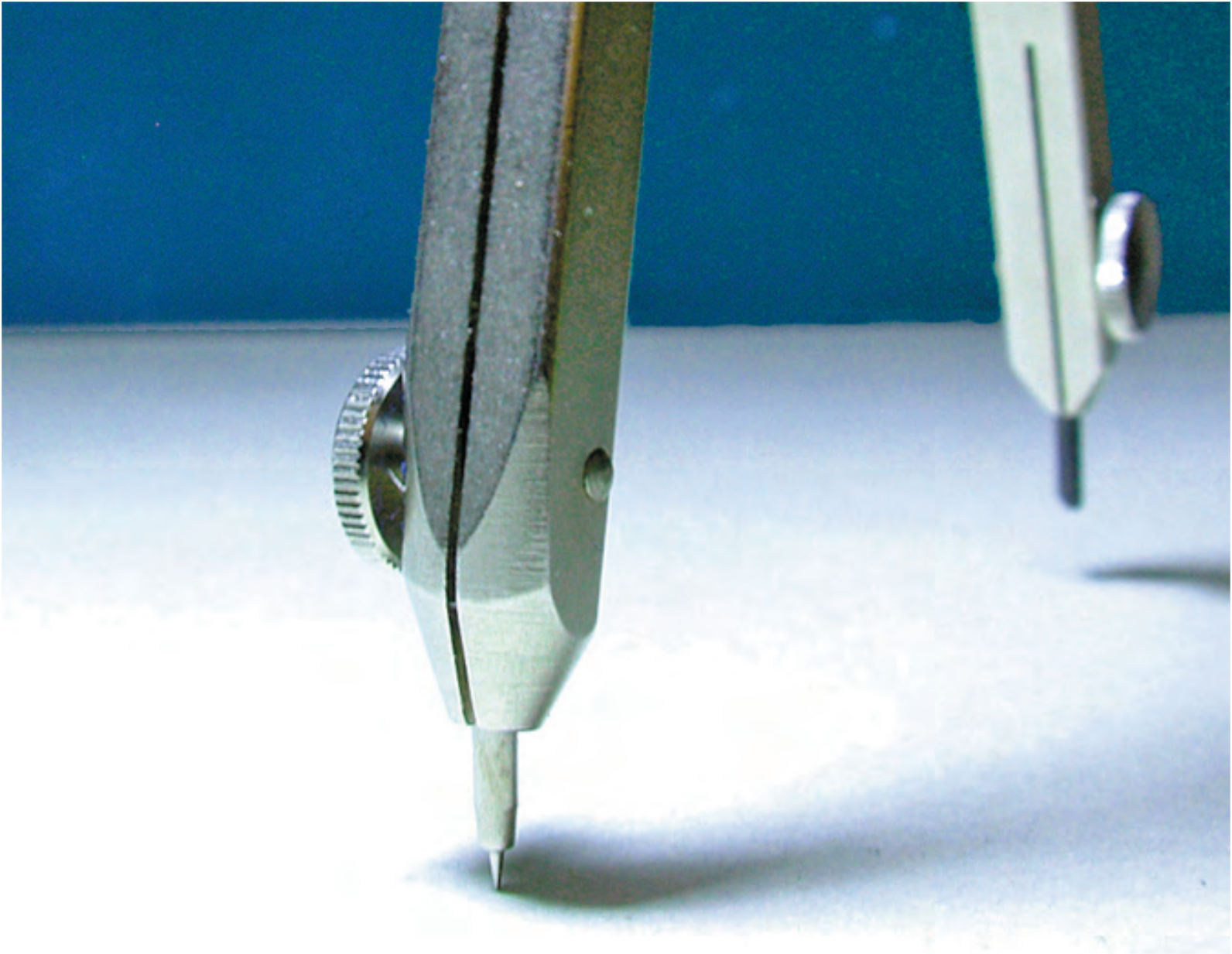

SWEDISH CLUSTER MAPS

A STATISTICAL INVENTORY OF CLUSTERS IN SWEDEN IN 2002

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The Center for Strategy and Competitiveness at the Stockholm School of Economics focuses on four research tracks: Strategy and International Business, Creation and Diffusion of Knowledge in Networks, Clusters and Competitiveness, and Micro Policy. Analyses of business clusters and the importance of regions as well as knowledge flows through both local and global networks stand central in our theoretical work as CSC works in a trans-disciplinary tradition involving theories from Strategy, Management, Economic Geography, Economic Sociology and Economic History. At CSC we both apply and develop our theoretical models to investigate the determinants of competitiveness and economic development from a bottom up, microeconomic perspective.

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This is a translation from Swedish of the report "Svenska klusterkartor" published in 2003 by Centre for Research on Innovation and Industrial Dynamics (CIND), Uppsala University, with support from Swedish Agency for Economic and Regional Growth (NUTEK).

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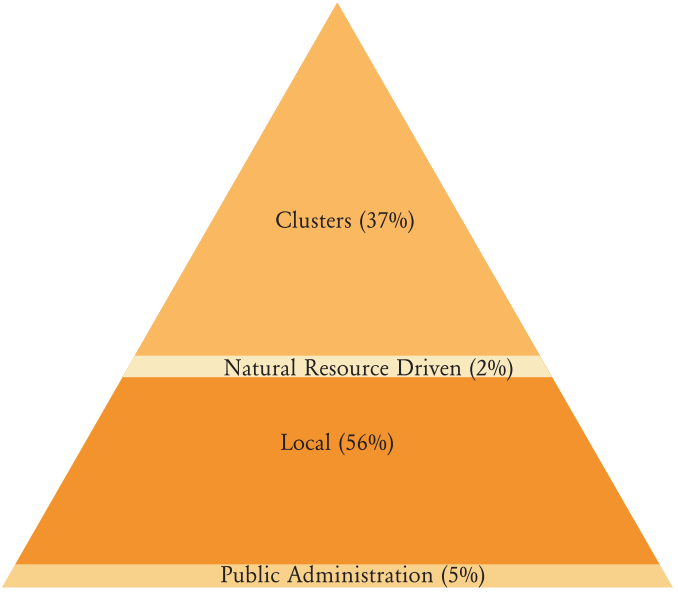
1. SUMMARY

On behalf of the Swedish National Programme for Innovation Systems and Clusters, we have in this report carried out a preliminary statistical inventory of Swedish clusters. The data used are based on industry classifications (SNI) and labour market regions (LA regions). The industries which in the course of history have co-located themselves for the purpose of exploiting business and technology links are classified into 38 so-called industry clusters. The model for the definition of these clusters has been developed by Professor Michael E. Porter at Harvard University, and has now, for the first time, been applied outside North America. The interest in clusters is due to the fact that these industrial systems are extremely important for development and innovation in industry, and the fact that they constitute a building block for modern enterprise and regional policies.

The industry clusters and the regional and local clusters which have become apparent through our statistical processing present one image of Swedish clusters. Of course, traditionally based industry statistics cannot give a wholly accurate image of cluster structures and business dynamics in Sweden. It is, however, an image which can be of guidance to politicians and public authorities in their work on developing cluster initiatives. For a more nuanced and in-depth image of the dynamics in various parts of Sweden, finer-grained statistical processing as well as qualitative micro-level studies are needed.

