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Measuring and Predicting Export Activity:

An application on the Region of West Sweden

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Abstract

In Sweden, export accounts for approximately 50 percent of the GDP and is a good indicator of the economic situation. This thesis develops an export index on quarterly basis to measure and predict the business cycle. The export index is built as a composite diffusion index. We propose a diffusion index including five categories and show that it is more informative than a diffusion index with three categories. The export index uses the opinions and expectations from firms in the region of West Sweden in 2013. This region has the largest export and was the region most affected by the recent financial crisis. The focus lies on firms from three well established clusters in the region: automotive, life science and textile. The estimated export index shows that 56.34 percent of the firms have a positive view on the current state, where life science is the cluster most positive. We also evaluate the determinants of positive export expectations using a discrete choice export policy function from a dynamic model. The findings show that previous quarter result, share capital and productivity have a positive impact on the expectations.

Keywords: Export, cluster, expectations, composite index, diffusion index, OLS, binary choice model

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Contents

1. Introduction

Export accounts for approximately 50 percent of Sweden's GDP and is a vital part of the Swedish economy (SCB, 2012A). It is an important factor of economic growth since it generates resources that enable import of goods and services. Export further widens the demand of a company's products as the market expands and includes the world market instead of being limited to the home market, which in turn might increases profitability and important economics of scale. Exporting firms have been proven to be more productive than non-exporting firms (Park, et al., 2009).[1] In addition, productivity contributes to the economic welfare within a country and regions, as well as increases the overall competitiveness. During the last two decades, the competition on the global market has changed from firms having competitive advantages in low input cost to competitive advantages in local knowledge and inter-firm relationships. In line with this, today's global competition requires that companies are capable to constantly innovate and develop their products and businesses. This development has led to the creation of business clusters. A cluster is in this thesis defined as a group of companies, governmental institutions and non-governmental organizations (NGOs) that collaborate within a product family to increase innovations and productivity. Clusters are created to enhance the competitiveness of companies and regions.

The purpose of this thesis is to develop an export index, which we apply on the region of West Sweden.[2] This is done in collaboration with the West Sweden Chamber of Commerce. West Sweden is the most export intense region in Sweden. The latest financial crisis that started in 2008 showed the vulnerability among West Swedish companies as the export declined to a large extent in the following years. The purpose of the index is to show the dispersion of the development of the firms' export activity over time and thereby get an indication of the business cycle of the region. We therefore build the export index as a composite diffusion index, where changes in firms' volume of the export sales, backlog of the export and the profitability of the export sales are separate diffusion indexes which form the composite index. The combination of these factors gives a good picture of firms' export activity and the export index is performed on a quarterly basis. As register data is not available for these factors on a frequent (monthly and quarterly) basis the index provides us with key information about export activity. With the availability of this data, we use it in a

[1] See also: (Chung, et al., 2000; Aw, et al., 2011; Van Biesebroeck, 2005)
[2] With West Sweden we mean the region of Västra Götaland and the north parts of Halland which are included in the business area of West Sweden Chamber of Commerce.

combination with register data and analyze the determinants of positive expectations. Given that the expectations are good indicators of the upcoming development, the understanding of what effects the expectations can give the opportunity to quickly and precise frame policies that might improve the performance of the companies or prevent the performance from declining.

In the export index, the reference point is 50, where values below 50 indicates an overall decrease in export activity of the firms and values above 50 implies an overall increase in export activity of the firms. The thesis's focus is on the views and expectations of managers from firms in three different and important West Swedish clusters: automotive, textile and life science. The companies in the clusters are defined by information from VINNOVA reports, Region Västra Götaland, GöteborgBIO, TEKO and UC. The nature of clusters implies that they usually are in forefront when it comes to global competitiveness and exports. This indicates that an export index of clusters would give an indication of the economic direction of the region. By performing the index at cluster level, more specific conclusions can be drawn regarding industries which in turn could affect the choice of national and regional policies. To get an indication of the performance of the country, regions and clusters and to predict future development of the economy is in the interest of governmental institutions, NGOs, companies and consumers when deciding about future economic activities.

The export index in this thesis is done on a regional level as well as for different clusters. In addition, the index we develop is based on a five scale response category questionnaire in contrast to other common composite indexes which uses a three scale response category questionnaire, for example Business Sweden's Export Managers' Index (EMI). We conduct a questionnaire in 2013 in order to collect the views and expectations about the economic factors of concern. This data is used to compute the export index value in this thesis. The questions concern the development the previous quarter and the expectations about the development the upcoming quarter in order to get an indication of the current state of the firms' export activity. The questionnaire was sent to 221 firms in the region of West Sweden and 70 answers were received, which is equal to an answer frequency of 31.67 percent.

The export index shows that 56.34 percent of the companies experience a positive current state in the export activity. The index also shows that the expectations about the upcoming quarter are more positive than the views on the development during the previous quarter. Further, the life science cluster has experienced the most positive development and is the

cluster with the highest share of firms having positive expectations. When aggregating the index based on the five scale response category questionnaire (I_5) into a three scale category index (I_3), we find that I_5 is more informative than I_3 since it reveals if the positive and negative answers are small or large. The inclusion of five response categories makes the index less volatile than I_3. On the other hand, I_3 has the positive feature that it by construction shows the share of firms that are positive.

We further analyze the determinants of positive expectations among the respondents by using a discrete choice export policy function from a dynamic model that includes both firm specific characteristics and market specific characteristics for each firm. When performing the analysis we use register data from Bisnode Market AB, Statistics Sweden (SCB), the Swedish Agency for Growth Policy Analysis and the Swedish National Agency for Higher Education as well as the data received from the questionnaire. The previous quarter results has a large impact on the probability of having positive expectations; a firm that has experienced a positive development the previous quarter is about 62.6 percent more likely to have positive expectations about the upcoming quarter. The results also show that the level of share capital and labor productivity have a positive impact on the probability of having positive expectations, where the impact of labor productivity is larger among small firms than on large firms. Firms exporting to West Europe and China are more likely to have positive expectations, while firms exporting to Japan and firms located in conurbations are less likely to have positive expectations.

As productivity affects the probability of having positive expectations and in order to gain a broader picture of the responding firms, we analyze the determinants of the firms' labor and capital productivity and the difference between the clusters. This paper uses register data from the same sources as in the analysis of the determinants of positive expectations. We find that the three clusters have relatively equal productivity. For the firms within the automotive and life science cluster, there are large differences concerning the productivity, while for the textile cluster the firms have relatively low productivity dispersion. Share capital positively affects the labor productivity in the capital intensive clusters automotive and textile whereas for the life science cluster the location and industry affiliation affects the productivity. The results are in line with cluster theory, since we find that firms in the life science and automotive cluster are more productive in the region of Gothenburg and firms in the textile cluster are more productive in the region of Sjuhärad.

The thesis is divided into different sections where Section 2 presents related literature concerning export and clusters and section 3 describes the questionnaire and descriptive statistics of the firms, including the analysis of the productivity. Sections 4 and 5 present the theory and construction of the export index. Sections 6 and 7 present the results and include a conclusion of our findings.

2. Literature Review

2.1 Export

Economic literature suggests that export is an important factor of a country's GDP and that smaller countries are usually more export dependent, since their domestic market is relatively small. For Sweden, the export as a share of GDP has increased from approximately 30 percent to 50 percent over the last two decades (SCB, 2012A). Since export accounts for approximately 50 percent of total GDP it is a vital part of Sweden's economic growth. According to SCB (2012B), as much as 73 percent of the total Swedish export is exported to European markets and out of this, 78 percent is exported to members of the European Union. Among these members, the largest importers of Swedish goods and services are Germany and United Kingdom. Among non-members of the European Union, Norway accounts for the largest share. Outside of Europe, China and the US are the largest markets for Swedish exports. In a report conducted by SCB (2011A), at request of the West Sweden Chamber of Commerce, it is concluded that West Sweden is the region in Sweden with the highest amount of goods exported in the years of 2006 to 2010, accounting for 22 percent of the total exported goods. Compared to the regions of Stockholm and Skåne, the report concludes that West Sweden is the region where the export is most affected by the financial crisis that started in 2008. Moreover, West Sweden has also experienced a slower recovery since the financial crisis than the other regions. This implies that the companies in this region might be more affected by worldwide economic fluctuations, due to their export dependence. Concerning the export markets of West Sweden, Norway and Belgium are the largest importers of Swedish goods followed by Germany and the US. For the region of Gothenburg, the export mainly consists of produced goods, where the automotive sector is by far the largest exporting sector followed by biochemical and life science products. (Andersson, 2013)

Recent empirical literature suggests that exporting affects the productivity of a firm, where exporting firms are shown to have higher productivity than non-exporting firms. Although, the view on why this is the case differ. Some researchers mean that higher productivity among exporting firms derives from exporting firms absorbing usable knowledge from their international contacts which non-exporting firms do not experience. Another reason discussed regarding exporting firms being more productive is that of self-selection. (Park, et al., 2009; Chung, et al., 2000; Aw, et al., 2011; Van Biesebroeck, 2005) Self-selection means that more productive firms select themselves into exporting, and that this self-selection is the reason

why export seems to lead to higher productivity, when it is in fact higher productivity that leads to firms participating in exporting activities. Chung et al. (2000) compare the exporting-productivity link for producers in the Republic of Korea and Taiwan and analyze whether there exist a relationship between the total factor productivity of a firm and the firm's decision to export. Korea and Taiwan are two countries were the export has played an important role for the growth of the countries. Their findings regarding this relationship differ between the two countries. In Taiwan, there seems to be more support for the self-selection theory, since there are significant differences regarding the productivity of the firms that choose to enter and exit foreign markets. For Korea, there seems to be other factors than productivity affecting the decision of entry and exit and they find no evidence of variations in productivity that could be traced to export decisions. Biesebroeck (2005) examines the role of exports on the performance of sub-firms in nine African countries by looking at how exports affect productivity. He finds that productivity is higher among firms that participate in foreign trade, that exporting firms further pay higher wages, is more capital intensive and operate at a larger scale. In addition, he finds that the increase in productivity takes place after the firms have entered the world market. The latter finding indicates that the higher productivity among exporting firms do not exist due to self-selection. He further suggests that most of the difference between the variance in productivity between exporters and non-exporters can be explained by exporting firms experiencing exhausted economies of scale and further that exporting firms experience an advantage since they have a possibility to absorb new technology before non-exporting firms do. Aw et al. (2011) find that investment in R&D and export has a positive effect on productivity. They find that productive firms self-select into participating in export and R&D investment. Since both activities increase productivity, the self-selection is further amplified. In addition, they investigate how an enlargement of the size of the export market affects R&D and export participation and finds that it has a positive impact on both. Another finding of theirs is that decreased trade costs will increase the probability of firms investing in R&D and exports. Atkeson and Burstein (2010) show the effects of a change in international trade costs on a firm's decision to invest in activities concerning process and product innovations. Their aim is to examine if the increased possibility for firms to engage in international trade has had any impact on the incentives to invest in innovative activities. The authors find that the impact of a change in the trade cost on the innovation actions depends heavily on the extent of the firm's exporting activities.

In addition to export having an impact on the productivity and development of firms, various researchers have found evidence of positive effects of export on a number of different factors regarding the performance of countries (Frankel & Romer, 1999; Irwin & Tervio, 2002; Van Biesebroeck, 2005). Frankel and Romer (1999) examine the effect of trade on income per person using data on 150 countries. They use a country's geographic characteristics as instruments for trade when estimating the effect of trade on income, in order to deal with the endogeneity problem. Their findings show that there is no evidence that countries with higher income participate in trade to a greater extent, but they do find evidence of the reverse causality; increasing the ratio of trade to GDP by 1 percent increases income per person by between 0.5 to 2 percent. Irwin and Terviö (2002) widen the study of Frankel and Romer and include more time periods when estimating the effect of trade on income. Their conclusion is in line with Frankel and Romer and shows that trade indeed increases income, furthermore in a greater extent than the previous study found. Park et al. (2009) studies Chinese exporting between the years 1995 to 1998, which was the period for the Asian financial crisis. During the financial crisis, severe exchange rate shocks occurred in numerous countries to which China exported. Firms that exported to destinations which currency had depreciated were shown to experience a slower growth after the crisis, in comparison to the growth before the crisis. They also found that exporting has a positive impact on a number of characteristics of a firm, such as productivity and returns to assets.

In their aim to analyze what factors that affect export, Katsikeas et al. (1996) focus on exporting activities of Greek manufacturers that are already involved in international trade. They suggest that in attempts to increase trade in a country, focus could lie on expanding exports in firms already participating in trade and that a limitation of previous research is the fact that they often focus on firms that are not engaged in exports by the moment, but rather on firms that will be. In contrast to previous research they find no significant effect of firm's size on success in exporting and conclude that this could be of importance for small firms to consider, as they might disparage their ability when it comes to participating in foreign trade. In addition, they find that performing export marketing research increases the likelihood of a firm becoming successful in exports since it reduces uncertainty about foreign markets. The finding concerning the effect of firm size on export performance is in line with Bonaccorsi (1993) who analyzes a large number of research findings regarding the relationship between firm size and exporting in the Italian manufacturing market and rejects the hypothesis of firm size having an impact on export.

2.2 Cluster

In a globalized world, a company's success is dependent on its capability to innovate and improve its performance and products (Porter, 1990).[3] In the search for competitive advantages, the importance of nations and local regions has been highlighted. Porter (1998) and Maskell and Malmberg (1999) describe that the location has been an important factor throughout the industrial history. Nowadays, the globalization has shifted the competitive advantages from low input cost to more dynamic advantages in local knowledge, policies and relationships, i.e. factors that enhance innovations. Porter (1990) shows that companies can innovate in different ways; innovation can be technical in new products or processes or more economical with new approaches to educate co-workers as well as marketing the products and the company brand. In order to raise innovation within a country, and thereby increase the competitiveness of both the nation and companies, four determinants are discussed. Which industries that become globally successful are determined by how well the country's factors of production, such as infrastructure, raw materials and labor, fits the industry as well as how strong the home-market demand is. Moreover, he states that industry success is determined by the existence of related and supportive industries, which also are globally competitive and which close, innovative business relations can be developed with. The last determinant for an industry to gain competitive advantage is the national environment in which the companies experience the first competition. The national environment also influences how companies are created, controlled, organized and managed.

The discussion of upgrading products and processes in order to gain competitive advantages has together with the thoughts of national and local importance in the upgrading process led to the formation of clusters (Pyke, 1992).[4] A cluster usually has an historical connection to the location and is, in this setting, defined as an industry working within the same product family, but incorporates different sectors. This could for example be research and development firms and production firms as well as marketing firms and consultant firms together with governmental institutions and NGOs. Pyke (1992) and Cooke and Morgan (1998) state that in order for firms and countries to gain competitive advantages it is not only necessary for a separate industry but for a whole cluster to innovate and upgrade. In line with this, individual industries are increasingly dependent on other actors, such as suppliers and buyers, and on

[3] See also: (Pyke, 1992; Porter, 1998; Cooke & Morgan, 1998; Maskell & Malmberg, 1999; Kaplinsky, 2000; Humphrey & Schmitz, 2002)
[4] See also: (Porter, 1998; Cooke & Morgan, 1998; Maskell & Malmberg, 1999; Humphrey & Schmitz, 2002)

infrastructure in order to upgrade their own business. This has led to further incentives to collaborate and develop inter-firm relationships, i.e. to develop collaborative clusters. Pyke argues that cluster incentives and developments can be made more efficiently by analysis centers with actors from both companies within the cluster as well as other institutions. Maskell and Malmberg (1999) strengthen the discussion by arguing that, in a globalized world, where codified knowledge are easily and fast distributed around the globe, tacit knowledge and face-to-face relationships are becoming ever more important for maintaining competitive advantages. Further, a region with successful clusters attracts new firms which in turn increase local competition and improve innovations (Sölvell, et al., 1999).

In addition to competitive advantages, the concept of productivity is argued to affect global competition where the productivity is increased within local clusters (Porter, 1998). He also argues that clusters have an effect on competition by showing the direction and speed of innovations as well as influencing the creation of new companies and businesses. Porter indicates a positive effect of clusters on individual companies: “A cluster allows each member to benefit as *if* it had greater scale or *as if* it had joined with others formally-without requiring it to sacrifice its flexibility.” (Porter, 1998, p. 80). Schmitz (1999) highlights the importance of trust within the clusters. The factor of trust between the actors within a cluster is a vital and, perhaps obvious, necessity for its survival. He finds that the trust within a cluster is at first based on social and cultural connections between actors included, but is later evolved to have its base in the inter-firm relationships that has evolved from strategic investments in the cluster.

