaceutical company in Skåne, Astra Zeneca decided to close its operations in the region. This came as a chock to the life science sector. The future looked dark, not only for the 900 employees who would stand without jobs (Meerveld, 2012), but also for the many subcontractors (Sydsvenskan, 2010b) and for the overall attractiveness of the life science cluster in Skåne (Sydsvenskan, 2010a). From march 2010 until now, the research and innovation council in Skåne (FIRS) has worked for turning the shutdown into an opportunity. Astra Zeneca's buildings with their 80 000 square meters are today in the process of becoming a research park. Due to philanthropic funding from the PEAB-founder Mats Paulsen, the research park, called Medicon Village started its operations in January 2012. Except from companies, the research park houses the ESS-office and the Lund Life Science Incubator. The institute Life Science Foresight Institute, which will provide organizations with business intelligence and prospective analyses will also be housed by Medicon Village, but is today under construction (Medicon Village, 2012).

Other important actors are for example the science parks and incubators Ideon, Medeon, and Krinova, Lund University's holding company with a pharmaceutical focus, LUBio (LUBio, 2012), the organization PULS which acts as an incubator and investor for early projects within life science (PULS, 2012), and the life science forum Medical Malmö, which was initiated 2011 by Region Skåne, Malmö Stad, Lund University, and Malmö University in order to support and promote initiatives within the life science sector in Skåne (Medical Malmo, 2012).

8.2 ICT

As for the rest of Sweden, Skåne's success in ICT is much due to Ericsson's development towards the multinational company it is today. Sony Mobile (previously Sony Ericsson) and ST Ericsson have 2500 (Olofsson, 2012) and 1100 (Nielsen Negrén, 2012) employees respectively in Lund. Skåne's position in ICT is also much due to high qualitative research at LTH and its supply of knowledge and competence to the industry (Region Skåne, 2009). According to Henning et al, there are 17 000 employees in the IT sector in Skåne. Most of

them are found in Malmö and Lund and many are situated in or in close proximity to Ideon Science Park and LTH. The focus is on manufacturing of electronics and IT-equipment, computer consultant services, and telecommunication (Region Skåne, 2009).

The two primary network organizations in Skåne are Öresund IT and Mobile Heights. Öresund IT aims to support innovation and development projects as well as promote collaboration between different actors within the Öresund region (Henning et al, 2010). The network organization Mobile Heights promotes partnerships for innovation in mobile communications, from hardware to software and services. It also aims to promote southern Sweden as a leading region in the area and to attract new talent to the region. Mobile Heights is the initiator behind the three industrial research centers at LTH: System Design on Silicon (SOS), Embedded Applications Software Engineering (EASE), and Network for Mobile Services & Applications (NMSA). These focus on hardware, software and service innovations respectively. Mobile Heights furthermore hosts Mobile Heights Business Center, where entrepreneurship is supported (Mobile Heights, 2012). It started with the aim of taking charge of disused ideas and untapped potential (Henning et al, 2010).

The organization was started on the initiative of ST Ericsson, Sony Ericsson (Sony Mobile), and Telia Sonera (Henning et al. 2010) in 2007. It started as a response to problems of attracting labor with the right competence (Region Skåne, 2009) and the declining research budgets in mobile technology (Caniëls, 2010) due to increased global competition. Sony Ericsson experienced decreasing demand, Telia Sonera had a drought of patents and had cutting employment in several years, and ST Ericsson's future as a 'stand-alone' company looked dark. The industry implemented two 'resilience strategies' in order to survive the competition. One was 'change of focus' where for example Sony Ericsson (Sony Mobile) changed focus from hardware to services. Another is the adoption of 'open innovation': Sony Ericsson is now highly active in 'open innovation'-relationships with innovative start-ups. It has however under the Ericsson-era had a history of a very closed innovation process (Cooke and Eriksson, 2011).

The sector is today under high pressure both from fierce global competition and from the economic crisis. This is particularly noteworthy in Skåne. ST Ericsson has during the last years been so unprofitable that it is now difficult selling (Holm, 2012) and it has since 2009 fired 300 employees in Skåne (Nielsen Negrén, 2012). Sony mobile is moving its main-office to Japan and will therefore lay off 650 employees until 2014 (Sandahl, 2012). It has however also declared that it will start up a new company in Lund where some of the affected can be employed (Niklasson, 2012). Moreover, Sigma has declared they will lay off 30-125 employees due to the declining market in Skåne (Kalin, 2012).

8.3 Moving media

Moving media lies in the interface between film, TV, computer games, and mobile technology (Henning et al, 2010). This is a new area that has come to develop in the middle of the 2000's when Malmö University decided to focus more on creative areas (art,

design, moving media, etc.) partly as an effort of trying to distinguish itself from Lund University (Region Skåne, 2009). It is a niche area that builds upon existing strength within traditional media and IT (Henning et al, 2010). The sector is characterized by a big share of small companies (Hallencreutz, Bjerkesjö and Daal, 2010), which in total employs around 5100 individuals in the region and is therefore regarded as quite small. It is however seen as a growth sector with good potential for new interesting innovations, also in the interface with other sectors (Cooke, 2010). The sector has recently gained more legitimation in the region. It is now viewed as a sector that creates jobs and value, although there still exists some doubtfulness against certain areas such as computer gaming (Hallencreutz et al, 2010).

Research in moving media is characterized by a high degree of collaboration with companies and users. This is partly due to the researchers' need to detect in what direction the industry is moving since it is a very fast-moving area. It is also an area with a distinctive user-driven innovation profile. Malmö University has educational programs focusing on moving media. Due to the fast development in the area, a challenge lies in adapting these after prevailing advances (Hallencreutz et al, 2010).

Malmö University is the key academic actor in moving media in the region. Interactive design and service innovation are areas where research at Malmö University is particularly well developed (Hallencreutz, 2010). It has a research center, MEDEA, which is focusing on 'collaborative media'. The center started 2009 and has now about 90 partners including the cluster organizations Media Evolution and Mobile Heights (MEDEA, 2012). Media Evolution is the cluster organization that links the moving media sector. It initiates collaboration and networking among its members (Hallencreutz et al, 2010) and aims at stimulating the emergence and growth of start-ups in the sector (Cooke and Eriksson, 2011). Another important actor is MINC (Hallencreutz et al, 2010). It started 2003 as an incubator, but has now expanded to include the arrangement of seminars, workshops as well as meetings between companies and investors and advisors. It also has workplaces for companies to rent (MINC, 2012). The moving media sector in Skåne is also linked to the one in Blekinge, where for example Blekinge Institute of Technology (focus on computer gaming), the polytechnic SOFE, and the network organization and science park Netport constitute important actors. When it comes to support for innovation in the area of moving media, it is noted that the general support system in Skåne is not adapted for the area's service-oriented innovation profile. The support system built around technological innovations, aimed for patenting and licensing does not apply to moving media, which is built upon a different type of business logic (Hallencreutz et al, 2010).

8.4 Functional food

Skåne has a long and strong tradition in food. Today the region is not only a major producer of primary products, but also of more specialized and high-refinement products, i.e. functional food. Although the sector encompasses actors from the whole value chain (Hallencreutz et al, 2010; Henning et al, 2010), the potential for knowledge transfer is

relatively limited to only a few parts. The total food sector therefore cannot be considered as a cluster (Henning et al, 2010)

The increased international competition within the sector has put a pressure on the actors to start cooperate. Many companies in Skåne have therefore recognized the need for collaboration in product development and innovation with universities as well as with other firms (Henning et al, 2010). Hallencreutz et al (2010) find that there are many strong informal networks especially among smaller foodstuff producers. Cooke (2010) recognizes a high degree of interaction especially in the functional food area. There are however generally weak linkages between processing firms and academia. Direct linkages between companies and farms are almost non-existent. Cooke (2010) concludes that there are a few tighter sub-system arrangements among the generally anonymous interactions that are found within the food sector in Skåne.

There are several important organizations with the aim to strengthen the food industry within the region. For example FoodBEST, the successor (FoodBEST, 2011) of Öresund Food Network (Henning et al, 2010), which operated in the whole Öresund region where it provided support for companies in the stat-up and growth phase, business and industry advice and help with networking among other things (Öresund Food Network, 2012). In difference to Öresund Food Network, FoodBEST is a European project that is today coordinating a large European proposal for a knowledge innovation center (KIC) to the European Institute of Technology (EIT) (FoodBEST, 2011). Ideon Agro Food is another important organization (Henning et al, 2010). It has since 1986 operated in Skåne with the aim to strengthen the linkages between industry and academia (Ideon Agro Food 2010) and to strive for the utilization of scientific findings in existing firms (Hallencreutz et al., 2010). Ideon Agro Food moreover provides support and advice to start-ups to for example find the right contacts (Henning et al, 2010). Yet another organization, Skåne Food Innovation Network (Skånes Livsmedelsakademi) established 1994, aims to strengthen networking among actors as well as increase the supply of skilled labor within the region (Skånes Food Innovation Network, 2012).

Many actors from the academia are involved in the innovation system, for example Lund University with faculties within economy, science, and technology, the Swedish University of Agricutural Science (SLU) in Alnarp, and Kristianstad University. Lund University is for example operating the project Innovation in Gränsland (described below) (Hallencreutz, 2010) and has a science center for functional food (Functional Food Science Center) which hosts the Antidiabetic Food Centre where the industry participates in research collaboration (Functional Food Science Centre, 2012) and Kristianstad University house the science park Krinova which to a large extent focus on functional food (Krinova, 2012). Hallencreutz et al (2010) find that there are several organizations for support and likewise in the region that work in the same direction. The problem is that they work almost parallel, which is rather inefficient in terms of resource utilization. Another problem is that the many actors are small and work with small resources. There is thus a potential risk that they cannot reach a critical mass in their operations where the

resources can have maximum effect. Hallencreutz et al (2010) therefore suggest that the actors should try to refine their roles and be better at focusing their efforts.

The food sector in the region has traditionally been very fragmented and there has been lack of a common view on how it should be developed (Henning et al, 2010). This is something that Henning et al (2010) describes as relatively overcome today much due to a great work from Skåne Food Innovation Network to join the sector around a common vision. This has been made possible by stimulating networking through workshops, seminars, and other types of activities where people from different organizations have participated. This has further result in consensus about the importance of high-refinement and niche products and a higher degree of networking among actors. Skåne Food Innovation Network understand the importance of a good overview of the system and has therefore mapped all project and participants within Innovation i Gränsland, which is the main project within the region for stimulating networking and innovation (Henning et al, 2010). When looking for the website in question, 2012-04-17, it was out of function. Innovation i Gränsland has operated since 2003 and will continue until 2013 (Region Skåne, 2007).

One of the primary problems in the food sector in Skåne is the lack of supply of skilled labor. This is mostly due to the difficulty of attracting recently graduated students who wrongly believe that the sector is too traditional, static, and only producing raw material (Hallencreutz et al, 2010; Henning et al, 2010). The unattractive view of the food sector is something that Skåne Food Innovation Network is working on to change, especially when it comes to students. The initiatives include for example a website for summer jobs and school theses, participation in career-days, and seminars (Henning et al, 2010).

Henning et al (2010) state that the most developed initiatives and programs for innovation and regional development among all sectors in Skåne actually are found in the food sector. They do however also find that many companies do not know about these efforts. Some companies even express that there is a problem that such initiatives do not exist (Henning et al, 2010).

8.5 Packaging

According to Invest in Skåne (2012), the region is one of Europe's most dynamic centers for the packaging industry. Skåne's tradition in packaging is much due to the large global companies Tetra Pak and Åkerlund and Rausing (now Å&R Carton) (Henning et al, 2010). They were founded 1951 (Tetra Pak, 2012) and 1929 (Å&R Carton, 2012) and have today about 3500 (Tetra Pak, 2012) and 130 employees in Lund (121.nu, 2012) respectively.

The cluster organization Packbridge was founded 2010 and has today around 170 members from the industry, academia, and public sector (Packbridge, 2012). The cluster is largely involved in the food, life science, ICT, and cleantech sector (Cooke and Eriksson, 2011). The need for packaging in the food and life science sector is big, about 80% of the societal need of packaging is made up by these sectors (Oxford Research, 2011b). Ideon

Agrofood, Skåne Food Innovation Network, Gambro, and BASF are examples of members from the two sectors (Packbridge, 2012). The ICT sector is involved in interactive packaging solutions using mobile telephony applications in payment, traceability, etc. (Cooke and Eriksson, 2011). ICT-related members include Media Evolution and Sony Ericsson (Packbridge, 2012). When it comes to cleantech, sustainability and recyclability is as in many other sectors also a highly prioritized area in packaging. Here, Sustainable Business Hub is an important partner (Cooke and Eriksson, 2011). Logistics is another area that overlaps packaging. It creates an interface between packaging, ICT, and cleantech where Lund University and companies in the region collaborate, for example at the VINN Excellence center Next Generation Innovative Logistics hosted by the university (Next Generation Innovative Logistics, 2012).

Packbridge offers its members education, technical and strategic consultation, R&D, seminars, networking opportunities, and promotion internationally. In 2013 the organization will merge with Packaging Mid Sweden located in Sundsvall, which is claimed to bring a new dimension to the network partly due to its strategic location with the forest in instant proximity (Packbridge, 2012).

8.6 Security and safety

The cluster organization Training Regions was established 2010 by Lund University, SAAB, Region Skåne, the Swedish Armed Forces, Eon, and If. It focuses on societal security, risk, and crisis management in order to promote resilient cities (Training Regions, 2012). Research in the area is made by Lund University's Centre for Risk Assessment & Management (LUCRAM), which focus on emergency response, disaster studies, human and organizational factors in risk management, and complexity and systems thinking (Cooke and Eriksson, 2011).

Training Regions has 17 members. It is open for national and international actors and offers networking opportunities, seminars, conferences, workshops, advice, and counseling as well as collaborative efforts with Training Regions Research Centre hosted by Lund University (Training Regions, 2012).

8.7 Cleantech

According to the interviewee Per Simonsson (2012), Vice President and project leader at Sustainable Business Hub, the most prominent cleantech areas in Skåne are energy systems, water treatment, and sustainable urban development. There are especially many companies within energy systems dealing with district heating. Some of the bigger companies make heat exchangers (Alfa Laval, Swep, Heatex). Other companies deal with everything from pipes and components to incinerators. Most are small ones. There are also quite many companies within water treatment, some of which also treat biogas and waste disposal. Sustainable urban development is another area. It is very wide and includes actors such as municipalities, architectural firms, and engineers (Simonsson, 2012). Region Skåne (2009) writes that due to the many and very different technological

bases, cleantech cannot be regarded as a coherent sector or industry, rather it can be viewed as consisting of several industrial sectors or niche industries (Henning et al, 2010). There do however exist some areas where complementarities and synergies arise, for example in the production of biogas which can be linked to many different areas where input can come from for example food waste, treatment plants, or residuals from the agriculture. There are also overlaps between cleantech and other sectors, for example with Life Science as well as ICT (Cooke, 2010).

Henning et al (2010) state that the cleantech companies seldom see the potential of collaborating with each other due to their different knowledge bases. Simonsson (2012) state that collaboration is however typically centered around some type of utility, such as a treatment plant, waste management center, or an electric utility, e.g. the clients of their products. Sustainable Business Hub has therefore chosen to focus on promoting collaboration within a number of subdomains, which share similar knowledge bases. Whereas Sustainable Business Hub has a strong linkage to the industry, its connection to the academia is rather weak (Henning et al, 2010). Simonsson (2012) state that the companies coming from outside the academia often find it difficult to get in contact with the academia. He thinks that this is due to the fact that there is no clear entrance of which they can address themselves to at Lund University. The researchers relevant to the cleantech sector are spread at many different departments and have little knowledge about each other. Lund University is now in the process of creating an interdisciplinary platform that aim to facilitate for this. Simonsson (2012) further states that it is often bigger companies that participate in research collaboration with the academia, they often have industry affiliated PhD students and contracts with the universities. It is often the small companies that have problems approaching the academia, and which also have too scarce resources, both in terms of money and time, for investing in such collaboration. He thinks that the lack of research institutes in the region might have implied missed opportunities since they often have a better ability to act together with the industry than what the universities have.

Simonsson (2012) believes that there is a high intensity of innovation going on in most areas of the cleantech sector in Skåne. This has mostly to do with the increasing demand all around the world due to the rising awareness about the environmental impact. For example, it is known that cities stand for 80% of all the carbon dioxide emissions. A huge amount of money has to be invested in the future. Innovation within cleantech is therefore to a large extent demand driven, i.e. it often requires someone to demand it. Actors like Sustainable Business Hub work on promoting innovation within cleantech for example by pointing this out to bigger clients and advocating the sector. What is often demanded are ‘solutions’, which often also requires many different types of products connected into one unit. Such solutions can seldom be produced just by one company, and it is not a simple task to find the right ones that in concert work on putting it together. Sustainable Business Hub is working with assembling its member companies in front of bigger clients so the latter can gain a holistic perspective of what a potential solution

would look like, what it would cost, and how efficient it would be. This is a win-win situation for the client and the companies. The clients do not have to put time and money on the search process of finding the right companies that can supply such a solution. In addition, the companies get visualized in a totally different context and enjoy greater competitive advantage than if they would act alone. Even for a very big company like Alfa Laval it is vital to be visualized in such contexts. Simonsson (2012) explains that being able to coordinate such events is a typical Swedish strength. Swedes are whatsoever especially skilled dealing with complex systems in which different components and products need to be connected.

The cluster organization Sustainable Business Hub, which has been mentioned above, is the unit that links the cleantech sector in Skåne. It aims to promote the cleantech sector in the region regionally, nationally, and internationally. It also aims to promote collaboration between the companies themselves. For this sake, they work with informing stakeholders for example by newsletters (has a send list of 2000 names) as well as the arrangement of workshops, seminars, and breakfast meetings which also aims to bring actors together so that they can expand their network of contacts. The organization moreover provides information about possibilities for different type of support that the companies can benefit from.

Region Skåne has decided that before 2020 all their transportation will be based on renewable fuels and all thermal energy will come from renewable sources. As the very large organization that it is, it will contribute to less negative environmental impact in the region and serve as a role model (Region Skåne, 2010). Malmö Stad has a similar goal, but also aim to make the whole city self-sufficient on renewable energy until 2030. Malmö Cleantech City is a project owned by Malmö Stad that aims to promote companies within sustainable urban development and provides companies with marketing assistance, networks, and to seize business opportunities (Malmö Cleantech City, 2012). Trough a joint effort Swedish and Danish actors from the public sector and academia also embrace the work towards integration of sustainable infrastructure. One example is the project EcoMobility Öresund which aims to gather knowledge about sustainable transports (Ecomobility Öresund, 2012). Yet another is Energi Öresund where the actors work with strategic energy planning (Energi Öresund, 2012).

Another important actor is Skåne Energy Agency, which is a department within The Association of Local Authorities in Skåne. It drives several networks with different focuses in the cleantech area. One is Biogas Syd, which promotes the production, distribution, and utilization of biogas. Another, Skånes Vindkraftsakademi, aims to promote communication about wind power issues and stimulate networking for collaboration. Yet a third, Solar Region Skåne, is a network organization that aims to diffuse knowledge about solar energy and increase the usage of it (Skåne Energy Agency, 2012). Other actors in the cleantech sector are for example Cleantech inn Sweden which provides companies with business support (Cleantech inn Sweden, 2012) and the private

organization Cleantech Scandinavia which brings together companies with venture capitalists (Cleantech Scandinavia, 2010).

9 Sectors in Västra Götaland

A group of the greatest leaders from the regional governance in Västra Götaland and the universities in Göteborg was set together 2009 to discuss how they could better collaborate to enhance the attractiveness of the region (Global forum, 2011a), but also to identify the main knowledge-based clusters in the region, which further would be promoted in national and international contexts (Global Forum, 2011b). In the autumn of 2011, at the conference Global Forum in Göteborg, they presented five key clusters. These are: urban future; the marine environment and the maritime sector; transport solutions; green chemistry and bio based products; and life science (Andersson, Fredman, Hultén, Losman, Markides, Ransgård, Trouvé, Törsäter, 2011, p. 5). According to European Commission (2012a) the key sectors[13] prioritized in the regional development process in Västsverige are automotive, life science, food processing, textiles, Information and Communication Technology (ICT), the petro chemical industry, environment/energy and maritime industries. These match quite well taking to account that the five clusters are broad and therefore encompass most of the sectors highlighted by the European Commission. The sectors brought up in this chapter are based on these as well as the universities areas of advance and strengths, these are: automotive, life science, ICT, The maritime and marine sectors, smart textiles, functional food, and cleantech with focus on energy, green chemistry, and sustainable urban development. It should be noted that these sectors do not act as separate units since there are plenty of overlaps and interfaces uniting them.

9.1 Automotive

Västra Götaland has a long history in automotive and is today one of four European regions that have a complete vehicle manufacturing industry (NUTEK, 2009). In 2011 the sector covered about 5% (Center for Strategy and Competitiveness, 2012) of the total workforce and was thus the largest sector in the region. In 2006 Göteborg, Trollhättan, and Skövde made up about half of the total number employees in automotive in Sweden with 30%, 9%, and 8% respectively (NUTEK, 2009). Within the world, Västsverige's automotive sector scored four in terms of number of employees year 2008 (Huggins and Izushi, 2008). Today there are 145[14] companies and around 38 000 employees in the automotive industry in Västra Götaland. Year 2004, there were 197 companies and around 50 000 employees in the region. The greatest cause of this drop is due to the bankruptcy of SAAB Automobile which had about 6 200 employees. Many subcontractors to the company were also affected, for example Lear Corporation, which had around 2 000 employees. Today it is under the process of winding up and has only a few employees left (Markör, 2012).

[13] Also includes trade and tourism, which here are left out due to delimitations of the thesis
[14] With over 30% of sales in the automotive industry

The automotive industry is mainly concentrated in Göteborgsregionen, where the largest companies, Volvo Cars and Volvo Trucks employs 11 000 and 8 500 respectively. There are two vehicle manufacturers (OEM - original equipment manufacturers) in Västra Götaland; Volvo Cars and AB Volvo. These, along with subsidaries, make up 4% of all automotive companies, but 65% in terms of number of employees. 74% of all companies are tier 1/2/3 subcontractors, representing 27% of all employees. A bigger share of these have their sales targets in automotive industries abroad (tier 1/2/3 - global). 35% of all companies are foreign owned[15], wheras 50 % of all employees are working in foreign owned companies. This is explained by the foreign owned Volvo Cars being the largest employer in the region as well as that many of the biggest subcontractors are foreign owned.

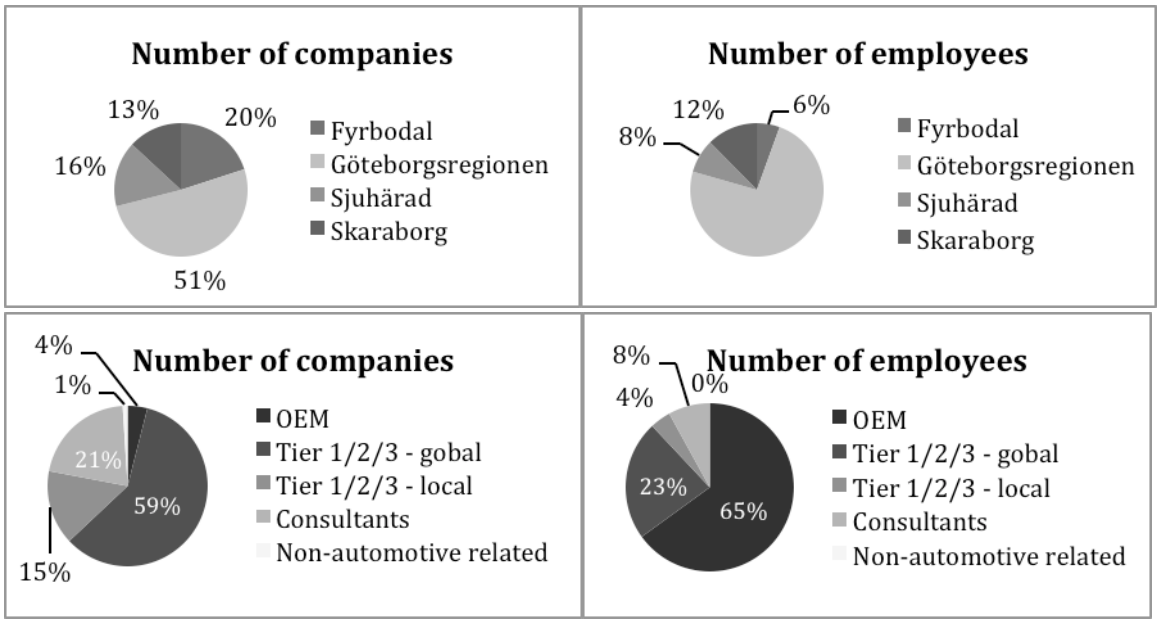


Figure 20, 21, 22, and 23. Number of companies and employees in Västra Götaland (Markör, 2012)

Due to the many constituents of vehicles, the value network in the sector is complex and involves a large number of subcontractors. Innovations typically stem from different levels of the value network. This makes the sector vulnerable to multiplier effects; innovation that has stemmed form one part of the network often affects many other parts. The different layers of the value network are often collaborating in R&D, which makes the network rather tightly knit (NUTEK, 2009).

The most important academic actor is Chalmers (Markör, 2012) which has a number of collaborative platforms in the area where the industry participates, they are Combustion Engine Research Center, the Swedish Hybrid Vehicle Centre, and SAFER Vehicle and Traffic Safety Centre, Competence Centre for Catalysis (KCK), Swedish Knowledge Centre for Renewable Transportation Fuels (f3), Northern Lead Logistics Centre (Chalmers Transport Area of Advance, 2012). The Univrsity of Gothenburg does also have some collaborative project, but their research is centering around the societal aspects.

[15] Here "foreign owned" means that the company has 50% or more foreign owners

University West has a focus on production technology, University of Skövde focus on production optimizing through visualization and simulation, and University of Borås' only link to the automotive industry is through research on lean production and smart textiles. The institutes within the automotive sector are SP, Swerea IVF, and the Viktoria Institute (Markör, 2012). Collaborative triple-helix platforms are found at Lindholmen Science Park, which has a focus on the interface with ICT, safety, and sustainability (Lindholmen Science Park, 2012) and at the science park Innovatum which focuses on production technology and sustainability (Innovatum, 2012). Other important actors are the network organization Telematics Valley, The Swedish Road and Transport Research Institute VTI, the network organization Automotive Sweden, and Test Site Sweden and Astra Zero which provides demonstration and test environments (Markör, 2012).