It is complicated to transfer and adapt the system for aggregating industries into clusters from an American to a Swedish/European business structure and industry nomenclature. Results in this report should therefore be considered preliminary for the time being.



INDUSTRY CLUSTERS

This report identifies 38 industry clusters, i.e. major industrial systems in Sweden, which are described with regard to employment and growth in recent years. The report focuses mainly on the cluster sector in its entirety, which supplies some 1.4 million jobs. Apart from this, Sweden has a local business sector comprising slightly more than 2 million jobs, a natural resource driven sector with almost 100 000 employees and a public administration sector with almost 200 000 employees. The cluster sector, which employs 37% of Sweden's total workforce, had the strongest growth in the period 1997–2003 increasing by 12%. In second place, we find local business with 6% growth. In both natural resource driven industry and public administration, employment contracted during this period.

A breakdown of employees by gender confirms the image of Sweden's labour market as gender segregated. The cluster sector comprises 68% men and only 32% women, albeit with a different distribution in different industry clusters. In the local sector, proportions are reversed with a workforce consisting of 60% women and 40% men.

GEOGRAPHICAL STRUCTURE OF INDUSTRY CLUSTERS

There is a clear correlation between the size of a industry cluster and its distribution in Sweden. The largest clusters (100 000 employees or more), Business services, Transportation and logistics, Research and development, Construction and Metal manufacturing, are spread all over Sweden. In contrast, smaller clusters such as Tobacco, Footwear, Leather products, and Jewelry and precious metals (with less than 1000 employees) are highly concentrated in one or a few regions. Some fairly dominant industry clusters, such as Automotive and Forest products, have a greater tendency to be concentrated in fewer regions than expected, indicating strong specialisation and a "Hollywood-type" concentration.

REGIONAL AND LOCAL CLUSTERS

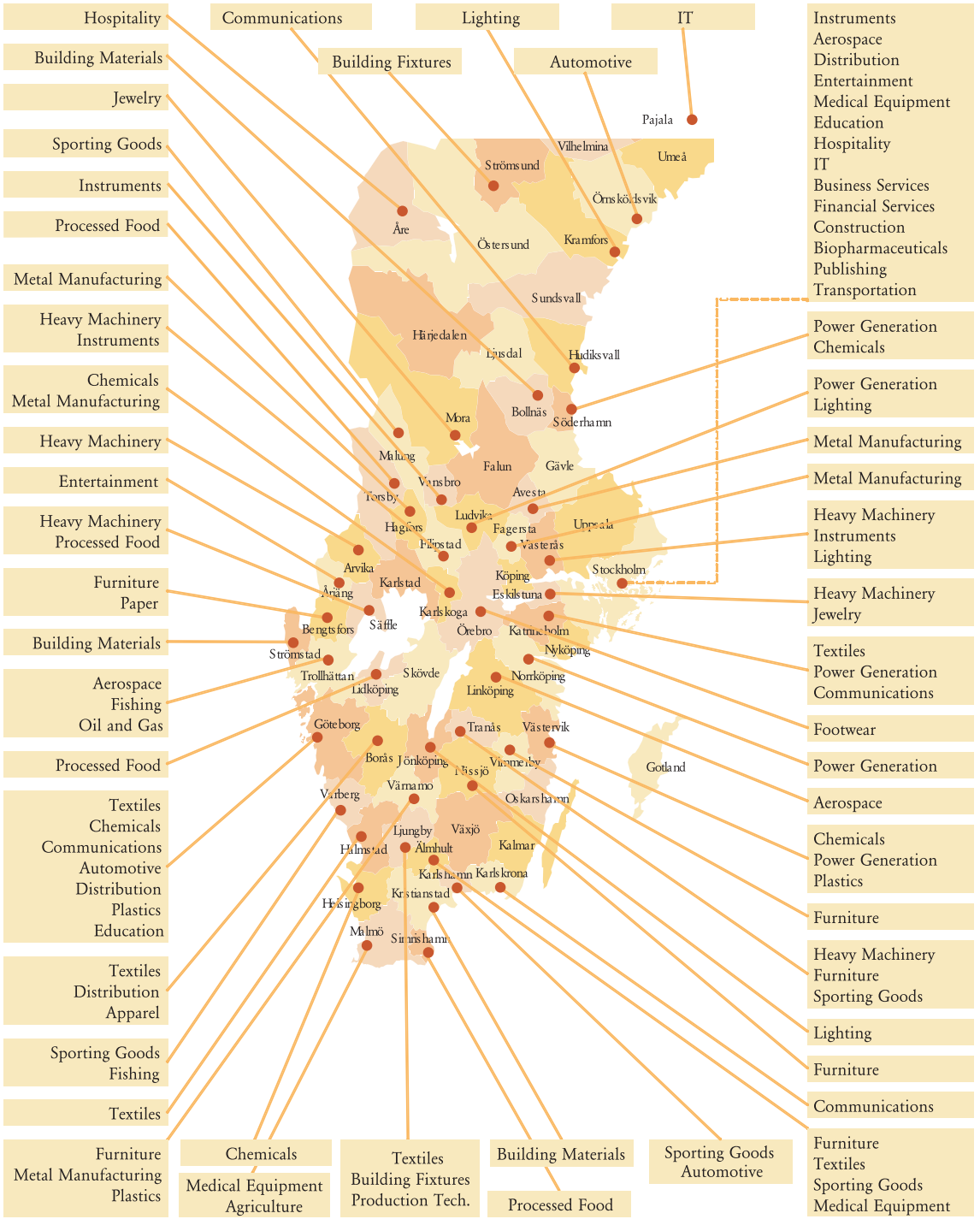
In some cases, there are clear regional patterns where several adjacent labour market regions are prominent in a certain industry cluster. One example is the aerospace industry in the Mälar region, around Linköping and in the Gothenburg region. Unsurprisingly, the two industry clusters Textiles and Apparel show similar patterns of localisation. There is a degree of a spread, but the industry is centred in South Sweden and the centre of gravity is still to be found in the Borås region.

Sweden's sixth largest cluster is Automotive, comprising cars, buses and lorries in addition to surrounding suppliers. Some 75 000 people work in this cluster, which has its focus in West Sweden and in Småland. There are also some companies in the Mälar region and a minor cluster around Umeå. Metal manufacturing, comprising almost 100 000 jobs, is fairly evenly spread in Sweden, mainly in Central and Southern Sweden.