Stating that regional cluster formations increases the possibility to innovate within industries and sectors as well as enhances productivity, governmental policies could be focused on creating and develop cluster formations (Porter, 1990; Pyke, 1992; Porter, 1998). Cooke and Morgan (1998) add to the theory concerning clusters by discussing and emphasizing the importance of regional policies in contrast to national policies. Especially stressed is the ability of a region to have an impact on the higher education system and vocational training within the area, in order to have access to regionally educated employees. It is also shown that the region is able to boost innovation by regionally determine how cluster policies and analyst centers should be designed and how subsidies shall be distributed. In order to decide upon governmental policies, on both a regional and national level, reliable economic measurements are needed.

Historically, Sweden's international firms have gained their competitive advantages by a combination of activities on the home market and activities on foreign markets (Sölvell, et al., 1999). Swedish firms and industries have over the years experienced strong clustering effects, but not all clusters and industries in Sweden have been internationally successful. In a small, open economy, competitiveness and success is usually measured as export shares, both in relation to domestic and foreign competitors. Sölvell et al. (1999) state that the most successful industries in Sweden during the 20th century deals with raw material, heavy industrial products and transportation, and only a few of these industries produce consumer products. These industries further experience long product life cycles. This implies that the Swedish economy to a large extent has been dependent on its natural resources, and clusters have been developed around the source of these resources. The authors discuss that early and continuous investments in innovations and upgrading of advanced products within certain industries have helped to develop the Swedish economy and to make the industries internationally competitive. Today, Sweden's most important export goods are still raw materials and automotive goods, but an increased export in services and consulting has been apparent the last decade (SCB, 2012C; SCB, 2012D). A report conducted by VINNOVA shows that a relatively large number of cluster initiatives have been developed during the latest years. In Sweden, West Sweden is the region where the most cluster initiatives have been initiated (Nordensky, 2009). The same report concludes that the vast majority of the initiatives are developed in cooperation with geographically close universities and colleges.

3. Data

3.1 Questionnaire Structure

As discussed earlier, export is usually a vital part of the economic growth in a country and thereby serves as an indicator of the economic performance. Clusters are usually in forefront regarding global competitiveness and exports. Further, exporting firms are shown to be more productive, which implies that exporting firms are leading firms within each cluster. By studying the development of these firms, this could be a signal of the direction of the cluster and region.

In this study we develop an export index where the index values are, and will be, based on questionnaires sent out to managers in control of the export in firms in the region of West Sweden. The questionnaire is conducted in 2013 where the managers state their views and expectations regarding the export performance of the firm. Managers in control of the export are usually well informed about the performance of the company as a whole. Further, expectations are proven to be good predictors to use when forecasting economic outcomes (Muth, 1961; Linden, 1982). The expectations of economic agents, for example managers, are especially argued to carry relevant economic information (Köhler, 1997). Due to the managers' knowledge and the predictive power of expectations, they are most appropriate to answer the survey questions. The managers in control of the export could for example be CEOs, exporting managers, market managers or sales managers.

The questionnaire includes questions concerning both the present and the nearest future. The questions about the present state indicate factual information regarding the performance of the company during the last quarter. The questions concerning the future show the expectations concerning the company performance in the upcoming quarter. Separately, both parts are economic indicators but one is based on actual information while the other has a forecasting character. Together, these two parts form an indicator of the current state. The questionnaire consists of four parts, see Appendix 1. The first part is general questions about the company, the second part contains questions concerning the last quarter, the third part is questions regarding the upcoming quarter and the last part includes general questions concerning other economic factors. The questions in the second and the third part compose the index but will also be presented as sub-indexes.

In the first part, we ask questions concerning whether the company export or not, if the company mainly exports goods or services, how large the export is in proportion to the company's turnover and to which markets the company mainly exports. The aim of this section is to get an overview of the general export situation of the company and we use these questions when analyzing the results. Part two and three of the questionnaire includes the same questions but, as stated above, they concern different time periods. We ask three questions in order to get a more detailed overview of the export activity of the companies and clusters. The first question concerns the volume of the export sales, where if the sales has or is expected to increase it is assumed to be a positive indicator of the current state. The second question deals with the backlog of the export orders of the companies, which indicates the demand of the companies' export. An increase in the backlog indicates a positive development of the current state. The third question captures the profitability of the export. The profitability can vary with several factors, even if the export sales increases, the profitability might not change due to for example change in price, change in exchange rates or increase in costs for input goods. The expectation is that an increase in profitability is a positive indicator of the current state. The second and the third part also include questions about the development of the company's main export markets, but these questions will not be a part of the index. The reason to include them is to capture movements in the companies' export markets as well as changes in the export to these markets. In the fourth part, questions concerning foreign direct investments (FDI), employment and length of the delivery time are asked. The questions are asked to assure the accuracy of the answers. For example, if the respondent answers with positive expectations about the growth of the export, the overall answers regarding these questions should not be of a negative character. Moreover, these questions could be of further interest when studying the performance of the region.

3.2 Questionnaire Method

Each question in part two and three in the questionnaire will represent a separate diffusion index. Aggregating these questions will build a composite index, where all questions will be given the same weight. The reason for all questions to be given the same weight is that the index includes expectations and it is difficult to establish if these expectations about the different variables reflect the business cycle to different extent. The composite indicator is in addition split up into two sub-indexes, where one handles the present situation and one is a

forecast. Together, this information forms a strong economic indicator of the clusters of concern.

Ejlertsson (2005) states that there are both pros and cons with using a questionnaire when conducting a survey. The advantages are that the cost is minimized and at the same time a large respondent group and geographic area could be reached in short time. In addition, the respondent could take the time needed when answering the questionnaire and possible interviewer bias is eliminated. Further, the processing of the data is simplified due to the standardized question set, where all of the respondents get the same questions. The disadvantages with a questionnaire are that it is common with a significant shortfall of respondents and the number of questions in the survey are limited since there is a risk of a larger shortfall if the questionnaire is too time consuming. Another disadvantage is that additional questions that might arise because of misinterpretations cannot be asked by the respondent. At the same time the constructor of the survey do not have any opportunities to ask too complicated questions and nor yet follow-up questions. Further, the constructor cannot ensure that the intended respondent is the one who answers. In the survey, the questionnaire is sent out via a web based program.[5] The respondents were able to answer this questionnaire between the 25th of March and the 15th of April 2013. The email includes a cover letter which incorporates a description of the survey and its purpose, see Appendix 2.

We conduct a pilot study before sending out the questionnaire in order to ensure the quality of the questionnaire. Ejlertsson (2005) emphasizes that a pilot study is important since people could have different views on the same questions and to investigate whether others interpret the questions in the same way as the creator or if the questions lead to misinterpretations. Other reasons why a pilot study is of importance is to confirm that what should be measured really is measured, if the questions are possible to answer and to ensure that the questionnaire includes no questions the respondents would feel uncomfortable answering. In choosing respondents to include in the pilot study, the respondents should be as similar as possible to the real sample. The respondents in this pilot study consist of eleven CEOs, CFOs or marketing managers from different firms in the three clusters of concern in the region of West Sweden.

[5] The program used is Netigate which is the system used by the West Sweden Chamber of Commerce. This choice of approach facilitates their continued work with the index.

3.3 Exporting Firms Receiving the Questionnaire

This study includes 241 exporting firms from three different clusters in West Sweden. All firms are given the same weight in the index. If the purpose would have been to capture the development in total exports of the region, different weight based on export value could have been given to the firms. In this thesis, the aim of the index is to capture the dispersion of changes in export activity and thereby equal weights are attached to all firms.

The three clusters in this thesis are automotive, life science and textile. We include the automotive cluster since it is a big, well-established and important industry for the region. The same characteristics hold for the life science cluster and in addition, this industry has been growing in the region during the last decade. The textile cluster has historical roots in this region, as well as being an industry in progress and is thereby an interesting cluster to analyze.

When defining the clusters, there are different approaches to use. One way to define a cluster is to use SNI codes and include the total industry. One advantage with this method is that it is easy to gain complete records over the firms in these SNI codes. Although, the disadvantages with this approach is that since it includes all firms in these SNI codes, the population is very vague where the same firms could belong to widely different SNI codes. This paper defines a cluster as a group of companies that collaborates within a product family to increase innovations and productivity. We establish which firms to include in the clusters together with market actors, see below. If we instead would use SNI codes in identifying the clusters it would lead to many firms being included that falls under the SNI codes but not belong to the cluster. Using this method could imply that the clusters will not be well defined. Each cluster includes companies from various industries. For a list of SNI codes that the exporting firms in this thesis falls under and the number of firms in each SNI code, see Appendix 3. The following section defines each cluster.

The automotive industry is the 6th largest industry in Sweden and is characterized by a division of companies into either small or large companies, with a lack of companies being medium sized. Further, this industry is one of the primary industries in Sweden. Out of the total number employed in the automotive industry, 43 percent is employed in the region of West Sweden (Dolk & Persson, 2012). This industry is very production intense and therefore demands a close relationship with actors that focus on research and development. This study includes automotive companies collected from a report conducted by VINNOVA (2007) and

updated in 2012, and from a list of companies obtained from Region Västra Götaland through VINNOVA. In the report by VINNOVA, each firm included has been individually examined and are included if the companies' business are established to be development and production of vehicles and vehicle components. The investigation is done based on annual reports, literature, expert opinions and in cooperation with some of the chosen companies. Only companies with more than 20 employees are included in the report conducted by VINNOVA. This thesis includes 98 companies in total to begin with which are the companies that compose the automotive cluster, i.e. the firm part of the cluster. Adjusting this list to only include exporting companies, 50 companies remain which represents 51.02 percent of the total population.

The life science industry has experienced a rapid growth in the beginning of the 21th century, with a peak in 2005. According to Sandström et al. (2011), this industry contributes to long-term innovation in other industries as well as the society as a whole. The total population of this industry is collected from the database over life science companies in the region of West Sweden published by GöteborgBIO (2012). The validity of this population is determined in correspondence with industry professionals. This paper includes companies from this industry that "[…] develop, manufacture and/or market the following types of product or service: pharmaceuticals, diagnostics, medical devices (including aids for disabled persons), biotechnology tools for research and production, and contract or clinical research" (Laage-Hellman, et al., 2007, p. 1). A list of companies in the industry received from the Region Västra Götaland complements the GöteborgBIO list. After this process, the thesis includes a total of 277 companies which makes up the firm part of the cluster. Adjusting the list to only include exporting companies, 78 companies remain which represents 28.16 percent of the total population.

The textile industry has a history of being located in the area around Sjuhärad and mainly Borås. The industry was growing strong in the first half of the 20th century although experienced a rapid decline during the 1960s and 1970s since many industries were moved abroad (Borås Stad, 2010). According to Lindqvist et al (2002) the textile industry in Sweden is still focused around these regions and many industry initiatives have been taken during the last decades to further develop the industry. The initiatives have focused on research and development of new materials and methods. In this survey, the list of companies originates from two sources; a list from Region Västra Götaland via UC which is developed using SNI 2007 codes and TEKOs member list, which includes textile and fashion companies. After

synchronizing these two lists the cluster includes a total number of 715 companies to begin with. Adjusting the list to only include exporting companies, 113 companies remain. This represents 15.80 percent of the total population. As can be seen, the textile cluster includes significantly more companies than the two other clusters. Due to lack of alternatives, the textile cluster is partly defined using SNI codes and as discussed above, this usually leads to a larger population.

In order to gain complete information concerning whether the firms export or not, and other data necessary for the analysis we use an extern source; Bisnode Market AB. Section 5.2.3 presents this data. Worth noticing is that 20 percent of the total population, before sorting for exporting firms, are lost in the process at Bisnode Market AB. This is due to their inability to find data for these companies and it is a common shortfall when handling this type of data. Further, 20 more respondents are lost due to incorrect email addresses, this implies that 221 companies remain in the result and analysis section. Out of these 221 companies, 45 are from the automotive cluster, 71 are from the life science cluster and 105 are from the textile cluster. One explanation to the relatively small proportion of exporting companies in the life science and textile cluster could be the firm sizes; both these clusters include a great proportion of small firms where the majority of the firms only have 1 to 49 employees. Other explanations could be that many of the firms sell to an agent that in turn exports and that many of the firms work with R&D and not production of goods per se.

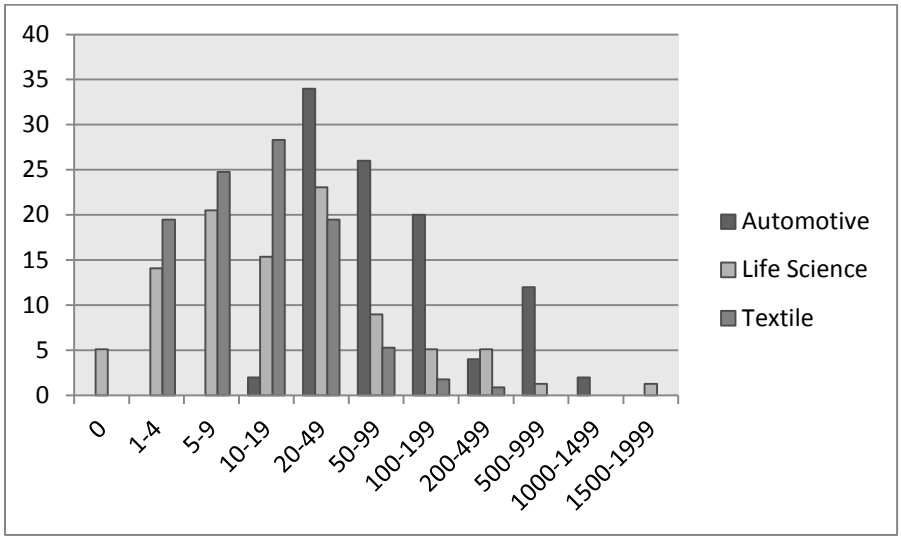
3.4 Descriptive Statistics of the Exporting Firms

3.4.1 Number of Employees, Turnover and Region

The different characteristics of the industries as well as the difference in the products they are producing imply that changes in the economy and exporting conditions could affect these industries differently. The following three figures present some descriptive statistics of the exporting firms, i.e. the sample. In this section we use register data from Bisnode Market AB. Figure 1 describes the distribution of firms in each interval of number of employees for each cluster. As can be seen, most firms in the automotive sample employ 20 to 199 employees, where the majority of firms have 20 to 49 employed. Some large firms employing more than 200 employees are also in this cluster. For the life science sample, most of the firms employ between 1 to 49 individuals. This sample includes both small and big firms, where the smallest firms have no employees and the largest firm employs 1500 to 1999 individuals.

Regarding the textile sample, the vast majority of firms have 1 to 49 employees. There are no firms that employ more than 500 individuals.

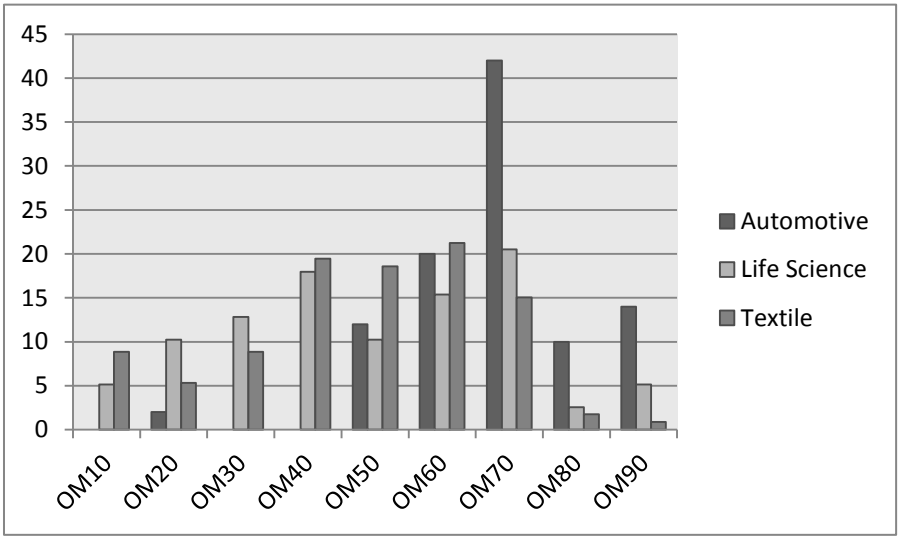
Figure 1 The distribution of firms in each number of employees-interval, as the share of total firms in each cluster.