One of the major trends for the future is the increased need for environmental friendly solutions such as electric vehicles, fossil free gas, and smaller and lighter vehicles as well as transport efficiency. In terms of electric vehicles, research in the region is focusing on battery capacity, electro mobility, fuel cells, etc, and is seen as competitive internationally. On the other hand is the region seen as falling behind when it comes to launching electric vehicles. The vehicle manufacturers do however have several electrifying projects going on, and there are also some new vehicle manufacturers in the region which focus on electrification. There are several projects going on around fossil free fuels, but this area has been somehow overshadowed by electrification, which has come to be a stronger trend. The industry is moreover standing in front of a change towards smaller and lighter vehicles. Here, several new manufacturers challenge the traditional view of vehicles, taking on a user-perspective where the user-need is in focus. Another trend is active security systems, e.g. sensors, radars, and systems which can detect where the vehicle is located on the road and in relation to other passengers. In this area, Volvo Cars is on the front edge. Also AB Volvo is a forerunner, when it comes to heavy vehicles. A central actor in active security is the competence center SAFER at Lindholmen Science Park. Yet another trend is telematics/connectivity which enable transfer of information between different systems, e.g. between systems in the vehicle and those at the office. The region has been a forerunner in this area, but other regions are now catching up. One possible trend for the future relates to future behavior patterns of the users: It might not be a natural choice in the future to own a car and it might not even be the main choice for transportation, instead the use of public transportation and carpools might dominate (Markör, 2012).

The region's strengths are related to competence, cooperation, and international competitiveness. Västra Götaland's long tradition in the automotive industry has resulted in strong and multifaceted competence around vehicle manufacturing. To stay in the game, the cluster has developed a good climate in research and development. The strength in competence is also much due to research at, and competence supply from the academia, where Chalmers is the main actor. Cooperation between companies, academia and the public sector is also seen as a strength (Markör, 2012). One interviewee to

Markör (2012) stated that the public sector is rather supportive when it comes to testing of new techniques. This is necessary for companies to dare trying new things. The automotive cluster in Västra Götaland is moreover said to be one of the world leaders, especially when it comes to trucks. Safety as well as IT and telematics are considered key strength.

The weaknesses are related to cooperation (too), common vision, and international collaboration and marketing. Cooperation is not only considered a strength, there are some aspects of it that fails. For example are the vehicle manufacturers Volvo Cars and AB Volvo considered too dominating in collaborative projects. They steer the projects in the direction they want and the other participants are expected to conform to that. The problem is that the smaller companies are not left enough space to share their own ideas. In this way, many good ideas and potential innovations are left behind. Critics are also pointed towards the public sector which often talk about the importance of SMEs in wealth creation but are nevertheless only investing in what the larger companies demand. One interviewee to Markör (2012) states that Volvo is so big and dominating so the region does not dare investing in the smaller ones. The interviewee further states that Volvo should not be part of all projects: The pace of development slows down when everything is centered around just a few big companies. Another problem related to cooperation is the existence of protectionism among the actors in the projects. People do not trust each other and do therefore not share enough knowledge and ideas. Competitiveness is therefore sometimes pointed in the wrong direction: locally instead of globally. There is moreover a mismatch in the way of working between different types of actors. The companies are seen as too concentrated on commercial ideas and too 'close' when it comes to new solutions suggested by the academia. Smaller companies do also find the bigger ones too rigid and stuck in old way of thinking. The academia and the public sector, on the other hand, are seen as too slow from the industry's perspective. Another weakness put forth by Markör (2012) is that the sector lacks a common strategy as well as coordination of initiatives and collaborations. Today, there are a lot of initiatives and collaboration, sprawling at different directions and some of which are parallel. There is neither a common vision nor a strategy about where the region is aiming and how it is going to get there. It is furthermore mentioned by the interviewees that there is a good understanding about the sector and its issues from a regional level, but not from a national level from which few efforts are made. Yet another weakness which also is related to the previous, is that of international collaboration and marketing: There are too little efforts of that sort and there is a concern that if not making use of the world outside the national border, the Swedish automotive sector will gradually become outcompeted. For this sake, it is vital to better promoting the sector's strengths and to have a strategy in place in order to attract international investors and collaboration partners Markör (2012).

9.2 Life science

The area around Göteborg is employing 17% of the total number of employees in life science in Sweden, and is thus the third biggest region after Stockholm-Uppsala (53%) and Malmö-Lund (19%). In 2009, there were 5 600 employees in the life science sector around the Göteborg-area. About one third of them where in pharmaceuticals, almost two thirds in medtech, and only a few percent in biotechnology. The biggest life science company in the region, the pharmaceuticals company Astra Zeneca has its largest research unit in Mölndal in the Göteborg-area (VINNOVA, 2011b). In 2010 the company had over 2100 employees around Göteborg (Business Region Göteborg, 2010). There are however also several big companies in the medtech area (VINNOVA, 2011b). Except from these, the region is dominated by micro-companies (77%) (Oxford research, 2011a).

Among the academic actors the University of Gothenburg (GU), the Sahlgrenska Academy, and Chalmers are the most important ones in the region. The University of Skövde does also have some life science focus for example within system biology, and the University of Borås (HiB) in medtech in the area of smart textiles (Carlsson and Norrman, 2011). Some important actors for triple-helix collaboration are for example Sahlgrenska Science Park which is a business park and incubator, the research network and collaborative platform MedTech West (founded by Chalmers, GU, Sahlgrenska University Hospital, HiB, and VGR) (MedTech West, 2012), Gothia Forum which is a platform for clinical research (Gothia Forum, 2012), BIOMATCELL which is a national center for the research and development of the next generations of biomaterial based medical devices (BIOMATCELL, 2012), and the network Medicine in West (Medicine in West, 2012), among others. Moreover, GöteborgBio acts as a cluster organization for the Life Science sector in the Göteborg region (GöteborgBio, 2012).

In terms of possibilities for financing for companies, there has during the past ten years been a strong focus on the creation of new ones. The number of micro-companies has during this period tippled. Carlsson and Norrman (2011) do however state that these numbers also uncovers the difficulty to create viable companies that can mount over 10 employees.

Companies generally find it difficult to attract new labor from outside to the region. Newly hired do however enjoy their stay when they finally have moved to the region. Carlsson and Norrman (2011) discuss the importance of being able to bring the right services to people who consider employment in the region, such as a place to rent, possibilities to have kids in international schools, better possibilities to travel to Oslo and Copenhagen as well as to commute to Mölndal for the employees at Astra Zeneca.

An equal amount of companies in all sizes are represented in research collaborations with research centers and the university. It is often the same companies that take part in the different collaborations form year to year. The interviewee Maria Anvret, (2012) professor in neuro-genetics active at both University of Gothenburg and the medical university Karolinska Institutet, senior advisor in research-political issues at University of

Gothenburg and the Confederation of Swedish Enterprise (Svenskt Näringsliv), and former Head of Department of molecular biology at Astra Zeneca, states that the University of Gothenburg is not very good at managing the contact with companies, and compares it to Karolinska Institutet in Stockholm which is much more successful in this aspect. Too much of the University of Gothenburg's interaction with companies is built upon personal relationships and too little is managed in a formal way. Karolinska Institutet's success is partly built upon that they have instructed the scientist in how to manage the contact with the companies. This is something that the University of Gothenburg would need to learn from. Karolinska Institutet is also collaborating with more companies than what the University of Gothenburg does. Anvret (2012) explains that this is much due to recognition. Karolinska Institutet has a better reputation and much of its recognition is due to the fact that it is handing out the Nobel Prize in medicine. The recognition stimulates a self-reinforcing cycle where the university can attract better researchers, more and better research is made, and more recognition is gained (Anvret, 2012).

When it comes to collaboration between the academia and public sector in the region Anvret (2012) thinks that it works well. The close relationship between the academia, healthcare, and VGR is something that she puts forth as unique and as functioning much better than in Stockholm, which has too many actors to unify around decisions. She also mentions that it is similar in Skåne (the well-functioning collaboration). In terms of collaboration with Astra Zeneca things works less well. Here, Anvret (2012) thinks that the University of Gothenburg should work more with approaching Astra Zeneca, not just "sit and wait". Public, academic actors, and Astra Zeneca has however started working with how to improve collaboration. Astra Zeneca neither collaborates much with other companies. Anvret (2012) compares this with Pharmacia (which was acquired by Pfizer some years ago and had to leave is location in Uppsala), which had a totally different culture of close interaction with other actors. A lot of new companies grew up around Pharmacia as a result of its presence. Comparing the local life science sectors when Pharmacia left Uppsala with the one in Södertälje that Astra Zeneca left recently, the differences are profound. Pharmacia left a vibrant location where companies could continue to grow, compared to Astra Zeneca which left behind nothing (Anvret, 2012).

Carlsson and Norrman (2011) highlight the importance of cross-regional and cross-national collaboration for Västra Götaland. This is especially important for the pharmaceutical sector and clinical trials for drug development where each region possesses patient base that are too small by themselves. There has for some years been a collaboration between Göteborg and Oslo (Medcoast). Hellqvist Greberg and Litsne (2012) do however state that it might not have had the impact that one whished. They explain that it is not enough just directing top-down, the researchers also need to have an interest participating. Carlsson and Norrman (2011) see the establishment of ESS (in Lund), which will enable new research in the area of material science, as a strength for cross-regional research collaboration in the future. In conjunction with Carlsson and

Norrman, also Anvret (2012) thinks that the region needs to interact better with other regions. She believes that better interaction is on its way now when VINNOVA prioritizes efforts within the framework of national strategic innovation agendas. Anvret further calls for more presence of actors from other regions in for example seminars. This is something that concerns all regions. Hosts need to be better at inviting actors from other regions; they need to expand their list of contacts. Anvret would, beside the website of overview described above, like to see GöteborgBio build a database of stakeholders that could be used by all actors in the region. Its aim would not only be to invite relevant people to seminars, but also to facilitate for actors in the region who search for potential partners. It is after all interaction that drives the innovation system (Anvret, 2012). Larsson (2012) thinks that collaboration with other regions is satisfactory. He explains that especially life science companies are forced to collaborate over the borders in order to stay alive.

Companies within Västsverige find the external picture of the life science sector in the region as diffuse, both in terms of the general picture as well as of capacity and competence. The companies do not see themselves as part of a "cluster" and the trademark 'GöteborgBio' has not had the same success as Medicon Valley in Öresund. There is also a problem for companies to access competence in the academia. Especially small ones have difficulties knowing where to turn (Carlsson and Norrman, 2011) since they often are founded by persons who do not come from the scientific world (However, compared to other sectors, a much higher share of the company founders in life science come from the scientific world) (Anvret, 2012). This is further aggravated by the universities' criticized web presence, where it is difficult for companies to find information about what possibilities there are for taking part of competence and collaboration (Carlsson and Norrman, 2011). In accordance with Carlsson and Norrman (2011) Anvret (2012) also recognizes the problem of getting an overview of the system. She further states that GöteborgBio needs to be better at enhancing the local knowledge among companies about possibilities for support and collaboration. They would for example need to build a website where companies and other actors can get that overview of the system, so that they easily can find out where to turn. GöteborgBio should coordinate this website, but the organizations themselves would need to stand for the information. The organizations and universities would, however, also need to better and clearly communicate on their own websites what they do. Anvret (2012) is however skeptic to whether GöteborgBio at present really should market the regions' life Sscience sector. If it should, she thinks that the organization needs enhance its credibility among the researchers, and not only "be a lot of advertisers" who actually do not understand anything about the research. GöteborgBio should have a coordinating role. It can manage the initial contact with other regions, but not being out there communicating what the region's research is about, this task must be managed by the scientists. It is also important that Chalmers and the University of Gothenburg promote their areas of strength.

Carlsson and Norrman (2011) state that although having good competitive potential, Västra Götaland has problems responding to regional and global challenges in life science. This is for example visualized in its problems to attract EU-financing (does worse than Stockholm and Skåne), interact with the private sector, and building new viable businesses. In order to leverage the competitiveness, they point to the importance of focusing the resources on the areas where one actually has the potential to compete internationally. Spreading the resources over too many will ruin the chances for all. They do however also think that one not should focus too narrow on just biomed; it is important to invest in new interesting areas with potential. Also Anvret (2012) thinks that there is a too narrow focus; the three areas cardiovascular diseases, biomaterial, and health-technology gets too much attention. She calls for new perspectives, investing in new interesting areas and not only focus on those that are already up and running. Carlsson and Norrman (2011) mention the interface with for example the chemical industry found in Göteborg, Stenungsund, and Lysekil as interesting for the future.

9.3 ICT

According to the interviewee Jan Grahn, (2012) director of Chalmers ICT Area of Advance, the premier areas in the ICT sector in Västra Götaland are telecommunication, defense, space technology, and vehicles. The region is also good at computer- and antenna systems, and is world-leading in automotive, defense and space technology. For vehicles, ICT has become increasingly important. Grahn (2012) estimate that up to 70% of the cost of a vehicle in a near future can be derived to software. Thus, Volvo Cars and AB Volvo are extremely dependent on advanced ICT. For this sake, arenas for collaboration in intelligent vehicles and transportation have been established at Lindholmen Science Park (Lindholmen Science Park, 2012). In telecommunication, Ericsson is the main player having facilities at Lindholmen, in Mölndal, and Borås. The latter facility produces 30-40% of all microwave linkages in the world. Microwave technology has contributed to the development of one of Ericsson's most important products; radio-base stations which has resulted in tens of thousands of jobs in Sweden (Grahn, 2012).

Although world leading in some ICT areas, Göteborg is from an international perspective often in the shadow of Kista, where more jobs are located, a greater dynamism is present, more money in circulation, and several headquarters are located, for example that of Ericsson (Grahn, 2012). The regions are however specialized in different areas of ICT (Behm, 2012; Grahn, 2012). For example, compared with Skåne and Stockholm, Västra Götaland does not have any apparent profile in mobile IT and the companies in the technological area are not as big and famous (as for example Skype and Spotify in Stockholm).

The interviewee Erik Behm (2012), project leader at the cluster promoting association IT Centrum Väst, estimates that the ICT sector is employing around 25 000 people in about 5 000 companies in Västra Götaland (Behm, 2012). A few of them are very large (like Ericsson which stand for about 80% of all software in the region), whereas the lion's share is found in the small-company segment. In the middle segment, there are however

very few (Grahn, 2012). As a result of having some very big companies in the region, a relatively large part of all ICT-companies are consultants. Most of the companies are located around Göteborg (Behm, 2012; Grahn, 2012), but there are also some agglomerations found for example around Skövde (software) and Borås (e-commerce) (Behm, 2012). As mentioned, Ericsson also has a facility in Borås. Moreover, the antenna company, Arkivator, is found in Falköping in Skaraborg (Grahn, 2012).

Grahn (2012) explains that Chalmers is the main academic player in the ICT sector in Västra Götaland and that it has a low degree of collaboration with other HEIs in the region, whose research is generally much weaker. The collaboration with KTH Royal Institute of Technology, Lund University, Linköping University, and some international universities is much more intensive. Concerning research institutes in the region, Chalmers has good collaboration with SP, but has a much lower degree of collaboration with Viktoria and Acreo West (known as Imego), which have ICT as their main focus but are nevertheless much weaker and smaller. Grahn (2012) thinks that the institute-side on ICT is much less developed in Västra Götaland than in Stockholm.

Chalmers hosts several centers for research collaboration (Chalmers ICT Area of Advance, 2012), and is also one of the owners of Lindholmen Science Park, which has a number of arenas that centers around ICT, as mentioned above (Lindholmen Science Park, 2012). It is mostly companies in the "large" and "medium" segment that participates in collaboration with science parks and research centers (Behm, 2012; Grahn, 2012). For smaller companies, the incubators Chalmers Innovation and GU Holding are important linkages to the academia (Behm, 2012). There is however sometimes an obstacle for small companies from outside the academia to participate in research collaboration with the HEIs and institutes due to the large investments needed (Grahn, 2012).

Grahn (2012) states that Chalmers has a good culture of collaborating with the industry. For this sake Chalmers gets a large portion of the allocation among all Swedish HEIs from VINNOVA for collaboration with the industry. He also mentions that the fact that many alumni work at for example Ericsson and Ruag facilitate collaboration. Chalmers does moreover have good collaboration with international companies. For about ten years ago it was not acceptable to involve international companies in Swedish research collaboration since public authorities did not like the thought of them taking part of Swedish tax-payers money. Today this has totally changed. The value network has become too global to afford cutting international companies out. At for example Giga Hertz Centre at Chalmers, both Swedish and international companies are present, large as well as small. The Swedish companies Ericsson, SAAB, and Ruag stands for the system-competence, whereas international companies like Mitsubishi and NXP Semiconductor add the component-competence that Swedish companies lack (Grahn, 2012).

Behm (2012) states that Sweden has a tradition in close interaction and collaboration and that Göteborg work more integrated and are less stuck in silos than the rest of the country. He believes that the very close collaboration is a result from working with highly

complex products such as found in the automotive industry and in space technology. Complex products as in these areas need a much higher level of collaboration and interaction going on in their value networks. Grahn (2012) mentions that putting together complex systems is a typical Swedish strength. It is linked to the Swedish culture of collaboration, efficiency, and orderliness. Much of the contacts within these value networks are of an informal kind. Although much of the ICT network in Västra Götaland is built upon informal networking there exists formal nodes (meeting places). These serve as open "spots" where actors can expand their informal networks. Behm believes that there is relatively good presence of companies in different sizes in cluster/network organizations such as Microwave Road, Telematics Valley, and Center of Visulaization Göteborg, which are outlined shortly below.

Microwave Road is a typical bottom-up initiative created by researchers in the area (Grahn, 2012). It is a national cluster organization (with base in Göteborg) having 31 member organizations from the industry, academia and institutes (Microwave Road, 2012). It aims to promote knowledge sharing among its members and acts as a platform for collaboration (Intersecta, 2008). Västra Götaland is further part of of the European microwave cluster organization, EuRaMIG which was initiated by GigaHertz Centre at Chalmers. The international network organization Telematics Valley is an initiative from both industry and public sector in Göteborg (Grahn, 2012). It aims to strengthen the telematics area in west Sweden and provides a platform for collaboration for its 35 member companies (Telematics Valley, 2012). The Centre of Visualization Göteborg is more of a top-down initiative from the regional authority (Grahn, 2012). It aims to stimulate growth in the field of digital visualization and serve as a platform for its 39 members (VINNOVA, 2010).

Grahn (2012) explains that there are very little synergies between the different ICT areas in West Sweden, they act as relatively separate clusters. The cluster organization IT Centrum Väst is however promoting all ICT areas in the region, both nationally and internationally to attract new companies, competence, and investors to the region, as well as regionally to enhance the knowledge about potential partners, collaboration, and other opportunities. In order to stimulate networking and knowledge sharing they arrange different kinds of activities and seminars. Another important tool for informing the regional actors about what is going on in the region is the News Mail that is sent out to 2800 readers continually (Behm, 2012).

Behm (2012) believes that the main challenge for the region's ICT sector is to visualize itself more so that it can attract new companies and competence to the region. Today there is a shortage in the supply of competence in the region. There would for example be needed more students in the more advanced programs at Chalmers. The region is also, at present, recruiting competence from abroad (e.g. Spain). Another challenge lies in trying to help companies reach new markets. In this aspect, it is extremely important to promote the region's strengths and to be in the front edge technologically.

9.4 The maritime and marine sectors

Göteborg has a long tradition in the maritime sector and has the largest harbor in Northern Europe, which makes it a center for logistics. For only forty years ago it was the premier location for shipbuilding. No other place in the world built as many ships as Göteborg. The city's position did however gradually diminish as the development of cost-cutting accelerated. The west Swedish' market share became soon overtaken by the Japanese shipbuilders who better managed the so-called 'lean' production. Today, an important share of the maritime industry is dealing with manufacturing and development of components. This is a result of component manufacturers, often niche companies, successfully managed to reach out internationally as the Swedish ship builders gradually disappeared (Södahl, 2012).

Today, it is not only well known that the sea stand for ¾ of all transportation worldwide (Södahl, 2012) and that it is the biggest source of protein, but also that it can be used as a powerful source of energy (Andersson et al, 2011). The interviewee Björn Södahl (2012), Co-director at Lighthouse and former leader of Ocean Energy Centre states that sea transportation, energy extraction, and marine biology are areas in which the region is on the front edge. Sea transportation and maritime operations focus on how to make the sector more environmentally friendly and energy effective and includes such things as logistics and construction. Energy extraction includes fossil fuels, wave power, marine biofuels, tidal-, and offshore wind power. The alternative energy sources are under rapid development. They are supported by the Chalmers-hosted innovation platform Ocean Energy Centre, which was initiated by four Swedish development companies in 2011. In Lysekil, the largest wave power park in the world is under construction. Marine biology focuses on the ecosystems and fact of lives in the ocean and deals with such things as nutrients, health, bioenergy, and industrial products and processes. Söhdal (2012) states that the clusters do not act as separate units, rather there are important interfaces that links from which synergies and complementarities arises. One example is the usage of ballast water where marine competence complements the maritime sector with important knowledge on how to prevent the diffusion of organisms. Another example is in terms of fouling of vessel bottoms. In the ocean energy area the maritime knowledge about floating constructions and hydromechanics is a vital complement (Södahl, 2012). The marine and maritime clusters are also related to other sectors/clusters in the region: urban future, transport solutions, green chemistry and bio based products, and life science (Wenblad et al, 2012). Södahl (2012) state the maritime area share common issues especially with the automotive industry, for example concerning the development of powertrains, fuels, materials, etc. These are areas in which a higher degree of collaboration would be of great value, not at least for the maritime sector, which has not enjoyed an as intense product development as the automotive industry (due to different preconditions).

Only within maritime operations and maritime technology there are about 12 000 employees in about 500 workplaces in the region. That is a share of 44% of all employees

in the country (Wenblad, 2012). Södahl (2012), state that most companies in the maritime area are small or medium sized and a bigger share is component manufacturers. The fact that most are SMEs can be explained by their often narrow focus on niche-markets. The component manufacturing industry is relatively mature and most innovations can be found in the area, for example in cargo managing solutions, purification technologies for exhausts, different types of efficiency solutions, propellers, piston rings, etc. When it comes to growth-areas like wave power, the technological development is rapid. However, no such technology has yet become commercial.

Södahl (2012) believes that there is relatively good interaction and collaboration in the maritime area. The collaboration between the marine and maritime areas could however be more tightly knit, but this is something that is under improvement. Södahl (2012) mentions that it is a problem to attract companies from industries with low academic tradition to participate in research collaboration with the universities. This is often the case in the shipping industry. For this sake, Lighthouse is working with overcoming communication barriers, for example by hosting seminars, conferences and theme days, which aim to create a greater understanding for each other and to create meeting places where scientists can present their results and companies their needs. Concerning academic research, collaboration is intense and both national and international, as it usually is in most areas. Regarding the geographical distance between Göteborg and for example Uddevalla, which both can be seen as centers for maritime research in Västra Götaland, Södahl believes it play a role for collaboration, but does not believe it is a barrier. For example does Lighthouse have good communication with Swedish Marine Technology Forum located in Uddevalla, greatly facilitated by video-conference technologies.

There are a number of organizations and arenas that promote innovation in Västra Götaland's marine and maritime clusters. Lighthouse is one of the most prominent innovation platforms (Wenblad et al, 2012). It is a competence and research center established by Chalmers, University of Gothenburg, and The Swedish Shipowners' Association which focus on making shipping environmentally friendly, efficient, and safe (Lighthouse, 2012). It promotes research, education, and innovativeness within the shipping sector. It does this for example by creating meeting places, making research more easily accessible, creating test- and pilot projects, and reorient the education after new arising needs (Södahl, 2012). Another prominent innovation platform is Swedish Marine Technology Forum which is an association dedicated towards subcontractors to the shipping industry as well as for the leisure boat industry (Wenblad, 2012). It aims to promote the development of more efficient and environmental friendly marine products and to promote collaboration between academia, private and public sectors (Svenskt Marintekniskt Forum, 2012). Other important actors are for example the research institutes SP, SIK, and IVL Swedish Environmental Research Institute, and the consultant SSPA, which is housing a well used test site in the maritime area. For marine and maritime companies, the support system is more or less the same as the general support

system in Västra Götaland. One exception is however Mare Novum, which aims to support marine innovations (Wenblad et al, 2012).

9.5 Smart textiles

The area around Borås is known for its strong history in textiles. The sector has however been exposed to dramatic change during the past 60 years with a fall of number of employees with 90%. This is much due to the increased production in countries with low-cost labor, which resulted in a forceful importation of textiles. At the same time did companies that managed the change towards lower prices outcompete the traditional ones. The ones that survived the globalization did either change the location of the production to low-cost labor countries, or turn their focus towards knowledge-intensive areas that was not under the same price pressure (Gråbacke and Jörnmark, 2008).

The textile industry in the region is today focusing much on what is called *technological textiles* such as airbags, special textiles for safety cloths, and other types of advanced textiles. This is an R&D- and capital-intensive field where the competition from low-cost labor countries is left out. The trend is pointing towards what is called "smart" textiles such as sweaters that can measure pulse and temperature, curtains that lights when it is dark outside, and crucriate ligament that can be broken down by the body (Gråbacke and Jörnmark, 2008), and materials that senses how much noise it shall absorb, etc. Research in the area integrates advanced textile technology with sensor-, computer-, and other types of advanced material technology (Smart Textiles, 2012). According to VGR (2011a) the region is one of the world leaders in the area, which is "expected to revolutionize the textile industry and create huge business opportunities". The Swedish School of Textiles in Borås (at University of Borås) is doing much research within smart textiles (Gråbacke and Jörnmark, 2008) and do also cooperate closely with the research and competence center Smart Textiles, which ties together actors from academia and public and private sectors. Research is also made in collaboration with other sectors, such as automotive (Volvo), life science (Mölnlycke health care), etc. (Smart Textiles, 2012). The region is moreover collaborating internationally, for example via the international organization Crosstexnet where the region is the only Nordic member among 17 other European ones (Crosstexnet, 2012). Except from the above-mentioned actors, the network includes Chalmers, the incubator 'inkubatorn i borås', institutes such as Swerea IVF and SP (Smart Textiles, 2012), and the research center Centrum för Textilforskning and the competence center Textile Innovation & Competence center at the Swedish School of Textiles in Borås (University of Borås, 2012).

The smart textiles 'sector' is dominated by SMEs, there are however some large companies from other sectors that are involved in some research projects, as mentioned above. Most companies are concentrated in the Sjuhärad-area (the area around Borås) and the Göteborg-area, and about 20-25% are found in the rest of Västra Götaland and around Halmstad in Halland (Brésky, 2012). Since such a large share of the companies are SMEs, the cluster has worked much with "opening up" the knowledge infrastructure so that smaller companies "dare" taking part of it. The interviewee Erik Brésky, project

leader at Smart Textiles and head of the Swedish School of Textiles in Borås (2012) explains that it is important to be present, visible, and create trust among them. This is something that he and other cluster leaders are working actively with for example by having seminars, visits at the companies, and other types of informing and trust creating activities. Both formal and informal networks are important means: they complement and strengthen each other. When asked whether the support system lives up to the demands from the companies, Brésky (2012) states that it differs from company to company; what one claims is a lack, another is totally satisfied with. He further states that the support system is under development. Brésky (2012) finds the collaboration with the public sector as satisfying. He states that they were especially important in the early phase of the creation of the cluster, and brought the cluster legitimacy.