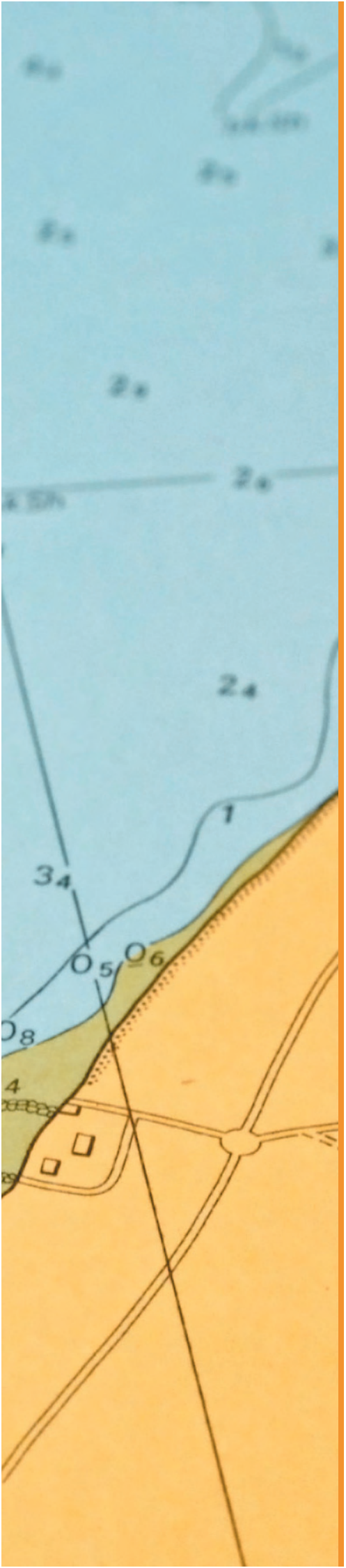
Furniture (wood laminates etc.) is a medium-sized cluster with almost 20 000 employees. The focus is to be found in Småland and Västergötland and in a few regions in North Sweden. Lighting and electrical equipment is located in the Bergslagen region (Västerås, Köping, Fagersta, Ludvika) and in Southern Sweden. Power generation and transmission is concentrated in the same region in Bergslagen, and to Norrköping (Finspång) and Söderhamn. Medical devices (medical apparatus, wheelchairs, etc.) shows clusters in Skåne and around Stockholm. The pharmaceutical industry is highly concentrated in Stockholm/Uppsala and in Skåne. This cluster is fairly large with some 20 000 employees.

One of the smallest clusters in Sweden is Footwear, at present employing less than 500 persons. It is centred in South Sweden, around Örebro and in Åre. Sporting and children's goods is another small cluster, with foci in Småland and Malung.

During our work, we have identified some 100 local clusters which are or could become Sweden's "Hollywoods", i.e. leading local industrial environments and innovation hotbeds capable of developing goods and services for an international market.



Only 50 of Sweden's 81 labour market regions have these kinds of local clusters. Stockholm, representing about a quarter of Sweden's entire labour market, has 14 clusters, which is to be expected given the city's size. Gothenburg has seven and Malmö two. In North Sweden, only nine clusters can be identified: two in Söderhamn and one each in Bollnäs, Hudiksvall, Åre, Kramfors, Örnsköldsvik, Strömsund and Pajala.



2. INTRODUCTION

The use of concepts like “cluster” and “industrial systems” has moved to the forefront of business policy (for an overview, see Malmberg 2002.) This trend, which began in the 1990s, is now making an impact on Swedish policy making. New public authorities have been founded, and policy is increasingly contributing to creating innovation and development in the lattice of industry, academia and political agencies at various levels – the “triple helix”. Of central importance in this process is the understanding that development and innovation to a great – and possibly increasing – extent take place through cooperation and interaction in local clusters.

In order for the political agencies to be able to refine their work, a thorough mapping of Swedish clusters is required. This can be carried out from two diverging starting points: a comprehensive statistical study or a qualitative study based on interviews and contacts in the clusters. In this first report, we have chosen to carry out a statistical analysis of clusters in the Swedish business environment as a whole (industry clusters) as well as clusters in local labour market regions (local clusters).

Underlying our work is a model developed by Professor Michael E. Porter of Harvard University (www.isc.hbs.edu). Professor Porter has kindly allowed CIND to use the codes required for making comparable cluster maps. After the USA and Canada, Sweden is the first country in the world where the cluster keys are tested. The authors would like to sincerely thank Professor Porter who has thus been pivotal in making this study possible.

2.1. FROM MACRO-LEVEL TO MICRO-LEVEL POLICY

A good macroeconomic environment is a necessary but insufficient precondition for the development of successful clusters in a country. The microeconomic preconditions for dynamic clusters are based on specific institutional factors, which drive business strategies, the starting-up of new companies and competition. Furthermore, access to sophisticated and specialised production factors (particularly human capital), proximity to and contact with demanding and leading customers internationally as well as close links to a number of supporting industries and suppliers of specialised goods and services constitute the foundations on which a cluster grows.

The emergence of fixed and mobile telecommunications in Sweden is a good example of the outcome of a new microeconomic environment in the 1980s and 1990s. A new reg-

ulatory framework, increased competition, the founding of new businesses and active measures contributed to an immense upturn. This process of renewal was in its turn based on a strong cluster of more than a hundred years' standing in telecommunications and a cluster of seventy years' standing in radio and mobile telephony. This should be kept in mind in a time when more and more countries and regions try to build new clusters rapidly.

2.2. GLOBALISATION AND INCREASED IMPORTANCE OF LOCAL CLUSTERS

Global realities make themselves known in our everyday lives and in the workplace. High technology products, both tangibles and intangibles, are traded globally, as are bulky raw materials like timber and pulp. Internet portals, advertising agencies, banks, insurance companies, restaurant chains, waste management companies and other service businesses are rapidly expanding their international networks, with concepts being created in one part of the world and marketed in a global marketplace. New patterns of manufacturing and trade are emerging, and businesses split their value chains according to the comparative advantages of countries.

The changed patterns have been made possible by the fact that both businesses and individual consumers now have dramatically increased access to information, goods, services and capital from the entire global market. Knowledge production is also starting to take place in increasingly global networks with software developers shaping new technologies in virtual groups via the net. In other words, we are seeing a completely new global mobility in the markets for goods, services, capital and production factors.

However, this perception of globalisation is only partially true. Global markets work well for standardised, preferably digitised information, for standardised services, production equipment, standard components and raw materials. Where rapid change and continuous innovation are central driving forces, proximity to sophisticated customers, leading competitors, prominent universities and training facilities, trust and speed are crucial. While physical capital moves easily, human capital is sluggish and social capital does not move at all.

With this increased globalisation, it is justified to say that we are, paradoxically, seeing increased local specialisation. Above all, labour markets and "social capital" are mainly local. Social capital can be seen as the institutional glue emerging between individuals and organisations in a local context. This glue in turn serves as the basis for firms' renewal and innovation processes, which largely take place through daily contacts, in a spirit of mutual trust and in formal and informal networks. The advantages of local systems where players not only have regular planned meetings but, perhaps more importantly, meet spontaneously , is that they can more easily manage uncertainties surrounding new ideas in trusted relationships. Furthermore, the search for solutions is facilitated by trial and error and through frequent contacts. The closeness and intensity of the contacts also increase the possibilities for flexible specialisation and rapid retargeting. Finally, flow is boosted by so-called silent knowledge through the emergence of a common culture and a common language based on, for example, common schooling.

Are these local phenomena dying out and is it only a matter of time before they also go global? There are indications that this is not the case, but rather that the local context may actually be increasing in importance as globalisation continues. Above all, this applies to firms' innovation processes (but not scientific research, which has a large global component). The simpler and more inexpensive the flow of information, goods and services, the greater the possibility for local environments to be linked to the whole world. In other words, it is not a drawback to be situated in a local innovation system, provided it is fully linked to the global market. In addition, in a world of global flow of standardised goods and services accessible to all, it is becoming more and more important to be an insider in leading local environments, such as Silicon Valley or Stockholm's Wireless Valley.