Source: Bisnode Market AB, authors' calculations.

Figure 2 presents the share of firms in each turnover class for each cluster. Appendix 4 presents a list of the turnover classifications. For the automotive sample, almost all firms have a turnover larger than 25 million SEK, where the most firms have a turnover of 100 to 500 million SEK. The average turnover in this sample is 683 million SEK while the median turnover is 156 million SEK. Both the textile and life science sample include firms that have wide turnover spread. Within these samples, the majority of firms have a turnover between 10 to 500 million SEK. The average turnover for the life science sample is 387 million SEK while the median is 31 million SEK. For the textile sample, the average turnover is 75 million SEK while the median is 32 million SEK. The large difference in turnover and the fact that some large firms are affecting the mean causes the relatively large spread between mean and median. This descriptive statistics implies that the firms in the automotive sample in general are larger when it comes to turnover.

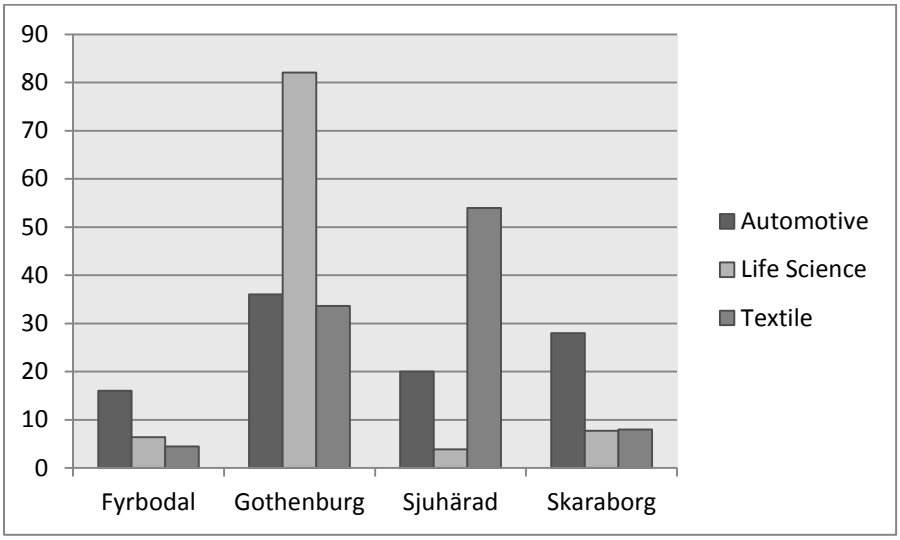
Figure 2 The distribution of firms in each turnover classification, as the share of total firms in each cluster.



Source: Bisnode Market AB, authors' calculations.

Figure 3 presents the location of the firms within each sample. The automotive cluster is relatively evenly spread over the four regions, with the largest share of firms having its locations in the Gothenburg region. For the life science sample, the absolute majority of the firms have their location in Gothenburg. The firms in the textile sample have their location mainly in Sjuhärad and Gothenburg.

Figure 3 The distribution of firms in each region, as the share of total firms in each cluster.



Source: Bisnode Market AB, authors' calculations.

3.4.2 Determinants of Firm Productivity

In order to gain a broader picture of the exporting firms, we analyze the determinants of the firms' productivity and differences between the clusters. This analysis considers the labor productivity and the capital productivity, where the definition of labor productivity is turnover per employee and where the definition of capital productivity is turnover divided by the nominal value of outstanding shares. When performing this analysis we use register data from Bisnode Market AB, Statistics Sweden (SCB), the Swedish Agency for Growth Policy Analysis and the Swedish National Agency for Higher Education as well as the data received from the questionnaire.

Table 1 presents the mean, minimum, median and maximum values of the productivity for each cluster. Both the labor productivity and the capital productivity are relatively equal between all clusters regarding mean and median. Comparing the mean values and the median values within the clusters, it is apparent that the values differ to some extent where the mean is higher than the median. This, together with the fact that the median values are closer to the minimum values than to the maximum values, indicates that there are outliers with high labor and capital productivity that affects the mean positively.

Table 1 Labor and capital productivity in thousands of SEK

	Labor Productivity				**Capital Productivity**			
	Mean	**Min**	**Median**	**Max**	**Mean**	**Min**	**Median**	**Max**
Automotive	3514.93	24.53	2001.01	50063.39	391.78	1.22	78.95	9602.64
Life Science	3730.21	62.81	1760.65	69232.41	371.02	0.12	90.20	10038.70
Textile	3270.22	208.80	2297.01	13056.80	178.80	0.83	95.38	1100.11

Note: Labor productivity is measured as turnover per employee and capital productivity is measured as turnover divided by the nominal value of outstanding shares.
Source: Bisnode Market AB, authors' calculations.

In the life science cluster, there are some firms having a very high productivity but according to the median value, the 50 percent with the lowest productivity in this cluster are in general shown to have lower productivity than the corresponding part in the automotive and textile clusters. It can also be seen that the textile cluster is the cluster with the smallest spread, both concerning labor and capital productivity. This indicates that the firms in the textile cluster are more similar to each other concerning productivity than firms in the other two clusters are.

When analyzing the determinants of productivity, we estimate two OLS regressions with robust standard errors for each cluster and the overall sample, one where labor productivity is the dependent variable and one where capital productivity is the dependent variable.

Appendix 5 presents the results from the two regressions as well as a description of all explanatory variables. According to the F-test, in all of the models, except the total model concerning capital productivity, the variables have a significant joint explanatory power.

The result in Table A5.1 shows that share capital has a positive effect on the labor productivity in the automotive and textile cluster but not in the life science cluster. That these two clusters are in general more capital intensive can explain this finding since increasing the capital in a relatively low capital intensive industry as life science will not affect labor productivity to the same extent. The share capital is the only variable found to affect the labor productivity in the automotive and textile cluster. However, for the life science cluster, the location and the industry affiliation have an effect on the productivity. Life science firms with its location in Gothenburg are shown to be more productive, as well as firms in the industries for rubber and plastic products, machinery and equipment and wholesale trade.

Table A5.2 presents the results of what affects capital productivity. As for the labor capital, firms with location in Gothenburg are more productive within the automotive and life science cluster whereas for the textile cluster firms in Fyrbodal and Sjuhärad are more productive. Since the automotive and life science cluster are mainly located around the region of Gothenburg and the textile cluster is located around the region of Sjuhärad, this result supports the cluster synergy effects discussed in Section 2.2. The number of start-ups in the municipality is affecting the capital productivity for the automotive and textile cluster. This effect is negative for the automotive cluster and positive for the textile cluster. The opposite effects can be because of the different characteristics of these clusters. The characteristics of the automotive cluster is that it is an established cluster, implying that increasing the number of start-ups will not help the cluster evolve but rather attract capital to new industries. In contrary, the textile cluster is growing after a period of declination and this cluster is located in a region with many textile companies. This implies that start-ups positively affect the textile cluster since the region is becoming attractive to investors. Firms participating in wholesale trade are shown to be less productive in the automotive and the textile cluster. In line with the labor productivity, these firms in the life science industry are more productive. Concerning the textile cluster, firms in the wearing apparel industry and the textile industry are less productive compared to other firms.

4. Theoretical Framework

4.1 Diffusion Index

In the field of measuring and forecasting, the diffusion index has been considered a major tool ever since the 60's, with its indicating ability regarding economic activity (Stekler, 1962; Kennedy, 1994). The index usually consists of disaggregated data including a number of component series, such as for example different industries. The diffusion index works as a barometer of the economy and could be used in attempts to capture and determine the direction of economic turning points and thereby point out economic trends. It could be used to show variations in a specific measurement from period to period. The time period over which the index is measured varies with interest, but could for example be a period of a month, quarter or year (Getz & Ulmer, 1990).

By construction Kennedy (1994) explains that the component series are summed up to show the aggregated path of the series. Every series in the index receives a value of 0, 50 or 100 depending on the direction of change. If the individual series experience an increase it gets the value 100, if it experience a decrease it takes the value 0 and if the series do not undergo any change, it gets the value 50. All the values of the component series are thereafter summed up and divided by the number of component series to receive the index value. The index can also be expressed as:

$$Index_t = S_{1t} \times 0 + S_{2t} \times 50 + S_{3t} \times 100, \quad (1)$$

where S_{1t} is the share of component series experiencing a decrease, S_{2t} is the share of component series experiencing no change and S_{3t} is the share of component series experiencing an increase. This received number is then the value of the index (Kennedy, 1994). Graf (2002) concludes that the diffusion index by construction always takes a value between 0 and 100, where a value of 0 reflects none of the series experiencing a positive trend and 100 indicating all of the time series experiencing a positive trend. An index of the value 50 indicates that all series experience neither a positive nor a negative trend or simply that 50 percent experience an increase and the other 50 percent experience a decrease. As 50 is the value where the same share of component series experience an increase as a decrease it is usually considered the reference point in the index. Under the assumption that 50 percent of the respondents answering unchanged is accounted as positive and the other half is accounted as negative, the exact value of the index shows the percentage of the series reflecting a

positive trend and therefore the dispersion of the change in the population. During an upturn in the economy, the percentage that experiences a positive trend increases while during a slowdown in the economy, the percentage and thus the index, decreases.

4.2 Composite Index

While the diffusion index shows the turning points and trends of a specific measurement, aggregating various indicators would give a broader picture about the general area of concern (OECD, 2008; Zarnowitz, 1992). The composite index consists of a number of underlying indicators, and shows the aggregated path of them, if computed repeatedly over time. Since the composite index takes various factors into account, it has a multidimensional character and is able to measure concepts that single indicators are not able to measure, such as for example industrialization or competition. Further, by including numerous variables, the probability of getting incorrect signals decreases and the chances of getting correct signals increases. When aggregating different series into one index, noise is reduced and the index is smoother than an individual series (Zarnowitz, 1992). The composite index forms a more perspicuous index that is easier to view and to understand than a set of indicators. This character leads to the composite index being applicable when commenting on the economic performance in public and a valuable tool when it comes to policy implications. For the index to give an unbiased and correct picture of the situation of concern, it should be constructed in a correct and transparent way. Transparency throughout the construction of the index is also an assumption for policy implications to be addressed in the right direction. Lack of transparency might lead to misinterpretation and even to biased results if the tool is constructed in order to reach a desirable policy (OECD, 2008).

Composite indexes are often used in order to measure, predict and understand changes in business cycles (The Conference Board, 2001). Since the composite index is based on various indicators, its quality depends upon the quality of these indicators. The indicators should together contribute with the information that the composite index want to show. In the selection of variables to include in the composite index, the variables must fulfill some certain economical and statistical requirements (The Conference Board, 2001; Gyomai & Guidetti, 2012). They must be of economic relevance, meaning that they must have a significant relationship to the business cycle and carry information valuable in predicting, modeling and understanding the business cycle. Further, the variables, i.e. the index components, must be

time consistent and be consistent with the business cycle. The variables should not be irregular and the data should be reliable and collected in a statistical adequate way for the variables to be valid indicators. In aggregating the individual variables, different weights could be attached to each of the individual indicators depending on their importance in the total index, or the same weight could be attached to all of the indicators. The latter approach is the most common in building a composite index and is called equal weighting. (OECD, 2008)

There are three main types of cyclical indicators; leading, coincident and lagging (Zarnowitz, 1992). Gyomai, et al (2012) explains that what distinguishes these three types from each other is the timing at which changes in these indicators take place. The composite index of leading indicators is used to forecast and predict future economic activity and turning points. In order to do so, the index consists of indicators that change prior to a reference variable which in turn works as an estimate of the economic activity. By aggregating a number of such leading indicators and investigate their aggregated trend, the economic activity could be predicted. The Conference Board (2001) states that examples of such leading indicators could be stock prices, where changes in stock prices could reflect either changes in the interest rate or changes in the thoughts of investors, which both are based on predictions of the upcoming economic situation. Coincident indicators provide information about the current state of economic activity, and could for example be personal income. Personal income is an important determinant of economic activities since it both reflects spending and in itself indicates the state of the economy. Lagging indicators are those that experience a change after variations in the business cycle has occurred and could be used in order to confirm variations in leading and coincident indexes. The information could also be used in detecting structural imbalances in the economy. An example of a lagging indicator is average duration of unemployment, since this measurement increases after a recession, when few firms are hiring and the redundancies increase. For examples of some composite indexes, see Appendix 6.

A common problem in composite leading indicators is that, since it consists of many different component series, some series are more frequently measured than others (Battaglia & Fenga, 2003). In many cases, this available data are overlooked in favor of a time-consistent dataset, which could imply that information is not established in an efficient way. In order to address this problem, the Conference Board (2001) uses an autoregressive model to estimate missing values. Together with the available data, the estimated values are used when the index is constructed. These values are then replaced with the actual values as soon as possible and the concerned indexes are thereafter revised. In line with this, McGucking et al. (2007) establish

that real time, out of sample forecasting with composite leading indicator including estimated missing values are in most cases better than the same forecast with an indicator using the latest (usually one month lagged) value available for all components. It is also shown that both these leading indicator model outperform a real time, out of sample forecasting using autoregressive models without leading indicators. Linden (1982) evaluated the predictability of a well-established composite index that the Conference Board in the US performs. This is the Consumer Confidence index (CCI), which is used in order to capture the status of the US economy and is based on the opinions and expectations of the consumers. He evaluated the predictability for a period of 15 years by comparing the evolution of the index with changes in real GNP during the same period. He found that the predictability of the index was good since it prefigured every turning point in the economy, with a lead time of three to six months. (Linden, 1982)

5. Empirical Method

5.1 Index Model

In this paper we develop a composite index, where each component (the questions from the second and third part of the questionnaire) is a diffusion index. In line with Section 4.2, this index is a coincident indicator, since it shows the current state of the firms and clusters. All of the diffusion indexes are given the same weight in the composite index, since there are six questions, this weight will be equal to 1/6. The individual series in each diffusion index are different firms. The individual diffusion index takes a value between 0 and 100, where the value of 0 reflects none of the firms experiencing an increase and the value of 100 reflects all firms experiencing an increase in exports. In comparison with the index discussed above, the diffusion index in this paper allows for five categories instead of the common used three categories. We refer to the index with three categories as I_3 and to the index with five categories as I_5. Instead of using the categories decreasing, unchanged and increasing (see Section 4.1), the categories included are: decreasing by more than 5 percent, decreasing between 0 and 5 percent, unchanged, increasing between 0 and 5 percent and increasing more than 5 percent.[6] Depending on the answer we attach a number in the set 0, 25, 50, 75 or 100 to each individual series.

$$I_{5t} = S_{1t} \times 0 + S_{2t} \times 25 + S_{3t} \times 50 + S_{4t} \times 75 + S_{5t} \times 100, \qquad (2)$$

where S_{1t} is the share of individual series experiencing a decrease by more than 5 percent, S_{2t} is the share of individual series experiencing a decrease between 0 and 5 percent, S_{3t} is the share of individual series experiencing no change, S_{4t} is the share of individual series experiencing an increase between 0 and 5 percent and S_{5t} is the share of individual series experiencing an increase by more than 5 percent. We do this modification in order for small and large changes to have different impact on the index value. This might smooth out the turning points, and not make a small decrease in export activity affect the index value to a great extent and vice versa for a small increase. By doing so, it will give a more precise picture of the cycles in the index. Further, we can also capture the firms that, if there only would be three categories, maybe will choose to tick the box "unchanged" since they might think that the shift is not of a sufficient magnitude. Thereby the firms with small changes in the export activity also contribute to the index.

[6] Where between 0 and 5 percent represents a relatively small increase/decrease and above 5 percent represents a relatively large increase/decrease.