The biggest challenge for the cluster lies in attracting financing. Brésky (2012) states that it is important that the financing is big enough so that it allows them to be more long-termed in projects and in their work with innovation support for the cluster members. He explains that the long-termed perspective is extremely important in order to be able to create innovations (which are time-consuming) as well as to be able to create trust among the actors in order to obtain a dynamic and well functioning network. He further states that it is problematic to attract financing when the cluster only contains SMEs, since financers prefer investing in fields where some larger companies are present and where there are a greater number of employees; High growth potential is not enough incentive for them. Moreover, smart textiles is a very broad technological field which intersects many other sectors. This is a problem when attracting financing since the financers often prefer investing in sectors that are more narrowly specialized. Brésky (2012) does however only find the broad scope as an advantage since the field can be linked to many other sectors and does therefore have great potential to generate interesting interdisciplinary innovations.

9.6 Functional food

The interviewee Charlotte Eklund-Jonsson (2012), CEO at Food & Health Concept Centre states that Västra Götaland is investing a lot in its food industry. About 30% of the total research (Livsmedel i Väst; 2012, VGR, 2011b), and 60% of the research made by companies in the food area in Sweden is made in Västra Götaland. Moreover does 25% of the Swedish food production come from Västra Götaland and 75% of the Swedish fish processing (Livsmedel i Väst, 2012).

Functional food is an area that has gained more focus during the past years, and it is a growing field with high potential. Eklund-Jonsson (2012) states that Västra Götaland has great potential for developing its functional food cluster. She explains that there exist good resources, and refers to the fact that food is a large industry in Västra Götaland. There is also good potential in collaborating with the functional food cluster in Skåne. For this sake, a dialog with Ideon Agro Food about future collaboration has been initiated. Halland, which is known for being a large food producer, and which lies in between Västra Götaland and Skåne is also mentioned as a potential partner. But in order for these three

regions to collaborate and to take advantage of each other's knowledge, Eklund-Jonsson (2012) highlights the need for a common platform (Eklund-Jonsson, 2012).

Functional food companies that are engaged in research in the area are mainly located in the area around Göteborg and most of them are SMEs. Eklund-Jonsson (2012) mentions that the companies that take part in research centers and research projects generally are either very small ones or very big. The middle-segment is more difficult to attract. Eklund-Jonsson (2012) finds the overall innovation system in Västra Götaland as well functioning and that the resources for start-ups to be good. Although the existence of financing is relatively good in the early phases, companies which lies between the start-up phase and the more mature phases do have more problems attracting financing. Among the supportive actors, the organization Food & Health Concept Centre has a central role. It mainly aims to facilitate for the commercialization of new products and inventions and serves as a communication platform for the industry and academia (Eklund-Jonsson, 2012). Its activities comprise support for different actors in product development, investigation of market- and finance opportunities, IPR, and in finding the right contacts. The organization was founded 2005 on the initiative of a number of actors form the academia (for example Chalmers, University of Gothenburg, SLU) and the public sector (Food and Health Concept Centre, 2012).

Another central organization is the knowledge center Food Bioactives Centre. It aims to promote collaboration among researchers in the field of bioactive compounds in food and the compounds' relation to human health (Food Bioactives Centre, 2012) and serves as a communication platform for the industry (Eklund-Jonsson, 2012). The center started 2009-2010 and is currently funded by VGR and Chalmers (Food Bioactives Centre, 2012). Other actors involved in the area are Livsmedel i Väst (has an overall focus on the food industry). It aims to initiate development projects and collaboration between industry, academia, and public sector. It is moreover the parent of Food & Health Concept Centre as well as Agroväst and Lokalproducerat i Väst (Livsmedel i Väst, 2012). Yet other important actors are Sahlgrenska Science Park, the food and biotechnology institute SIK, the incubator Encubator, and the bioscience business school GIBBS (now under CSE), Venture Cup, among others (Food and Health Concept Centre, 2012).

9.7 Cleantech

Västra Götaland is the region with the highest number of employees and turnover in the cleantech sector in Sweden. The industries put forth as the most important ones within the cleantech sector in the region are IT, automotive/transportation, energy, petrochemicals, life science, textile, wood, construction, and culture and tourism (Norrman, Brenmeck, and Hedar, 2011). Since most of the areas are brought up in this thesis, this section will deal with[16] energy, petrochemicals (green chemistry), wood and construction (sustainable urban development).

[16] Culture and tourism are left out due to delimitations of the thesis

According to Cooke and Eriksson (2011, p.64) Västra Götaland was "one of the first regions in the world to publish in 2003 a Climate Change response strategy report 'Gothenburg 2005' involving policies for 'Smart Energy'". In 2009 VGR launched a climate strategy with the ambition that the West Swedish economy will be independent of fossil energy year 2030. In conjunction with this it supports and drives several projects for promotion of the cleantech sector as well as its usage in the region (Algehed and Eriksson, 2012).

9.7.1 Energy and its utilization

In terms of alternative energy, efforts are made especially within wind power and ocean energy (which is brought up in the maritime section). The region is also supporting the usage of sun power and the growth of sun power companies through the network Soluppgång i Väst (Algehed and Eriksson, 2012) and Chalmers is doing some research in the area but it is not as visible as in the wind power area where the university for example has a center for wind power: Swedish Wind Power Technology Centre which aims to provide academic knowledge and support for the industry (Swedish Wind Power Technology Centre, 2012). Research within the wind power area is also made at Göteborg Wind Lab, a research center for wind power and energy production technology where Göteborg Energy, General Electric and Chalmers are involved in research collaboration. Another involved party worth mentioning is SKF, the bearings producer, which has supplied the turbine with components (Göteborg Wind Lab, 2012). In order to better coordinate the efforts made within the wind power industry, VGR initiated Power Väst 2008, which aims to promote the development and expansion of wind power in the region and to promote the industry by encouraging collaboration between actors.

Through Energigården, the region is promoting the development of bioenergy production form the Swedish agriculture. This is a project initiated by Agroväst which links the value chain from agriculture to end-user and its goal is to replace 5 TWh petrol, diesel, and fuel oil with renewable energy until 2020. Biogas West, IVL Swedish Environmental Research Institute, SLU, SP, Chalmers are some of the participants (Energigården, 2012). The regional development program Biogas West aims to promote increased production and usage of biogas within the region. It is promoting collaboration between companies within the energy-, agriculture-, automotive sector, fuel companies, the academia, and municipalities (Biogas West, 2012). There is moreover a knowledge center in the area, the Swedish Knowledge Centre for Renewable Fuels (f3), where actors from industry, academia, and public sector are involved (f3 centre, 2012). Hydrogen gas and fuel cells is another area that the region promotes, for example by the project SamVäte i Väst from which the national collaborative organization Vätgas Sverige has arisen (Algehed and Eriksson, 2012).

There are also many organizations focusing on sustainable transportation for example through more efficient utilization of fuels and improved logistics. Some organizations found in the region are Closer at Lindholmen Science Park which is an arena for transport

efficiency (Lindholmen Science Park, 2012), the collaborative project KNEG, which aims to reduce the transportation's polluting impact (KNEG, 2012), the logistics center Northern Lead at Chalmers and University of Gothenburg (Northern Lead, 2012), the competence center for electric and hybrid vehicle technology Swedish Hybrid Vehicle Centre (Swedish Hybrid Vehicle Centre, 2012), the science park Innovatum, and the institute SP, among others (Norrman et al, 2011).

9.7.2 Green chemistry

Västra Götaland is the leading Swedish region in petrochemical and oil. The industry is mainly located in Göteborg, Stenungsund, and Lysekil. Stenungsund became an industrial hot spot after 1953 when the Swedish State Power Board located a large heat power plant in the area. A few years later, companies started to exploit the area, for example in the processing of ethylene gas (Kemiföretagen i Stenungsund, 2012). Today, several large companies are operating in Stenungsund. These are more or less united by the cracker company Borealis, which delivers ethylene. The ethylene is further processed to polyethylene by Borealis (Invest in Sweden, 2012), PVC by INEOS (Kemiföretagen i Stenungsund, 2012), amines and surfactants by Akzo Nobel, and hydrogen gas, propylene, and fuel gas by Perstorp Oxo. Their dependence of each other makes them closely interlinked (Invest in Sweden, 2005).

The chemical industry is today using about 90% fossil raw material (Höök, 2012). The chemical companies in Stenungsund do however have a vision of basing their production totally on renewable raw materials such as rapeseed oil, straw, wood chips, and all type of waste from biological material and industrial products. In the future they also expect to use cultivation of algae. The companies' vision is to be sustainable and carbon neutral in 2030 (Business Region Göteborg, 2012). A collaborative project has been established between the industry and Chalmers, SP, VGR, and Business Region Göteborg in order to facilitate its transition into sustainability. The project is financed by the European Regional Development Foundation and VGR among others (Business Region Göteborg, 2012). Chalmers has for some years run a competence center, PLUS (Plastic for a sustainable society). The center was founded by Chalmers, Business Region Göteborg, VGR, the institute SP, Borealis and Ineos (Chalmers, 2009) and aimed at develop the competence within the cluster as well as strengthen SMEs in the area. It has however been resting for some years but will start up soon again (Algehed and Eriksson, 2012).

9.7.3 Sustainable urban development

As mentioned earlier, Urban Future is one of the five strong clusters promoted by the group of leaders from VGR and the universities in Göteborg among others. In Andersson et al (2011) they state "West Sweden is a forerunner in cross-sector collaborations concerning sustainable urban development. Several established processes and areas for cooperation, capacity building, and knowledge creation are in place" (Andersson et al, 2011, p.7). A large number of companies engaged in urban development are said to be situated in the region (Andersson et al, 2011).

Within urban development, Mistra Urban Futures, a center for knowledge sharing and cooperation was established in Göteborg 2010. It is managed by the universities in Göteborg, VGR, and the institute IVL. The center serves as a platform for collaboration between the private sector, interest groups, and the public (Andersson et al, 2011). Another platform in the area that aims to stimulate triple-helix collaboration is Johanneberg Science Park, which focus on research within urban development, energy, and material/Nano technology (Johanneberg Science Park, 2011).

Knowledge in urban development is especially relevant for Göteborg, since the city is planning to rebuild some of its most central locations, which today are full of empty lots. Actors from academia, public and private sectors are together working on how these best should be exploited and developed (Andersson et al, 2011). The development of these central locations, which are located on both sides of the river, Göta Älv, is managed by Älvstranden Utveckling AB, which is a company owned by the municipality of Göteborg. It is running several projects for different locations in the area and is also one of the actors behind Green Gothenburg. The latter is a collaborative project between four municipal corporations and aims to promote the city's work for sustainable development through for example study visits (Green Gothenburg, 2012)

10 Results from the survey

This chapter presents results from the survey. Since all results cannot be presented due to the data's magnitude, this chapter focuses on results that show statistically significant differences between the two regions. General aggregated results are presented in cases where no significant differences are found. See appendix VII and VIII for more results as well as results from the Chi2- and Spearman's correlation test.

The surveyed companies are ones that innovate and/or perform research. 77% of the companies strongly agree to the statement that the companies' businesses are dependent on R&D, 16 % agree, 6 % partly agree and only 1,5% disagree/strongly disagree. About 90% of the companies strongly agree/agree that they perform applied research.

There is a positive correlation between the companies' ages and number of employees, especially in Västra Götaland where the correlation coefficient is significantly larger. In difference to Västra Götaland there is also a correlation between the age, number of employees and distance from major city in Skåne where the larger and older a company, the longer away from a bigger city it lies. (Characteristics of the sample are found in textbox 5 in the end of the chapter).

Importance of collaboration. The companies' perceptions of the importance of collaboration are found in figure 24. It can be seen that most companies find collaboration with customers and universities as important and most of them also find collaboration with other companies, science parks, collaborative organizations, and research institutes as less important. There are no general difference between Skåne and Västra Götaland in terms of how important the companies perceive the collaboration with different types of actors. There are however differences between the regions in some sub-groupings. For example in the 'sectors other than life science'-category as well as for companies older than 8 years, a much larger share of companies in Västra Götaland perceive the collaboration with consultants as important than those in Skåne. When it comes to the importance of collaboration with suppliers, companies in the category 'other' and '0-1 employees' find it more important in Västra Götaland than in Skåne. The difference is particularly profound in the 'other'-category.

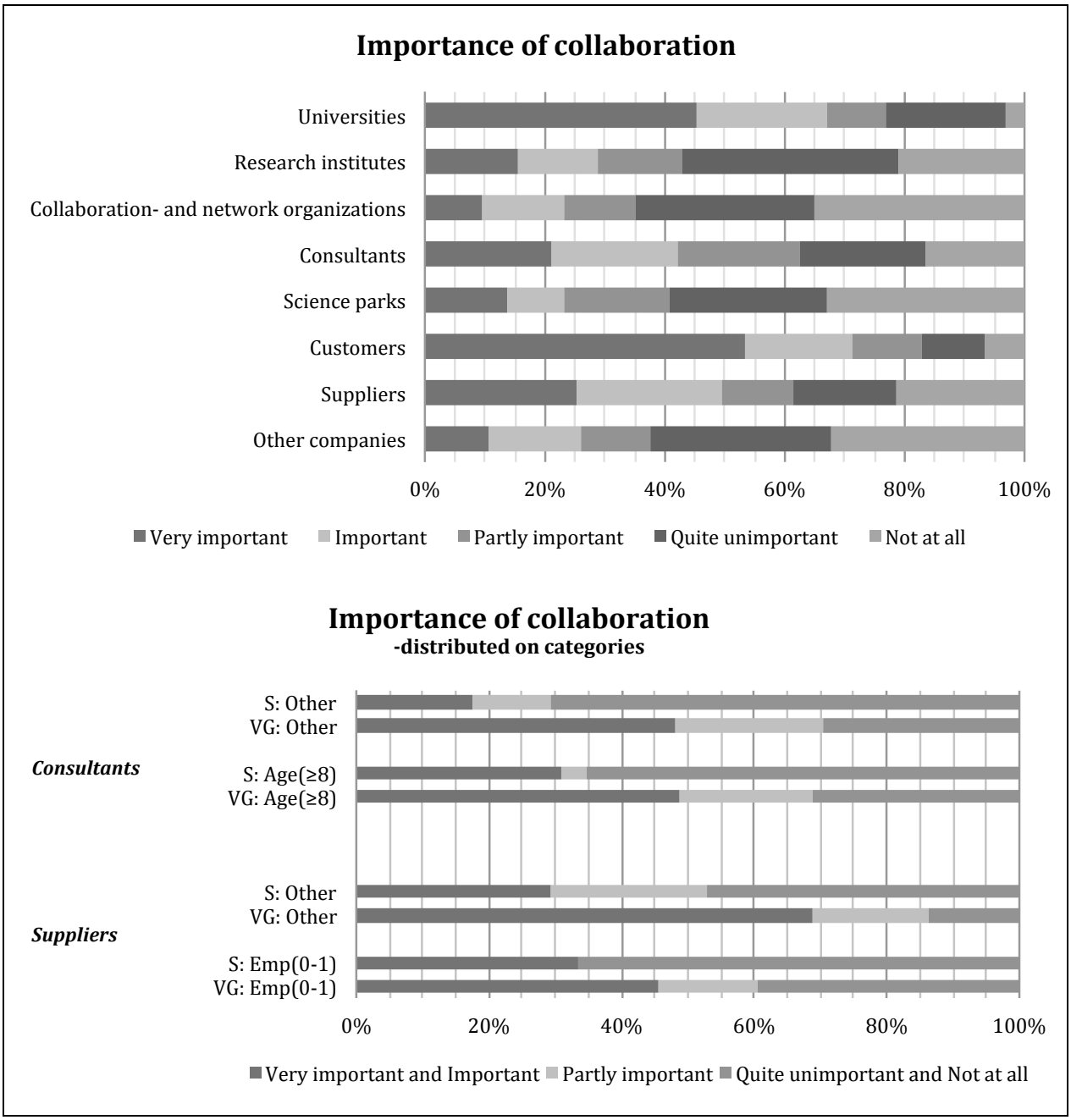


Figure 24. Importance of collaboration

Correlations between type of research and the importance of collaboration with different actors can be found in table 5. Some similarities and some differences are found. For example, there is a positive correlation between basic research and the importance of collaboration with universities. In Västra Götaland there is a positive correlation between basic research and the importance of science parks, whereas no such correlation can be found in Skåne. There is however a positive correlation between basic research in Skåne and consultants and customers that is not found in Västra Götaland. The positive correlation that applied research in both regions has in common is with universities, research institutes, and customers. In difference to Skåne, applied research is also correlated to the importance of collaboration with collaborative organizations, science parks, and suppliers in Västra Götaland. In difference to Västra Götaland, it is

more correlated with the importance of collaboration with consultants. Contract research in the two regions have in common correlation with the importance of research institutes, consultants, and customers. In difference to Västra Götaland, contract research in Skåne is also correlated to universities, and collaborative organizations.

Table 5. Correlation between different types of research and the perceived importance of collaboration with different actors. Shaded cells represent significant correlations and the numbers spearman rho values.

	Skåne			Västra Götaland		
	Basic	**Applied**	**Contract**	**Basic**	**Applied**	**Contract**
Universities	0,531	0,624	0,358	0,462	0,259	0,145
Research org.	0,245	0,392	0,321	0,160	0,358	0,528
Collaborative org.	0,297	0,266	0,421	0,240	0,340	0,156
Consultants	0,476	0,343	0,650	0,141	0,204	0,254
Science Parks	-0,093	0,089	0,273	0,318	0,298	0,133
Customers	0,308	0,391	0,646	-0,077	0,356	0,375
Suppliers	-0,281	0,055	0,179	-0,033	0,270	0,141
Other companies	-0,151	0,004	0,267	0,115	0,157	0,145

Frequency of collaboration. For both regions, there is a strong correlation between the importance and frequency of collaboration with different actors. Although no bigger difference could be found regarding the *importance* of collaboration with universities between the two regions, there is a significant difference regarding the *frequency* of collaboration (figure 25): 17% more companies in Skåne declare that collaboration with universities takes place continuously. The difference is especially profound in the life science sector and for companies with 0-1 employees where 28 and 23 percentages more companies in Skåne than in Västra Götaland state it takes place continuously or several times a year.

Generally, companies in both regions collaborate much less often with 'other companies than customers and suppliers' than with other types of actors. Companies with two or more employees in Skåne do however collaborate much more often with this category (24% continuously/several times a year) than the overall surveyed companies (8%) as well as what those in Västra Götaland do (6%).

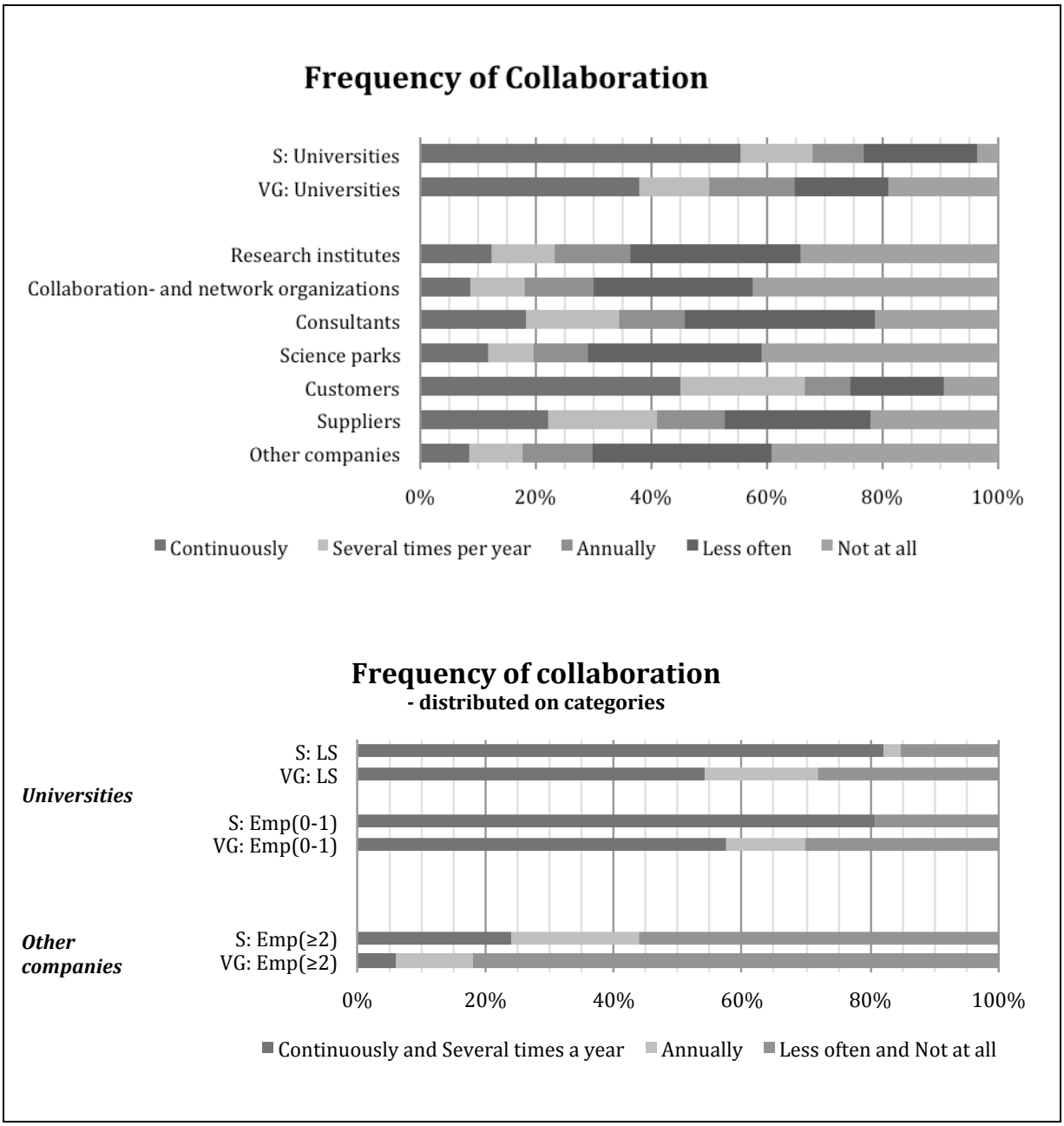


Figure 25. Frequency of collaboration

Level of collaboration. There are no overall significant differences between the regions regarding how much the companies collaborate regionally, nationally, or internationally (figure 26). There is however a significant difference in the 0-7 category between the two regions where those in Västra Götaland collaborate more nationally than those in Skåne. Moreover, significant internal differences in Skåne regarding international collaboration are found – Other sectors collaborate much more internationally than the life science sector. This is also true for companies aged 8 years or older, which collaborate significantly more internationally than companies aged 0-7 years.

Regarding how much companies collaborate within or outside the sector they belong to, no significant differences are found.

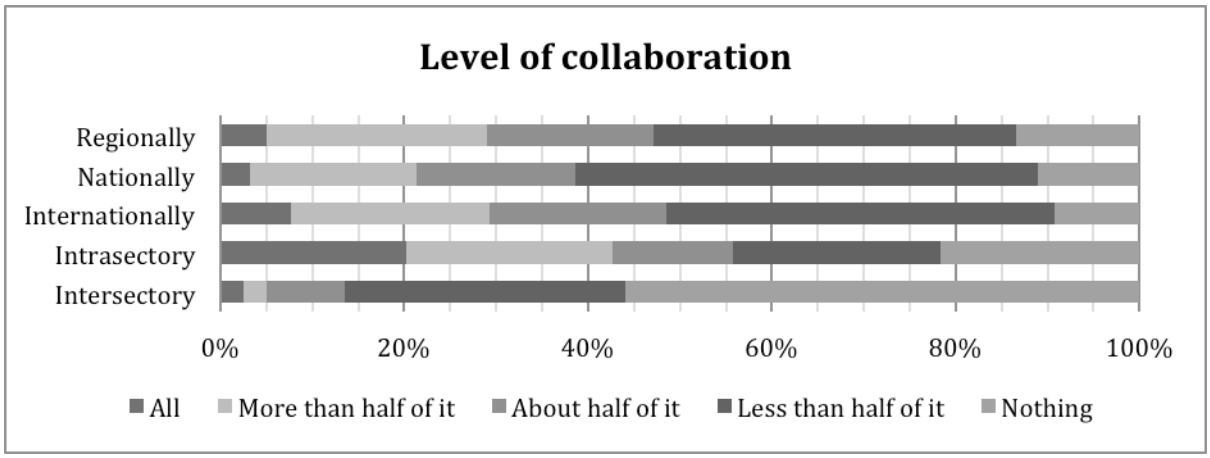


Figure 26. Level of collaboration

Barriers to collaboration. Regarding barriers to collaboration, most companies experience that it is too costly (56%) and too time consuming (53%) to collaborate. 39% see lack of partners as a barrier. There are significant differences found between the two regions in terms of 'time' and 'lack of partners', but not in terms of money. In Skåne more companies in the '0-1 employees' category (64%) experience time as a barrier for collaborating than in Västra Götaland (38%). The regions exhibit a similar pattern for companies aged 0-7 years. When it comes to lack of partners as a barrier for collaboration, it is more profound in Västra Götaland than in Skåne, with a Chi-square value that is close to the critical value. This should however be taken with care since it is not statistically significant. Significant differences can however be found within the life science sector and within the category 'companies aged 0-7 years' where more companies in Västra Götaland than in Skåne experience lack of partners as a barrier for collaborating.

Barriers to innovation. The barriers to innovation (figure 27) that most companies experience (Strongly agree/agree) are 'high cost to develop new products, processes, and services' (61%), 'high risk and uncertainty' (45%), and 'lack of support' (31%). 18% experience lack of competence as a barrier. When it comes to lack of collaboration and contacts there is a significant difference between the two regions where the barrier is more profound in Västra Götaland (17%) than in Skåne (2%). Life science companies, ones with over 2 employees, and those 8 years and older stand for the biggest difference. Whereas 'lack of info of support' did not exhibit a significant difference between the regions in general, there is a profound difference between the two regions in the category 'other sectors than life science' where 46% of the companies in Västra Götaland strongly agreed or agreed, compared with 7% in Skåne. However, if counting 'partly agree' into these the difference would be much smaller: 60% in Västra Götaland and 47% in Skåne.