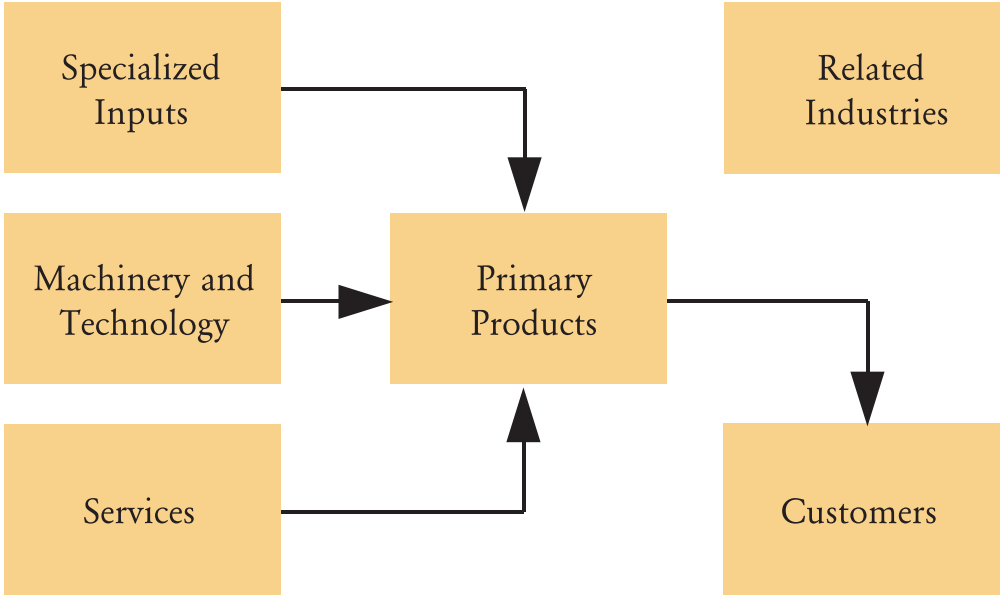
2.3. CLUSTERS AND INDUSTRY DYNAMICS

An important part of business dynamics takes place in clusters. A cluster consists of a number of related industries (see figure 1) linked through the flow of information, technology and other forms of knowledge (the flow of goods as such is often of limited importance, as this is becoming increasingly globalised).

Around the cluster core of firms and industries, we also find specialised institutions (organisations and regulatory systems), universities, political agencies and authorities and financial players. The main function of a cluster is to act as an innovation framework. Firms rarely create a continuous flow of innovations in isolation. On the contrary, research shows that a sustained innovation capacity is based on interaction with the environment. Frequently, firms facing technological or organisational problems turn to another enterprise nearby for help in developing a solution. The problem solving process developed between the two companies may then be the launching pad for a product which can later be marketed. This means that analyses of company contact networks and interaction patterns are of key importance if we wish to understand how innovation processes and industry dynamics arise.

The concept of clusters was launched by Michael Porter in the late 1980s (see Porter 1990.) In Sweden, one of ten countries in Porter's study, the concept was introduced in the book Advantage Sweden (see Sölvell, Zander and Porter, 1993.) The cluster concept focused on business and the links between different industries (customer–supplier, technology links etc.) Clusters were identified based on the companies supplying finished main products, but also included industries producing important production inputs (raw materials, services, machinery), buyers of finished products and technologically related industries. The driving forces underlying the development of a cluster were summarised in the so-called diamond model (see figure 2). Recently, the cluster concept has come to include several interlinked institutions and public authorities in the so-called triple helix – the nexus of industry, government and academia, i.e. the diamond model is becoming integrated with the cluster concept.

Figure 1. An industry cluster. The core of a cluster consists of firms in various industries linked to one another through the flow of knowledge and goods. Source: Sölvell, Zander and Porter, 1993.



Source: Michael Porter.

This industry dynamics model stresses that while the macro environment in a country is the same for everybody, industry clusters differ in terms of development, sophistication and international competitiveness. The greater the force of the diamond, i.e. the micro environment, the greater the change pressure and development power. Some clusters are driven by a high-powered engine, while the engine of other clusters has slowed down or never even started. The diamond model was developed during analysis of nationally based industry clusters, but it has also come to be regarded as a model for analysing and understanding industrial dynamics and competitiveness on other levels, both in large regions (groups of adjacent countries) and small regions such as parts of a country or individual city regions (local clusters).

2.4. SWEDISH CLUSTERS

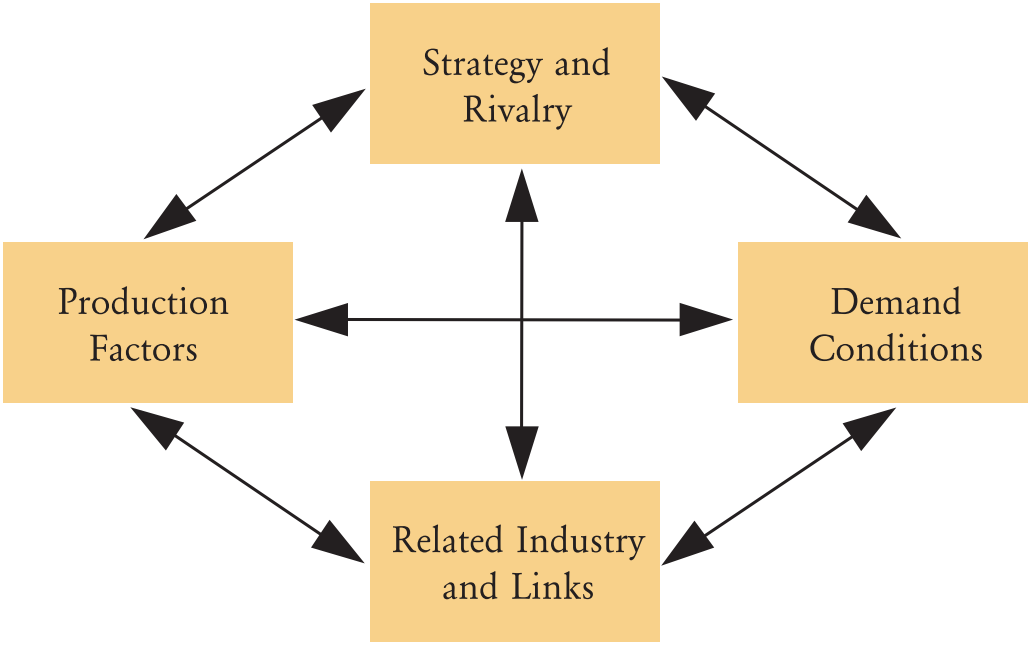
The world is full of well-known local clusters such as Hollywood in the motion picture industry, Silicon Valley in IT, Detroit in cars and the City of London in financial services. These are examples of some of the most dynamic and rich clusters in the world. Other clusters may be more static with thinner links. One case in point is the cluster of IT companies attracted to Scotland, an area which is known as Silicon Glen. These companies are located close to one another, but the links between them are weak and the diffusion effects are limited.

Sweden's heaviest industrial clusters are well known, such as electrical power (concentrated in Västerås and Ludvika), forestry/wood/pulp (focusing on packaging around Karlstad and on furniture in Småland and Västergötland), car manufacture (West Götaland) and IT/telecommunications (in Telecom City and Kista). There are smaller, thinner cluster environments in Bohuslän (small boats around Orust/Lysekil/Smögen, shipping in Skärhamn and Donsö). Another case in point is the hydraulics cluster around Örnsköldsvik. In Skåne, there is a major food cluster (around the freezing technology in Helsingborg).