In I_5, the inclusion of the two extra categories leads to inability to interpret the index value as the share of respondents that are positive. In order to calculate the share of positive respondents, we aggregate I_5 into I_3 where S_{1t} and S_{2t} are given the value 0 and S_{4t} and S_{5t} are given the value 100, the attached value to S_{3t} is unchanged. As discussed above in Section 4.1, this is done under the assumption of equal biases of respondents answering unchanged. I_3 is modeled as:

$$I_{3t} = S_{1t} \times 0 + S_{2t} \times 0 + S_{3t} \times 50 + S_{4t} \times 100 + S_{5t} \times 100 \quad (3)$$

If the answers are equally distributed between the five response categories, or if S_2 is exactly equal to S_4, I_3 and I_5will be equal. Whenever this is not the case the two index values will differ. In the case that S_2 is larger than S_4, I_3 is smaller than I_5 and if S_4 is larger than S_2, I_3 is larger than I_5. Given that S_2 is not equal to S_4, I_3 is more volatile since the positive values become more positive and the negative values become more negative. Using the I_5 approach it is possible to capture more positive and negative answers by the introduction of the two additional categories, answers that otherwise could sorts under the category "unchanged". Moreover, in I_5 it is possible to determine if the positive and negative trends are relatively small or large and this index is therefore more informative than I_3. In contrary to I_5, I_3 does by construction reveal the share of positive answers which is a usable function when determining the breadth of change. This is also possible when conducting I_5, but the data has to be aggregated into three categories.

In this thesis, we aggregate I_5 into I_3, but it is not possible to compare the outcome of I_3 with the outcome of an index including three categories from the start. This is because it is not possible to assume that the distribution is the same when the respondents face a questionnaire with three categories in relation to when the respondent face a questionnaire with five categories that we in turn aggregate into a three scale response category index. Since the aggregated I_3 in this thesis captures even the smallest changes, and because respondents facing a three scale response category index might choose "unchanged" I_3 can be more volatile compared to an index with three categories from the start.

5.2 Modeling Framework

5.2.1 Model of Firm's Expectations

In addition to developing the export index, the purpose is further to analyze what factors that affects expectations about growth in export, to extend the export analysis in Section 2.1. Given that the expectations are good indicators of the upcoming development, the understanding of what effects the expectations can give the opportunity to quickly and precise frame policies that might improve the performance of the companies or prevent the performance from declining.

A firm faces three dynamic decisions (Aw, et al., 2008). These dynamic decisions concern the level of R&D, d_t, investment in physical capital, i_t, and the decision to export, e_t, where e_t is equal to 1 if the firm chooses to export. The value function for the firm is $V(\omega_t, e_{t-1}, k_t; \psi_t)$, where ω_t is the productivity in period *t*, k_t is the capital stock in period *t* and ψ_t represents other states that that affect the firm's decisions.[7] The value function is maximized with respect to the three dynamic decisions in order to get the policy function for each decision:

$$V(\omega_t, e_{t-1}, k_t; \psi_t) = \max_{[e_t, d_t, i_t]} \{\pi_t^d(\omega_t, k_t, \psi_t) + (e_t = 1)(\pi^f(\omega_t, k_t, \psi_t) - \gamma_s - u_1)$$
$$-c_d(d_t) - c_i(i_t, k_t) - (e_t - e_{t-1} = 1)(\gamma_s(k_t) + u_2)$$
$$+\beta E[V(\omega_{t+1}, e_t, k_{t+1}; \psi_{t+1}) | d_t, i_t]\}. \quad (4)$$

In Equation (4), $\pi_t^d(.)$ is the firm's profit in the domestic market in period *t*, $\pi^f(.)$ is the firm's export market profits in time *t* and the sunk cost a firm faces when starting to export is γ_s. The cost of R&D is represented by $c_d(.)$ and $c_i(.)$ is the cost of capital investment. The expected discounted value of the firm period *t+1* is $\beta E[.]$. The optimal policy functions from the firm optimization problem are given by:

$$d_t = d(\omega_t, e_{t-1}, k_t) \quad (5)$$

$$i_t = i(\omega_t, e_{t-1}, k_t) \quad (6)$$

$$e_t = e(\omega_t, e_{t-1}, k_t) \quad (7)$$

[7] In the empirical implementation, we use the nominal value of outstanding shares instead of capital stock. k_t is included in the firm characteristics, f_{jt}, in Equation (8).

The policy function for the export, Equation (7), indicates that the decision for a firm to export is affected by the productivity in the same period, if the firm exported in the previous period and the capital stock in the same period.

The growth in export from period *t* to period *t+1* is $\Delta e_{jt+1} = e_{jt+1} - e_{jt}$, where e_{jt} is the export for firm *j* in period *t*. Since e_{jt+1} is unknown, this paper uses firms' managers expectations in order to predict the export growth for the firm. The expected growth in exports by the managers is $E\left[\Delta e_{jt+1} \middle| I_{jt}\right]$, where

$$E\left[\Delta e_{jt+1} \middle| I_{jt}\right] = \beta_0 + \beta_1 z_{ct} + \beta_2 f_{jt} + \beta_3 s_{mt} + \varepsilon_{jt}. \quad (8)$$

This means that the expected growth is conditional on I_{jt} where I_{jt} is the information set available for the manager at time *t*. This information set contains cluster (z_{ct}), firm characteristics (f_{jt}) and local market characteristics (s_{mt}), see Table 2 in Section 5.2.3. We use data from the questionnaire and register data from Bisnode Market AB, Statistics Sweden (SCB), the Swedish Agency for Growth Policy Analysis and the Swedish National Agency for Higher Education when performing this analysis.

Because it is not possible to observe the realization of the export in period *t+1*, the absolute growth in export for the firm is not feasible to measure. As this study collects information about the managers' expectations it is possible to model the determinants of the likelihood of positive expectations, which is a binary variable that takes the value 1 if the expectations are positive and 0 otherwise. In order to estimate the probability of positive export expectations with a dependent binary variable and cross-sectional data, we use a probit model:

$$P(E\left[\Delta e_{jt+1} > 0 \middle| I_{jt}\right]) = \Phi(\beta_0 + \beta_1 z_{ct} + \beta_2 f_{jt} + \beta_3 s_{mt} + \varepsilon_{jt}), \quad (9)$$

where $P(E\left[\Delta e_{jt+1} > 0 \middle| I_{jt}\right])$ is the conditional probability and $\Phi(.)$ is the standard normal cumulative distribution function.

The coefficients from a probit model are, apart from the signs, not straightforward to interpret. Estimating the marginal effects makes it possible to say something about the magnitude of the results. The marginal effects for continuous variables are the partial derivative of the probability that the expectations are equal to one:

$$\frac{\partial \Phi(x_i'\beta)}{\partial x_{ik}} = \phi(x_i'\beta)\beta_k, \quad (10)$$

where $\phi(x_i'\beta)$ represents $\phi(\beta_0 + \beta_1 z_{ct} + \beta_2 f_{jt} + \beta_3 s_{mt} + \varepsilon_{jt})$, x_{ik} is the variable of interest and $\phi(.)$ is the standard normal density function. The effect of one variable depends on the other explanatory variables (Verbeek, 2008).

5.2.2 Tests of Model Adequacy

Using different measures of goodness-of-fit, it is possible to establish how well a model fits the data. In contrast to linear models, there are many measurements available when determining the adequacy of binary choice models. This section presents three different goodness-of-fit measurements that we use in this thesis; McFadden (pseudo) R^2, the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC).[8]

The McFadden R^2 compares the model of interest with the same model but only including the constant (Verbeek, 2008). The greater difference between the loglikelihoods of the two models, the better is the model that includes the explanatory variables. The McFadden R^2 is compute as:

$$McFadden = 1 - \log(L_1)/\log(L_0), \tag{11}$$

where $\log(L_1)$ is the maximum loglikelihood value of the model including parameters and $\log(L_0)$ is the maximum likelihood value of the model where the parameters are set to zero.

The construction of the AIC measurement is:

$$AIC = -2\log(L) + 2k, \tag{12}$$

where $\log(L)$ is the maximum loglikelihood of the model and k is the number of parameters in the model. According to Burnham and Anderson (2004), the AIC value is not interpretable as it is, but one needs to compare it with AIC values of other models since it can take on different values depending on the data structure. A smaller AIC value indicates a better goodness-of-fit. In Equation (12) it is shown that the AIC value decreases with the loglikelihood and $2k$ represents a penalty term, which increases the AIC value with number of included parameters, given that the loglikelihood is constant.

[8] McFadden R^2 is the pseudo-R^2 used in Stata.

The construction of the BIC measurement is:

$$BIC = -2\log(L) + klog(n), \quad (13)$$

where n is the number of observations. In accordance with the AIC measurement, the lower the BIC value is the better is the fit of the model. Increasing the loglikelihood improves the BIC value. The penalty term of the BIC measurement increases with the number of parameters and with the sample size (Burnham & Anderson, 2004).

5.2.3 Variables in the Binary Choice Model

In analyzing the determinants of positive expectations, the regression includes a number of variables that are likely to affect the expectations, for explanation and definitions see Table 2. The regression includes dummies for cluster to account for differences within each cluster. Concerning the variables for firm characteristics, the previous result is a dummy taking the value 1 if the average answer of the questions about the export development the previous quarter is positive. This shows the present state of the company as well as the recent export development. We expect this variable to have a positive impact on the expectations in general, i.e. the better the present situation is the higher will the expectations about the upcoming three months be. We use labor productivity as a measure of the productivity of the firm and expect it to have a positive impact on the expectations, since more productive firms have more competitive advantages. Share capital measures the nominal value of the company's outstanding shares and we expect it to positively affect the expectations since firm with higher share capital are assumed to have higher pressure on performing well. Sales and export share are control variables where sales account for the company size and the export share is the export as a share of the turnover. Manager position explains the respondent's position in the company, and is included as a control variable, since the views and expectations might differ depending on the position. The regression includes a dummy for each market that the firms exports to. Depending on the country characteristics and the exchange rate, we assume that the effect on the expectations will differ. For example, if firms export to countries where the Swedish krona experiences an appreciation against the local currency, the assumption is that these firms have lower expectations.

Table 2 Description of the variables in the binary choice models

Variable	Description
Positive expectations	Dependent variable. A dummy variable taking the value 1 if the average answer about the export development the upcoming quarter is positive
Cluster	Dummy variables for each cluster
Firm characteristics	
Previous quarter result	A dummy variable taking the value 1 if the average answer about the export development the previous quarter is positive
Sales	Total turnover in thousands of SEK
Productivity	Labor productivity equals total turnover over the number of employees
Share capital	The nominal value of outstanding shares in thousands of SEK
Export share	Total export as a share of the turnover
Manager position	The managers' position in the company
Markets	Dummy variables for each market the firm exports to
Local market characteristics	
Region	Dummy variables for the region where the company has its location, Fyrbodal, Gothenburg, Sjuhärad and Skaraborg
Education	The share of the population in the municipality where the firm has its location that has completed tertiary education
Start-ups	The number of start-ups in the municipality where the firm has its location after controlling for the population size
Age	The mean age in the municipality where the firm has its location
Income	The mean income in the municipality where the firm has its location
Population density	The population density in the municipality where the firm has its location
University	A dummy taking the value 1 if there is an university located in the municipality where the firm has its location

Source: The data for cluster, previous quarter results, export share and markets are from the questionnaire in 2013. Bisnode Market AB supplies the data for sales, productivity, share capital, manager position and region from 2011. We collect the data for start-ups from the Swedish Agency for Growth Policy Analysis (2011) and the data is for 2011. SCB presents data for education (2012E), age (2012F), income (2011B) and population density (2012G) and the data is from 2011 and 2012. The data for universities come from 2012 and the Swedish National Agency for Higher Education (2012).

The local market characteristics account for the differences between the regions where the companies have their locations. These characteristics include the region where the firm has its location, the share of the population having completed tertiary education in the municipality where the firm has its location, the number of start-ups in the municipality where the firm has its location, the mean age in the municipality where the firm has its location, the mean income in the municipality where the firm has its location, population density in the municipality where the firm has its location and if there is one or more universities or colleges in the

municipality where the firm has its location. We include these characteristics as control variables. All continuous variables are in logs to improve the distribution of the data.

6. Results and Analysis

6.1 Respondents Answering the Questionnaire

6.1.1 Answer Frequency

Out of the 221 firms that receive the questionnaire, 45 are from the automotive cluster, 71 are from the life science cluster and 105 are from the textile cluster. Table 3 shows this firm distribution of 20.36, 32.13 and 47.51 percent, respectively. The total number of responses of the questionnaire is 70 which are equal to a response rate of 31.67 percent.[9] Out of these 70 respondents, 10 are from the automotive cluster which implies that 14.29 percent of the total amount of answers is from the automotive cluster. From the life science cluster the number of answers is 23 which are 32.86 percent of the total answers. Concerning the textile cluster, the number of answers is 37 and this represents 52.86 percent of the total answers.

Table 3 Distribution of answers

Cluster	Number of Firms that Receive the Questionnaire	Firm Distribution (%)	Number of Respondents	Respondent Distribution (%)	Answer Frequency (%)
Automotive	45	20.36	10	14.29	22.22
Life Science	71	32.13	23	32.86	32.39
Textile	105	47.51	37	52.86	35.24
Total	221	100	70	100	

Note: Data from 221 firms that have received the questionnaire and 70 respondents.
Source: Questionnaire in 2013, authors' calculations.

By comparing the firm distribution and the respondent distribution it can be seen that they are approximately the same for the life science cluster. This implies that that the respondent distribution for this cluster reflects the share that this cluster represents of the total firms. It is also apparent that the automotive share of the respondent distribution is lower than if it would reflect its share in the firm distribution. In contrary, the textile share of the respondent distribution is higher than if it would reflect its share in the firm distribution. This is also apparent in the answer frequency, where the automotive has the lowest answer frequency with 22.22 percent, and the life science cluster the highest with 32.39 percent. Further, in the textile cluster, the answer frequency is 35.24 percent.

[9] When including the original 241 respondents, the response rate is 29.05 percent.

6.1.2 Descriptive Statistics of the Respondents

Appendix 7 presents some descriptive statistics of the respondents. Table A7.1-A7.3 shows a comparison between the number of firms receiving the questionnaire and the number of respondents sorted on number of employees for each cluster. For the automotive and textile clusters, the distribution of respondents in each employee interval follows approximately the distribution of the exporting firms in the clusters. The same is apparent for the small life science firms with a lack of answers from companies with more than 50 employees. When looking at the number of firms receiving and answering the questionnaire sorted on turnover classifications for the automotive and the life science cluster, there seems to be the relatively small firms in each sample that answers to a slightly greater extent, see Figure A7.4-A7.6. In the textile cluster, the firms with a turnover between OM30 and OM70 seem to have the relatively highest response rate. In Figure A7.7-A7.9, the same distribution is done but sorted on regions. For the automotive cluster, the number of respondents in the big regions of Gothenburg and Borås does not reflect the share of firms from these regions. In the life science and the textile cluster the distribution of respondents per region is similar to the share of firms from each region. The comparison between the firms receiving and answering the questionnaire on all three levels i.e. employment size, turnover size and region, implies that the data is representative for the exporting firms in the three clusters.

Figure A7.10 presents the share of answering firms, in each cluster, divided into export size classifications, where export size is the share of the turnover that export accounts for. Among the answering firms in the automotive cluster, the largest share has an export between 1 to 20 percent of the turnover. For the life science cluster, the largest share has an export between 81 to 100 percent of the turnover, but also a big share of the answering firms has an export between 1 to 20 percent of the turnover. In the textile cluster, the majority of the answering firms have an export between 1 to 40 percent. Figure A7.11 shows that regarding the area of export, the majority of all answering firms export goods in relation to services.

Figure A7.12-A7.14 shows some descriptive statistics about the responding firms' present situations concerning FDI, employment and delivery times. The overall trend is that these factors have remained unchanged in this period in the three clusters, but that the automotive and the life science cluster in general seem to be more positive than the textile cluster.

Regarding the export markets of the responding firms, a large part of the firms are exporting to the European markets. Within the European markets, the largest importers are the Nordic

and West European countries. The export to these markets has been relatively unchanged during the previous quarter but some firms expect an increase in the export to these markets. The African and Middle East countries are not large importers of the goods supplied by these firms, but a small increase have been seen and is expected the upcoming quarter. Both Asia and America are relatively large export markets, and as for the export to Africa and Middle East, a small increase in export to these regions has been seen and is expected. The same development can be seen for the Oceanic markets.

6.2 Export Index

Table 4 presents the export indexes where the values use the five scale response category from Section 5.1. We base the export index on all six questions, i.e. questions about both the previous quarter and the upcoming quarter. The previous quarter index includes the three questions about the previous quarter and the upcoming quarter index includes the three questions about the expectations. As discussed in Section 5.1, it is not possible to estimate the share of firms with positive answers in the index with five categories. We aggregate the export index into three categories to be able to calculate this share. Table 5 presents the results from aggregating and these values are the basis for the results in Table 6 and 7.