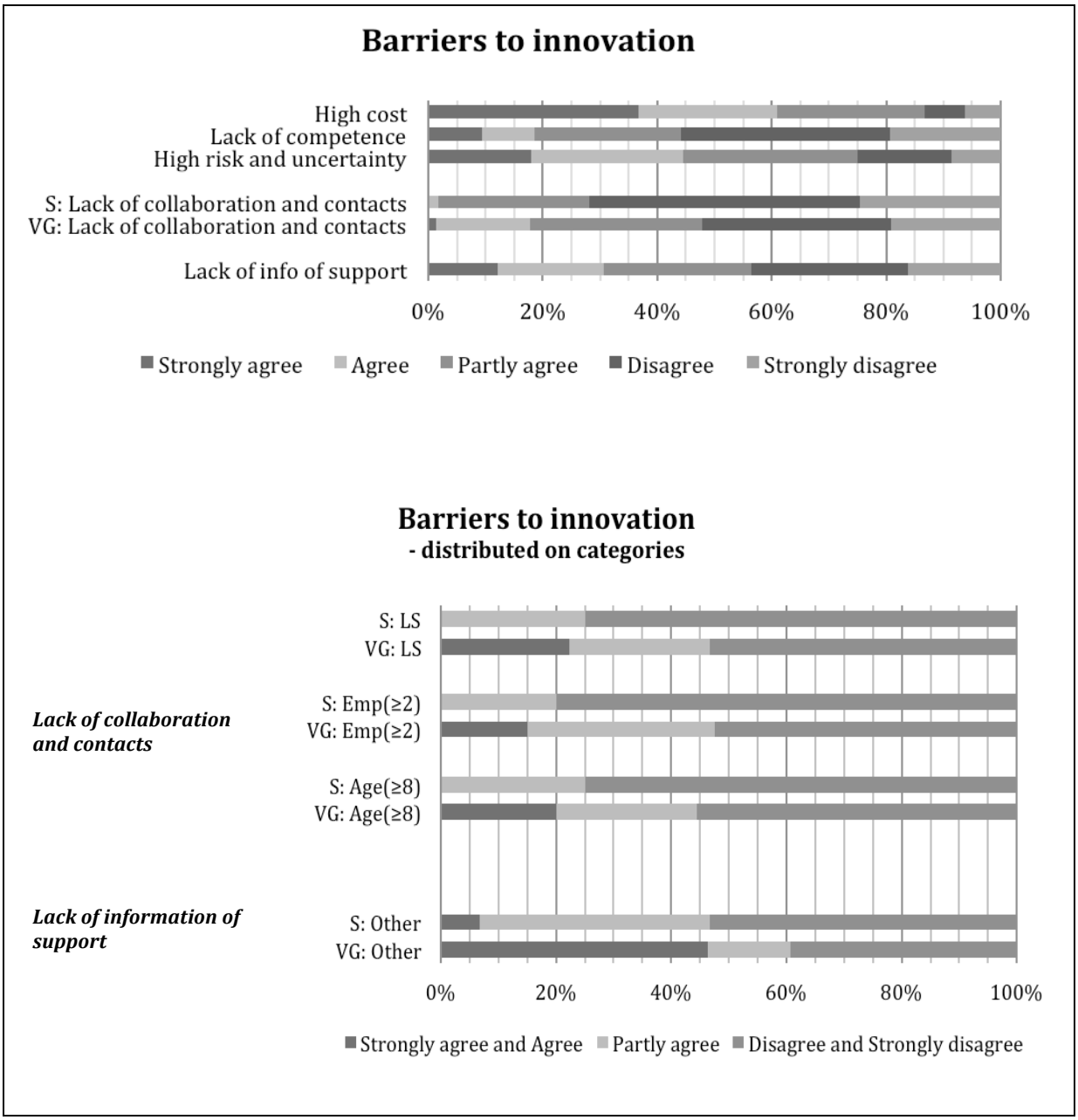


Figure 27. Barriers to innovation

Perception of availability of innovation-promoting elements. The companies' perceptions of the availability of different innovation promoting elements greatly varied between the two regions (figure 28 and 29) and a pattern can be distinguished: whereas most of the companies in Skåne found the availability to be very good or good, most companies in Västra Götaland found it to be okay. More companies in Västra Götaland did also experience the support as scarce or very scarce than in Skåne. Differences were found regarding qualified labor, business advice, academic expertise, competence development, and collaboration and networking opportunities. The greatest difference was found in the supply of qualified labor where 71% in Skåne found it very good or good compared to 42% in Västra Götaland. The gap was particularly large between the regions' life science sectors and the category 'companies aged over 8 years'. The next biggest difference was 'collaboration and networking opportunities' where 69% of the companies

in Skåne perceived it to be very good or good compared to 35% in Västra Götaland. A majority of the companies in Västra Götaland did however believe the opportunities to collaborating and networking to be okay.

Both regions' companies were most negative about the availability of public and private funding: About 65% found it scarce or very scarce. The life science companies and the ones with 2 employees or more in Västra Götaland were a little bit less negative (60% and 47% stated it was scarce or very scarce) to the public funding than the ones in Skåne (82% and 83%). A majority found information about support to be ok, but a relatively large share found it scarce or very scarce (32%).

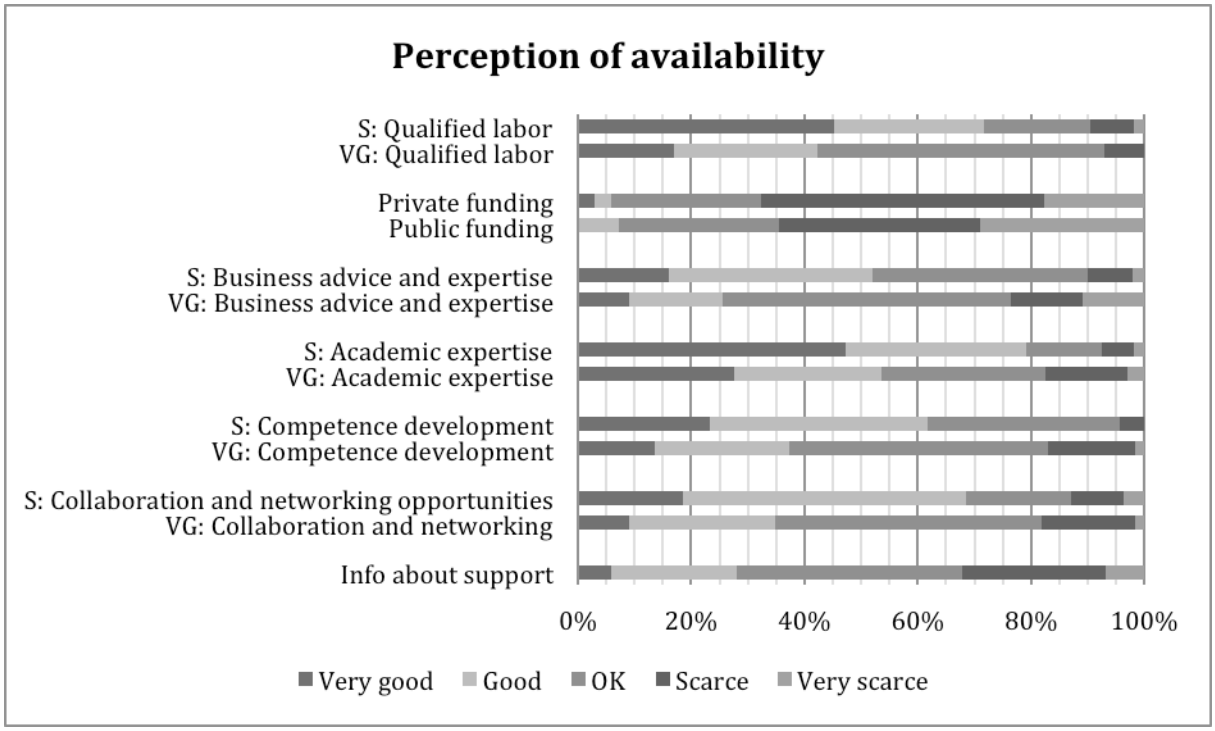


Figure 28. Perception of availability

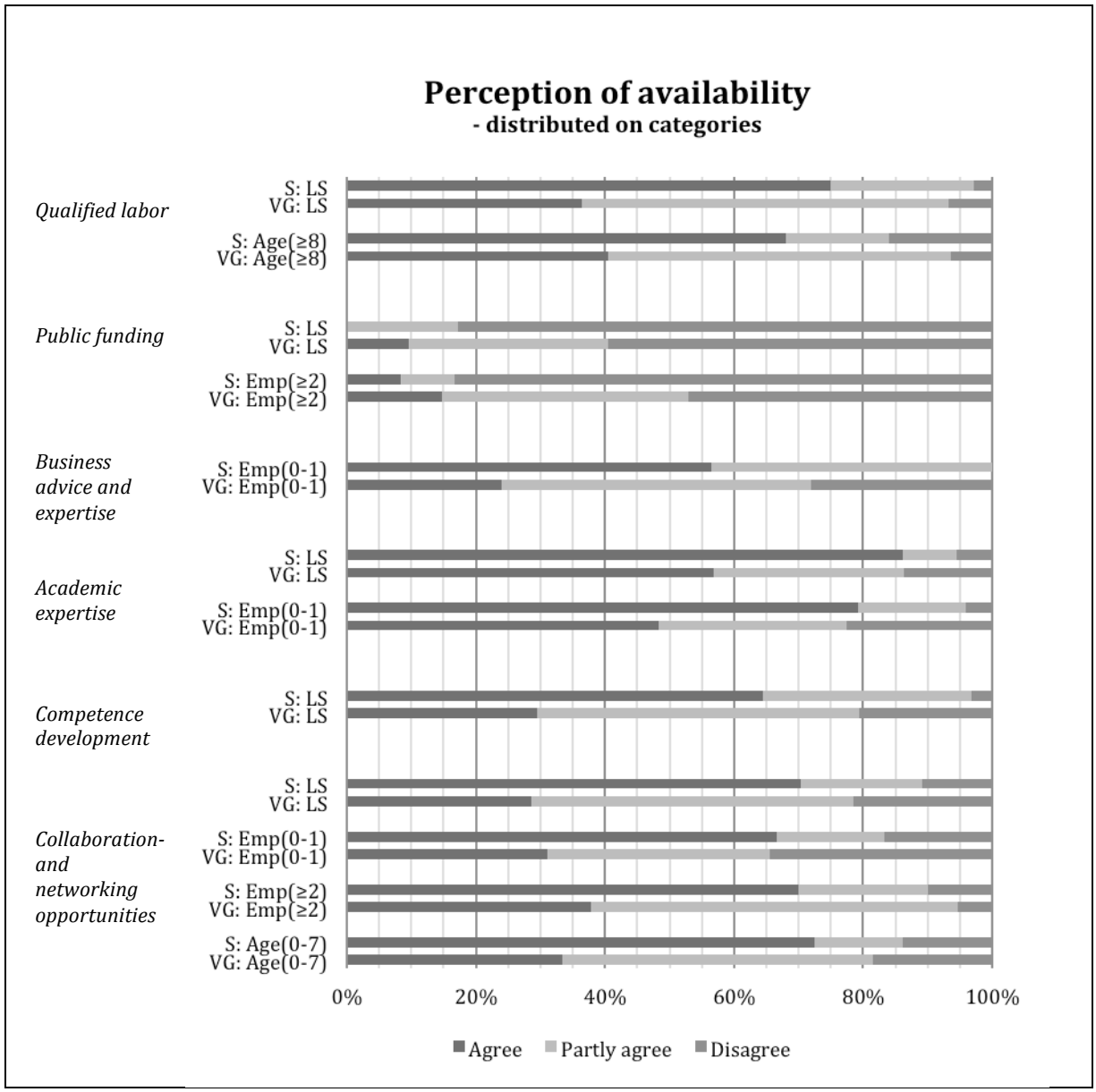


Figure 29. Perception of availability distributed on categories

The importance of support. A majority found funding to be decisive/very important as an innovation support mean. The other innovation support means - business advice and expertise, support from incubators, and competence development - were mainly found quite unimportant and unimportant. This could be thought to be due to the representation of bigger companies in the survey. However, neither the Chi-square test or spearman's rank correlation show that it is the case regarding any of the questions except from support from incubators, where companies of higher age and greater number of employees tend to answer that it has been quite unimportant or unimportant. A majority of the companies with 0-1 employees and those under 8 years find the incubator support either decisive/very important. Whereas the companies' perceptions about the supply of different innovation promoting inputs greatly varied between the two regions, there were no significant differences found regarding the importance of different support.

Input additionality. Regarding input additionality (effects of R&D subsidies), the answers on what have happened if there was no support was widely spread between the four alternatives (figure 30). 23% stated that their innovation projects would have been realized without any changes, 33% realized under a longer time period, 17% downsized, and 27% abandoned. There is a positive correlation (spearman's rank) between the different answers and the companies' number of employees, age, and distance. This was also seen in the Chi-square test, but where the difference of the two categories for number of employees was not shown significant. Regarding differences between the two regions, no such thing can be found significant.

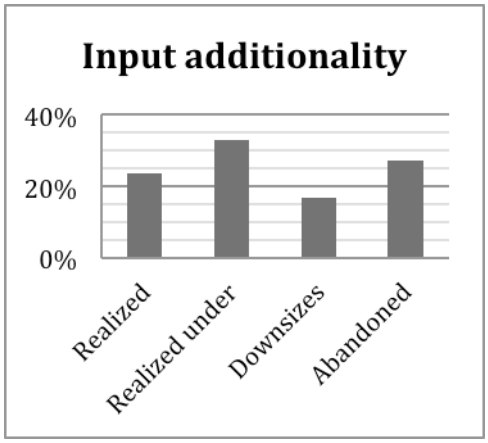


Figure 30. Input additionality

Barriers to support-taking. The mostly experienced barrier to support taking is costly application procedures and project documentation. Many also experience 'lack of possibilities for support' as a barrier. Lack of information of support as a barrier to support-taking was more concentrated around the 'partly agree'-alternative. The greatest differences between the regions are found in costly application procedures and project documentation where 71% of the companies aged 8 years or older in Skåne strongly agree or agree compared to 51%. More companies in Västra Götaland in the category 'life science' and 'companies aged 0-7 years' experience lack of support as a barrier for support taking than in Skåne.

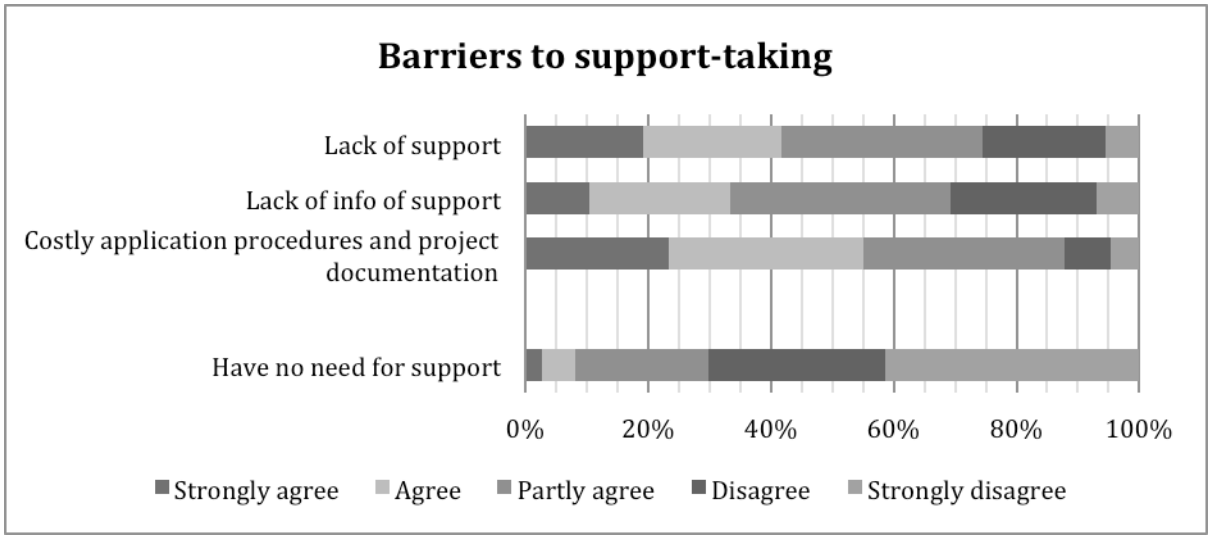


Figure 31. Barriers to support-taking

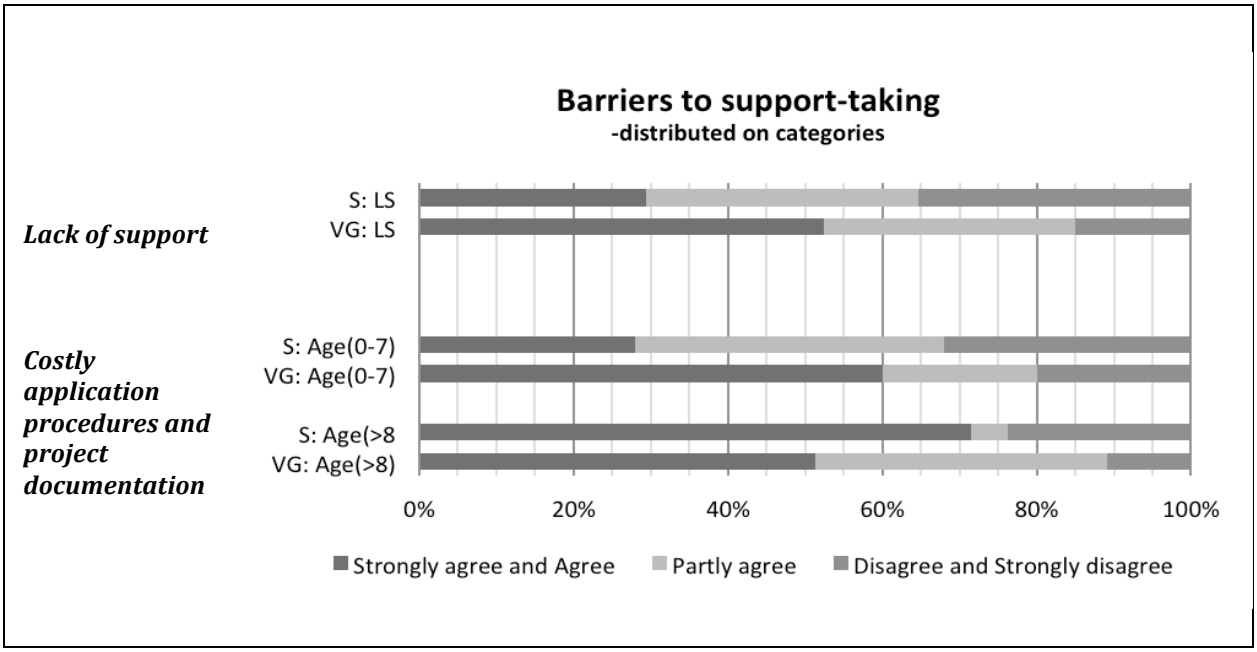


Figure 32. Barriers to support-taking distributed on categories

Textbox 5. About the sample:

There is a higher share of respondents from the life science (LS) sector in both regions, but slightly higher in Skåne than in Västra Götaland. There are comparable shares of 0-1 employees and ≥2 employees in both regions. There are however more companies 8 years and older in Västra Götaland. Comparing averages, the companies in Västra Götaland are more than twice as big in terms of number of employees (including outliers), older, and on a longer distance from a larger city with a university.

In the life science category in Västra Götaland, there are comparable shares of companies in the Employees and Age categories. The life science category in Skåne does also have comparable shares in the Employees categories, but differs in Age – More companies are found in the '0-7 years' category than '≥8 years'.

Tables 6-7. Sample characteristics and Averages in sample categories. *Includes only those over 30 km from 'larger' city with a university.

Sample characteristics				
	Skåne (N)	Skåne (%)	VG (N)	VG (%)
LS	42	71%	47	62%
Other	17	29%	29	38%
Emp(0-1)	28	47%	34	45%
Emp(≥2)	31	53%	42	55%
Age(0-7)	31	53%	28	37%
Age(≥8)	28	47%	48	63%
Distanced (≥30 km)	9	71%	15	62%

Averages in sample categories		
	Skåne (N)	VG (N)
Employees (number)	44	99
Age (years)	13	16
Distance* (km)	41	62

The Other category shares similar characteristics in both regions: It is dominated by companies in the '≥2 employees' and '≥8 years' category.

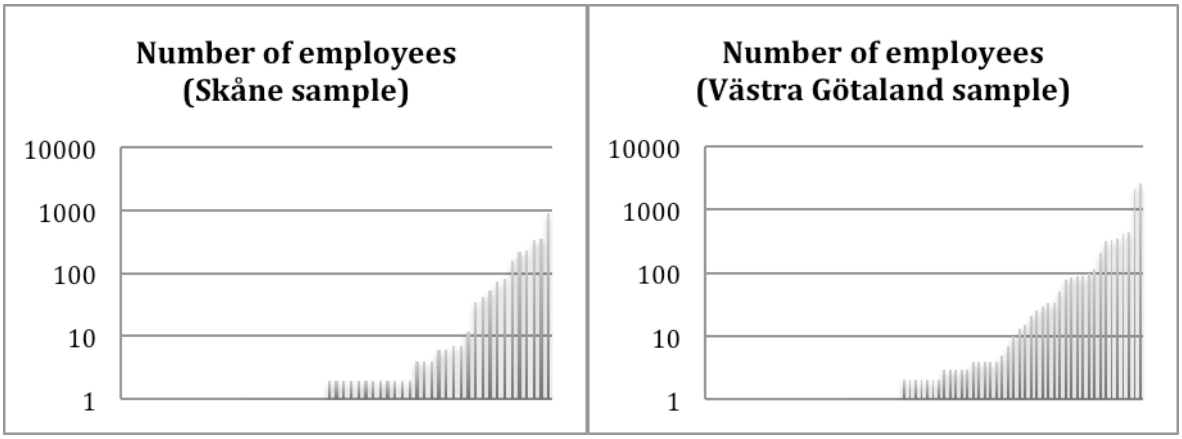


Figure 33 and 34. The diagram shows the number of employees for each company in Skåne and Västra Götaland respectively. The y-axis shows number of employees on a logarithmic scale.

Textbox 5. About the sample (continued):

Table 8. Characteristics of sectors in Skåne and Västra Götaland respectively.

	Characteristics of sectors in Skåne				Characteristics of sectors in Västra Götaland			
	LS (N)	LS (%)	Other (N)	Other (%)	LS (N)	LS (%)	Other (N)	Other (%)
Emp(0-1)	23	55%	5	29%	24	51%	11	38%
Emp(≥2)	19	45%	12	71%	23	49%	18	62%
Age(0-7)	27	64%	4	24%	21	45%	7	24%
Age(≥8)	15	36%	13	76%	26	55%	22	76%

11 Analysis/Discussion part I

Based on the findings in the empirical framework and with regard to the theory, this chapter analyzes and discusses the most interesting differences and similarities between Skåne's and Västra Götaland's innovation systems. The chapter follows the same structure as the theoretical framework - beginning with knowledge infrastructure, continuing with knowledge application and generation, governance and policy, and finally local interactions and socio-institutional factors.

11.1 Knowledge Infrastructure

Both regions have extensive knowledge infrastructures in place, making the innovation systems resemble what Asheim and Isaksen (2002) call 'regionally networked innovation systems'. One profound difference between the two systems can be found – Västra Götaland has several research institutes while Skåne very recently (2012) got its first. The first section in this subchapter analyzes and discusses this issue. It further discusses the role of the research institutes in Sweden in general. The universities' problems working with small companies are also put forth and analyzed/discussed. The next subchapter deals with the support systems of the both regions, where similarities of inefficiency brought up. Finally, a note on whether or not there is a lack of venture capital is made.

11.1.1 Knowledge transfer to the industry

11.1.1.1 Differences in number of research institutes – differences in functionality between the innovation systems?

There are several research institutes in Västra Götaland, whereas Skåne very recently (in 2012) got its first. Since research institutes are important actors in the knowledge infrastructure - transferring knowledge to the industry through contract research (Bozeman, 2000) - one can wonder if there have been other structures filling their functions in Skåne as a result of the lack. For example, structures of more research-based consultants might have arisen (Gerling-Gerdin; Börjesson, 2012). It is however difficult to say without looking at statistics of number of such companies, which has not been possible to do in this study. The survey indicates that there are no major differences in collaboration with consultants between the two regions. It does however not distinguish between research-based ones and other types of consultants. Another possibility is that the universities have taken on that role, but no formal structures at Lund University shows that is the case. The structure most similar to that of a research institute at Lund University is LUEX, but it started 2012 (LUEX, 2012). There might however be informal structures at Lund University that have compensated for the lack. Yet other possibilities are that the system simply has had a shortfall in that type of function, or that it has not needed the function to the same extent as in for example Västra Götaland, which depends on another type of industrial structure. The latter possibility is further elaborated in subchapter 11.2.1.

Although Skåne just recently got its first research institute and Västra Götaland has several, there is surprisingly no significant difference in how much the surveyed companies in the two regions collaborate with research institutes. Maybe, companies in Skåne turn to research institutes in other regions, or the respondents have misinterpreted the word 'research institutes' and included other similar types of organizations with comparable functions.

11.1.1.2 The role of the research institutes in Sweden

Performing applied research and transferring knowledge to the industry, the role of research institutes and universities partly overlap as indicated by Edquist (2005), VINNOVA (2006), Bozeman (2000) and Borysiewicz (2012). Some interviewees claimed that research institutes are better suited to work with small companies arguing that they are easier to access than what the universities are. Some other interviewees do however claim that research institutes – like universities - are mostly targeted at larger companies that have enough resources to employ them. This is partly confirmed by the survey showing a positive correlation between the number of employees and the importance of, as well as frequency of collaboration with research institutes. There is also a significant difference between the two Age-categories in terms of importance of collaborating with such. Although a positive correlation, the Chi-2 values lie slightly below the critical value indicating no significant difference. As mentioned above, one should be careful using these numbers for the narrow definition of 'research institutes' since there is a risk that the respondents have misinterpreted what is meant and included similar types of organizations with comparable functions, i.e. that of contract research.

Bozeman (2000) states that universities often have an organizational structure (stuck in silos) that is less suited for performing interdisciplinary research than the research institutes. This is however not entirely the case at Chalmers with its matrix-organized Areas of Advances, which are aimed at facilitating for interdisciplinary research and industry collaboration. Chalmers also has an organization for contract research (Chalmers Industriteknik), which today acts separately from the Areas of Advance (Börjesson, 2012). If these two functions somehow could work together - and if taking into account what Borysiewicz (2012) stated about the importance of a close link between basic and applied research - one could question the existence of research institutes. This type of structure would also work for other universities - at least for those who succeed to manage a matrix-organization – and maybe that is only the case for smaller and more flexible universities with lighter organizational structures and smoother decision-making as indicated by Bengtsson and Börjesson (2012). Many of the universities in both regions have structures similar to institutes – Chalmers Industriteknik at Chalmers, MEDEA at Malmö University, LUEX at Lund University (LU), Forsknings- och innovationsservice at the University of Gothenburg (GU), etc. – but some universities like GU and LU might at present be too large and too rigid (Bengtsson; Börjesson, 2012) to manage a matrix-organization. This is something that the universities preferably should look over.

In terms of enhancing the quality of knowledge transfer to the industry, applied research should be managed from the universities (if having structures in place), as suggested by Borysiewicz (2012). This does however not mean that there is no future for research institutes – they still have important developmental functions needed by the industry. Such functions would probably best stay at the research institutes since they do not fit with the universities' purposes and missions, i.e. that of generating and diffusing research. Another interesting question however is whether or not today's partly government subsidized research institutes instead should be privatized. This thesis does not attempt to answer that question, but it is definitely an interesting issue for further research.