There are also several examples of clusters past their prime. In Sweden, the rich shipbuilding cluster in Gothenburg and Uddevalla, textiles and apparel around Borås and the steel cluster in Bergslagen have all faded away (while leaving clear traces in some niches). One of our oldest clusters, the glass-blowing region of Småland, survives in a renewed form.

In the following description, we will base the analysis on 38 industry clusters based on linked SNI-coded industries (according to

Figure 2. Porter's diamond model. The diamond model describes the microeconomic sources of a cluster's competitiveness.



Porter's model).

2.5. METHODOLOGY

One of the points of the cluster concept is that it cuts across the borders of traditional business statistics sector breakdowns. Thus, the cluster concept draws our attention to the fact that there are links and dependencies between activities in different industries and that these links are important to industry dynamics. This is, however, also one of the problems of the cluster as a concept, as it makes it harder to do simple empirical analyses based on sector data.

In this report, we use a method which tries to work around this problem by bringing together industries which we have reason to assume are strongly linked to one another. Such aggregates or collections of industries are referred to as industry clusters. The model of aggregation, described in more detail below, has been developed in the USA and is being applied here to Europe for the first time.

The method used in this report to describe of Sweden's industry from a cluster perspective is therefore three-fold:

- Gather data describing Swedish industry at a fine-grained sector level
- Group industry data in relevant industry clusters
- Analyse industry clusters with respect to geographical localisation in local clusters.

As a data source, we have used the Central business and workplace register (CFAR) of Statistics Sweden. This register should cover all companies, public authorities and organisations as well as workplaces. This means that workers can be linked to the place where they actually work, not just to the place of their employer's main office. The register covered some 3 700 000 employees in 2003, corresponding to approximately 90% of all employed persons in Sweden.

The data in CFAR are based on information from the Patent and Registration Office, the National Tax Board, a postal management company called Svensk Adressändring, questionnaires and contacts with companies. Reliability is generally high for enterprises with more than ten employees. Enterprises not subject to VAT are underrepresented, while there may be some overcoverage due to enterprises not being taken off the records. We have used data from 1997 and 2002 in order to get a current image as well as a rough idea of the change in the number of employees in a cluster over time.

For the gender analysis, we have also used data from RAMS (Regional labour market statistics) from Statistics Sweden. The latest available data in this context refer to 2000, and we have used 1993 as a baseline. In other words, the gender analysis refers to a different timeframe than the rest of the analysis.

The measure we have used to describe the size of the clusters is the number of employees. This is the most robust and widely available indicator, and it is also a key aspect of cluster importance to the economy of Sweden. Employment also provides a good comparison between clusters and over time.

The industry cluster breakdown is based on the sector codes used in CFAR, i.e. Swedish Standard Industrial Classification (SNI92). These have been aggregated into groups using the industry cluster definitions provided by Professor Michael E. Porter. Porter's breakdown is the result of a multi-annual research project studying which industries tend to actually be located together and where it can be assumed that there are links in the shape of the flow of knowledge or goods, for example. Porter has identified 41 main industry clusters. These definitions, based on an American nomenclature (1987 SIC), have been transferred to the Swedish SNI92 system. Due to the short time at our disposal when preparing this report, we have had to accept several approximations in this transfer. The breakdown given below should therefore be considered a first estimate rather than a final result.

2.6. EVERYTHING IS NOT CLUSTERS

The first step in the breakdown is to identify industries that, for one reason or another,

are not relevant for a cluster-based study. This applies to three kinds of activities (see Table 1 on next page):

- Local activities. This group comprises private as well as public producers of goods and services which are not traded significantly over regional borders but must be supplied locally. Health care, retail trade and hairdressing are examples.

- Natural resourcebased activities. These are localised wherever there are natural resources. Farming and mining are examples of this kind of activity.

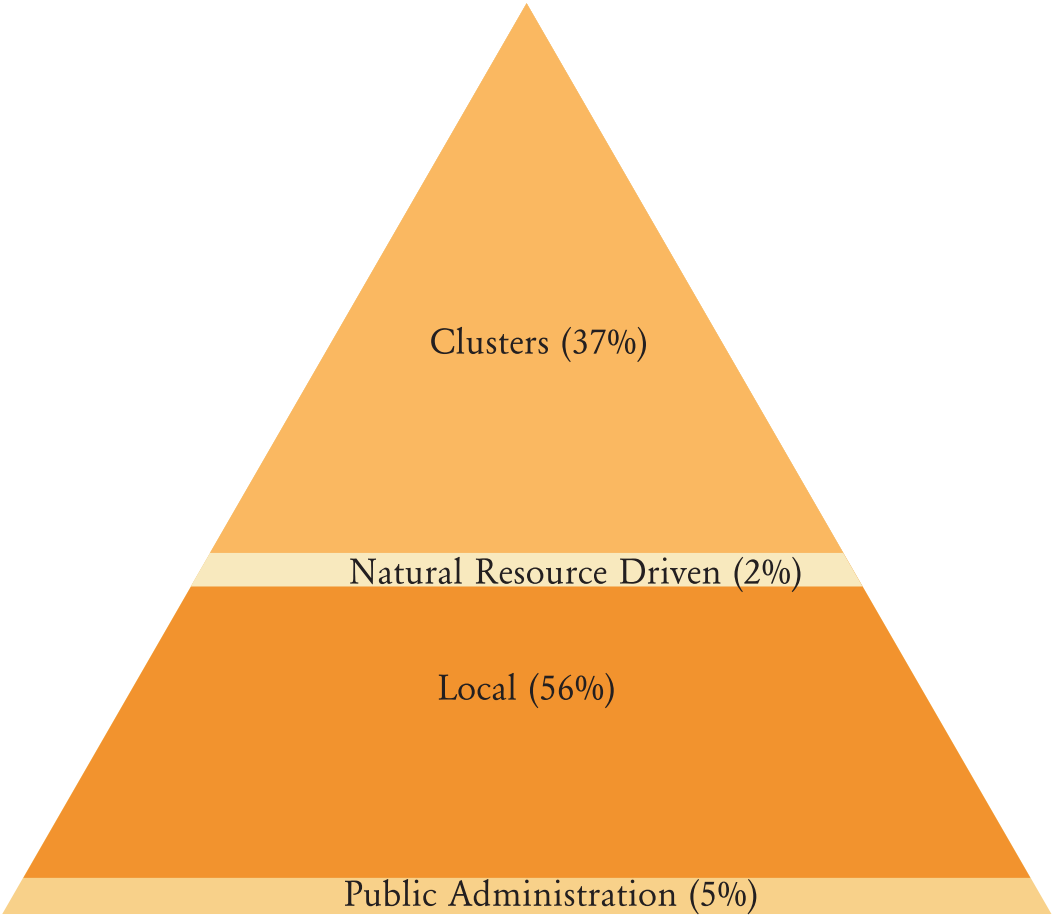
- Public administration. Some public activities, such as public administration and defence, are localised according to political decisions and very rarely because of cluster effects.