The total values for I_5 and the sub-indexes previous quarter index (PQI_5) and the upcoming quarter index (UQI_5) are positive. In Table 4, the total value of the export index is 54.12 and Table 5 shows that 56.34 percent of the total firms in these three clusters experience a positive current state in the export activity. Even if it shows an overall positive state, the fact that the value is fairly close to 50 indicates that the firms experiencing an increase are not that dominating. Further, the total UQI_5 is higher than the total PQI_5 indicating a more positive view on the upcoming quarter in relation to the past. Differences between the clusters are also apparent.

Table 4 Results from the export index including five response categories, I_5

	Total	**Automotive**	**Life Science**	**Textile**
Export Index (I_5)	54.12	49.54	62.68	49.98
Previous Quarter Index (PQI_5)	50.39	46.57	57.24	47.09
Upcoming Quarter Index (UQI_5)	57.86	52.50	68.12	52.88

Notes: Presents the values from a five scale response category index. The index is a composite diffusion index.
Source: Questionnaire in 2013, authors' calculations.

Table 5 Results from the aggregated export index, I_3

	Total	Automotive	Life Science	Textile
Export Index (I_3)	56.34	48.24	65.94	52.47
Previous Quarter Index (PQI_3)	51.01	44.81	58.69	47.80
Upcoming Quarter Index (UQI_3)	61.67	51.67	73.19	57.15

Notes: Presents the values from a three scale response category index. The index is a composite diffusion index.
Source: Questionnaire in 2013, authors' calculations.

The life science cluster experiences a positive current state in the export activity, where 65.94 percent of the firms are positive. The current state of the export activity concerning the automotive and textile cluster is relatively unchanged with index numbers slightly below 50. I_3 reports that in the automotive cluster there are slightly more firms that are experiencing a negative current state while the opposite holds for the textile cluster. Due to the relatively high percent of life science companies experiencing a positive current state and the index values from the automotive and textile cluster being close to 50, I_5 reveals an overall positive result. Further, the life science is the cluster with the most positive view, both concerning the previous quarter and the upcoming quarter. Automotive is the cluster with the consistently lowest index values.

PQI_5 shows the development of the export during the previous quarter. The value of 50.39 indicates that the overall development has been relatively unchanged during the previous quarter. Out of the clusters, automotive is the cluster where the smallest share of firms has experienced a positive development. In this cluster, the number of firms that have experienced a negative development during the last quarter is larger than the firms that have experienced a positive development. The same development is apparent in the textile cluster, but here the share of firms that have experienced a negative change is smaller than it is for automotive. In the life science cluster, the development has been positive for the majority of firms. The share of firms experiencing a positive growth is 58.69 percent. As for the total I_5, the reason for the total PQI_5 to be above 50 is the relatively high index value for life science.

In contrast to the other indexes, the majority of firms in each cluster have positive expectations about the upcoming quarter. UQI_5 has in total a value of 57.86 and UQI_3 shows that 61.67 percent of the total firms have positive expectations. The relative relationship between the clusters remains the same as for the other indexes, where the life science cluster has the highest share of firms with positive expectations.

I_5, PQI_5 and UQI_5 imply that the development during the last quarter has been relatively unchanged while the expectations about the upcoming three months are more positive. Table 6 presents the percentage deviation from the total index, for each cluster and index. The automotive cluster has approximately 14 percent less firms that experiences a positive state compared to the total index. Regarding the textile cluster, in comparison to the total index the share of firms with a positive state is on average 7 percent less. In the life science cluster the share of firms with a positive state is on average approximately 17 percent higher than the total index. Table 7 shows that the change in positive answers between the last quarter and the upcoming quarter is in total 21.90 percent.

When comparing I_5 with I_3, it is apparent that the value of the total indexes increases when aggregating. This implies that the share S_{4t} is larger than the share S_{2t} meaning that the share of firms being attached the value 100 instead of 75 is larger than the share of firms being attached the value 0 instead of 25. Looking at cluster level, the same reasoning holds for the life science and textile clusters, where the values of all of the indexes increase when aggregating. However, the contrary holds for the automotive cluster, where all the values of all three indexes fall when aggregating the answers into three categories.

Table 6 Percentage deviation from the total index

	Automotive	**Life Science**	**Textile**
Export Index (I_3)	-14.37	17.05	-6.85
Previous Quarter Index (PQI_3)	-12.14	15.07	-6.28
Upcoming Quarter Index (UQI_3)	-16.21	18.69	-7.33

Notes: Percentage deviation from the total I_3, PQI_3 and UQI_3.
Source: Questionnaire in 2013, authors' calculations.

Table 7 Percentage change in positive answers

	Total	**Automotive**	**Life Science**	**Textile**
$\frac{UQI_3 - PQI_3}{PQI_3}$	21.90%	15.29%	24.70%	19.55%

Notes: Percentage change in positive answers between the last quarter and upcoming quarter.
Source: Questionnaire in 2013, authors' calculations.

As discussed in Section 5.1, I_5 is more informative than I_3. Using the data for PQI_5, we can see that for the automotive cluster, there are more firms experiencing a large decrease than a small decrease. Concerning the UQI_5, more firms are expecting a small decrease than a large decrease. Regarding both these indexes, it can be shown that out of the firms that are positive in the automotive cluster, more firms are in general stating a large increase than a small increase. For the life science cluster and PQI_5, there is an equal distribution of small and large

increases, among the firms with negative answer they are in general experiencing a small decrease than a large decrease. Regarding the UQI_5, the firms are in general expecting a large increase than a small increase. In the textile cluster, the share of firms having experienced a large decrease is in general higher than the share of firms that have experienced a small decrease. The firms answering with positive development and the firms answering with negative expectations are in general equally distributed between small and large increase, and small and large decrease respectively. Out of the firms that have positive expectations in the textile cluster, more firms are expecting a small increase than a large increase.

6.3 Determinants of Positive Answers

6.3.1 Positive Expectations

In this section we estimate what affects the probability of the respondents having positive expectations. In order to do this, we use five different models and discuss the results. In all of the models, the dependent variable is the binary variable positive expectations. Section 5.2.3 presents the explanatory variables. The first model, $M_{11,}$ includes the cluster and the firm characteristics as explanatory variables. The significant variables in this model compose M_{12}. The same model further includes the labor productivity since it is part of the interaction term. Model M_{13} includes cluster, firm characteristics and market characteristics and the significant variables in M_{13} compose M_{14}. Finally, model M_{15} includes the significant variables from M_{11} and M_{13}.

Table 8 presents the marginal effects from the probit models. The model M_{15} is our preferred and further interpretations of the marginal effects are based on this model. As life science is omitted from the regressions, the dummies for the automotive and textile cluster are estimated in relation to life science. The results show that firms in the textile cluster have on average 70.7 percentage points lower probability of answering with positive expectations than firms in the life science cluster. This is in line with the export index, where life science is overall the most positive cluster.

Table 8 Results from analyzing determinants of positive expectations

	M_{11}	M_{12}	M_{13}	M_{14}	M_{15}
Automotive	-0.593**	-0.450*	-0.635***	-0.469	-0.473
	(0.19)	(0.19)	(0.13)	(0.23)	(0.23)
Textile	-0.427**	-0.252	-0.946***	-0.671**	-0.707***
	(0.19)	(0.20)	(0.08)	(0.20)	(0.19)
Previous quarter result	0.679***	0.597***	0.733***	0.627***	0.626***
	(0.09)	(0.10)	(0.15)	(0.13)	(0.12)
Turnover[1]	-0.055		-0.245*	-0.185	-0.167
	(0.11)		(0.15)	(0.12)	(0.12)
Share capital[1]	0.138**	0.111*	0.238***	0.138*	0.201**
	(0.07)	(0.06)	(0.09)	(0.08)	(0.09)
Export share	-0.059		0.056		
	(0.08)		(0.11)		
Labor productivity[1]	-0.071	-0.019	0.581**	0.354*	0.341*
	(0.14)	(0.07)	(0.23)	(0.20)	(0.21)
Large firms' productivity[1]	-0.087*	-0.114**	-0.102		-0.115*
	(0.05)	(0.05)	(0.07)		(0.06)
CEO	-0.209		-0.156		
	(0.17)		(0.22)		
North Europe	0.395		0.220		
	(0.22)		(0.27)		
West Europe	0.480**	0.337**	0.555***	0.342*	0.378**
	(0.17)	(0.15)	(0.15)	(0.18)	(0.17)
East and central Europe	0.158		-0.045		
	(0.23)		(0.35)		
China	0.607***	0.534***	0.720***	0.609***	0.645***
	(0.08)	(0.09)	(0.10)	(0.10)	(0.08)
Japan	-0.766***	-0.691***	-0.743***	-0.678***	-0.713***
	(0.08)	(0.09)	(0.14)	(0.10)	(0.10)
Fyrbodal			-0.613*	-0.520	-0.590
			(0.13)	(0.21)	(0.13)
Gothenburg			-1.000***	-0.990**	-0.995**
			(0.000)	(0.03)	(0.02)
Sjuhärad			-0.977**	-0.838	-0.899*
			(0.06)	(0.26)	(0.17)
University			-0.947		
			(0.18)		
Education[1]			-9.427**	-2.345	-3.100
			(3.99)	(1.97)	(2.05)
Age[1]			-36.233*	-13.180	-17.965**
			(19.05)	(8.56)	(8.61)
Population density[1]			2.340***	0.477	0.523
			(0.84)	(0.33)	(0.34)
Start-ups[1]			-1.610		
			(1.20)		
Income[1]			-0.580		
			(8.31)		

*** Significant at a 1 percent level. ** Significant at a 5 percent level. * Significant at a 1 percent level

[1]Values are in logarithms

Notes: The results are from a probit model. Numbers are the marginal effects. Numbers in parentheses are robust standard errors.

Source: The data for cluster, previous quarter results, export share and markets are from the questionnaire in 2013. Bisnode Market AB supplies the data for sales, productivity, share capital, manager position and region from 2011. We collect the data for start-ups from the Swedish Agency for Growth Policy Analysis (2011) and the data is for 2011. SCB presents data for education (2012E), age (2012F), income (2011B) and population density (2012G) and the data is from 2011 and 2012. The data for universities come from 2012 and the Swedish National Agency for Higher Education (2012). Authors' calculations.

By looking at the firm characteristics, the previous quarter result, share capital, productivity and some of the export markets have an impact on the probability of having positive expectations. As expected, if the previous quarter result is positive the firm has a higher probability of having positive expectations. A firm that has experienced a positive development the previous quarter is about 62.6 percent more likely to have positive expectations about the upcoming quarter. The result show that the more share capital a firm holds, the higher is the probability of positive expectations. If the share capital increases by 1 percent, the probability increases by 0.20 on average.

Concerning the labor productivity, it has a positive effect on the probability, i.e. the more productive firms have more positive expectations. The interaction term between labor productivity and large firms shows that the positive effect of labor productivity is lower for large firms compared to small firms. This can be because of large firms having more and diversified markets which imply a larger uncertainty about the future. Large firms can also be dependent on a larger set of actors. Excluding market characteristics from the model causes the sign of labor productivity to be negative, suggesting a possible endogeneity problem in the first two models. After testing, it is realized that the omitted dummy for Gothenburg is the variable causing labor productivity to be negative. Including this variable in the last three models causes the variable for labor productivity to be positive and reduces the endogeneity problem.

Including dummies for all of the markets to which the firms export result in problems with the model since not enough observations are included for some of the markets or some of the markets are correlated with other variables. The markets excluded from the model are Middle East, North Africa, Sub-Saharan Africa, India, Southeast Asia, North America, Central-/South America, Australia and the rest of Oceania. Regarding the included markets, if the company exports to North Europe or East and Central Europe does not affect the probability of having positive expectations. Firms that export to West Europe are about 37.8 percent more likely to have positive expectations about the upcoming quarter. A possible explanation can be that the respondents are expecting the Swedish krona to depreciate against the euro after a long period of a strong Swedish krona. Another explanation is that the firms' largest export markets in West Europe are relatively stable. Firms that export to China are about 64.5 percent more likely to have positive expectations about the upcoming quarter. China experiences a growth and the Swedish krona has been relatively stable against the Chinese yuan which could partly explain this positive effect. The final market that has an effect on the probability is the

Japanese market. In contrast to West Europe and China, if one of the export markets of a firm is Japan, the firm is about 71.3 percent less likely to have positive expectations about the upcoming quarter. Looking at the exchange rate, the development shows that the Swedish krona has appreciated against the Japanese yen and at the same time has Japan experienced a negative GDP growth.

Concerning the market characteristics, if firms have their location in Gothenburg and Sjuhärad the probability of having positive expectations is less in comparison to firms with location in Skaraborg. This implies that firms in larger regions are less positive regarding the export. The mean age in the municipality where a firm has its location are also shown to have a negative impact.

Table 9 presents the different model adequacy tests for each model. The different tests suggest different models to be the most adequate. Based on pseudo R^2, M_{13} is the most appropriate with the value of 61.9 percent. According to this test M_{15} is the second best model with a pseudo R^2 equal to 54.6 percent. The AIC proposes that M_{15} is the model that best fits this data, closely followed by M_{14}. Observing the BIC values, M_{12} is the one preferred followed by M_{14}. The different outcomes from the AIC and BIC tests can partly be due to these tests penalizing additional variables to different extent, where BIC is the test with the highest penalty. The model with the overall best fit according to the different tests is M_{15} which also accounts for the possible endogeneity problem, since Gothenburg is included.

Table 9 Adequacy test of models for determinants of positive expectations

	M_{11}	M_{12}	M_{13}	M_{14}	M_{15}
Log pseudolikelihood	-27.569	-29.761	-18.484	-23.028	-22.023
Pseudo R^2	0.432	0.386	0.619	0.525	0.546
AIC	85.138	79.521	84.967	78.055	78.046
BIC	118.865	102.006	138.931	114.031	116.271

Notes: Goodness-of-fit tests for the four models in Table 8. Pseudo R^2 is calculated as the McFadden R^2.
Source: Authors' calculations.

6.3.2 Positive Overall Answers in Relation to Positive Expectations

When aiming to determine what variables that affect the overall answer (both question about the last quarter and the upcoming quarter) to be positive, the same procedure as with the expectations is used. In all of the models, the dependent variable is a dummy variable taking the value 1 if the average answer about the export development the previous quarter and upcoming quarter is positive, i.e. positive overall answers. Section 5.2.3 presents the explanatory variables. Table 10 presents the marginal effects for each variable and model. The first model, M_{21}, includes clusters and firm characteristics. The significant variables from this model make up M_{22}. Model M_{23} includes the clusters, firm characteristics as well as the market characteristics. The significant variables from this regression compose M_{24}. In contrast to the positive expectations models, there was no need to have a fifth model since M_{24} includes all the significant variables from M_{21} and M_{23}.

Table 10 shows that there are relatively few significant results in these models. M_{23} is our preferred model and further interpretations are based on this model. As in the model for the positive expectations, the textile cluster has a significant and negative impact on the overall positive answer compared to the life science cluster. However, the marginal effect is smaller in this model than in the model for the positive expectations.

Concerning the firm characteristics, share capital and the interaction term between labor productivity and large firms have approximately the same impact on the probability of having positive overall answers as positive expectations. The export share has positive impact in this model but had no significant impact on expectations. This can indicate that the export share has an impact on the previous quarter result, but not on the expectations. Labor productivity is shown to have an impact on the expectations but not on the overall answers. None of the export markets but Japan has an impact on the probability, although the marginal effect of this variable changes sign indicating a possible problem with endogeneity.

When comparing the firm characteristics between this model and the positive expectations model, in this model, all regions have significantly negative impact on the probability compared to Skaraborg. In addition to mean age, mean income and number of start-ups have in this model a negative impact on the probability of having positive overall answers.