Although it is questionable if research institutes should deal with applied research, it might be necessary in some cases - for example in connection with ESS and MAX IV where some type of intermediary must be established (Friman, Gerling-Gerdin; Bengtsson, Börjesson, 2012). Whether it should be a research institute, initially subsidized private consultants or functions at the research facilities or university, this thesis do not aim to answer (it is however an interesting issue for further research). In either case, one has to be careful so that the intermediaries that one plans to establish do not outcompete the research-based consultants that today exist in the region (Börjesson, 2012).

11.1.1.3 Universities' problems working with small companies

As mentioned above, interviewees mentioned that small companies have problems accessing universities. The companies often have difficulties finding an entry and to get in contact with the right type of assistance. This is something that seems to be mitigated at Chalmers, which has more clear structures such as the Areas of Advances which seem to facilitate for first contacts and navigation in the university's internal innovation system, which further seems to be a point where many universities fails. It might however still be a problem attracting companies without academic tradition since their move to enter the universities not only depend on the universities' degree of openness, but also is a matter of the companies' cultures and habits. Non-academic companies might not initiate contact themselves, but rather need to be encouraged to do so (Hellqvist Greberg and Litsne, 2012). Therefore, the universities might need to establish even other structures to attract those types of companies. In order to increase their collaboration with small companies in general, universities also need to find new ways of collaboration that better suit small companies and their constraints in terms of small resources and short time frames. MEDEA at Malmö University has succeeded in this aspect – short and fast collaboration makes the small companies afford collaborating with the university. This is however a model that might only work for less research intense areas and for service innovation where time to productification is shorter (Bengtsson, 2012). For research intense areas, some other model might be needed.

11.1.2 The innovation support system – similarities in inefficiency

The support systems in both regions share similar problems. The organic development of the systems has created plenty of actors, but also overlaps, inefficiency, and confusion among stakeholders as indicated by interviews, focus groups, and secondary data. Letting

the support system develop organically does not seem to be a good idea, and both regions' authorities have realized this. Efforts do however seem to be put on preventing further messiness in the system (Gerling-Gerdin; Korner; Hellqvist Greberg and Litsne, 2012) rather than intervening with the system. It was explained that it is difficult to intervene and consolidate, and coordinate among the organizations and projects since they are owned by different actors (Hellqvist Greberg and Litsne, 2012). A next step might need to be to gather all owners to discuss how to solve the issue. In a healthy and dynamic innovation system actors do not run their own races. Interacting partners form good systems as indicated by Asheim and Isaksen (1997). Some think that many actors and overlaps can be beneficial if it leads to healthy competition and improved services (Region Skåne, 2009; Hellqvist Greberg and Litsne, 2012), but taking into account that both regions' systems encompasses many small supportive organizations with the risk of not reaching a critical mass in their business to make maximum use of invested money (Region Skåne, 2009), competition would barely be fruitful.

There is moreover an obvious need for better communication through websites, as indicated by interviews, secondary data, and the survey. The latter shows that companies in the Other-category[17] in Västra Götaland perceive 'lack of information about support' as a much larger barrier for innovation than their counterparts in Skåne. Both do however find the availability of information about support equally. This could be interpreted as the information in Västra Götaland is inferior, but the availability of information is about the same as in Skåne. An easy way of mitigating the problem of deficient information and overview is, in line with Anvret's (2012) suggestion, to create a common website where actors in the support system (and possibly other parts of the knowledge infrastructure) are mapped, described and categorized – one for the region (hosted by Region Skåne and VGR respectively), one for each cluster (hosted by the cluster organizations), and one for each university.

Actors do moreover need to be better at communicating on their websites what they do. The insufficiency in information has been put forth in primary and secondary data. This is supported by my own reflections after having visited and collected information through plenty of such websites. Communication through websites might however not be enough. As Hellqvist Greberg and Litsne (2012) stated, small companies without academic tradition are often much more difficult to attract to make use of the support system. VGR has noticed that 'field-presence' is crucial for involving them. This way of working could be advantageous also for other actors in order to attract such companies.

Other barriers for support-taking are costly application procedures and project documentation. In similarity to the study made in Upper Australia made by Tödtling and Kaufmann (2002), the survey in Västra Götaland and Skåne revealed that it is seen as a major problem - 55% strongly agreed or agreed to costly application procedures as a

[17] Other sectors than life science

barrier for support taking. If including those who partly agreed, the number is 88% - twice as much as in the Upper Australian case. Inefficiency of Swedish application procedures was further elucidated by Frostberg (2012). Inventors have to go through double application procedures when applying for an incubator program since both program and financing are provided by different actors. Taking into account that both such actors are funded by the same source (public funds), the system seems quite inefficient. Frostberg's (2012) suggested the creation of similar structures like the Danish 'innovationsmiljøer', where the program and financing are coordinated. This would facilitate for the applicants. Whether this is, from an operational perspective, possible to implement or not, this thesis cannot answer, but it is an interesting issue to further look into. Yet other ways of facilitating in different application procedures and project documentation need to be found – the problem exist for both smaller and bigger companies, indicated by Spearman's rho which shows no correlation between number of employees and perception of costly application procedures.

11.1.3 Funding - Lack of venture capital or not?

Whereas the interviewees from the public sector and the academia as well as secondary sources are not unified whether there is a lack of venture capital or not, the surveyed companies (especially companies with 0-1 employees) clearly point at a lack. Sweden did however have the third highest share of venture capital in relation to GDP among the OECD countries in 2001 (although a large share is agglomerated in Stockholm). Comparing the venture capital to the numbers in other countries makes it questionable to say that there is a lack, although there is a perceived lack. As stated by Hellqvist Greberg and Litsne (2012), the hunger for money will never be saturated - although providing more money, there will always be a perceived lack. But the perceived lack is also important to listen to, funding is after all the most important enabler and seen as 'decisive' for innovation by a large share of the surveyed companies. As long as one cannot find new smart models and structures reducing the need for funding, one should aim at finding better ways to attract foreign investors. As Skarin (2012) and participants at the Future of Swedish and Danish Life Science Seminar (2012) stated: Why not aim for a similar model like Israel? Maybe it is too radical for us Swedes with a mindset based on safety-optimization - but tougher global competition also means that one has to be innovative, not only technologically but also politically. At the same time, companies and idea providers need to be better at approaching investors, not only ask for money as Larsson (2012) stated. Here lies a challenge for support providers to reach out with the message and educate companies how to communicate with the investors.

11.2 Knowledge application and exploitation subsystem

This subchapter brings up two issues regarding the knowledge application and exploitation subsystem that stands out extra in the empirical findings. The first issue relates to different industrial structures of the two regions. The other relates to differences between the regions' life science sectors. These issues are dealt with in the following two sections.

11.2.1 The effect of different industrial structures

The two regions differ in their industrial structure - Västra Götaland has more large and very large companies (Largest Companies, 2012) than Skåne[18] and a heavier industrial structure as indicated by the Sectors-chapters. An interesting question is therefore how this difference is affecting the innovation systems.

Both interviews and the survey indicate that the higher representation of research institutes in Västra Götaland and the previous lack of such in Skåne can be due to the difference in number of large companies. As stated above, the survey data on research institutes should be taken with some care, since there is a risk that companies have misinterpreted what is meant with 'research institutes'. On the other hand, if that is the case, they have probably included entities with similar functions. Anyway, the survey shows that bigger companies find research institutes more important as collaboration partners and do also collaborate more with them than what smaller companies do (indicated by the correlation test). Interviewees (Bengtsson; Hellqvist Greberg and Litsne; Börjesson, 2012) also point at the heavier industrial structure as a reason for more research institutes in Västra Götaland since heavy industries as well as research institutes deal more with product and process innovations. However, it seem like the very biggest companies do not have a need for research institutes since they have so large internal R&D departments themselves (Bengtsson, 2012). This might come to change since it seems like it neither will be economically nor competitive sustainable doing all research in-house in the future.

Bigger companies can be seen as a great asset to the innovation systems. Their powerful resources are highly contiributive in research collaboration, of which involved smaller companies can take advantage, for example (Helqvist Grenberg and Litsne, 2012). Statistics shows that large companies in Västra Götaland stand for the lion's share of the region's R&D expenditures, indicating a great reliance on these (VGR, 2008). Although they are great assets to the region, they also make it very dependent on them. This is not at least visible in last years' sinking R&D and Non-R&D expenditures as indicated by data from European Union (2012). Comparing this to other Swedish regions there is a significant difference. This can have to do with a higher vulnerability to recessions that in turn is affected by the fact that the larger companies in Västra Götaland mainly deal with product and process innovation as indicated by their high R&D expenditures and their heavy industrial characteristics.

The dependence on the big companies is also shown in investments in research in other parts of the system – education, universities' research areas, open arenas, etc. are adapted to them (indicated by Brésky; Markör, 2012), which is natural. The problem is that many big companies in the region are foreign owned, meaning that there is a greater risk of

[18] This is however not seen in the survey sample where both regions have a similar share of companies represented in different size-categories. This can have to do with that mails to persons in leading positions at bigger companies in many cases are sifted by secretaries.

them moving their businesses, which would have severe impacts on their industries and the region (Hellqvist Greberg and Litsne, 2012). Due to the risk of them moving, one therefore has to make sure domestic companies grow and prosper so that they can even the region's reliance on these. As mentioned by Markör (2012), small companies' whishes in research collaboration are often overshadowed by the big companies. Of course on has to make sure the big ones are pleased so that they stay in the region, but there is a great danger in not investing in the smaller ones. Right now, Skåne's ICT sector stands in front of a great deal of uncertainty due to announcements of larger downsizing. If that comes true, the sector will become severely hurt (if not as successfully rescued as in the life science case). Look for example at the shut-down of SAAB in Trollhättan - not only the employees from SAAB had to go, many other firms were affected, many of which also had to shut-down (Markör; Hellqvist and Litsne; 2012). Industries dealing with highly complex products are more vulnerable to such multiplier effects since the value networks often involve much more actors (NUTEK, 2009).

Another point where it seems like the big companies affect the innovation system is through culture. As mentioned by Hellqvist Greberg and Litsne (2012), Sjuhärad, Fyrbodal, and Skaraborg has a tradition where the inhabitants are used to start their own businesses, whereas inhabitants in the Göteborg region tend chose to work at some of the big companies. This could mean that the presence of big companies result in a weaker entrepreneurial culture. On the other hand do their presence and interaction in the region have many positive effects on entrepreneurship since they create many new possibilities for entrepreneurship. It is therefore not clear-cut how the big companies affect the entrepreneurial culture. This is however an interesting area for further research.

There seems to be a stronger focus on service innovation in Skåne as indicated by Bengtsson (2012). This could explain why Skåne has a high number of new-to-market and new-to-firm products – the service innovation process is less resource intense and much faster. In a similar way might Västra Götaland's much lower number be derived to its heavier industrial structure that relies more on product and process innovations. The last years' declining number of new-to-market and new-to-firm products can also be explained by the heavier industrial structure since it is more vulnerable to recessions as mentioned earlier.

11.2.1.1 Lock-in?

Dependency on large firms and mature industries whose demand for technology transfer are better met than smaller companies can raise the question whether Västra Götaland is subject to lock-in that risk to render much of the knowledge in the region obsolete. This seem however not entirely to be the case. What speaks against lock-in is the strong reliance on scientific knowledge and tight industry-university linkage (Asheim and Coenen, 2005a; 2005b) that exists even in the 'mature' industries like automotive and maritime which can be thought as being based more on synthetic knowledge bases than analytical (Asheim and Coenen, 2005a; 2005b).

Sectors with long history in the region like automotive, maritime, textiles, petrochemicals, and food have managed to avoid decline and instead renewed themselves, focusing on front-edge technologies and trends that have to do with sustainability. This is particularly noteworthy in maritime and textiles, which have been highly vibrant, and then experienced significant decline over the years due to increased global competition, but finally managed to adapt to new settings and found new blue oceans –new areas where they could compete. Also the petrochemical cluster is an interesting example, which at present is radically shifting its focus from fossil-based to renewable products in order to prepare for future demand and new technological paths. Technological lock-in does therefore not seem to exist at present. The region further has a regionally networked type of innovation system since its knowledge infrastructure seems to be well developed – something that helps to counteract lock-in. Cultural, functional, cognitive, and political lock-in (Grabher, 1993, cited in Tödtling and Trippl, 2005) could however still exist. As mentioned above, the industrial structure in the Göteborg region can have affected the entrepreneurial culture in a way where one can talk about such type of lock-in.

In similarity to Västra Götaland, Skåne seems to be rather free from technological lock-in due to the same reasons mentioned above. The industrial structure in Skåne is not as heavy, but does in similarity to Västra Götaland have long tradition and has managed to renew itself to deal with the latest technologies, as in the food sector and packaging. Moreover, moving media is a new cluster that seems to partly have branched off from the ICT sector – a sector that for some time has been mature, but now seems to be experiencing decline due to increased global competition and due to foreign-owned companies moving out, as mentioned earlier.

11.2.2 Differences between the life science sectors

Both primary and secondary data point at a significant difference between the two life science sectors in terms of functionality of their 'clusters'. Most of the differences in the survey between the two regions can be traced to the life science sectors.

As Carlsson and Norrman (2011) recognized, the life science companies in Västra Götaland do not perceive their sector as a 'cluster' – there is a rather weak sense of belonging. Looking at secondary data of thorough investigations of the life science sector in Skåne, there is no indication on a similar dissatisfaction. Primary and secondary data reveal several sources of higher degree of dissatisfaction in Västra Götaland. The availability of business advice and expertise (Chi2 close the critical value), competence development, and qualified labor also show significantly less satisfactory result for Västra Götaland compared with Skåne. A general lack of support was further more commonly perceived in Västra Götaland.

The life science companies in Västra Götaland moreover collaborate significantly less with universities than those in Skåne, despite a minor difference in how important they

perceive such collaboration. Academic expertise is also seen as less available in Västra Götaland than in Skåne. This can further be verified by Anvret's (2012) statement about a lower degree of such collaboration. It further seems to be due to deficient management of the contact with the companies at the University of Gothenburg. There is overall a much larger perception of lack of collaboration and networking opportunities as a barrier for innovation in the life science sector in Västra Götaland than in Skåne. Despite dissatisfaction about the support system, it does not seem like the life science sector in Västra Götaland suffer from organizational thinness since it has an established knowledge infrastructure. Many collaborative organizations seem to be in place. How efficient these are is however a matter for further research (deficiency at the main cluster organization GöteborgBio is mentioned below).

Rather than organizational thinness, the life science sector in Västra Götaland seems to suffer from fragmentation – where interaction between actors is hampered (Isaksen, 2001), as often is the case in established and internationalized industries (Schamp, 2001, cited in Tödtling and Trippl, 2005). The weaker university-industry linkage as well as larger perception of lack of collaboration- and networking opportunities indicates this. Counteracting fragmentation, one should try to improve the institutional infrastructure and networking. More concretely one should engage knowledge organizations and companies to collectively formulate an innovation strategy, creating collaboration nodes as well as bridges between companies and technological- and knowledge-resources (Isaksen, 2001). There is a further possibility that the sector also suffers from lock-in since it holds its focus on to areas where one is not competitive enough. According to Isaksen (2001) - and in line with Anvret's (2012) and Carlsson and Norrman's (2011) suggestion - one should in this situation encourage transition into new sustainable fields, renew traditional networks, and stimulating new ones. Cultural, functional, cognitive, and political lock-in (Grabher, 1993, cited in Tödtling and Trippl, 2005) would beneficially be further investigated.

Anvret (2012) stated that the University of Gothenburg has a lower recognition than for example Karolinska Institutet. This results in difficulties in attracting foreign companies and researchers – something that is an important issue to deal with since external knowledge helps to counteract lock-in and make the sector prosper and grow. The issue seems to be general for the life science sector in Västra Götaland compared to those in Stockholm and Skåne. The external picture of Västra Götaland's life science sector is diffuse and the cluster-organization GöteborgBio has not managed to market and creating a trademark for it (Carlsson and Norrman, 2011). Anvret (2012) also stated that one is deficient at informing companies about support opportunities for example through websites. The survey verifies this, but there is no difference between the two regions in this aspect.

Several aspects of less satisfaction in the life science sector in Västra Götaland compared to Skåne have been mentioned above. Taking into account that Skåne is part of the larger

life science cluster Medicon Valley which includes the Danish side, one could believe that the companies in Skåne are more satisfied due to availability of a larger support system. This does however not seem to be the case. Due to boarder barriers many such shared support functions cannot exist. Revealed by the survey, there is neither a higher degree of international collaboration among life science companies in Skåne than in Västra Götaland. Moreover do companies in other sectors collaborate significantly more internationally than life science companies in Skåne. On the other hand is there also a significant difference between the Age-categories, where those over 8 years collaborate more internationally. Taking into account that the life science sector in Skåne are dominated by companies 0-7 years old, its lower degree of international collaboration could be due to that companies have not existed long enough for having developed an international network. Secondary sources do however state that the Danish and Swedish parts in Medicon Valley act as separate clusters, partly because they focus on different scientific areas. Due to low degree of commonalities and complementarities very little synergies arise and actors do not see the point of collaborating cross-border.

11.3 Governance and Policy

Both regions' authorities have the same type of responsibility. Compared to other Swedish counties, these two have extended authority over regional development and growth (Hellqvist Greberg, 2011; Region Skåne, 2012) and the European Commission (2012a; 2012b) considers their regional autonomy as relatively high. However, OECD (2012) state that these have relatively limited powers despite this. What factors these two bodies have based their analysis on is unclear, so it is difficult to say what degree of autonomy they have. Anyway, according to Cooke et al. (1997) small countries may not be as much in need of a regional level of governance as larger countries. Thus, Swedish regions might not need high degree of regional autonomy. On the other hand are the both regions in some cases left on their own, even when it comes to issues of national concern as indicated by several interviewees. The interviewees indicate a clash in communication between the two levels and a lack of interest in regional issues other than those found in the Stockholm whereabouts. This raises the question whether the national level is capable to direct regional development issues and if the regions should be given larger autonomy. Linked to this is the question whether the national agency VINNOVA is suited to decide what areas in the different regions that should be invested in. According to Eriksson (2012) it is difficult for a national agency to fully understand the particular regional conditions and needs and it obstructs regions to invest in new areas. Eriksson's suggestion of instead establishing regional financing bodies with functions similar to VINNOVA is therefore an interesting idea, which potential preferably should be looked more into.

Although both regions' authorities have similar responsibilities, there are some differences between their governance of the innovation systems. These are analyzed and discussed in the section below.

11.3.1 Stronger developmental and coordination focus in Skåne

Much is gong on in Skåne right now – ESS, MAX IV, the new district Science Village, Medicon Village, and the Öresund collaboration. Lund will become a world center for material research (Börjesson, 2012). The facilities will result in a lot of new job creation and business and innovation if creating good and efficient structures and management for it (Tyréns, 2011). It is not surprising that there is a higher degree of enthusiasm in Skåne than in Västra Götaland as indicated by Bengtsson (2012) and Börjesson (2012). It seems like the two regions are in different development phases. There is however no doubt the both regions are in mature phases having all important structures in place, but it is obvious that Skåne also partly is in a preparatory state arranging for future opportunities that ESS and MAX IV imply. Although Gerling-Gerdin and Korner (2012) claim that the thorough examination of the innovation system they have made is not linked to this, it is evident that it is influenced by it in some way – all examination and reports has after all come very timely and Skåne's decision to become "the most innovative region" cannot be unaffected by the huge opportunities that stand in front of them (Bengtsson; Börjesson, 2012). I do however not say that all examination is only due to the facilities, but I do believe that it is affected by them somehow. My own reflection is that it seems like the enthusiasm (Börjesson, 2012) rubs off to other actors, making the region embedded by a will to develop, which further makes it united, strong, and powerful. It is a positive reinforcing cycle. These positive cultural attributes most likely has a positive effect on the innovation systems' efficiency as stated by Cooke et al. (1997).

The thorough examination could also be due to previous fragmentation. Whether or not there has been fragmentation in Skåne, this thesis cannot answer, but one sign of it could be the higher degree of top-down cluster promotion where Region Skåne has initiating many projects and cluster organizations, which have served to promote networks and connect actors in the clusters. The survey, as well as data from the Regional Innovation Scoreboard (European Union, 2012), indicates that there today is good collaboration and network opportunities in Skåne. Revealing a significant difference between Skåne and Västra Götaland in this aspect, the survey indicates a less positive picture in Västra Götaland - especially in the life science sector - where fragmentation might be present. Now when well functioning structures for collaboration and networking is in place within the clusters, Region Skåne should stand down a little bit, letting the clusters develop more bottom-up in order to enhance engagement among the cluster-members, as suggested by Fromhold-Eisebith and Eisebith (2005), and in order to avoid a so called 'happy-fat-cat syndrome'. Top-down promotion in close collaboration with the academia is however still preferable when it comes to the creation of an infrastructure around ESS and MAX IV as indicated by Friman (2012).

The higher degree of energetics in Skåne is also shown in their organization of their innovation policy intelligence – having developed an innovation strategy, which adheres to the most advanced policy thinking according to OECD (2012), and triple-helix councils (FIRS and SIS) that deal with innovation policy issues. Although lack of a written-down

innovation strategy (Hellqvist Greberg and Litsne, 2012), Västra Götaland's innovation policy is comparable to Skåne's critically acclaimed one – embracing concepts like smart specialization (Hammarström, 2012) and encouraging engagement in 'global challenges' such as environment friendly solutions (Cooke and Eriksson; Norrman et al., 2011) and interdisciplinary collaboration (Hellqvist Greberg, 2011), among other things. VGR involve other actors in policy-making (Hellqvist Greberg and Litsne, 2012), but does not seem to have an as clear structure for it as Skåne although it has so called 'First-Vice-Presidents-meetings' (Hellqvist Greberg and Litsne, 2012). As made known by the Västra Götaland focus group (2012), actors in the region are in need of a shared vision and goal which they can unify and develop a sense of belonging around. As indicated by Cooke et al (1997), these are things that if satisfied, can enhance the efficiency of the innovation system. It would thus be preferable if the main triple-helix actors in Västra Götaland could create a similar organization for innovation policy issues like in Skåne and a strategy that can be shared by all actors.

11.4 Local interactions and socio-institutional factors

11.4.1 Better collaboration and networking opportunities in Skåne

There seems to be a better availability of collaboration and networking opportunities and a higher degree of collaboration between companies in Skåne. Several indicators point at this. Data from the Regional Innovation Scoreboard (European Union, 2012) shows that Skåne does a bit better than Västra Götaland in terms of 'innovative SMEs collaborating with others'. Västra Götaland is however still doing well in this aspect, rated slightly above the mean of the innovative European regions. The survey reveals that companies with two or more employees in Skåne collaborate significantly more with 'other companies than customers and suppliers' than their counterparts in Västra Götaland. It also shows that there is a general perception of much better availability of collaboration and networking opportunities in Skåne than in Västra Götaland. Moreover do companies in Västra Götaland perceive 'lack of collaboration and contacts' as a greater barrier for innovation than those in Skåne.

The difference could be seen as quite surprising since both regions have plenty of organizations and projects that promote collaboration. My own reflection scanning through all of these is that there are more such organizations and projects in Västra Götaland. On the other hand do they seem more diversified – meaning that there are a range of different organizations and project, but they sprawl in many different directions. Collaboration seems to be more coordinated around cluster organizations in Skåne. These cluster organizations furthermore seem to be more coherent in terms of functions, management, and clearness. Since cluster organizations seem to be important nodes in the clusters/sectors acting as coordinators, information diffusers, cluster promoters, and connectors, the difference in collaboration and networking opportunities can be due to them being differently successful between the regions. There might be plenty of opportunities to collaborate and find partners but companies might not know about it. This was the case in the food sector in Skåne – although a lot of initiatives, many actors

did not know about them (Henning et al, 2010). It might therefore be so that the cluster organizations in Västra Götaland not are as good at reaching out with information, attracting companies to seminars, etc. This is something that has to be dealt with in order to avoid regional fragmentation.

12 Analysis/Discussion part II - A model for data collection for evaluations of regional innovation systems

This part of the analysis/discussion aims to contribute to the theoretical framework in the field.

During the work progress, ideas of how to best design the data collection for evaluation of regional innovation systems have arisen as a result of lack of such in the literature. Since regional innovation systems are highly complex - involving a large amount of actors, networks, policies, interactions, and institutions - structuring the method greatly facilitates data collection and makes sure relevant areas are covered, appropriate methods are used, and different actors have provided their viewpoint regarding the innovation system in order to gain an as clear perspective on the system as possible. This specific model is based on methods and theory that I have used designing the data collection for this thesis. Due to insights gained during the work progress I present an extended model of the data collection process that I have used. The model is illustrated in figure 35.

The idea of the model is that data that concerns the regional innovation system (here divided into four parts in order to facilitate the understanding of something that is highly complex) should be collected using four methods which all have different aims. Further, each of the method should ideally involve all of the key actors found in the figure. The dimensions of the 'cube' are outlined below:

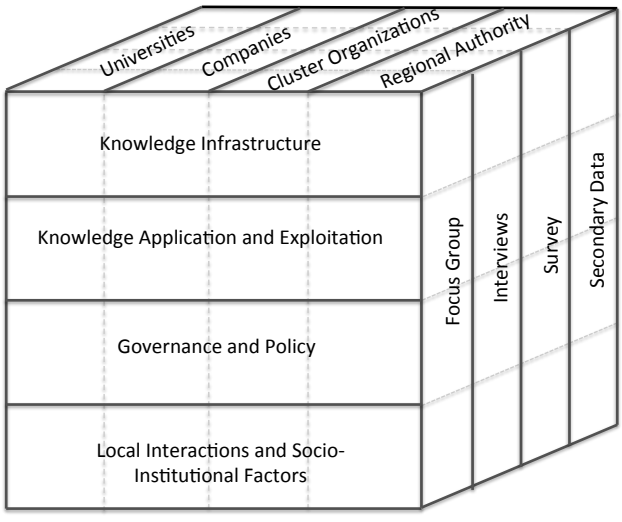


Figure 35. The Cubic RIS-Data Collection Model (Author's model)

The x-axis (the plane that varies in the y-axis) represents the five constituents of the innovation system based on the framework of Autio (1998) modified by Tödtling and

Trippl (2005), where I have chosen to group 'Local interactions' and 'Socio-institutional factors' since they depend very much on each other and are therefore best analyzed together.

The y-axis (the plane that varies in the z-axis) represents some of the key-actors in the innovation system. It is based on the triple-helix model framework of Etzkowitz and Leydesdroff (2000). The key-actors found in the figure are *examples* of actors to involve in the data collection process - for example, research institutes might also be important to involve, especially in countries where these have a greater role. Instead of using the triple-helix, this is an attempt to make the collection process more concrete.