In total, the excluded industries comprise almost half of all SNI codes on the five-digit level. They also comprise a majority of the employees (see Figure 3). The different sectors have also shown different growth rates, as seen in figure 4.

Table 1. Industries not included in industry cluster breakdown. For many activities, a cluster analysis is irrelevant. Their localisation depends on other factors, i.e. they are traded locally and not inter-regionally, they are localised where there are natural resources or according to political decisions. Source: Michael E. Porter (unpublished material).

Excluded Industries	Examples
Local	Small-scale construction, groceries, retail, and many other forms of retail, restaurants, healthcare, hairdressing, primary and secondary education
Natural Resource-Based	Farming, forestry, pulp mills, mines, quarries
Public Administration	Public administration, law enforcement, defense

Figure 3. The cluster sector and other sectors



Local activities comprise considerably more than half of all persons employed in Sweden. Of these, health and dental care, primary and secondary education and social services employ some 900 000 persons. For the rest, this sector mainly consists of local services (such as restaurants, bank branches and hauliers), local retail, local construction and local public services (e.g. electricity distribution).

While the cluster sector is considerably smaller than the local sector, it has nevertheless accounted for greater growth. The local sector between 1997 and 2003 grew by 118 000 employees (a growth of 6%), while the cluster sector grew by 146 000 employees, reaching almost 1.4 million employees (a growth of 12%).

In the same period, both the natural resources-based sector (chiefly farming, forestry and mining) and the public administration sector (administration, law enforcement and defence) decreased.

2.7. THE CLUSTER SECTOR

After excluding these industries, the remaining industries are broken down into sector code groups according to Porter's system. In order to do this, a transfer must take place between the SNI system used in Swedish statistics and the SIC system used in American statistics and underlying Porter's definitions. Unfortunately, there is no simple transfer relationship between these systems (se Figure 5). The transfer must be done step by step, going from SNI via the European standard, NACE, and the UN standard, ISIC. Thus far, the transfer is straightforward, but between ISIC and SIC, there is unfortunately a many-to-many relationship rendering a simple transfer impossible. (In other words, one ISIC category may be mapped onto several SIC categories, and one SIC category may belong in several ISIC categories). For the purposes of this report, we have thus had to make some compromises and simplifications.

Figure 4. Number of employees by sector, 1997 and 2003. The majority of employees are to be found outside the cluster sector, but the cluster sector had greater growth in the period between 1997 and 2003, both absolutely and relatively, than local activities. Source: CFAR, Statistics Sweden.

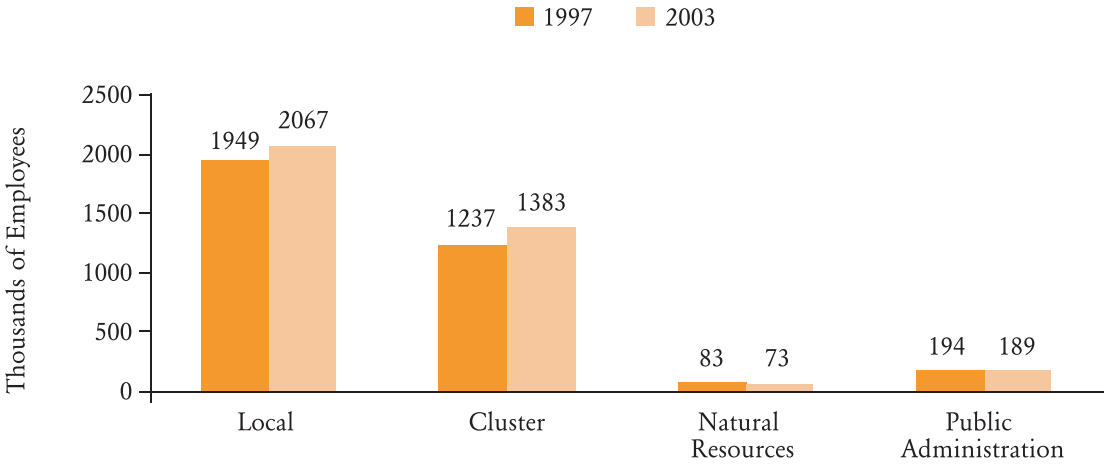
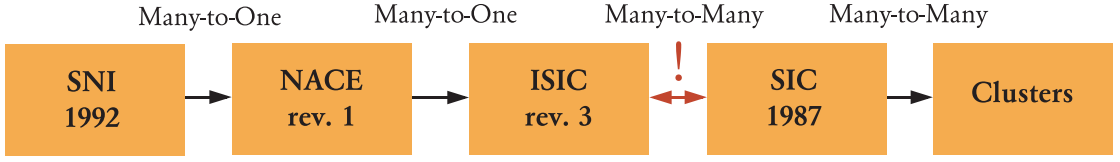


Figure 5. The relationships between the Swedish industry classifications and Porter's industry cluster definitions. There is no simple relationship between the Swedish industry classification and Porter's industry cluster definitions (referred to as "Clusters" in this figure).



The transfer between SNI and SIC has necessitated a few significant changes to cluster definitions. First of all, Porter's classification contains one industry code group for aircraft engine manufacture and another for aircraft and defence supplies. Due to the structure of the SNI classification, these two groups have been combined to form one single group. Secondly, in the SIC system a number of industry codes together form the groups "Prefabricated enclosures" and "Motordriven products". The level of detail in SNI is so low that most of these activities are included in other industry code groups. Only a few of them can be accounted for separately. As these groups are far too narrowly defined, their relevance is questionable and they have therefore been excluded from this report. Thus, we account for only 38 industry clusters, as opposed to Porter's 41.

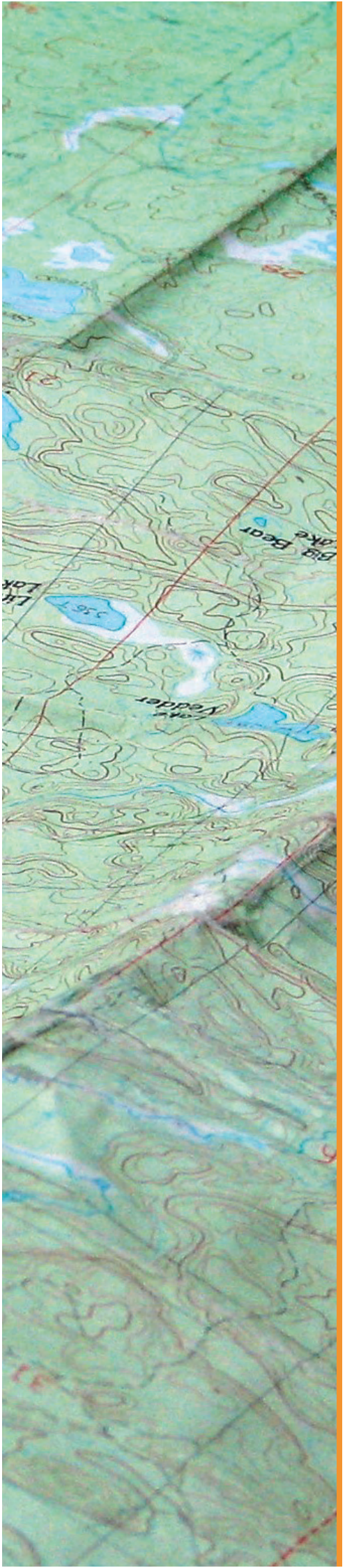
The remaining code groups comprise a varying number of SNI categories. At least one single and at most 37 five-digit SNI categories form one industry code group.