Table 10 Results from analyzing determinants of positive overall answers

	M_{21}	M_{22}	M_{23}	M_{24}
Automotive	-0.269		-0.262	
	(0.25)		(0.26)	
Textile	-0.066		-0.800**	-0.470**
	(0.18)		(0.23)	(0.18)
Turnover[1]	-0.011		-0.148	
	(0.09)		(0.12)	
Share capital[1]	0.124**	0.085*	0.324***	0.231***
	(0.06)	(0.05)	(0.12)	(0.07)
Export share	0.080		0.206**	0.142**
	(0.06)		(0.08)	(0.06)
Labor productivity[1]	-0.005	0.007	0.343*	0.107
	(0.12)	(0.06)	(0.19)	(0.09)
Large firms' productivity[1]	-0.100*	-0.065	-0.174**	-0.185**
	(0.06)	(0.05)	(0.08)	(0.08)
CEO	-0.002		-0.146	
	(0.15)		(0.31)	
North Europe	-0.048		-0.390*	-0.180
	(0.18)		(0.19)	(0.17)
East and central Europe	0.266		0.178	
	(0.19)		(0.32)	
West Europe	0.156		0.316	
	(0.15)		(0.20)	
China	-0.083		-0.376	
	(0.23)		(0.21)	
Japan	0.075		0.418*	0.327*
	(0.25)		(0.19)	(0.15)
Fyrbodal			-0.596**	-0.619***
			(0.10)	(0.07)
Gothenburg			-0.939**	-0.920***
			(0.12)	(0.09)
Sjuhärad			-0.834**	-0.640**
			(0.19)	(0.20)
University			0.784	
			(0.30)	
Education[1]			-5.623**	-0.852
			(2.61)	(0.67)
Mean age[1]			-19.382**	-22.961***
			(8.81)	(6.06)
Population density[1]			0.841	
			(0.54)	
Start-ups[1]			-2.630***	-1.305*
			(0.87)	(0.74)
Mean income[1]			6.079*	-3.100*
			(3.67)	(1.74)

*** Significant at a 1 percent level. ** Significant at a 5 percent level. * Significant at a 1 percent level

[1]Values are in logarithms

Notes: The results are from a probit model. Numbers are the marginal effects. Numbers in parentheses are robust standard errors.

Source: The data for cluster, previous quarter results, export share and markets are from the questionnaire in 2013. Bisnode Market AB supplies the data for sales, productivity, share capital, manager position and region from 2011. We collect the data for start-ups from the Swedish Agency for Growth Policy Analysis (2011) and the data is for 2011. SCB presents data for education (2012E), age (2012F), income (2011B) and population density (2012G) and the data is from 2011 and 2012. The data for universities come from 2012 and the Swedish National Agency for Higher Education (2012).

Table 11 Adequacy test of models for determinants of positive overall answers

	M_{21}	M_{22}	M_{23}	M_{24}
Log pseudolikelihood	-39.833	-46.517	-23.162	-28.492
Pseudo R^2	0.179	0.041	0.522	0.412
AIC	107.667	101.034	92.324	86.984
BIC	139.146	110.028	144.040	120.712

Notes: Goodness-of-fit tests for the four models in Table 10. Pseudo R^2 is calculated as the McFadden R^2.
Source: Authors' calculations.

In accordance with the models for the positive expectations the different tests for goodness of fit show ambiguous results. Table 11 presents the different test results. The pseudo R^2 is highest for M_{23} with a value of 52.2 percent. This model is followed by M_{24} with a pseudo R^2 of 41.2 percent. According to AIC, M_{24} is the model with the best fit followed by M_{23}. BIC contradicts this result by proposing that M_{22} is the model with the best fit, although the test concludes that M_{24} is the second best model. We conclude that M_{23} is the model with the best overall fit.

7. Conclusion

This thesis develops a composite diffusion index and applies it on the region of West Sweden. To develop the index, we use the views and expectations of managers, which represent companies from three different clusters in the region.

Concerning the representativeness of the index, we argue that the exporting firms within each cluster are a good sample base for the clusters. The answer frequency of the sample is 31.67 and the respondents are representative for these clusters. The distribution of answers between the clusters is also representative given the numbers of firms in each cluster. Regarding the representativeness for the total region of West Sweden, we suggest that more clusters and industries should be included in the study for the index to be representative for the total region. The reason is that the clusters are different both concerning the previous development and the expectations about the future.

The results show that the companies in these clusters are overall positive, but that this value is relatively close to 50 indicates only a slightly positive current state. The firms are in general more optimistic about the upcoming quarter compared to the previous quarter. Another finding is that the life science cluster is significantly more positive than the automotive and textile clusters. That the life science cluster experiences a positive situation is an optimistic result because the innovations in the life science industry contribute to the development in other industries as well as for society. A positive aspect of developing this export index at cluster level is the possibility to distinguish if the different clusters are experiencing different current states and trends. This gives the opportunity to adjust policy implications depending on the cluster of interest. An advantage with I_5 is that the distribution between small and large changes is visible. However, we cannot establish the share of firms that are positive by observing the I_5 value. This can be solved by aggregating the index into I_3. We further need to make a subjective distinction about what is a small or large change. Depending on what the aim of the index is, the two different approaches have different advantages. If the aim is to capture even the smallest changes, the five scale index is preferred and this index is less volatile than I_3. If instead the purpose is to get a broader picture and a more easily interpreted index the three scale category should be preferred.

By using both data from the questionnaire and register data, we analyze the determinants of positive expectations. We find that firms that experiencing a positive development during the previous quarter and firms having higher share capital are more optimistic about the future.

Labor productivity also has a positive effect, where we find that large productive firms are less optimistic about the future than small productive firms. Firms exporting to West Europe and/or China are also more optimistic about the future while firms exporting to Japan are less optimistic. Firms located in conurbations are less optimistic about the future. We analyze the determinants of labor and capital productivity of the exporting firms and find differences between the clusters. The labor productivity of the firms in the life science cluster is affected by the location and industry affiliation, whereas in the capital intensive clusters automotive and textile the share capital affects the labor productivity. For the capital productivity, the location seems to be the most important determinant.

Future research might incorporate more clusters in the index in order for it to be more representative for the region of West Sweden. Another factor to account for when conducting the index at a quarterly basis is the seasonality effect which might arise in time series with this type of data. An additional future research could be a comparison of the forecasting ability between a composite diffusion index and other econometric forecasting models as well as a comparison between the outcome of a five scale category index and a three scale category index when the same respondents get one of each of the underlying questionnaires. We conclude that this index is a good way to get an indication of the export growth on firm level in the three clusters because it is representative for the whole clusters. In line with this, we suggest that a composite diffusion index is a useful tool for similar or extended studies that have policy implications.

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Appendix 1 – Questionnaire

Introduction

The questions included in this questionnaire are asked in order to develop an index which will be recurred each quarter. As a respondent you are asked to answer the questions about the present in relation to previous quarter. With the previous quarter we refer to the last three months, i.e. 1st December to 28th February.

The questionnaire consists of four parts with a total of 17 questions.

Earlier research has shown that respondents tend to be over optimistic when stating their answers. Please try to answer the questions as truthfully as possible.

In the questionnaire export is defined as the company's sales to foreign countries. You do not have to consider possible seasonality in your company's sales when answering the questions. If needed, this will be adjusted for.

Thank you very much for your participation.

In the following part, you will be asked to answer three general questions about the company:

1. Does the company export?
   - ☐ Yes
   - ☐ No

2. What do you mainly export?
   - ☐ Goods
   - ☐ Services
   - ☐ We export goods and services to the same extent

3. How big proportion of the *turnover* is accounted for by export?
   - ☐ 0-20 %
   - ☐ 21-40 %
   - ☐ 41-60 %
   - ☐ 61-80 %
   - ☐ 81-100 %

4. Which is/are the company's main export markets today?
   Europe
   - ☐ Nordic countries (Denmark, Finland, Iceland, Norway)
   - ☐ Western Europe

- □ East- och Central Europe

Africa/Middle East

- □ Middle
- □ North Africa
- □ Sub Sahara

Asia

- □ China
- □ Japan
- □ India
- □ Southeast Asia

America

- □ North America
- □ Central-/South America

Oceania

- □ Australia
- □ Other

In the following part, you will be asked to answer four questions regarding the company's export the *last quarter*:

5. How have you experienced the change in the sales volume of exported goods the last quarter?

Decreased more than 5 %	Decreased between 0 and 5 %	Unchanged	Increased between 0 and 5 %	Increased more than 5 %
□	□	□	□	□

6. How have you experienced the change in the company's export backlog during the last quarter, measured as the number of orders?

Decreased more than 5 %	Decreased between 0 and 5 %	Unchanged	Increased between 0 and 5 %	Increased more than 5 %
□	□	□	□	□

7. How have you experienced that the profitability of the export sales has changed during the last quarter, where the profitability is measured as a mean of the profit margins on the exporting goods?

Decreased more than 5 %	Decreased between 0 and 5 %	Unchanged	Increased between 0 and 5 %	Increased more than 5 %
□	□	□	□	□

8. Have the company's export markets changed during the last quarter?
   - □ Yes
   - □ No

   If so, which markets does it concern?

Europe
- □ Nordic countries (Denmark, Finland, Iceland, Norway)
- □ Western Europe
- □ East- och Central Europe

Africa/Middle East
- □ Middle
- □ North Africa
- □ Sub Sahara

Asia
- □ China
- □ Japan
- □ India
- □ Southeast Asia

America
- □ North America
- □ Central-/South America

Oceania
- □ Australia
- □ Other

In the following part, you will be asked to answer four questions regarding your/the company's expectations about the export concerning the *upcoming quarter*:

9. How do you expect that the sales volume of exported goods will change during the upcoming quarter?

Decreased more than 5 %	Decreased between 0 and 5 %	Unchanged	Increased between 0 and 5 %	Increased more than 5 %
□	□	□	□	□

10. How do you expect that the company's export backlog will change during the upcoming quarter, measured as the number of orders?

Decreased more than 5 %	Decreased between 0 and 5 %	Unchanged	Increased between 0 and 5 %	Increased more than 5 %
□	□	□	□	□

11. How do you expect that the profitability of the export sales will change during the upcoming quarter, where the profitability is measured as a mean of the profit margins on the exporting goods?

Decreased more than 5 %	Decreased between 0 and 5 %	Unchanged	Increased between 0 and 5 %	Increased more than 5 %
□	□	□	□	□

12. Do you expect that the company's export markets will change during the upcoming quarter?
    - ☐ Yes
    - ☐ No

    If so, which markets does it concern?

Europe
- ☐ Nordic countries (Denmark, Finland, Iceland, Norway)
- ☐ Western Europe
- ☐ East- och Central Europe

Africa/Middle East
- ☐ Middle
- ☐ North Africa
- ☐ Sub Sahara

Asia
- ☐ China
- ☐ Japan
- ☐ India
- ☐ Southeast Asia

America
- ☐ North America
- ☐ Central-/South America

Oceania
- ☐ Australia
- ☐ Other

In the following part, you will be asked to answer three questions regarding the economy:

13. In the present, what is the status of the company's foreign direct investments?
    - ☐ Increasing
    - ☐ Unchanged
    - ☐ Decreasing

14. In the present, what is the status of the company's employment situation?
    - ☐ Increasing the number of employees
    - ☐ Unchanged
    - ☐ Decreasing the number of employees

15. In the present, what is the status of the delivery times of the company's goods, measured in number of weeks?
    - ☐ Increasing
    - ☐ Unchanged
    - ☐ Decreasing

Appendix 2 – Cover Letter

Welcome to West Sweden Chamber of Commerce's Export Index!

May we have your attention for a couple of minutes?

West Sweden is the most export intense region in Sweden. The latest financial crisis, with its beginning in 2008, showed the vulnerability among West Swedish companies as the export declined to a large extent in the following years thereafter.

The purpose with a West Swedish export index is to get an indication of how the companies in the region perform in relation to the overall economy. It is an important part of our mission to follow the West Swedish business life in order to at an early stage predict, and communicate, upcoming challenges for West Swedish companies.

In this survey, three large West Swedish clusters are included: Automotive, Life Science and Textile. The questions included in this questionnaire are asked in order to develop an index which will be recurred each quarter. As a respondent you are asked to answer the questions about the present in relation to previous quarter.

The answer will be handled confidentially and the data will only be presented at an aggregated level where it is impossible to identify an individual company. Single answers will not be used in a commercial way.

The aggregated results and analysis will be presented via the West Sweden Chamber of Commerce's communication channels and possibly through media. You will be able to take part of the results when the survey is presented.

We would be very pleased if you and your company would like to participate in this survey. Your answers are very important for the West Sweden Chamber of Commerce. Thank you very much in advance!

The questionnaire takes approximately 5 minutes to answer. Click on the link below to get to the questionnaire:

Appendix 3 – SNI Codes Exporting Firms

Table A3.1 Automotive SNI codes

No	SNI	Text	Amount
1	13960	Manufacture of other technical and industrial textiles	1
2	22290	Manufacture of other plastic products	1
3	24200	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel	1
4	25500	Forging, pressing, stamping and roll-forming of metal; powder metallurgy	1
5	25620	Machining	4
6	25730	Manufacture of tools	1
7	26120	Manufacture of loaded electronic boards	1
8	27320	Manufacture of other electronic and electric wires and cables	2
9	27900	Manufacture of other electrical equipment	1
10	28110	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	1
11	28120	Manufacture of fluid power equipment	1
12	28130	Manufacture of other pumps and compressors	1
13	28240	Manufacture of power-driven hand tools	1
14	28290	Manufacture of other general-purpose machinery n.e.c	1
15	29102	Manufacture of trucks and other heavy motor vehicles	1
16	29200	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	6
17	29310	Manufacture of electrical and electronic equipment for motor vehicles	1
18	29320	Manufacture of other parts and accessories for motor vehicles	16
19	45310	Wholesale trade of motor vehicle parts and accessories	1
20	46741	Wholesale of hardware	1
21	46750	Wholesale of chemical products	1
22	62020	Computer consultancy activities	1
23	70100	Activities of head offices	1
24	71122	Industrial engineering activities and related technical consultancy	1
25	71200	Technical testing and analysis	1
26	72190	Other research and experimental development on natural sciences and engineering	1
		Total Amount of Companies	**50**

Note: Number of exporting firms in each SNI 2007 code classification.
Source: Bisnode Market AB

Table A3.2 Life Science SNI codes

No	SNI	Text	Amount
1	10890	Manufacture of other food products n.e.c.	1
2	21200	Manufacture of pharmaceutical preparations	3
3	22220	Manufacture of plastic packing goods	1
4	22290	Manufacture of other plastic products	1
5	26510	Manufacture of instruments and appliances for measuring, testing and navigation	3
6	26600	Manufacture of irradiation, electromedical and electrotherapeutic equipment	3
7	28990	Manufacture of other special-purpose machinery n.e.c.	2
8	30920	Manufacture of bicycles and invalid carriages	1
9	32501	Manufacture of medical and dental instruments and supplies	10
10	32502	Manufacture of artificial teeth, dentures, dental plates etc.	2
11	32990	Other manufacturing n.e.c	2
12	46141	Agents involved in the sale of machinery, industrial equipment, ships and aircraft except office machinery and computer equipment	1
13	46180	Agents specialised in the sale of other particular products	2
14	46380	Wholesale of other food, including fish, crustaceans and molluscs	1
15	46435	Wholesale of photographic and optical goods	1
16	46450	Wholesale of perfume and cosmetics	1
17	46460	Wholesale of pharmaceutical goods	22
18	46499	Wholesale of other household goods n.e.c	1
19	46691	Wholesale of measuring and precision instruments	1
20	46750	Wholesale of chemical products	2
21	70100	Activities of head offices	2
22	70220	Business and other management consultancy activities	3
23	71200	Technical testing and analysis	1
24	72190	Other research and experimental development on natural sciences and engineering	7
25	73200	Market research and public opinion polling	1
26	74101	Industrial and fashion design	1
27	80200	Security systems service activities	1
28	86901	Activities of medical laboratories etc.	1
		Total Amount of Companies	**78**

Note: Number of exporting firms in each SNI 2007 code classification.
Source: Bisnode Market AB

Table A3.3 Textile SNI codes

No	SNI	Text	Amount
1	13200	Weaving of textiles	2
2	13300	Finishing of textiles	1
3	13910	Manufacture of knitted and crocheted fabrics	3
4	13921	Manufacture of curtains, bed linen and other linen goods	1
5	13922	Manufacture of tarpaulins, tents, sails etc.	7
6	13930	Manufacture of carpets and rugs	2
7	13940	Manufacture of cordage, rope, twine and netting	1
8	13960	Manufacture of other technical and industrial textiles	2
9	13990	Manufacture of other textiles n.e.c.	1
10	14120	Manufacture of workwear	2
11	14130	Manufacture of other outerwear	2
12	14140	Manufacture of underwear	3
13	14190	Manufacture of other wearing apparel and accessories	3
14	14200	Manufacture of articles of fur	1
15	14390	Manufacture of other knitted and crocheted apparel	3
16	31090	Manufacture of other furniture	1
17	32300	Manufacture of sports goods	1
18	46160	Agents involved in the sale of textiles, clothing, fur, footwear and leather goods	5
19	46240	Wholesale of hides, skins and leather	3
20	46410	Wholesale of textiles	15
21	46420	Wholesale of clothing and footwear	51
22	46470	Wholesale of furniture, carpets and lighting equipment	1
23	46731	Wholesale of wood and other construction materials	1
24	46769	Wholesale of other intermediate products n.e.c.	1
		Total Amount of Companies	**113**

Note: Number of exporting firms in each SNI 2007 code classification.
Source: Bisnode Market AB

Appendix 4 – Turnover Classification

Table A4.1 Classifications of turnover from companies' final accounts, in thousands of SEK.