The z-axis (the plane that varies in the x-axis) represents research methods that are useful for triangulation of case studies on regional innovation systems. Their preferable usages are explained below:

- Secondary data is a great source of information especially in the beginning of a study in order to find out the basics and to find people to talk to. Statistics from qualified sources are also highly useful for benchmarking to gain an overview of a system's status.
- Survey is a great method for comparison of different type of actors' viewpoints. In difference to interviews, one can collect data from larger amounts of individuals, which ensures reliability. It also provides more precise results, which facilitates and ensures comparison. Since innovation systems involves so many actors and of different type, I believe this is a very useful method for capturing their viewpoints and compare results. In this survey, I used a survey only for companies, but if having more time and resources it is preferable to cover all 'key-actors'.
- Interviews are preferable used in order to obtain more in-depth understanding of different issues from different actors' perspectives.
- Focus groups can beneficially be used in the end of the process in order to gather some key actors for discussing results that have appeared earlier in the process. Here one can discuss challenges, opportunities and future actions to take for improving the functionality of the innovation system.

Observe that it is not meant that this data collection process should be a linear, highly structured activity – it is just a model that attempts to facilitate for and guide in the work process which in reality is an iterative process.

13 Conclusions

This thesis aims to answer how the innovation systems of Skåne and Västra Götaland differ and what characteristics they share as well as putting forth areas for improvements. In addition, a model for data collection for evaluations of regional innovation systems has been developed since there is a lack of such in the literature. Several conclusions can be drawn from the analysis. These are briefly outlined below:

Both regions have extensive knowledge infrastructures in place and are performing very well among leading innovative European regions in innovation scoreboards.

Both regions' innovation support structures share similar problems of inefficiency and lack in communication. The latter point is easily mitigated through the creation of common websites where actors are mapped and described. For attracting companies without academic tradition, even other actions, like field-presence needs to be taken.

There is a higher degree of dissatisfaction of qualified labor, business advice and expertise, academic expertise, competence development as well as collaboration- and networking opportunities in Västra Götaland. This dissatisfaction can be traced to the region's life science sector, which further has a much weaker university-industry linkage than its counterpart in Skåne. Despite having structures for collaboration in place, networking seems to be hampered, which indicates that the sector could be suffering from fragmentation. Moreover is it possible that technological lock-in is present where the sector holds on to its focus on highly competitive areas where it does not seem strong enough.

Västra Götaland hosts larger companies and heavier industries than Skåne. This seems to have resulted in the larger presence of research institutes in the region. The dependence on larger companies, which in many cases are foreign-owned, means a great deal of risk. The region therefore has to be better at promoting the smaller companies.

The role of research institutes can be questionable if universities successfully manage to transform their organizational structure into matrix-organizations that can deal more with applied research collaboration with the industry. Furthermore, universities need new ways of collaborating with small companies, which often have too small resources for taking part in research collaboration and also tend to have problems finding an entry.

Although Sweden is doing very well in relation to other OECD countries in terms of venture capital there is still a large dissatisfaction among companies in the both regions. New ways of attracting capital is needed, for example creating favorable conditions for such businesses in Sweden as what has been made in Israel, or 'simply' better teaching companies how to approach the venture capitalists.

Generally, there seems to be a higher degree of enthusiasm in Skåne, much of which is due to the upcoming establishments of ESS and MAX IV. There further seems to be a stronger coordination and development focus in Region Skåne than in VGR, where the former is more actively driving innovation issues. Collaboration and networking opportunities are more available in Skåne than in Västra Götaland, which can have to do with better coordination around cluster organizations.

14 Suggestions for further research

Based on previous chapters, this part of the thesis presents some suggestions for further research. It should however be noted that the area presents endless of possibilities.

Innovation systems are broad and complex areas for research. Starting in the late 80's, it is a rather new area where much research remains to be made. Gaining more insight about how to increase performance of innovation systems is not only crucial for industries, regions, and countries in order to 'stay in the game' in an increasingly competitive and globalized world but also to be able to deal with global challenges. Also better ways of how to analyze and evaluate innovation systems needs to be searched for – an area where the literature does not present much guidance today.

The thesis has revealed and encountered several areas interesting for further research. One such thing is that the role of research institutes in Sweden does not seem to be certain. This is an area that preferably would be further investigated. An issue related to this is what intermediary structures that best would be established around ESS and MAX IV. Another interesting issue for further investigation concerns the regional autonomy in Sweden and whether it would be advantageous decentralizing the Swedish financing body VINNOVA to the regions as suggested by Eriksson (2012). Moreover, methods for how to better attract international venture capital would preferably be looked over. Yet another area interesting for further research is how the teacher's exception affects the innovation system, and if there are other alternatives that better promote innovation.

Concerning Västra Götaland's innovation system, which to a significant degree is dependent upon some very large companies, it would be valuable to gain more insight about how these affect the entrepreneurial culture in the region. The thesis has also found that Västra Götaland's life science sector might suffer from both fragmentation and lock-in. This would preferably be further investigated.

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Interviews, focus groups, and seminars

Interviews			
Name	**Title**	**Organization**	**Date**
Erik Brésky	Director	Swedish School of Textiles	2012-04-02
	processleader	Smart Textiles	
Erik Behm	Project Manager	IT Center West, Business Region Göteborg	2012-04-02
Charlotte Eklund Jonsson	CEO	Food & Health Concept Centre	2012-04-03
Per Eriksson	President	Lund University	2012-05-16
Björn Larsson	Business developer and accountable for investment	GU Holding	2012-05-22
Maria Anvret	Strategic advisor	University of Gothenburg, The Sahlgrenska Academy, and Chalmers	2012-05-23
Therése Friman (former K Nilsson)	TITA Project leader	Region Skåne	2012-06-07
Morgan Skarin	CEO	Encubator	2012-06-12
Björn Söhdal	Codirector	Lighthouse	2012-10-30
Maria Gerling-Gerdin	Business Developer	Region Skåne	2012-11-01
Maria Korner	Interregional coordinator	Region Skåne	2012-11-01
Per Simonsson	Vice president and project leader	Sustainable Business Hub	2012-11-01
Stefan Bengtsson	President	Malmö University	2012-11-01
Jan Grahn	ITC Area of Advance director	Chalmers	2012-11-07
Marika Hellqvist Greberg		Department of Research and Development, VGR	2012-11-13
Sophia Litsne		Department of Industrial Development, VGR	2012-11-13
Lars Böjesson	Chairman	ESS and MAX IV	2012-11-16
	Vice President	Chalmers	

Focus Group Skåne			
Name	**Title**	**Organization**	**Date**
Ursula Hultkvist Bengtsson	Vice President	Medicon Village	2012-05-15
Bengt Lövdén	CEO	Medeon	2012-05-15
Magnus Nilsson	PhD in Business Administration	Lund University	2012-05-15
	Co-author to Henning et al. (2012)		
Ola Skanung	CFO	Ideon	2012-05-15
Anna-Karin Alm	Project leader	Department of Innovation and Development, Malmö University	2012-05-15
Linus Owman	Knowledge Manager	PwC	2012-05-15

Focus Group Västra Götaland			
Name	**Title**	**Organization**	**Date**
Anna Nilsson-Ehle	Director	SAFER, Lindolmen Science Park	2012-05-16
Niklas Fernkvist	Innovation Advisor	Innovation and Legal Service, University of Gothenburg	2012-05-16
Johan Carlsten	Vice President	Chalmers	2012-05-16
Björn Westling	Director for SME Relations	Johanneberg Science Park	2012-05-16

Conferences and Seminars			
Event	**Host**	**Location**	**Date**
Global Forum	VGR,	Göteborg	2011-11-21
Life Science Investment Day	Medical Malmo	Malmö	2012-03-27
Future of Swedish and Danish Life Science	Medicon Village, Kemivärlden	Lund	2012-03-28
PwC-framtidsdialog: Öresundsregionens innovations- och konkurrenskraft	PwC	Malmö	2012-06-05

PwC Seminar-references		
PwC-seminar participant	**Title**	**Date**
PwC-seminar participant 1	Leading regional politician	2012-06-05
PwC seminar participant 2	Founder of a large company in the region	2012-06-05
PwC-seminar participant 3	Business developer at a large construction company	2012-06-05
PwC-seminar participant 4	Senior advisor at a large consultant company	2012-06-05

Appendix I – The survey

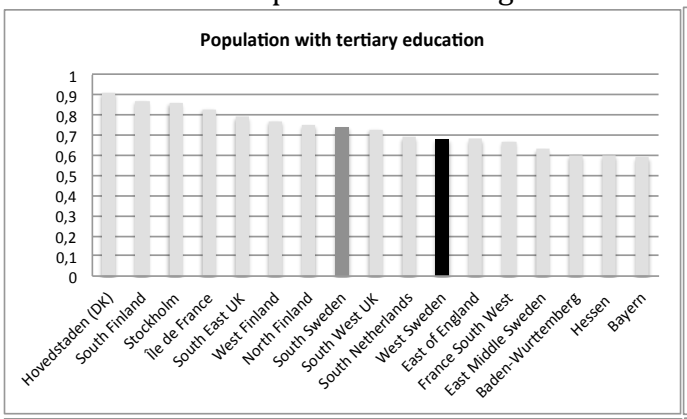
Questions	Answers	Inspired by
1. The company is dependent on engagement in R&D	Strongly agree, Agree, Partly agree, Disagree, Strongly disagree	Doloreux, 2004
2. The company's research is focused on: • Basic research • Applied research • Contract research (performed by other actor)	Strongly agree, Agree, Partly agree, Disagree, Strongly disagree	Tödtling and Kaufmann, 1999; Doloreux, 2004
3. The company's innovation is focused on: • Product innovation • Process innovation • Service innovation • Other innovation (Market/business innovation, organizational innovation)	Strongly agree, Agree, Partly agree, Disagree, Strongly disagree	Fritsch and Franke, 2004; Tödtling and Kaufmann, 1999, 2002; Doloreux, 2004
4. How important, for the company's innovation activities, is collaboration with: • Universities (including centers and other types of research collaboration) • Research institutes • Collaboration- and network organizations • Consultants • Science parks • Customers • Suppliers • Other companies (excluding customers and suppliers) • Other …….	Very important, Important, Partly important, Quite unimportant, Not at all	Tödtling and Kaufmann, 1999, 2002; Doloreux, 2004
5. How often, with aim to generate innovation, does collaboration take place with: • Universities (including centers and other types of research collaboration) • Research institutes • Collaboration- and network organizations • Consultants • Science parks • Customers • Suppliers • Other companies (excluding customers and suppliers) • Other …….	Continuously, Several times per year, Annually, Less often, Not at all	Tödtling and Kaufmann, 1999, 2002; Doloreux, 2004
6. How much of the collaboration, with aim to generate innovation, does take	All, More than half of it, About half of it, Less than half of it,	Tödtling and Kaufmann, 1999, 2002; Doloreux,

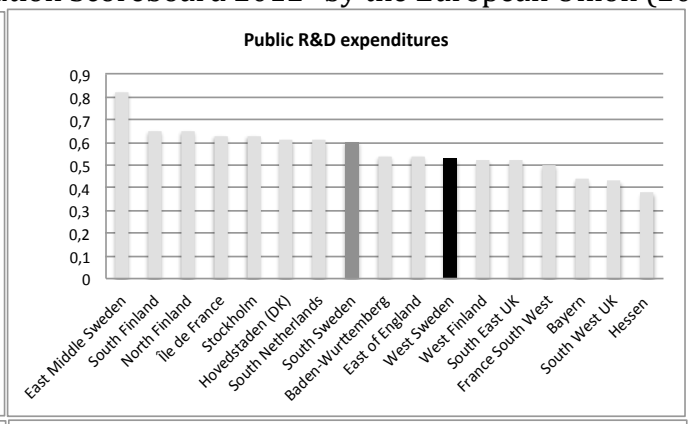
place: • Regionally • Nationally • Internationally • Within the industry the company belongs to • Outside the industry the company belongs to	Nothing	2004
7. What barriers to collaboration does the company experience? • Costly (money-wise) • Too little time • Lack of potential partners in the region • Other ……. • Have no need to collaborate	Yes, No	Tödtling and Kaufmann, 1999, pp.708-709
8. The company experience following barriers to innovation: • High cost for developing new products/processes/services • Lack of competence for research (Qualified labor, etc.) • High risk and uncertainty • Lack of collaboration and contacts • Lack of information of innovation support • Other …….	Strongly agree, Agree, Partly agree, Disagree, Strongly disagree	Doloreux, 2004
9. How well do you perceive the availability in the region regarding: • Qualified labor • Private funding • Public funding • Business advice and expertise (marketing, management, IPR, administrative) • Academic expertise • Competence development • Collaboration and networking opportunities • Information about support • Other …….	Very good, Good, OK, Scarce, Very scarce	Vonortas,2002, cited in Smedlund, 2006, p.210
10. How important have the support you received the last 3 years been? • Funding • Business advice and expertise (marketing, management, IPR, administrative) • Support from incubators • Competence development • Other …….	Decisive, Very important, Important, Quite unimportant, Unimportant	Tödtling and Kaufmann, 2002, p.22
11. What would have happened to the	Realized without change,	Rye, 2002

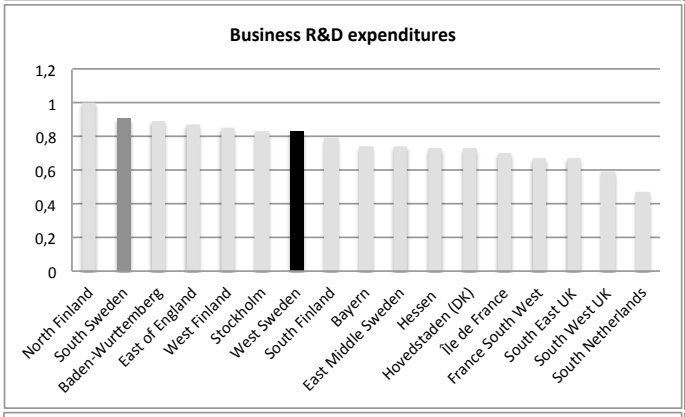
company's innovation projects if no support had been received during the last three years?	Realized under longer time frame, Downsizes, Abandoned	
12. The company perceive following barriers to support-taking • Lack of good possibilities of support in the region • Lack of information of support opportunities • Costly application procedures and project documentation • Other ……. • Have no need for support	Strongly agree, Agree, Partly agree, Disagree, Strongly disagree	Tödtling and Kaufmann, 2002, p. 22

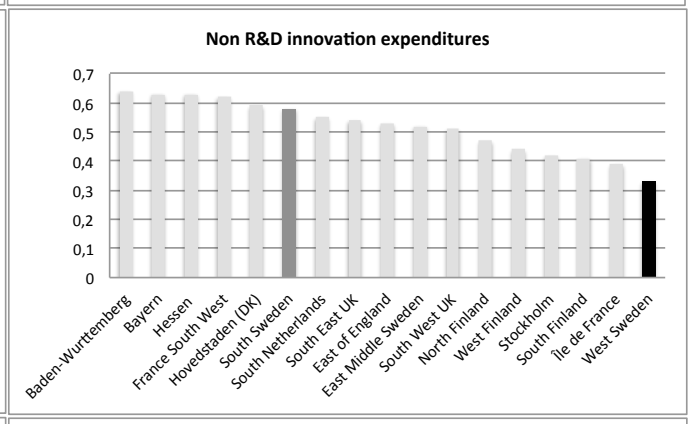
Appendix II – Regional Innovation Scoreboard

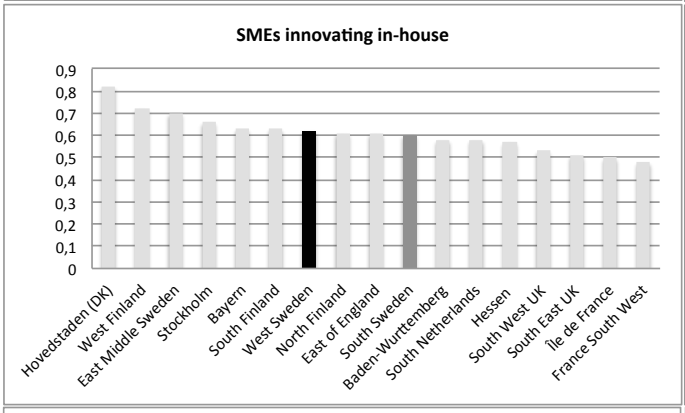
Modified from data presented in "Regional Innovation Scoreboard 2012" by the European Union (2012)

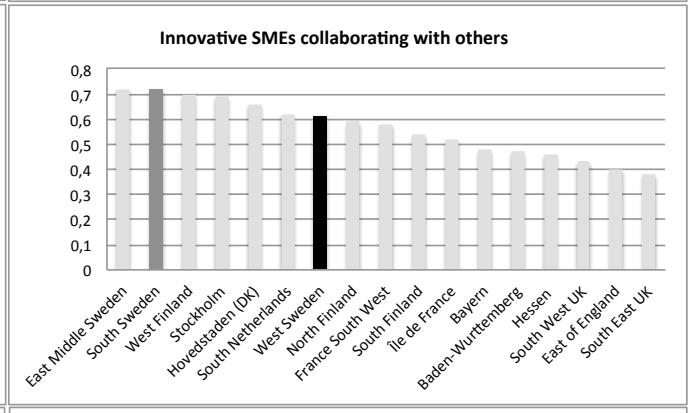


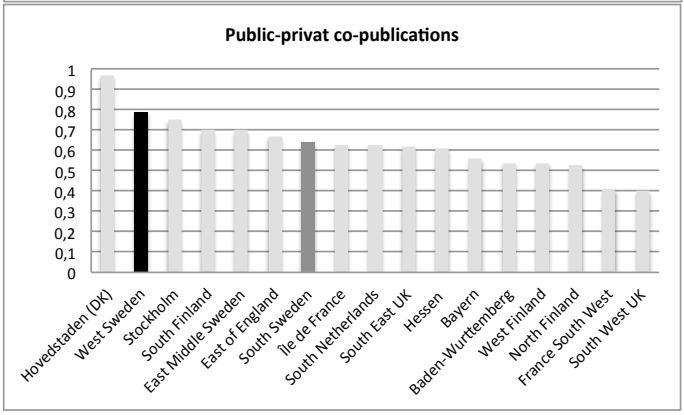


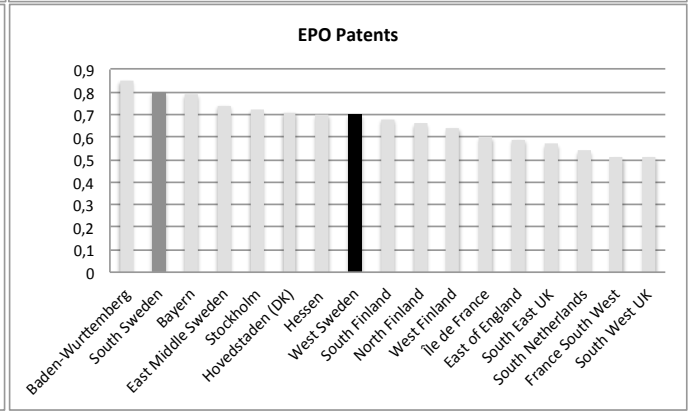


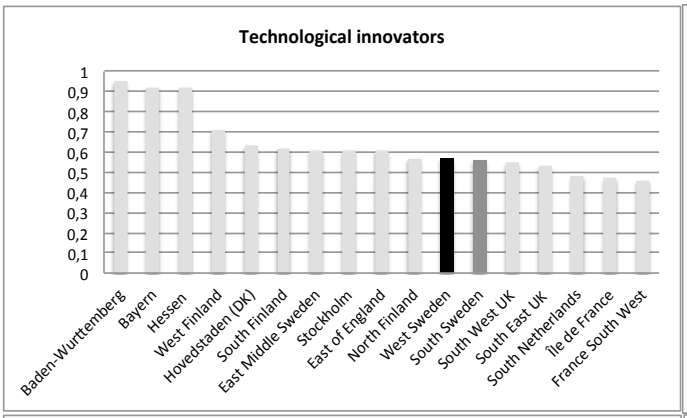


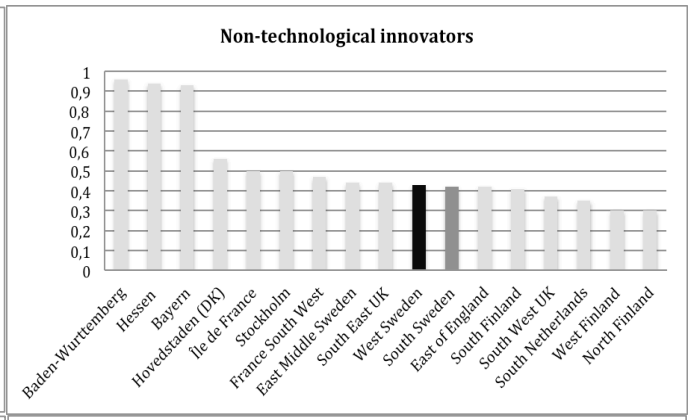


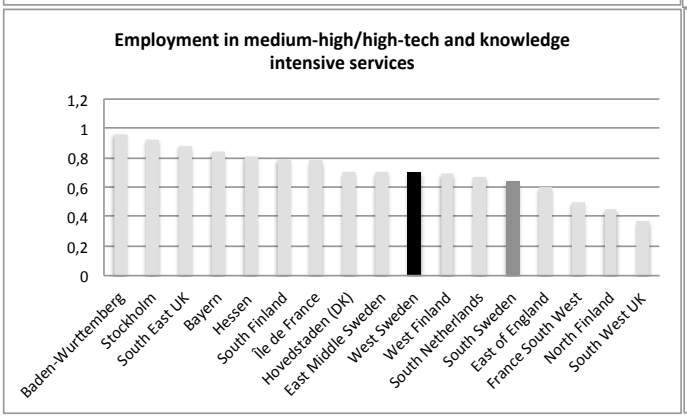










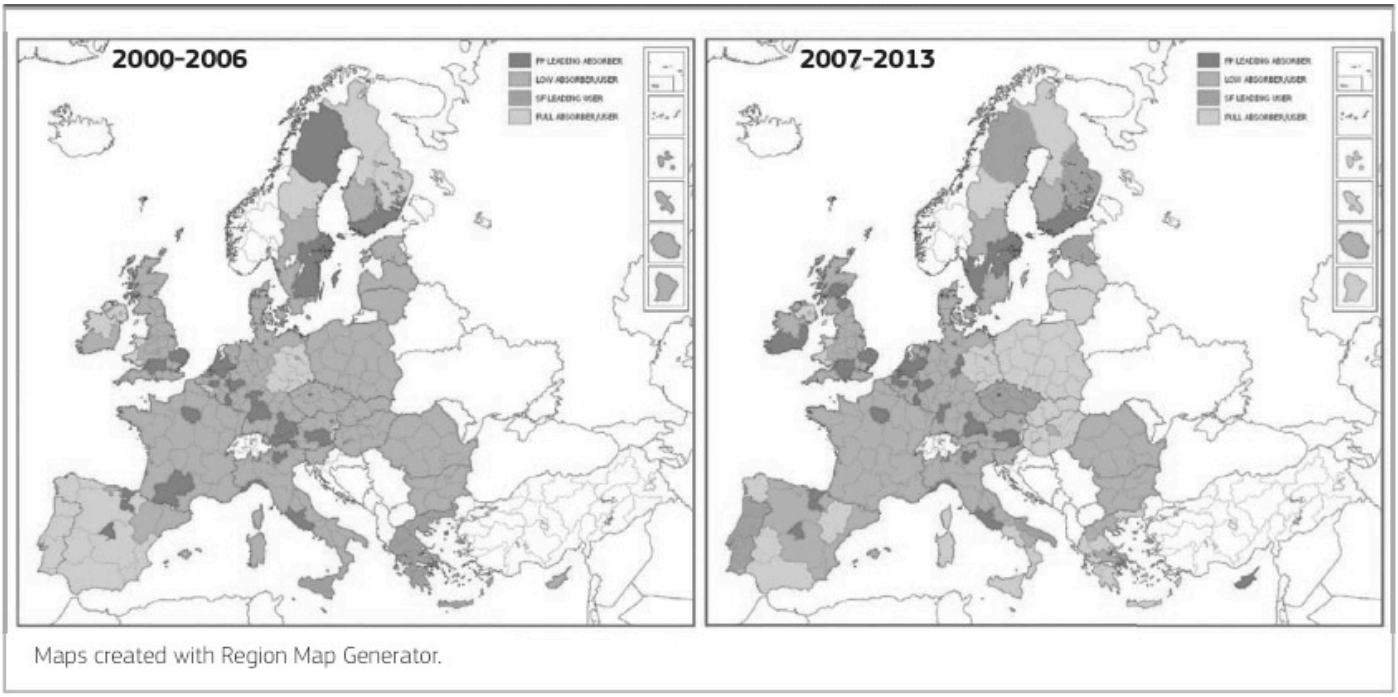


Regional Innovation Scoreboard 2012 – indicators explanation (European Union, 2012)

RIS-indicator	Denominator	Numerator
Population with tertiary education	Per population aged 25-64 years	Number of persons in age class with some form of post-secondary education (ISCED 5 and 6)
Public R&D expenditures	% of GDP	All R&D expenditures in the government sector (GOVERD) and the higher education sector (HERD). Both GOVERD and HERD according to the Frascati-manual definitions, in national currency and current prices
Business R&D expenditures	% of GDP	All R&D expenditures in the business sector (BERD), according to the Frascati-manual definitions, in national currency and current prices
Non-R&D innovation expenditures	Sum of total innovation expenditure for SMEs only, in national currency and current prices excluding intramural and extra- mural R&D expenditures	As % of total turnover for SMEs only (both innovators and non-innovators), in national currency and current prices
SMEs innovating in-house	% of total sum of SMEs (both innovators and non-innovators)	Sum of SMEs with in-house innovation activities. Innovative firms with in-house innovation activities have introduced a new product or new process either in-house or in combination with other firms. The indicator does not include new products or processes developed by other firms
Innovative SMEs collaborating with others	% of total number of SMEs	Sum of SMEs with innovation co-operation activities. Firms with co-operation activities are those that had any co-operation agreements on innovation activities with other enterprises or institutions in the three years of the survey period
Public-private co-publications per million population	Total population or total publication output	Number of public-private co-authored research publications (PPCs). The definition of the "private sector" covers business enterprises and for-profit organizations, but excludes the private medical and health sector. Publications are assigned to the region in which the private sector organization is physically located.