These problems, and a large number of similar problems of distinction, mean that Porter's system should preferably be processed further in order to fit Swedish and European conditions. However, that is work that cannot easily be fitted into the framework of the present initial mapping, so we have chosen to use a simplified transfer in this report and accept the resulting weaknesses.

The geographical breakdown follows NUTEK's LA regions (local labour market regions). This breakdown is based on municipalities, which are added to LA regions according to commuting flow. A municipality where more than 20% of the working population commutes out, or where more than 7.5% commutes out to any one municipality, is added to the municipality to which the greatest commuter flow goes. The composition and number of LA regions according to this definition varies from one year to another, but , based on 1996 commuter statistics, NUTEK has compiled 81 regions which are supposed to remain fixed in the long term. We use these 81 regions for this report.

LA regions are an extremely useful concept in cluster analyses. An important function of clusters is the exchange of knowledge made possible by several activities being located in the same place. The shorter the distances, the easier it is for this exchange to take place and the tighter the cluster is knit. To a certain extent it could suffice that the activities are located in the same country for the exchange to be facilitated, but there is an important limit on commuting distance. Activities that lie within commuting distance of one another can more easily exchange staff or set up meetings.

The LA region is therefore suitable as the smallest unit for a cluster analysis. Of course, this does not imply that a regional cluster cannot comprise several LA regions. (Cf. Section 4.2).



3. SWEDISH INDUSTRY CLUSTERS: A NATIONAL OVERVIEW

The method chosen generates data characterising the scope of 38 widely defined industry clusters in Sweden. These 38 clusters employ almost 1.4 million persons in Sweden (see Table 2.) The 38 clusters are different in many respects. Some are broad aggregates of several tens of industries, while others are narrower, consisting of only a few industries. In relation to the conceptual cluster definition discussed, it is probably the case that the biggest and broadest as well as the smallest and narrowest industry aggregates are the ones most likely to be problematic when considered as industry clusters.

The problem with the large, broad clusters is that they contain such diverse types of activities that there may be cause to question whether they really are linked industrial systems. In addition, when we come to show, as seen below, that some of the major industry clusters are widely geographically dispersed, there may be cause to think that they might as well be considered local activities or, alternatively, that they actually provide a support function other industry clusters rather than being industrial systems in their own right.

For the smallest clusters, the problem is different. Some industry groups which in the USA constitute large industrial systems are only insignificantly represented in Sweden. The extreme case here is the tobacco industry, which is large scale and has a clear cluster character in the USA, and which, in Sweden, only exists as a fragment within a specific niche: a site for the production of snuff in Gothenburg, with a subsidiary site in Borås. It is of course not reasonable to consider this a “Swedish cluster”, but for the sake of completeness we have nevertheless elected to let this virtually non-existent cluster remain in the account on the next page.

Table 2 Industry clusters in Sweden, 2002

	Empl.	Share of nat. empl.*	Work sites	Empl. per work site	Ac**
Business Services	196 857	5,30%	24 032	8	0,24
Transportation and Logistics	148 747	4,00%	5 609	27	0,13
Education and Knowledge Creation	118 374	3,19%	3 116	38	0,28
Heavy Construction Services	103 914	2,80%	10 628	38	0,11
Metal Manufacturing	99 858	2,69%	5 330	19	0,38
Automotive	75 710	2,04%	662	114	0,44
Financial Services	59 486	1,60%	3 235	18	0,28
Processed Food	58 157	1,57%	2 290	25	0,30
Forest Products	56 664	1,53%	1 648	34	0,42
Hospitality and Tourism	56 368	1,52%	6 941	8	0,15
Entertainment	54 274	1,46%	10 141	5	0,11
Production Technology	50 723	1,37%	2 192	23	0,26
Publishing and Printing	31 336	0,84%	3 122	10	0,16
Distribution Services	29 843	0,80%	3 179	9	0,31
Communications Equipment	25 678	0,69%	373	69	0,42
Building Fixtures, Equipment, and Services	22 793	0,61%	1 204	19	0,33
Information Technology	21 583	0,58%	1 422	15	0,24
Biopharmaceuticals	19 767	0,53%	133	149	0,57
Furniture	17 969	0,48%	945	19	0,50
Heavy Machinery	17 013	0,46%	492	35	0,47
Plastics	16 915	0,46%	481	35	0,39
Chemical Products	11 542	0,31%	274	42	0,48
Lighting and Electrical Equipment	10 836	0,29%	354	31	0,53
Aerospace Vehicles and Defense	10 519	0,28%	62	170	0,66
Medical Devices	10 339	0,28%	718	14	0,30
Textiles	10 074	0,27%	518	19	0,49
Analytical Instruments	9 758	0,26%	363	27	0,34
Power Generation and Transmission	8 111	0,22%	221	37	0,60
Agricultural Products	7 153	0,19%	843	8	0,34
Construction Materials	4, 219	0,11%	412	10	0,36
Apparel	2 873	0,08%	271	11	0,58
Fishing and Fishing Products	2 681	0,07%	291	9	0,61
Sporting, Recreational and Children's Goods	2 188	0,06%	137	16	0,57
Oil and Gas Products and Services	1 806	0,05%	40	45	0,58
Jewelry and Precious Metals	757	0,02%	116	7	0,67
Leather Products	449	0,01%	96	5	0,60
Footwear	387	0,01%	41	9	0,76
Tobacco	381	0,01%	2	191	0,86