Thousands of SEK	Turnover classification
0	OM00
1-1999	OM10
2000-4999	OM20
5000-9999	OM30
10000-24999	OM40
25000-49999	OM50
50000-99999	OM60
100000-499999	OM70
500000-999999	OM80
1000000-	OM90

Source: Bisnode Market AB

Appendix 5 – Productivity

Table A5.1 Results from analyzing determinants of labor productivity

	Total	Automotive	Life Science	Textile
Share capital[1]	0.107***	0.158**	0.068	0.149**
	(0.04)	(0.07)	(0.07)	(0.07)
Income[1]	-3.035*	-1.434	-7.746**	0.155
	(1.67)	(3.08)	(3.20)	(4.06)
Population density[1]	-0.104	-0.105	-0.331	0.208
	(0.14)	(0.23)	(0.35)	(0.56)
Age[1]	-2.280	-3.142	-1.188	3.569
	(3.64)	(4.29)	(6.72)	(21.59)
Education[1]	0.178	0.201	1.222	-0.417
	(0.55)	(0.70)	(1.79)	(1.21)
University	-0.094	0.434	-0.141	-0.295
	(0.27)	(0.47)	(0.42)	(0.42)
Start-ups[1]	0.061	-0.475	-1.534	1.493
	(0.53)	(0.71)	(1.08)	(1.24)
Life Science	-0.159			
	(0.42)			
Textile	-0.278			
	(0.41)			
Sjuhärad	-0.160	-0.660	-1.711**	0.619
	(0.30)	(0.48)	(0.72)	(0.47)
Fyrbodal	-0.399	-0.661	-1.379**	0.250
	(0.27)	(0.54)	(0.60)	(0.43)
Skaraborg	-0.251	-1.002	-1.385**	1.049
	(0.37)	(0.69)	(0.61)	(0.69)
b1	-0.373	-0.235		
	(0.75)	(1.16)		
b2	0.330			-0.425
	(0.53)			(0.37)
b5	0.054		0.657*	
	(0.45)		(0.37)	
b6	0.257	0.755		
	(0.60)	(0.93)		
b7	0.136		0.683	
	(0.50)		(0.46)	
b8	-0.524		0.059	
	(0.49)		(0.41)	
b9	-1.030		1.237***	
	(1.46)		(0.33)	
b11	-0.118		-0.048	
	(0.81)		(0.82)	
b13	0.306	0.415	1.902***	
	(0.59)	(1.03)	(0.42)	
b14	0.101	0.638		
	(0.63)	(0.91)		
b15	0.218	0.631		
	(0.60)	(0.88)		
b17	0.870**	0.596	1.534***	0.154
	(0.43)	(0.88)	(0.36)	(0.25)
b21	0.268			-0.476*
	(0.48)			(0.26)
b24	0.083		0.621	
	(0.50)		(0.44)	
_cons	32.903	24.290	49.782	-2.024
	(19.82)	(28.13)	(37.58)	(102.47)
R-squared	0.203	0.300	0.403	0.172

*** Significant at a 1 percent level. ** Significant at a 5 percent level. * Significant at a 1 percent level

[1]Values are in logarithms

Notes: Numbers are OLS-coefficients. Numbers in parentheses are robust standard errors

Source: Bisnode Market AB supplies the data for sales, productivity, share capital, manager position, SNI 2007 and region from 2011. We collect the data for start-ups from the Swedish Agency for Growth Policy Analysis (2011) and the data is for 2011. SCB presents data for education (2012E), age (2012F), income (2011B) and population density (2012G) and the data is from 2011 and 2012. The data for universities come from 2012 and the Swedish National Agency for Higher Education (2012). Authors' calculations.

Table A5.2 Result from analyzing determinants of capital productivity

	Total	Automotive	Life Science	Textile
Income[1]	-2.764	-11.160**	-5.324	-0.530
	(3.60)	(5.45)	(6.62)	(5.52)
Population density[1]	-0.315	-0.712*	-0.582	0.367
	(0.31)	(0.36)	(0.65)	(0.83)
Age[1]	-6.918	-15.328	4.487	10.294
	(9.48)	(11.57)	(16.32)	(27.64)
Education[1]	-0.500	0.765	2.293	-0.111
	(0.87)	(0.84)	(1.76)	(1.69)
University	0.232	0.578	-0.570	-0.057
	(0.54)	(0.85)	(1.12)	(0.79)
Start-ups[1]	0.155	-1.563**	-1.717	2.631*
	(0.78)	(0.73)	(1.98)	(1.41)
Life Science	-0.144			
	(0.51)			
Textile	-0.444			
	(0.56)			
Sjuhärad	-0.406	-2.563**	-0.974	1.335*
	(0.55)	(1.00)	(1.17)	(0.78)
Fyrbodal	-0.628	-2.570***	-2.401**	1.754***
	(0.54)	(0.90)	(0.94)	(0.60)
Skaraborg	-0.651	-2.881***	-0.607	1.078
	(0.58)	(0.89)	(0.81)	(0.84)
b1	-0.122	-0.618		
	(0.86)	(0.70)		
b2	-0.749			-1.979***
	(0.76)			(0.49)
b5	0.798		1.485	
	(0.87)		(1.05)	
b6	0.149	1.032		
	(1.31)	(1.50)		
b7	-0.175		1.191	
	(0.76)		(0.91)	
b8	-1.565*		-0.705	
	(0.90)		(1.15)	
b9	-1.655		0.402	
	(1.34)		(0.87)	
b11	-1.410		-0.853	
	(1.28)		(1.53)	
b13	-0.727	0.272	0.168	
	(0.85)	(1.06)	(1.58)	
b14	0.603	1.112		
	(1.10)	(1.07)		
b15	0.144	0.715		
	(0.77)	(0.80)		
b17	0.353	-1.995***	1.435*	-0.780**
	(0.66)	(0.71)	(0.78)	(0.35)
b21	0.339			-0.846*
	(0.72)			(0.46)
b24	0.094		0.776	
	(0.84)		(0.93)	
_cons	46.565	119.978	15.822	-19.998
	(50.77)	(66.18)	(90.13)	(130.62)
R-squared	0.128	0.484	0.259	0.140

*** Significant at a 1 percent level. ** Significant at a 5 percent level. * Significant at a 1 percent level

[1]Values are in logarithms

Notes: Numbers are OLS-coefficients. Numbers in parentheses are robust standard errors

Source: Bisnode Market AB supplies the data for sales, productivity, share capital, manager position, SNI 2007 and region from 2011. We collect the data for start-ups from the Swedish Agency for Growth Policy Analysis (2011) and the data is for 2011. SCB presents data for education (2012E), age (2012F), income (2011B) and population density (2012G) and the data is from 2011 and 2012. The data for universities come from 2012 and the Swedish National Agency for Higher Education (2012). Authors' calculations.

Table A5.3 Description of the variables in the productivity models

Variable	Description
Cluster	Dummy variables for each cluster
Share capital	The nominal value of outstanding shares
Region	Dummy variables for the region the company is located in, Fyrbodal, Gothenburg, Sjuhärad and Skaraborg
Education	The share of the population in the municipality where the firm has its location that has completed tertiary education
Start-ups	The number of start-ups in the municipality where the firm has its location weighted by the population size
Age	The mean of the age in the municipality where the firm has its location
Income	The mean of the income in the municipality where the firm has its location
Population density	The population density in the municipality where the firm has its location
University	A dummy taking the value 1 if there is an university located in the municipality where the firm has its location
B1	SNI 2007 for architect's offices, technical consultancy companies, companies for technical testing and analysis
B2	SNI 2007 for wearing apparel industry
B5	SNI 2007 for industry for computer, electronic and optical products
B6	SNI 2007 for industry for electrical equipment
B7	SNI 2007 for industry for basic pharmaceutical products and pharmaceutical preparations
B8	SNI 2007 for institutes for scientific research and development
B9	SNI 2007 for industry for rubber and plastic products
B11	SNI 2007 for head offices; management consultancy companies
B13	SNI 2007 for industry for machinery and equipment n.e.c.
B14	SNI 2007 for industry for fabricated metal products, except machinery and equipment
B15	SNI 2007 for industry for motor vehicles, trailers and semi-trailers
B17	SNI 2007 for wholesale trade, except of motor vehicles
B21	SNI 2007 for textile industry
B24	SNI 2007 for other manufacturing industry

Source: Bisnode Market AB supplies the data for sales, productivity, share capital, manager position, SNI 2007 and region from 2011. We collect the data for start-ups from the Swedish Agency for Growth Policy Analysis (2011) and the data is for 2011. SCB presents data for education (2012E), age (2012F), income (2011B) and population density (2012G) and the data is from 2011 and 2012. The data for universities come from 2012 and the Swedish National Agency for Higher Education (2012).

Appendix 6 – Examples of Established Indexes

An example of a composite index is the Purchasing Managers Index (PMI) conducted by the Institute for Supply Management in the US. The PMI is a composite index, where the individual components are five separate and equally weighted diffusion indexes. The different diffusion indexes forming the composite index are: new orders, production, employment, supplier deliveries and inventories. The data used in this index is collected through a questionnaire sent out each month to purchasing managers and other strategic supply managers that are all members of the ISM Business Survey Committee. In the survey, they are asked to report month-to-month changes in the sub-indexes according to a response scale consisting of three categories; increased, decreased or unchanged. The diffusion indexes are then calculated as described above, and all of the sub-indexes are then aggregated into one composite index. The aim of the index is to investigate the health of the manufacturing sector and to determine overall trend within the sector. (ISM, 2013)

Many attempts are being made to model, understand and predict the economy's cyclical patterns using composite indexes. In several of these cases, the composite indexes are not made up by diffusion indexes, but of time-series data. For example, OECD's Composite Leading Indicators (CLI) aims to forecast turning points in the economy (Gyomai & Guidetti, 2012). The CLI are calculated monthly for 33 OECD countries and a number of other major, non-OECD economies as well as regional aggregates. The index consists of time-series which all have a connection to the GDP, which is the reference series of the CLI and represents the business cycle. In other words, the included components experience similar turning points as the business cycle. In order for the CLI to be a predicting index, the components are assured to have an average lead time of 6 to 9 months, i.e. on average, the leading indicator experience the turning point 6 to 9 months before the reference series do. Depending on the country, the components of the CLI vary, but all components are chosen based on different economic criteria, for example: significance, cyclical behavior, data quality, timelessness, small variance and availability. In general, time-series describing the industry's changes in orders and inventories, financial indicators, business confidence surveys as well as performance of key sectors and the development of important trading partners are included in the CLI. When constructing the index, all components are given the same weights. Each component's average growth rate is calculated and these averages form the final indicator. In order to make reliable predictions of the economic cycles, the component series are filtered and factors such as periodicity, outliers and seasonal patterns are removed. The series are also

de-trended and smoothed using a Hodrick-Prescott filter,[10] and turning points are detected using a simplified version of the Bry-Boschan algorithm.[11]

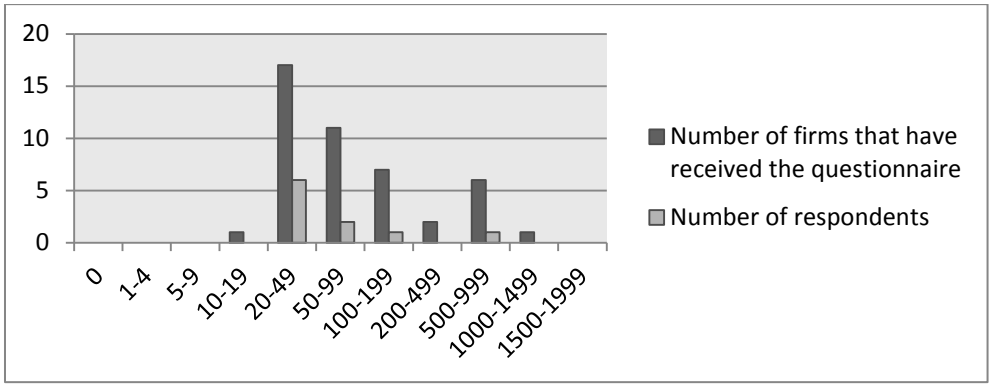
[10] For further information see: R. Nilsson, G. Gyomai (2008) "Cycle Extraction: A comparison of the Phase-Average Trend method, the Hodrick-Prescott and Christiano-Fitzgerald filters", OECD Statistics Working Papers, no.2011/04. Available at: http://www.oecd.org/std/clits/41520591.pdf

[11] For further information see: G. Bry, C. Boschan (1971) "Cyclical Analysis of Time Series: Selected Procedures and Computer Programs", Technical Paper 20, NBER

Appendix 7 – Figures of the Descriptive Statistics of the Respondents

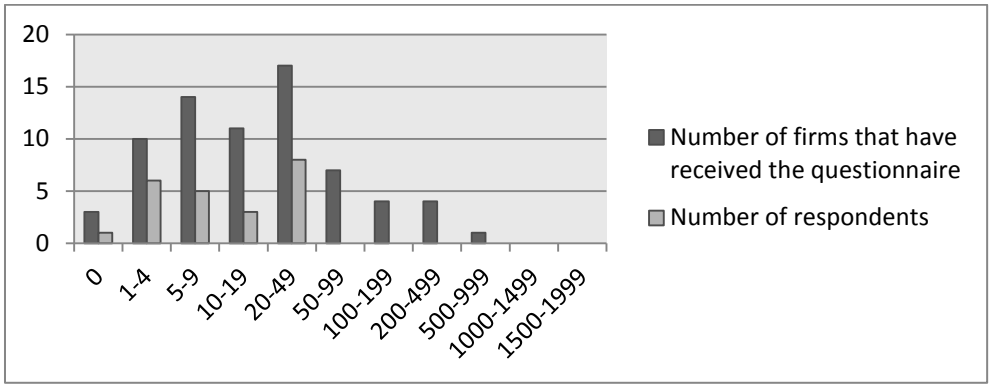
Figure A7.1-A7.3 Number of firms that have received and answered the questionnaires sorted on cluster and number of employees.

Figure A7.1 Automotive, firms in each number of employee classification



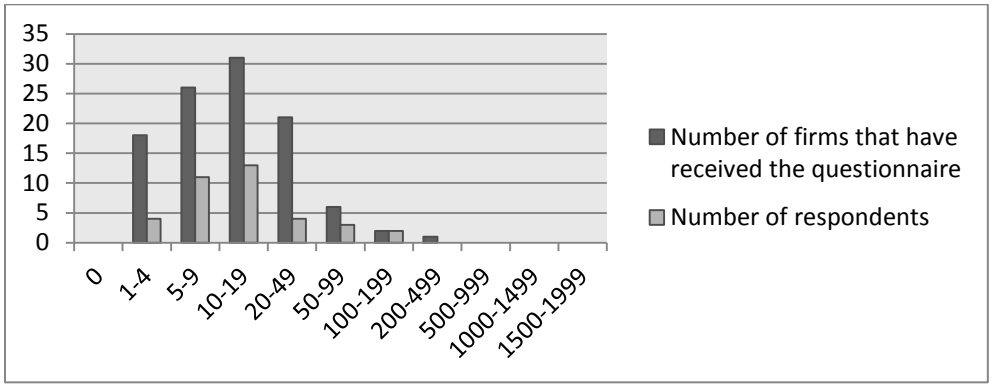
Note: Data from 45 firms that have received the questionnaire and 10 respondents.
Source: Bisnode Market AB, authors' calculations.