EPO patent applications	Per billion regional Gross Domestic Product in Purchasing Power Parity Euros	Number of patents applied for at the European Patent Office (EPO), by year of filing. The national distribution of the patent applications is assigned according to the address of the inventor
Technological (product or process) innovators	% of total number of SMEs	The number of SMEs who introduced a new product or a new process to one of their markets
Non-technological (marketing or organizational) innovators	% of total number of SMEs	The number of SMEs who introduced a new marketing innovation and/or organizational innovation to one of their markets
Employment in knowledge intensive services and in medium-high/high-tech manufacturing	% of total workforce (manufacturing and service sectors)	Number of employed persons in the knowledge-intensive services sectors include water transport (NACE 61), air transport (NACE 62), post and telecommunications (NACE64), financial intermediation (NACE 65), insurance and pension funding (NACE 66), activities auxiliary to financial intermediation (NACE 67), real estate activities (NACE 70), renting of machinery and equipment (NACE 71), computer and related activities (NACE72), research and development (NACE73) and other business activities (NACE 74) Number of employed persons in the medium-high and high-tech manufacturing sectors include chemicals (NACE24), machinery (NACE29), office equipment (NACE30), electrical equipment (NACE31), telecommunications and related equipment (NACE32), precision instruments (NACE33), automobiles (NACE34) and aerospace and other transport (NACE35)
Sales of new.to-market and new to firm innovations	% of total turnover for all SMEs	Sum of total turnover of new or significantly improved products either new to the market or new to the firm (and not to the market) for SMEs only

Regional absorption and leverage of EU funding



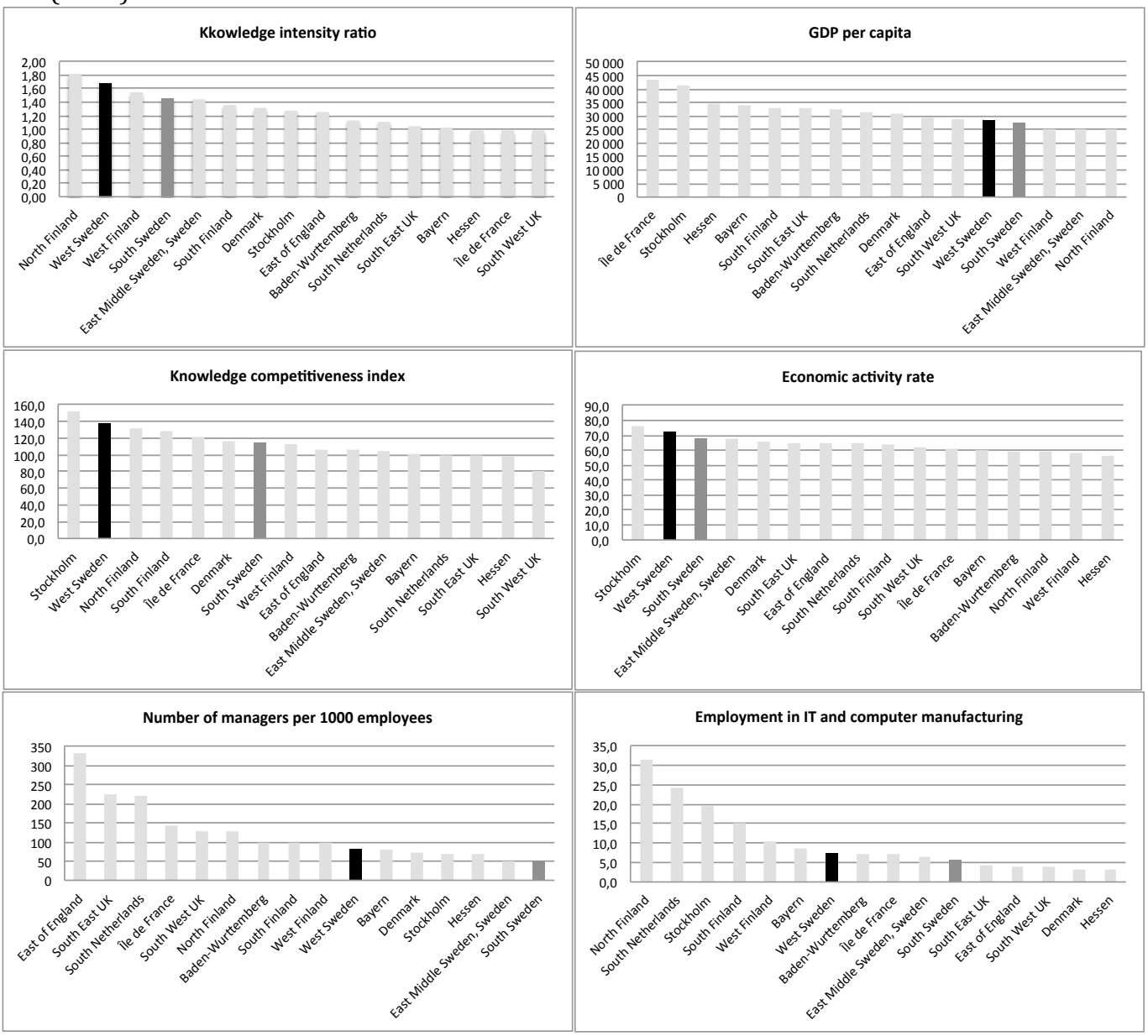
Maps of funding typology of regions (European Union, 2012)

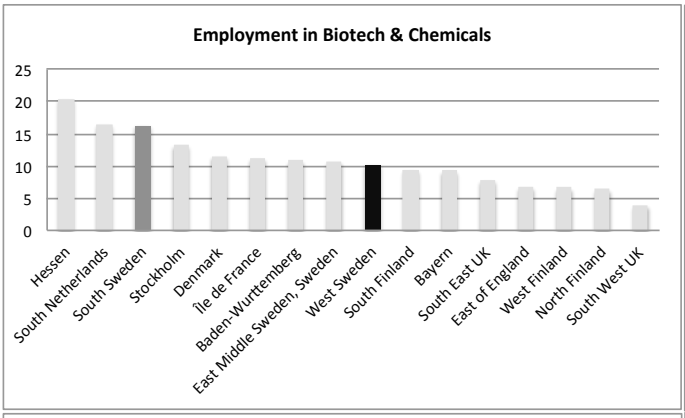
- FP Leading User
- Low users/absorbers
- FP leading absorbers
- Full users/absorbers – but at low levels

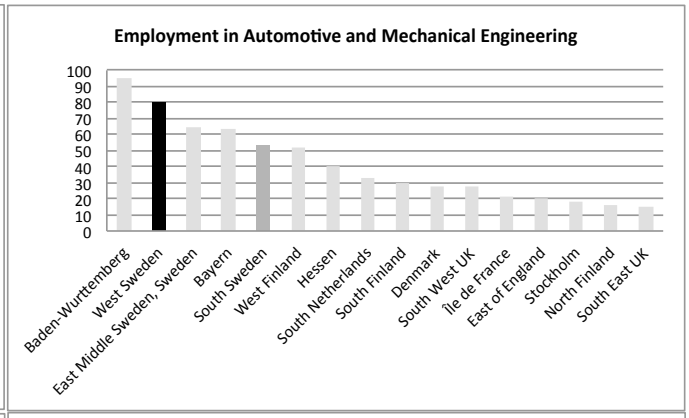
Type of region in terms of EU-funding	Explanation
FP leading absorbers	Regions with low use of SFs for business innovation; and medium-to- high participation in FPs, leverage power, and FP participation from the private sector
SFs leading users	Regions with medium-to- high use of SFs for business innovation (including R&D) and services (including ICTs and digital infrastructure and environmental technologies); and low participation in FPs and leverage power
Low users/absorbers	Regions with low use of SFs for business innovation; and low participation in FP and leverage power.
Full users/absorbers –but at low levels	Regions with medium-to-high use of SFs for business innovation and services, low use of funds for ICTs and digital infrastructure and environmental technologies; and low participation in FP and leverage power, but medium-high importance of SMEs' participation in the private sector

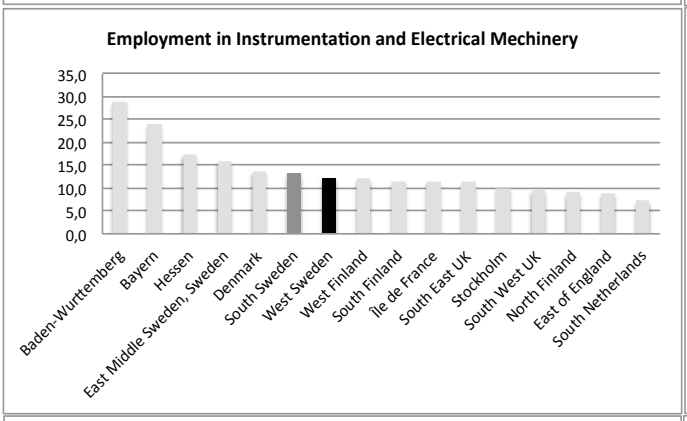
Appendix III – World Knowledge Competitiveness Index (2008)

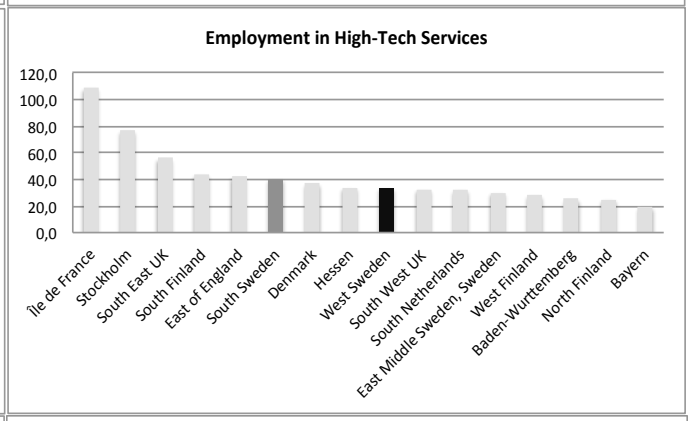
Modified from data presented in "World Knowledge Competitiveness Index" by the European Union (2012)

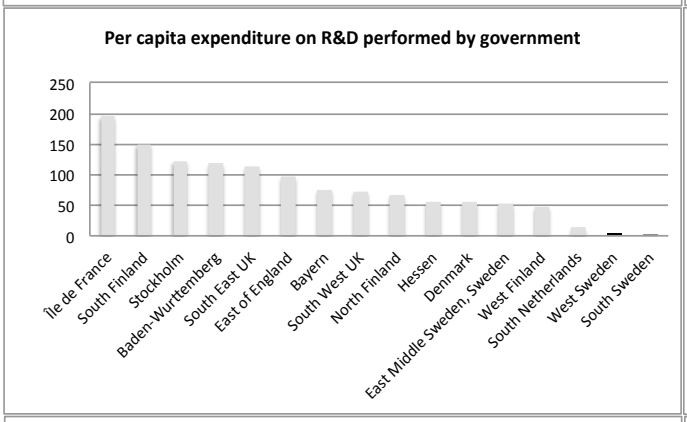


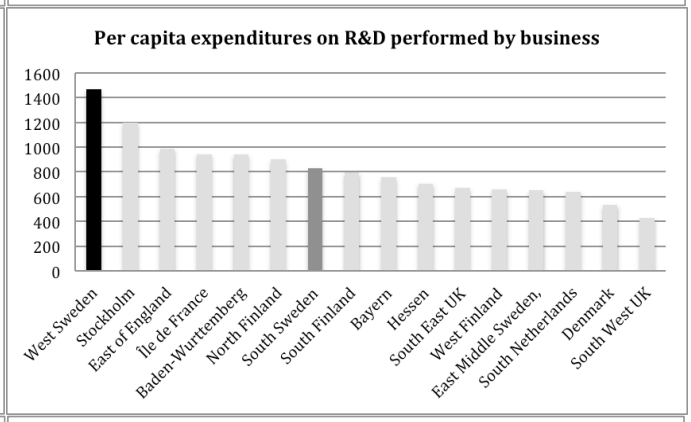

Employment in Biotech & Chemicals
25
20
15
10
5
0
Hessen
South Netherlands
South Sweden
Stockholm
Denmark
Île de France
Baden-Wurttemberg
East Middle Sweden, Sweden
West Sweden
South Finland
Bayern
South East UK
East of England
West Finland
North Finland
South West UK

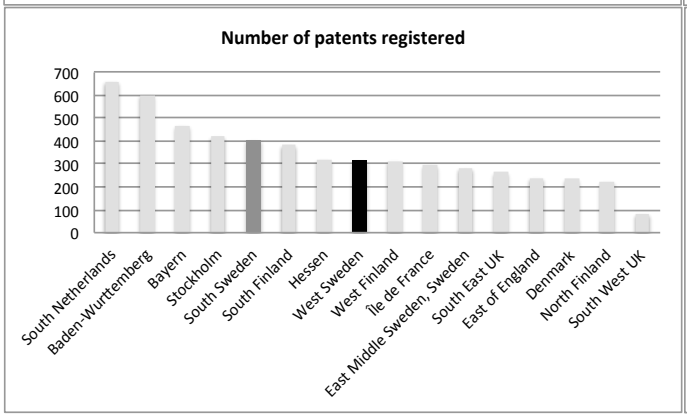

Employment in Automotive and Mechanical Engineering
100
90
80
70
60
50
40
30
20
10
0
Baden-Wurttemberg
West Sweden
East Middle Sweden, Sweden
Bayern
South Sweden
West Finland
Hessen
South Netherlands
South Finland
Denmark
South West UK
Île de France
East of England
Stockholm
North Finland
South East UK

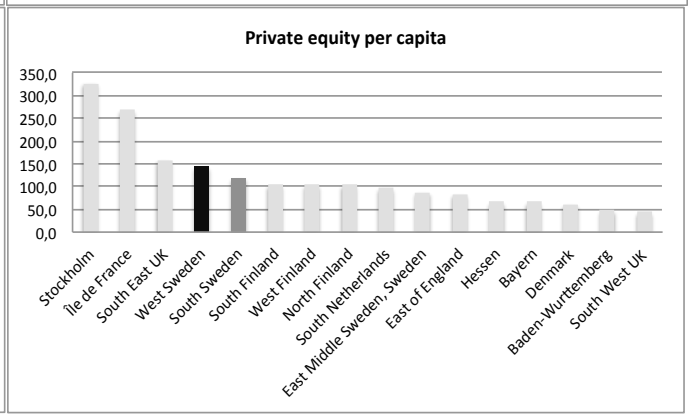

Employment in Instrumentation and Electrical Mechinery
35,0
30,0
25,0
20,0
15,0
10,0
5,0
0,0
Baden-Wurttemberg
Bayern
Hessen
East Middle Sweden, Sweden
Denmark
South Sweden
West Sweden
West Finland
South Finland
Île de France
South East UK
Stockholm
South West UK
North Finland
East of England
South Netherlands

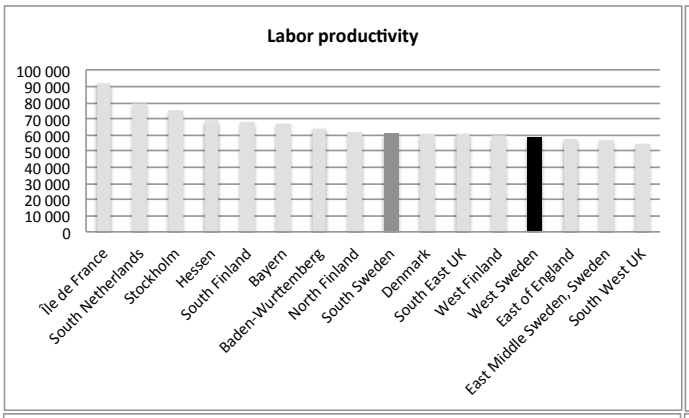

Employment in High-Tech Services
120,0
100,0
80,0
60,0
40,0
20,0
0,0
Île de France
Stockholm
South East UK
South Finland
East of England
South Sweden
Denmark
Hessen
West Sweden
South West UK
South Netherlands
East Middle Sweden, Sweden
West Finland
Baden-Wurttemberg
North Finland
Bayern

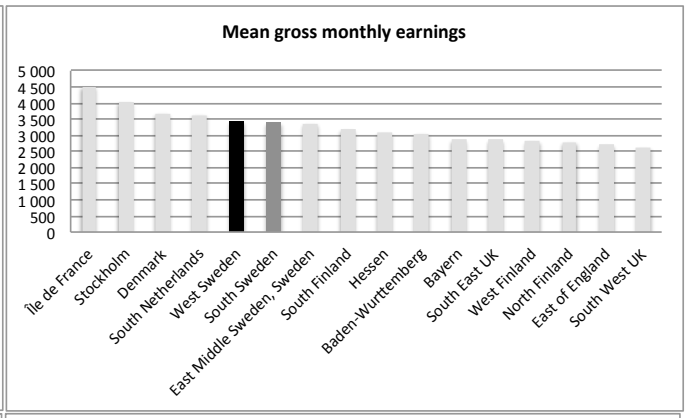

Per capita expenditure on R&D performed by government
250
200
150
100
50
0
Île de France
South Finland
Stockholm
Baden-Wurttemberg
South East UK
East of England
Bayern
South West UK
North Finland
Hessen
Denmark
East Middle Sweden, Sweden
West Finland
South Netherlands
West Sweden
South Sweden

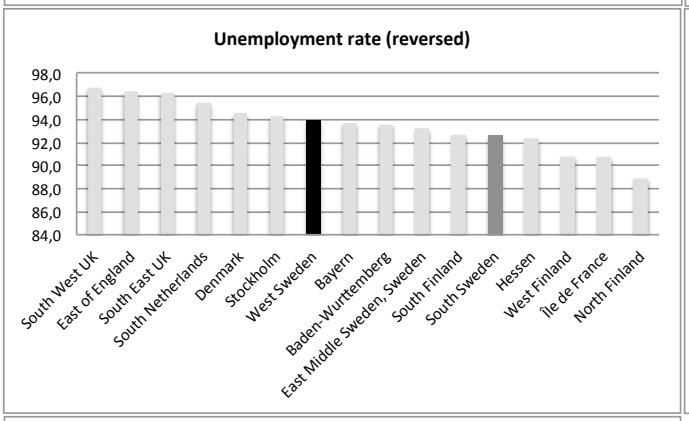

Per capita expenditures on R&D performed by business
1600
1400
1200
1000
800
600
400
200
0
West Sweden
Stockholm
East of England
Île de France
Baden-Wurttemberg
North Finland
South Sweden
South Finland
Bayern
Hessen
South East UK
West Finland
East Middle Sweden,
South Netherlands
Denmark
South West UK

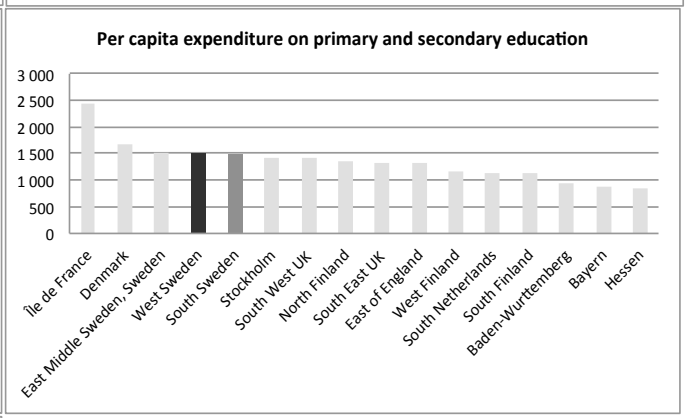

Number of patents registered
700
600
500
400
300
200
100
0
South Netherlands
Baden-Wurttemberg
Bayern
Stockholm
South Sweden
South Finland
Hessen
West Sweden
West Finland
Île de France
East Middle Sweden, Sweden
South East UK
East of England
Denmark
North Finland
South West UK

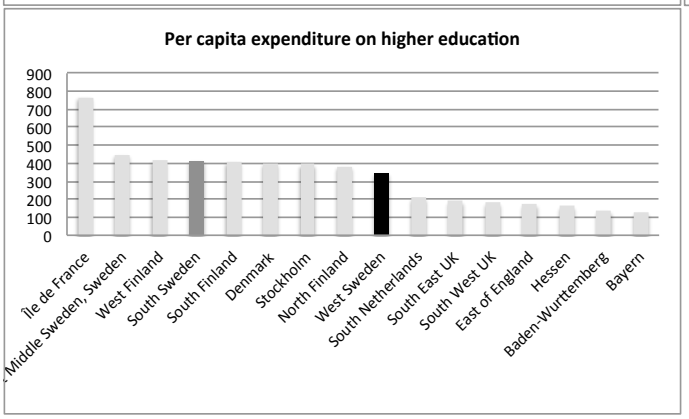

Private equity per capita
350,0
300,0
250,0
200,0
150,0
100,0
50,0
0,0
Stockholm
Île de France
South East UK
West Sweden
South Sweden
South Finland
West Finland
North Finland
South Netherlands
East Middle Sweden, Sweden
East of England
Hessen
Bayern
Denmark
Baden-Wurttemberg
South West UK


Labor productivity
100 000
90 000
80 000
70 000
60 000
50 000
40 000
30 000
20 000
10 000
0
Île de France
South Netherlands
Stockholm
Hessen
South Finland
Bayern
Baden-Wurttemberg
North Finland
South Sweden
Denmark
South East UK
West Finland
West Sweden
East of England
East Middle Sweden, Sweden
South West UK


Mean gross monthly earnings
5 000
4 500
4 000
3 500
3 000
2 500
2 000
1 500
1 000
500
0
Île de France
Stockholm
Denmark
South Netherlands
West Sweden
South Sweden
East Middle Sweden, Sweden
South Finland
Hessen
Baden-Wurttemberg
Bayern
South East UK
West Finland
North Finland
East of England
South West UK


Unemployment rate (reversed)
98,0
96,0
94,0
92,0
90,0
88,0
86,0
84,0
South West UK
East of England
South East UK
South Netherlands
Denmark
Stockholm
West Sweden
Bayern
Baden-Wurttemberg
East Middle Sweden, Sweden
South Finland
South Sweden
Hessen
West Finland
Île de France
North Finland


Per capita expenditure on primary and secondary education
3 000
2 500
2 000
1 500
1 000
500
0
Île de France
Denmark
East Middle Sweden, Sweden
West Sweden
South Sweden
Stockholm
South West UK
North Finland
South East UK
East of England
West Finland
South Netherlands
South Finland
Baden-Wurttemberg
Bayern
Hessen


Per capita expenditure on higher education
900
800
700
600
500
400
300
200
100
0
Île de France
Middle Sweden, Sweden
West Finland
South Sweden
South Finland
Denmark
Stockholm
North Finland
West Sweden
South Netherlands
South East UK
South West UK
East of England
Hessen
Baden-Wurttemberg
Bayern

The World Knowledge Competitiveness Index 2008 – by Huggins and Izushi (2008) – Explanation

WKCI-indicator		Further explanation
Knowledge competitiveness index		Represents the overall picture of the benchmarked regions
Knowledge intensity ratio		The ratio of the Knowledge Competitiveness Index divided by the GDP per capita
GDP per capita (US$)		
Human capital	Economic activity rate	Labor force as % of working age population
	Number of Managers per 1,000 employees	
	Employment in IT and Computer Manufacturing per 1,000 inhabitants	Consists of: communication equipment, computer and office equipment, electronic components and accessories.
	Employment in Biotech & Chemicals per 1,000 inhabitants	Consists of: pharmaceuticals, drugs, chemicals and chemical products.
	Employment in Automotive and Mechanical Engineering per 1,000 inhabitants	Consists of: motor vehicles and transport equipment, machine tools and equipment.
	Employment in Instrumentation and Electrical Machinery per 1,000 inhabitants	Consists of: precision and optical equipment, electrical transmission and distribution equipment, lighting and wiring equipment.
	Employment in High-Tech Services per 1,000 inhabitants	Consists of: software and computer related services, telecommunications, research, development and testing services.
Knowledge capital components	Per Capita Expenditure on R&D performed by Government	
	Per Capita Expenditures on R&D performed by Business	
	Number of Patents Registered per one million inhabitants	
Financial capital	Private Equity Investment Capital $ Per Capita	Such as venture capital and start-up investments
Regional economy output	Labor Productivity	Output in USD per employee – PPP adjusted
	Mean Gross Monthly Earnings	
	Unemployment rate (Reversed)	
	Per Capita Public Expenditures on Primary and Secondary Education	Expenditure per capita in USD
	Per Capita Public Expenditures on Higher Education	

Appendix IV – Technology Intensity Definition

OECD, 2011. ISCI Rev.3 Technology Intensity Definition. OECD Directorate for Science, Technology and Industry Economic Analysis and Statistics Division.

ISIC REV. 3 TECHNOLOGY INTENSITY DEFINITION

Classification of manufacturing industries into categories based on R&D intensities

High-technology industries

- Aircraft and spacecraft
- Pharmaceuticals
- Office, accounting and computing machinery
- Radio, TV and communciations equipment
- Medical, precision and optical instruments

Medium-high-technology industries

- Electrical machinery and apparatus, n.e.c.
- Motor vehicles, trailers and semi-trailers
- Chemicals excluding pharmaceuticals
- Railroad equipment and transport equipment, n.e.c.
- Machinery and equipment, n.e.c.