Figure A7.2 Life Science, firms in each number of employee classification



Note: Data from 71 firms that have received the questionnaire and 23 respondents.
Source: Bisnode Market AB, authors' calculations.

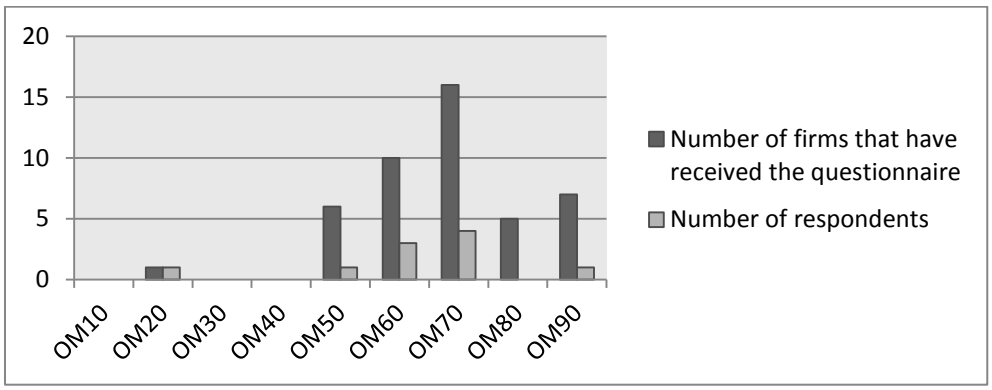
Figure A7.3 Textile, firms in each number of employee classification



Note: Data from 105 firms that have received the questionnaire and 37 respondents.
Source: Bisnode Market AB, authors' calculations.

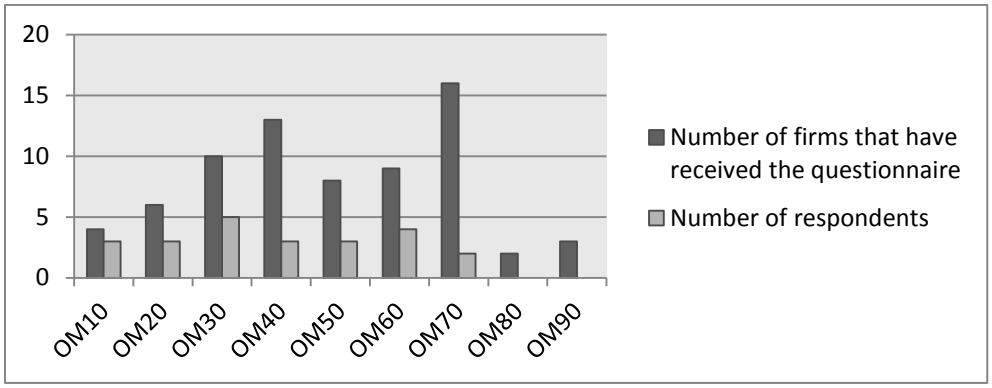
Figure A7.4-A7.6 Number of firms that have received and answered the questionnaires sorted on cluster and turnover classification. For turnover classifications, see Appendix 4.

Figure A7.4 Automotive, firms in each turnover classification



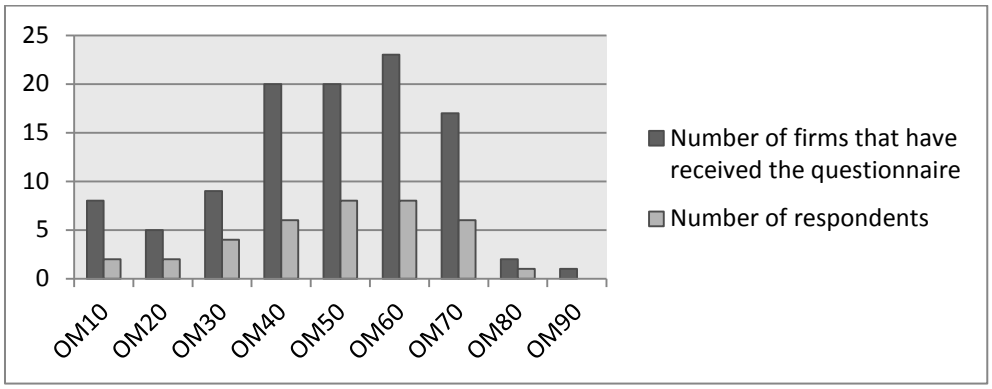
Note: Data from 45 firms that have received the questionnaire and 10 respondents.
Source: Bisnode Market AB, authors' calculations.

Figure A7.5 Life Science, firms in each turnover classification



Note: Data from 71 firms that have received the questionnaire and 23 respondents.
Source: Bisnode Market AB, authors' calculations.

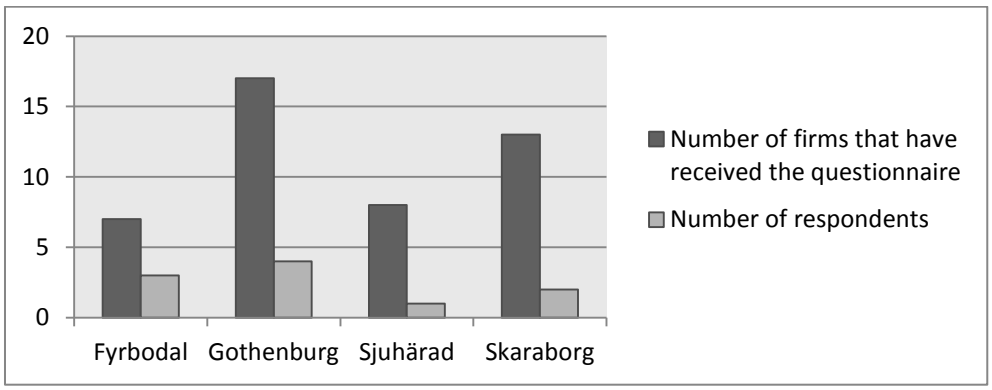
Figure A7.6 Textile, firms in each turnover classification



Note: Data from 105 firms that have received the questionnaire and 37 respondents.
Source: Bisnode Market AB, authors' calculations.

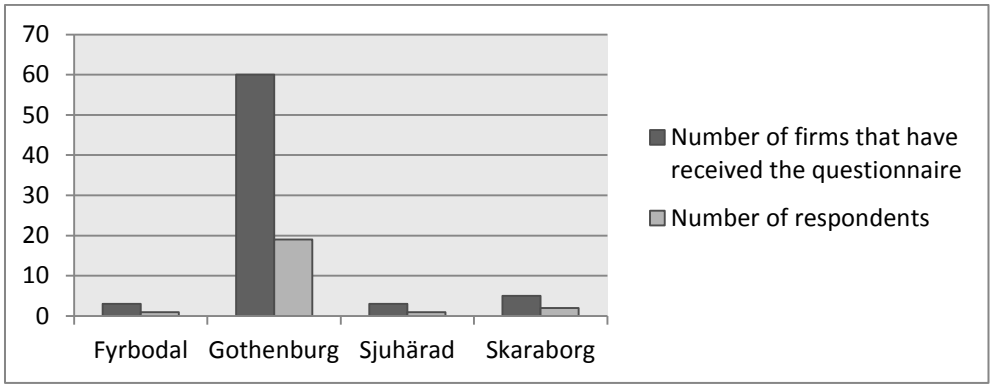
Figure A7.7-A7.9 Number of firms that have received and answered the questionnaires sorted on cluster and Regions. For definitions of the regions, see Appendix 6.

Figure A7.7 Automotive, firms in each region



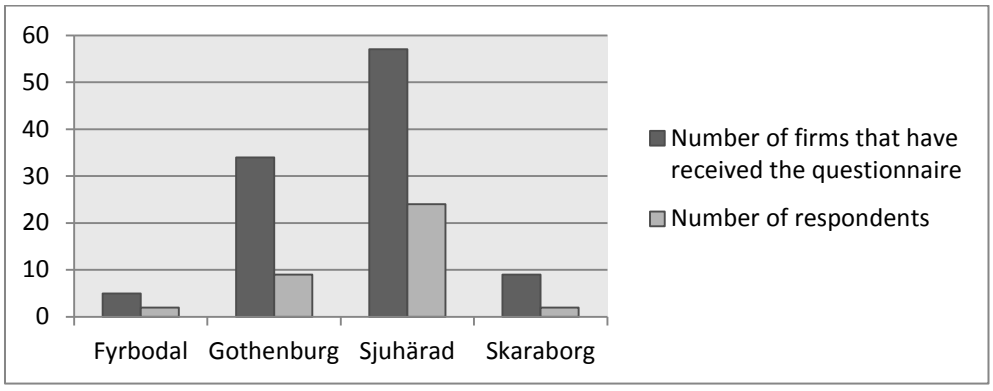
Note: Data from 45 firms that have received the questionnaire and 10 respondents.
Source: Bisnode Market AB, authors' calculations.

Figure A7.8 Life Science, firms in each region



Note: Data from 71 firms that have received the questionnaire and 23 respondents.
Source: Bisnode Market AB, authors' calculations.

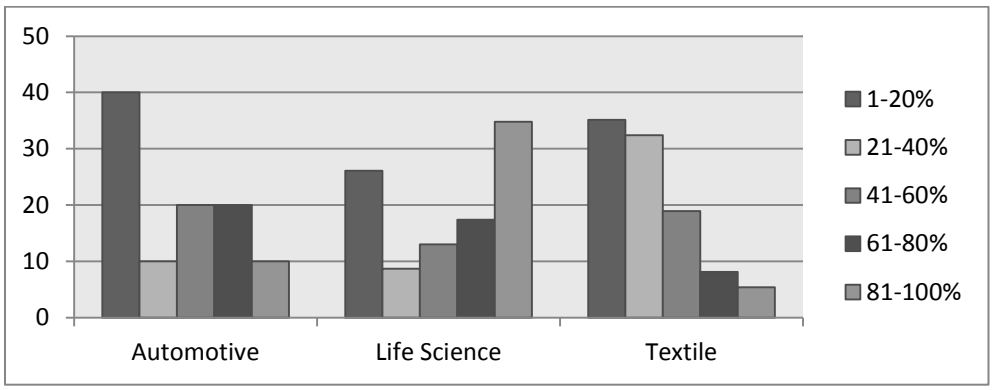
Figure A7.9 Textile, firms in each region



Note: Data from 105 firms that have received the questionnaire and 37 respondents.
Source: Bisnode Market AB, authors' calculations.

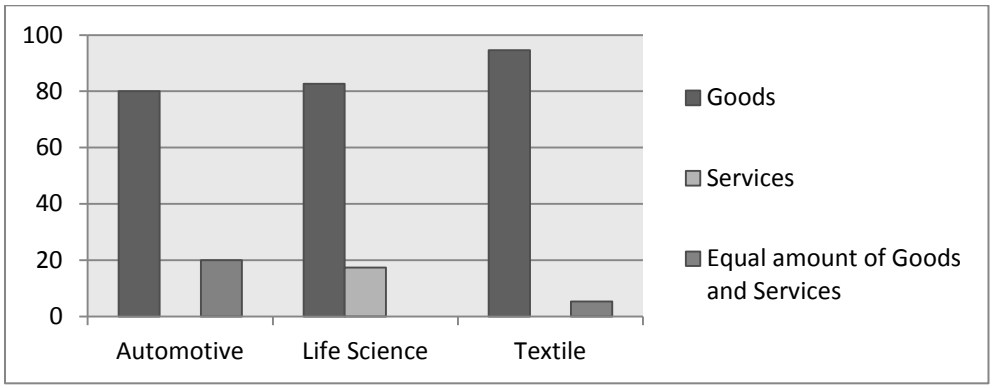
Figure A7.10-A7.14 Other descriptive statistics of the responding firms.

Figure A7.10 The share of firms, in each export size classification, where export is measured as a share of the turnover



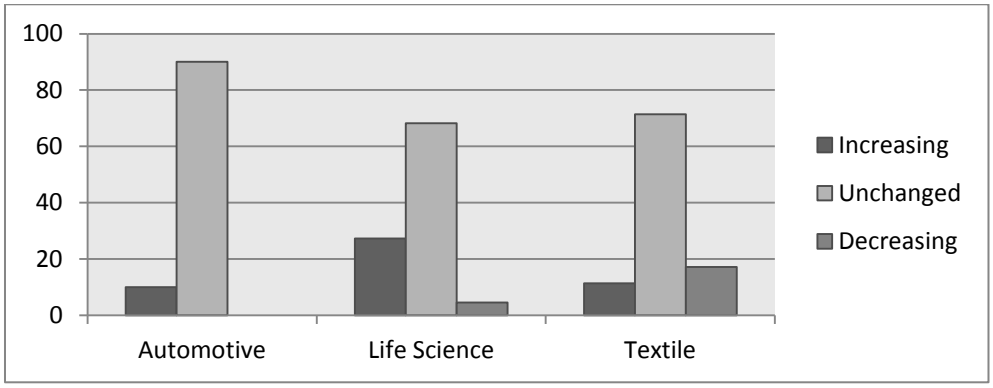
Note: Data from 10, 23 and 37 respondents respectively.
Source: Bisnode Market AB, authors' calculations.

Figure A7.11 The share of firms in in each export area



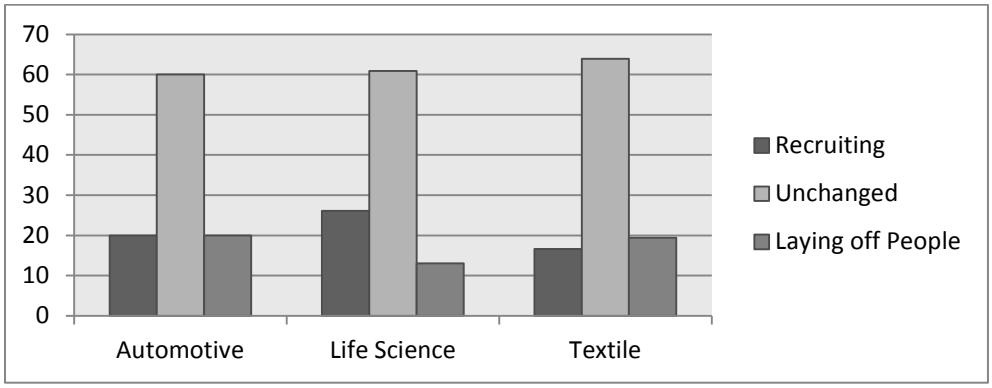
Note: Data from 10, 23 and 37 respondents respectively.
Source: Bisnode Market AB, authors' calculations.

Figure A7.12 The change in FDI of the firms measured as the share of firms experiencing increasing, unchanged or decreasing FDI



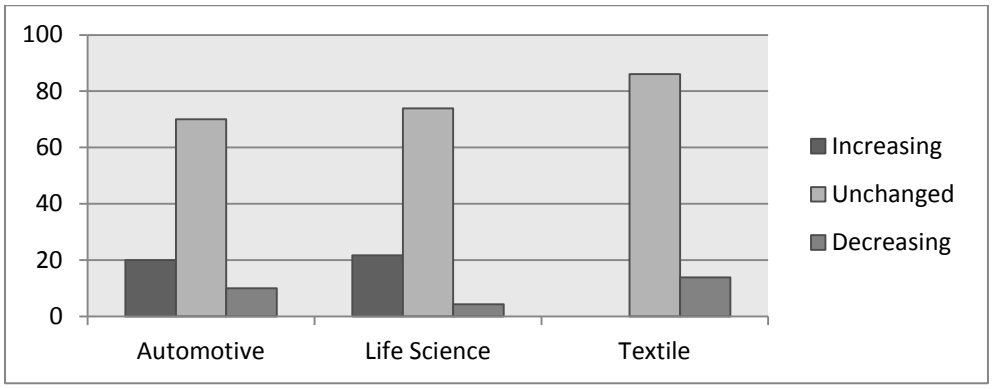
Note: Data from 10, 23 and 37 respondents respectively.
Source: Bisnode Market AB, authors' calculations.

Figure A7.13 The employment situation of the firms, measured as the share of firms which recruits people, experiences no change in employment and lay off people



Note: Data from 10, 23 and 37 respondents respectively.
Source: Bisnode Market AB, authors' calculations.

Figure A7.14 The delivery times of the firms, measured as the share of firms experiencing increasing, unchanged or decreasing delivery times



Note: Data from 10, 23 and 37 respondents respectively.
Source: Bisnode Market AB, authors' calculations.