Medium-low-technology industries

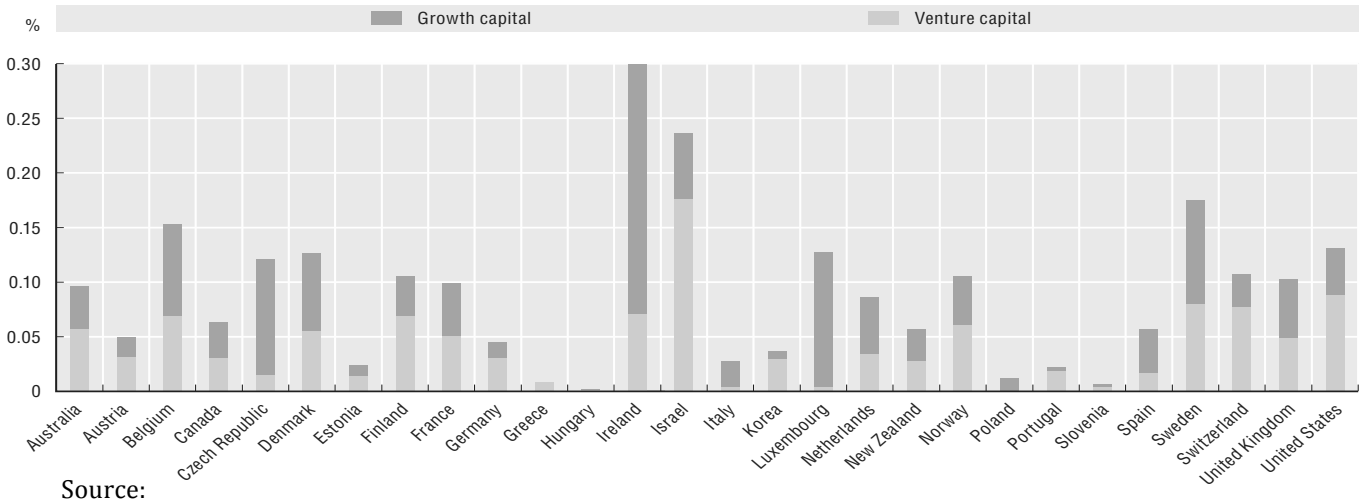
- Building and repairing of ships and boats
- Rubber and plastics products
- Coke, refined petroleum products and nuclear fuel
- Other non-metallic mineral products
- Basic metals and fabricated metal products

Low-technology industries

- Manufacturing, n.e.c.; Recycling
- Wood, pulp, paper, paper products, printing and publishing
- Food products, beverages and tobacco
- Textiles, textile products, leather and footwear

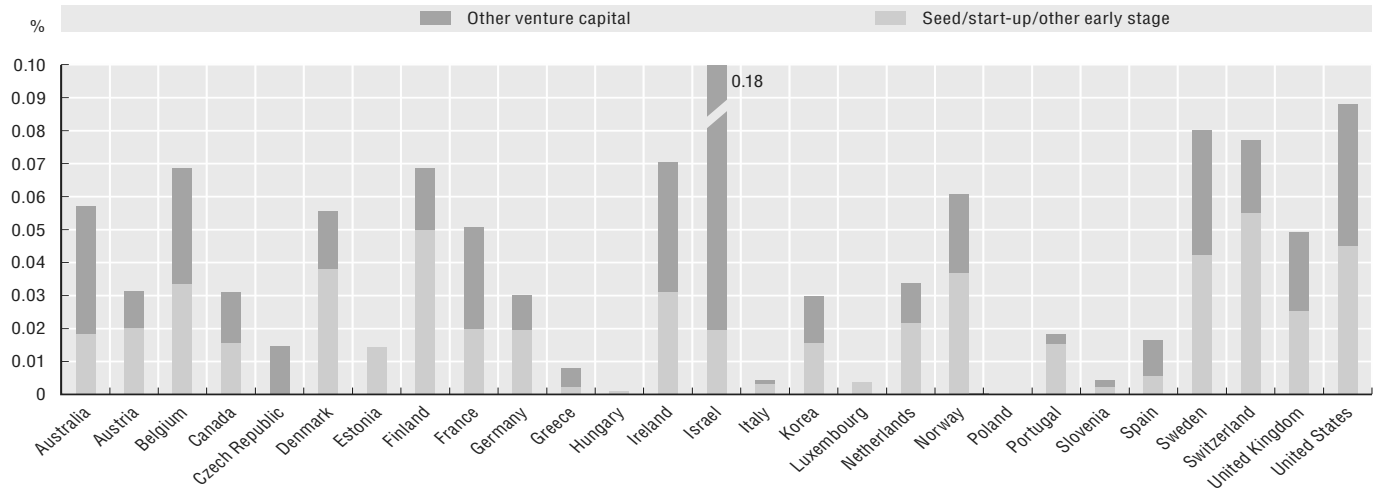
Appendix V – Venture capital as percentage of GDP 2009

Venture capital as percentage of GDP, 2009



Source:
OECD (2011).

Venture capital and growth capital as percentage of GDP, 2009



Source: OECD (2011).

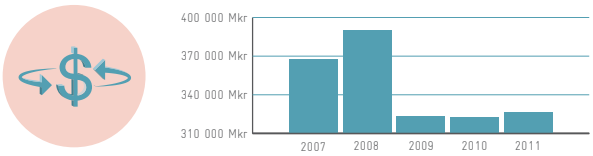
Appendix VI – The largest companies

The 20 largest companies in Skåne

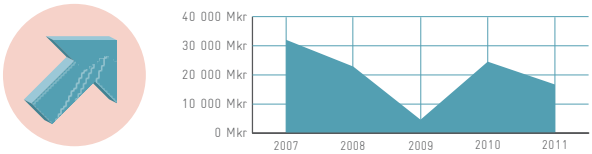
2011		2010	OMSÄTTNING I TKR 2011
1		(1)	SONY MOBILE COMMUNICATIONS AB	46 622 420
2	▲	(3)	PEAB AB	43 539 000
3	▼	(2)	E.ON SVERIGE AB	41 392 000
4		(4)	TRELLEBORG AB	29 106 000
5		(5)	ALFA LAVAL AB	28 652 000
6	▲	(7)	AARHUSKARLSHAMN AB (PUBL)	16 695 000
7	▼	(6)	TETRA PAK AB	16 176 664
8		(8)	PERSTORP HOLDING AB	15 199 000
9	▲	(ny)	GAMBRO AB [1)]	10 779 000
10	▼	(9)	BERGENDAHL & SON AB	10 208 570
11	▲	(14)	MELLBY GÅRD HOLDING AB	10 107 992
12	▲	(ny)	HEXPOL AB	7 197 000
13	▲	(17)	HÖGANÄS AB	7 081 000
14	▲	(16)	HILDING ANDERS	7 077 000
15	▲	(18)	LINDAB INTERNATIONAL AB	6 878 000
16	▼	(12)	ELEKTROKOPPAR AB	6 422 962
17	▲	(ny)	BE GROUP AB	5 941 000
18	▲	(ny)	G & L BEIJER AB	5 897 363
19	▼	(13)	LINDÉNGRUPPEN AB	5 865 000
20		(20)	KWINTET AB	5 764 830

1) HUVUDKONTORET FLYTTADE UNDER 2011 FRÅN STOCKHOLM TILL LUND.

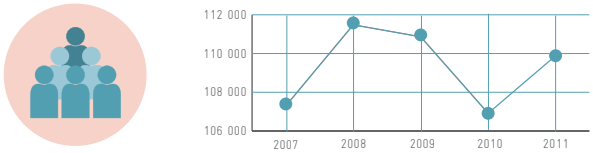
TOTAL OMSÄTTNING *20 största i länet*



TOTALT RESULTAT *20 största i länet*



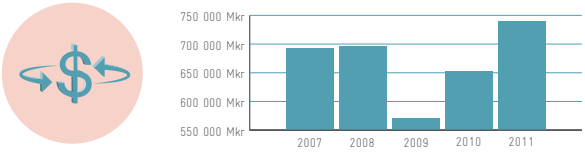
TOTALT ANTAL ANSTÄLLDA *20 största i länet*



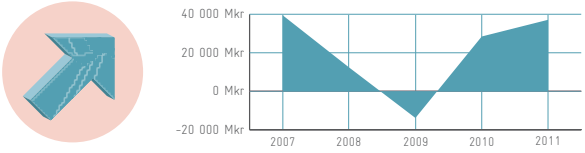
The 20 largest companies in Västra Götaland

2011		2010	OMSÄTTNING I TKR 2011
1		(1)	VOLVO AB	310 367 000
2		(2)	VOLVO PERSONVAGNAR AB	112 732 000
3		(3)	SKF AB	66 216 000
4	▲	(5)	STENA METALL AB	28 976 900
5	▼	(4)	STENA AB	27 968 000
6		(6)	CELLMARK HOLDING AB	20 513 835
7		(7)	WILLY:S AB	18 904 332
8	▲	(9)	BILIA AB	18 160 000
9	▼	(8)	PAPYRUS HOLDING AB	16 881 368
10	▲	(ny)	AKZO NOBEL SWEDEN FINANCE AB (PUBL)	16 745 033
11	▼	(10)	VOLVO PERSONBILAR SVERIGE AB	15 270 255
12		(12)	SCHENKER AB	12 956 584
13	▼	(11)	GÖTEBORGS KOMMUNALA FÖRVALTN. AB	12 404 800
14		(14)	EKMAN & CO AB	11 862 409
15	▼	(13)	TAMRO AB	10 359 516
16	▼	(15)	CAPIO AB	9 855 000
17		(17)	MÖLNLYCKE HEALTH CARE AB	7 675 700
18	▲	(ny)	CARL BENNET AB	7 574 512
19	▼	(16)	DUNROSS & CO AB	7 286 836
20		(20)	INVESTMENT AB LATOUR	7 171 000

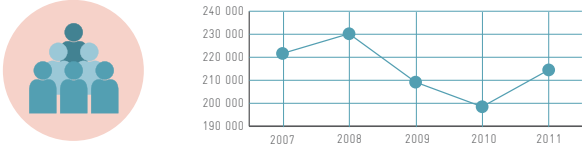
TOTAL OMSÄTTNING *20 största i länet*



TOTALT RESULTAT *20 största i länet*



TOTALT ANTAL ANSTÄLLDA *20 största i länet*



Source: Largestcompanies, 2012.

Appendix VII – Results from Chi2-test

Note that only significant (or close to significant) chi-2 values for each question are presented for both Skåne and Västra Götaland. In order to deal with the vast amount of data, results for insignificant values are here aggregated (i.e. responses from companies in Skåne and Västra Götaland presented as one), since those types of data anyway do not differ very much.

Observe that Skåne is denoted by S and Västra Götaland by VG

List of acronyms	
S	Skåne
VG	Västra Götaland
LS	Life science
Other	Other companies than Life Science
Emp	Number of employees of the companies, either 0-1, or ≥ 2
Age	Age of the companies, either 0-7 or ≥ 8 years

1. The company is dependent on engagement in R&D

1. The company is dependent on engagement in R&D						
Strongly agree	Agree	Partly agree	Disagree	Strongly disagree	N	Chi2*
77%	16%	6%	1%	1%	135	

*No significant Chi2-values when comparing Skåne and Västra Götaland

2. The company's research is focused on:

2. The company's research is focused on:							
	Strongly agree	Agree	Partly agree	Disagree	Strongly disagree	N	Chi2*
Basic research	21%	21%	20%	21%	16%	104	
Applied research	67%	21%	10%	0%	2%	121	
Contract research (performed by other actor)	25%	13%	22%	10%	30%	112	

*No significant Chi2-values when comparing Skåne and Västra Götaland

3. The company's innovation is focused on:

3. The company's innovation is focused on:							
	Strongly agree	Agree	Partly agree	Disagree	Strongly disagree	N	Chi2*
Product innovation	72%	16%	9%	2%	2%	128	
Process innovation	30%	20%	22%	12%	16%	119	
Service innovation	23%	16%	19%	18%	24%	114	
Other innovation	12%	17%	24%	17%	30%	103	

*No significant Chi2-values when comparing Skåne and Västra Götaland

3. The company's research is focused on: (distributed on categories)						
Product innovation	Category	Strongly agree & Agree	Partly agree	Disagree & Strongly disagree	N	Chi2*
	S: LS	92%	3%	5%	44	7,17
	VG: LS	82%	18%	0%	39	

*Critical Chi2 value: 5,99

4. How important, for the company's innovation activities, is collaboration with:

4. How important, for the company's innovation activities, is collaboration with:							
	Very important	Important	Partly important	Quite unimportant	Not at all	N	Chi2*
Universities	45%	22%	10%	20%	3%	130	
Research institutes	16%	13%	14%	36%	21%	128	
Collaboration- and network organizations	10%	14%	12%	30%	35%	125	
Consultants	21%	21%	20%	21%	16%	104	
Science parks	14%	10%	18%	26%	33%	125	
Customers	53%	18%	11%	11%	7%	133	
Suppliers	25%	24%	12%	17%	21%	127	
Other companies	11%	15%	12%	30%	32%	112	

*Critical Chi2 value: 9,49

4. How important, for the company's innovation activities, is collaboration with: (distributed on categories)						
		Very important & Important	Partly important	Quite unimportant & Not at all	N	Chi2*
Consultants	S: Other	18%	12%	71%	17	7,15
	VG: Other	48%	22%	30%	27	
	S: Age(≥8)	31%	4%	65%	26	8,77
	VG: Age(≥8)	49%	20%	31%	45	
Suppliers	S: Other	29,41%	23,53%	47,06%	17	7,85
	VG: Other	68,97%	17,24%	13,79%	29	
	S: Emp(0-1)	33,33%	0,00%	66,67%	24	6,17
	VG: Emp(0-1)	45,45%	15,15%	39,39%	33	

*Critical Chi2 value: 5,99

5. How often, with aim to generate innovation, does collaboration take place with:

5. How often, with aim to generate innovation, does collaboration take place with:							
	Continuously	Several times per year	Annually	Less often	Not at all	N	Chi2*
S: Universities	55%	13%	9%	20%	4%	56	9,38
VG: Universities	38%	12%	15%	16%	19%	74	
Research institutes	12%	11%	13%	29%	34%	129	
Collaboration- and network organizations	9%	9%	12%	28%	43%	127	
Consultants	18%	16%	11%	33%	21%	131	
Science parks	12%	8%	9%	30%	41%	127	
Customers	45%	22%	8%	16%	9%	129	
Suppliers	22%	19%	12%	25%	22%	127	
Other companies	8%	9%	12%	31%	39%	107	

*Critical Chi2 value: 9,49

5. How often, with aim to generate innovation, does collaboration take place with: (distributed on categories)						
	Category	Continuously &	Annually	Less often &	N	Chi2*

		several times a year		Not at all		
Universities	S: LS	82%	3%	15%	39	8,36
	VG: LS	54%	17%	28%	46	
	S: Emp(0-1)	81%	0%	19%	26	5,01
	VG: Emp(0-1)	58%	12%	30%	33	
Other companies	S: Emp(≥2)	24%	20%	56%	25	5,23
	VG: Emp(≥2)	6%	12%	82%	33	

*Critical Chi2 value: 5,99

6. How much of the collaboration, with aim to generate innovation, does take place:

6. How much of the collaboration, with aim to generate innovation, does take place:							
	All	More than half of it	About half of it	Less than half of it	Nothing	N	Chi2*
Regionally	5%	24%	18%	39%	13%	127	
Nationally	3%	18%	17%	50%	11%	127	
Internationally	8%	22%	19%	42%	9%	130	
Intrasectory	20%	22%	13%	22%	22%	129	
Intersectory	3%	3%	8%	31%	56%	118	

*No significant Chi2-values when comparing Skåne and Västra Götaland

6. How much of the collaboration, with aim to generate innovation, does take place: (distributed on categories)						
	Category	All and more than half	About half or less	Nothing	N	Chi2*
Nationally	S: Age(0-7)	7%	78%	15%	54	6,72
	VG: Age(0-7)	36%	50%	14%	73	

*Critical Chi2 value: 5,99

7. What barriers to collaboration does the company experience?

7. What barriers to collaboration, with aim to generate innovation, does the company experience?			
	Experience a barrier	N	Chi2*
Costly (money-wise)	56%	75	
Too little time	53%	72	
Lack of partners	39%	53	
Have no need to collaborate	4%	5	

*No significant Chi2-values when comparing Skåne and Västra Götaland

7. What barriers to collaboration, with aim to generate innovation, does the company experience? (distributed on categories)				
	Category	Experience a barrier	N	Chi2*
Too little time	S: Emp(0-1)	64%	18	4,17
	VG: Emp(0-1)	38%	13	
	S: Age(0-7)	65%	20	3,76
	VG: Age(0-7)	39%	11	
Lack of partners	S: LS	29%	12	5,53
	VG: LS	53%	25	
	S: Age(0-7)	26%	8	5,99

	VG: Age(0-7)	57%	16

*Critical Chi2-value: 3,84

8. The company experience following barriers to innovation:

8. Barriers to innovation							
	Strongly agree	Agree	Partly agree	Disagree	Strongly disagree	N	Chi2*
High cost	37%	24%	26%	7%	6%	128	
Lack of competence	9%	9%	26%	36%	19%	129	
High risk and uncertainty	18%	27%	30%	16%	9%	128	
S: Lack of collaboration and contacts	0%	2%	26%	47%	25%	57	9,99
VG: Lack of collaboration and contacts	1%	16%	30%	33%	19%	73	
Lack of info of support	12%	19%	26%	27%	16%	124	

*Critical Chi2 value: 9,49

8. The company experience following barriers to innovation: (distributed on categories)						
	Category	Strongly agree & Agree	Partly agree	Disagree & Strongly disagree	N	Chi2*
Lack of collaboration and contacts	S: LS	0%	25%	75%	40	10,46
	VG: LS	22%	24%	53%	45	
	S: Emp(≥2)	0%	20%	80%	30	7,5
	VG: Emp(≥2)	15%	33%	53%	40	
	S: Age(≥8)	0%	25%	75%	28	6,65
	VG: Age(≥8)	20%	24%	56%	45	
Lack of info of support	S: Other	7%	40%	53%	15	7,96
	VG: Other	46%	14%	39%	28	

*Critical Chi2 value: 5,99

9. How well do you perceive the availability in the region regarding:

9. How well do you perceive the availability in the region regarding:							
	Very good	Good	OK	Scarce	Very scarce	N	Chi2*
S: Qualified labor	45%	26%	19%	8%	2%	71	18,07
VG: Qualified labor	17%	25%	51%	7%	0%	53	
Private funding	3%	3%	26%	50%	18%	102	
Public funding	0%	7%	28%	35%	29%	110	
S: Business advice and expertise	16%	36%	38%	8%	2%	50	9,59
VG: Business advice and expertise	9%	16%	51%	13%	11%	55	
S: Academic expertise	47%	32%	13%	6%	2%	53	9,27
VG: Academic expertise	28%	26%	29%	14%	3%	69	
S: Competence development	23%	38%	34%	4%	0%	47	7,99

VG: Competence development	14%	24%	46%	15%	2%	59	
S: Collaboration and networking opportunities	19%	50%	19%	9%	4%	54	15,57
VG: Collaboration and networking opportunities	9%	26%	47%	17%	2%	66	
Info about support	6%	22%	40%	25%	7%	118	

*Critical Chi2 value: 9,49

9. How well do you perceive the availability in the region regarding: (distributed on categories)						
	Category	Agree	Partly agree	Disagree	N	Chi2*
Qualified labor	S: LS	75%	22%	3%	36	11,89
	VG: LS	36%	57%	7%	44	
	S: Age(>8)	68%	16%	16%	25	9,64
	VG: Age(>8)	40%	53%	6%	47	
Public funding	S: LS	0,00%	17,14%	82,86%	35	6,29
	VG: LS	9,52%	30,95%	59,52%	42	
	S: Emp(≥2)	8,33%	8,33%	83,33%	24	8,32
	VG: Emp(≥2)	14,71%	38,24%	47,06%	34	
Business advice and expertise	S: Emp(0-1)	56,52%	43,48%	0,00%	23	9,69
	VG: Emp(0-1)	24,00%	48,00%	28,00%	25	
Academic expertise	S: LS	86,11%	8,33%	5,56%	36	8,17
	VG: LS	56,82%	29,55%	13,64%	44	
	S: Emp(0-1)	79,17%	16,67%	4,17%	24	6,1
	VG: Emp(0-1)	48,39%	29,03%	22,58%	31	
Competence development	S: LS	64,52%	32,26%	3,23%	31	9,53
	VG: LS	29,41%	50,00%	20,59%	34	
Collaboration- and networking opportunities	S: LS	70,27%	18,92%	10,81%	37	13,82
	VG: LS	28,57%	50,00%	21,43%	42	
	S: Emp(0-1)	66,67%	16,67%	16,67%	24	6,69
	VG: Emp(0-1)	31,03%	34,48%	34,48%	29	
	S: Emp(≥2)	70,00%	20,00%	10,00%	30	9,3
	VG: Emp(≥2)	37,84%	56,76%	5,41%	37	
	S: Age(0-7)	72,41%	13,79%	13,79%	29	9,62
	VG: Age(0-7)	33,33%	48,15%	18,52%	27	

*Critical Chi2 value: 5,99

10. How important have the support you received the last three years been?

10. How important have the support you received the last 3 years been?							
	Decisive	Very important	Important	Quite unimportant	Unimportant	N	Chi2*
Funding	26%	21%	20%	16%	18%	102	
Business advice and expertise	4%	11%	26%	34%	25%	107	
Support from incubators	2%	13%	22%	24%	40%	88	
Competence development	3%	14%	25%	33%	25%	102	

*No significant Chi2-values when comparing Skåne and Västra Götaland

11. What would have happened to the company's innovation projects if no support had been received during the last three years?

11. What would have happened to the company's innovation projects if no support had been received during the last three years?					
Realized without change	Realized under longer time frame	Downsizes	Abandoned	N	Chi2*
23%	33%	17%	27%	107	

*No significant Chi2-values when comparing Skåne and Västra Götaland

12. The company experience following barriers to support-taking:

12. The companies experience following barriers for support taking:							
	Strongly agree	Agree	Partly agree	Disagree	Strongly disagree	N	Chi2*
Lack of support	19%	23%	33%	20%	5%	110	
Lack of info of support	11%	23%	36%	24%	7%	114	
Costly application procedures and project documentation	23%	32%	33%	7%	5%	107	
Have no need for support	3%	5%	22%	29%	41%	111	

*No significant Chi2-values when comparing Skåne and Västra Götaland

12. The company experience following barriers to support-taking: (distributed on categories)						
	Category	Strongly agree & Agree	Partly agree	Disagree & Strongly Disagree	N	Chi2*
Lack of support	S: LS	29%	35%	35%	34	5,49
	VG: LS	53%	33%	15%	40	
	S: Age(0-7)	28%	40%	32%	25	5,27
	VG: Age(0-7)	60%	20%	20%	25	
Costly application procedures and project documentation	S: Age(>8)	71%	5%	24%	21	8,05
	VG: Age(>8)	51%	38%	11%	37	

*Critical Chi2 value: 5,99

Appendix VIII – Results from Spearman's correlation test

This appendix presents all results from Spearman's correlation test. Here, the companies' responses have been set in relation to their number of employees, age (of the company), and distance from 'knowledge hub'. Significant values are found in shaded cells. Note that the closer to 1 and -1, the more positive and negative respectively is the relationship.

No correlation test could be made for question 7 due to the dichotomous nature of its data.

Question	Skåne				Västra Götaland			
	Emp.	Age	Dist.	N	Emp.	Age	Dist.	N
1. The company is dependent on engagement in R&D								
	0,194	0,004	0,191	59	0,156	0,174	0,139	76
2. The company's research is focused on:								
Basic research	-0,090	-0,120	-0,287	44	-0,072	-0,029	-0,073	60
Applied research	0,227	0,293	0,231	53	0,181	0,049	0,160	68
Contract research (performed by other actor)	0,224	-0,102	-0,102	45	0,239	0,184	0,118	67
3. The company's innovation is focused on:								
Product innovation	0,372	0,234	0,284	55	0,235	0,330	0,285	73
Process innovation	0,308	0,307	0,308	50	0,246	0,307	0,116	69
Service innovation	0,205	-0,021	0,204	47	0,225	0,254	0,032	67
Other innovation (Market/business innovation, organizational innovation)	0,328	0,212	0,190	41	0,275	0,313	0,109	62
4. How important, for the company's innovation activities, is collaboration with:								
Universities (including centers and other types of research collaboration)	-0,205	-0,065	0,055	57	-0,022	-0,038	-0,160	73
Research institutes	0,347	0,165	0,148	55	0,314	0,243	-0,102	73
Collaboration- and network organizations	0,058	-0,373	-0,057	56	0,208	0,042	-0,274	69
Consultants	0,175	-0,201	0,065	56	0,052	0,183	0,129	72
Science parks	0,308	-0,210	-0,006	54	0,070	-0,146	-0,234	71
Customers	0,356	0,157	0,325	57	0,394	0,129	0,218	76
Suppliers	0,320	0,107	0,162	54	0,171	0,167	0,126	73
Other companies (excluding customers and suppliers)	0,138	-0,255	0,047	49	0,040	0,051	0,115	63
5. How often, with aim to generate innovation, does collaboration take place with:								

Universities (including centers and other types of research collaboration)	-0,153	-0,105	-0,010	56	0,053	-0,015	-0,076	74
Research institutes	0,301	0,097	0,136	55	0,362	0,277	-0,046	74
Collaboration- and network organizations	0,119	-0,281	-0,117	53	0,215	0,108	-0,030	74
Consultants	0,169	-0,069	-0,009	55	0,176	0,229	0,103	76
Science parks	0,238	-0,227	-0,077	54	0,146	-0,074	-0,007	73
Customers	0,417	0,215	0,054	54	0,355	0,092	0,277	75
Suppliers	0,323	0,137	0,095	53	0,207	0,280	0,146	74
Other companies (excluding customers and suppliers)	-0,015	0,327	0,115	47	0,047	0,098	0,283	60
6. How much of the collaboration, with aim to generate innovation, does take place:								
Regionally	-0,012	-0,284	-0,284	55	-0,095	-0,206	0,003	72
Nationally	0,124	0,257	0,256	54	0,066	0,013	0,226	73
Internationally	0,387	0,342	0,258	57	0,203	0,069	0,103	73
Within the industry the company belongs to	0,196	-0,075	0,077	56	0,009	-0,043	0,049	73
Outside the industry the company belongs to	0,300	0,055	-0,005	51	0,326	0,316	0,003	67
7. What barriers to collaboration does the company experience?								
Costly (money-wise)	Correlation test not possible							
Too little time								
Lack of potential partners in the region								
8. The company experience following barriers to innovation:								
High cost for developing new products/processes/services	0,011	-0,037	0,333	54	-0,131	-0,151	0,027	74
Lack of competence for research (Qualified labor, etc.)	0,220	0,128	0,247	55	0,102	0,004	-0,006	74
High risk and uncertainty	0,128	-0,167	0,049	54	0,054	0,050	-0,043	74
Lack of collaboration and contacts	0,015	0,089	0,094	57	0,079	-0,068	0,131	73
Lack of information of innovation support	0,091	-0,031	0,244	51	-0,073	-0,004	0,329	73
9. How well do you perceive the availability in the region regarding:								
Qualified labor	0,064	-0,046	0,095	53	0,203	0,058	0,156	71
Private funding	0,065	0,288	0,302	43	0,370	0,078	0,245	59
Public funding	0,043	0,368	0,377	47	0,299	0,049	-0,072	63
Business advice and expertise (marketing, management, IPR, administrative)	0,029	-0,129	0,160	50	0,117	-0,077	0,237	55
Academic expertise	0,023	0,011	-0,087	53	0,060	-0,043	-0,092	69
Competence development	0,194	-0,148	0,111	47	-0,034	-0,083	0,054	59

Collaboration and networking opportunities	0,184	-0,154	0,198	54	0,133	0,112	0,182	66
Information about support	0,094	-0,088	0,156	48	0,057	0,003	0,110	70
10. How important have the support you received the last 3 years been?								
Funding	-0,011	-0,216	0,050	46	0,071	-0,152	-0,129	56
Business advice and expertise (marketing, management, IPR, administrative)	0,025	-0,241	0,020	49	-0,095	-0,060	0,135	58
Support from incubators	-0,047	-0,358	0,026	42	-0,383	-0,286	0,198	46
Competence development	0,270	0,111	0,176	44	0,148	0,234	0,254	58
11. What would have happened to the company's innovation projects if no support had been received during the last three years?								
	0,313	0,343	0,313	49	0,394	0,462	0,459	58
12. The company perceive following barriers to support-taking								
Lack of good possibilities of support in the region	0,002	0,023	0,197	47	-0,104	-0,028	0,282	63
Lack of information of support opportunities	0,159	0,015	0,269	50	-0,009	-0,007	0,301	64
Costly application procedures and project documentation	0,142	0,184	0,136	46	-0,082	-0,032	0,399	61
Have no need for support	0,200	0,301	0,306	48	0,167	0,370	0,243	63