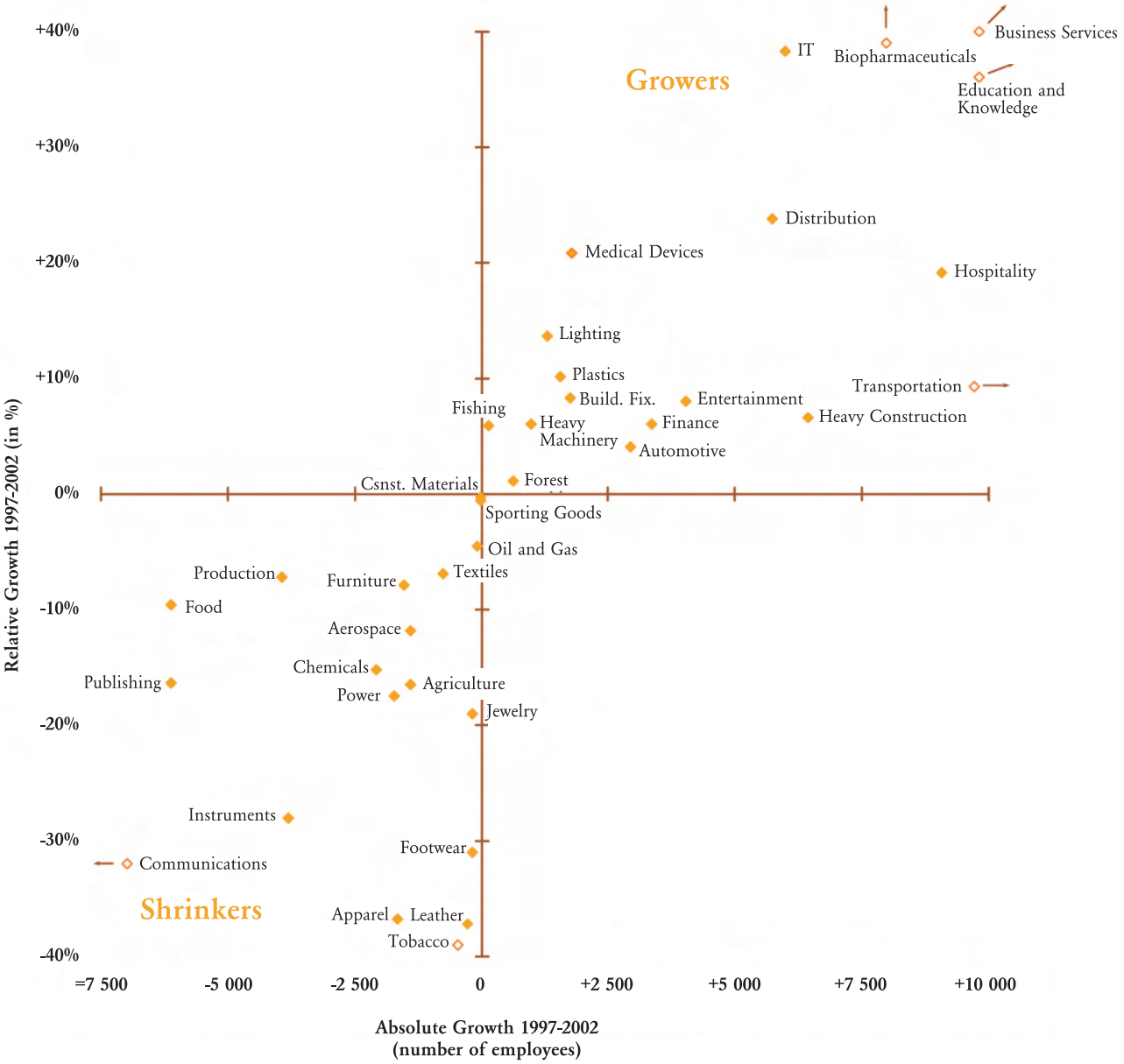
* The share of national employees is based on all employees, including those outside the cluster sector.

** Ac means agglomeration coefficient, a measure of how unevenly a industry cluster is distributed between regions (Cf. Section 4.1 on Agglomeration and spread) Source: CFAR, Statistics Sweden.

3.1. CLUSTERS LARGE AND SMALL

Bearing the above reservation in mind, we may now direct our attention towards the 38 clusters. The largest industry aggregates from an employment point of view all have a "support character". The largest cluster is Business services, employing approximately 200 000 persons. This cluster is dominated by consultancy activities, such as IT and management consulting. Transportation and logistics is the second largest, with some 150 000 employees. The industry aggregates immediately below them can be partly characterised as support functions too. The industry clusters most clearly associated with Swedish international specialisation and competitiveness – Metal manufacturing, Automotive, IT, Biopharmaceuticals, Power generation and transmission, etc. – are mostly to be found in the range of 10 000–100 000 employees. The industry aggregates comprising only a few hundred employees are, as seen above, so insignificant that they can hardly be considered Swedish industry clusters.

Figure 6. Absolute and relative growth in industry clusters 1997–2002. Source: CFAR, Statistics Sweden



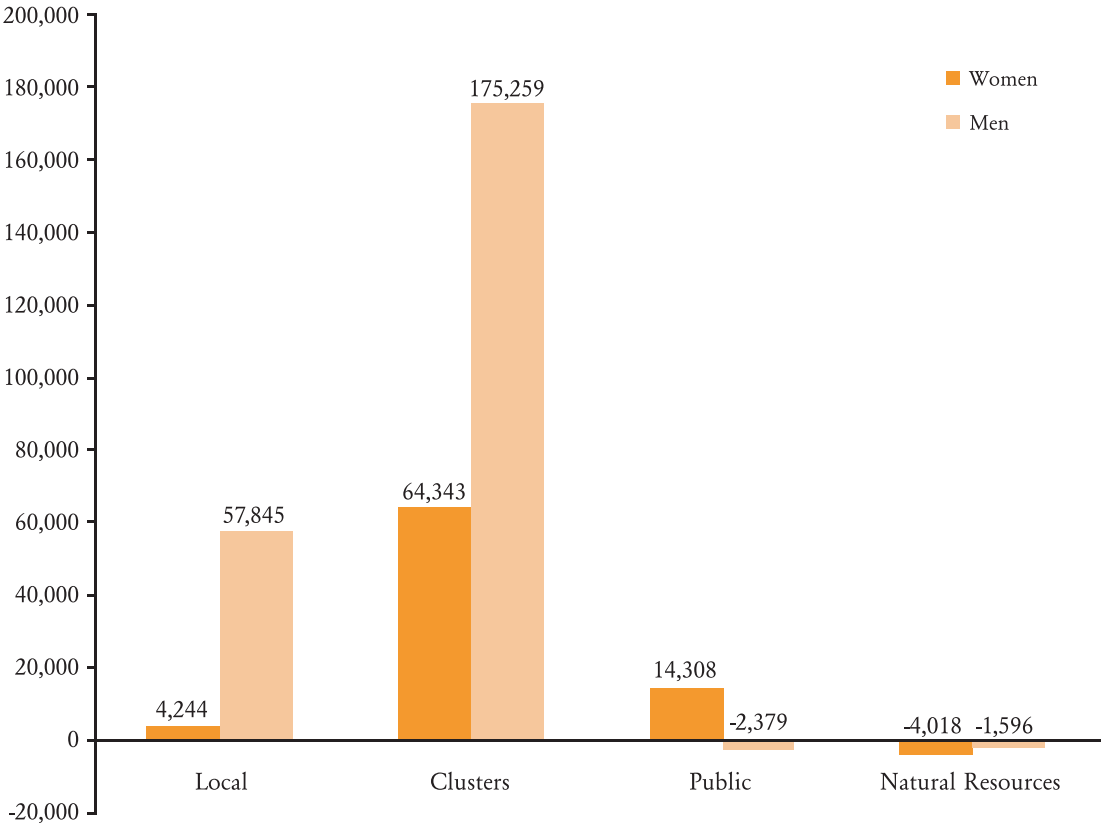
3.2. GROWING CLUSTERS

Globally, industry clusters have grown during the period of 1997–2003 by approximately 146 000 employees. This growth is unevenly distributed, however, and many industry clusters have contracted during this period. 19 of the clusters have grown during this period, with a total of 193 000 employees, while 21 have contracted with a total of 47 000 employees.

In most clusters, the number of women has decreased. Women's share has decreased both in growth clusters (lower right-hand quadrant) and shrinking clusters (upper right). In some clusters however, women have received more than their proportional share of growth (Heavy machinery, Power generation, Building fixtures, IT and Distribution), and in others, they have been hit by decline more severely than the men (Footwear, Chemical products, Aerospace and Jewelry and precious metals).

Accordingly, we see in the cluster sector that women have not received their "fair share" of growth. This is the case to an even greater extent in the local sector, where women proportionally speaking should account for some 60% of growth. Actually, women account for only 7% of local sector growth. In the public sector (public administration, law enforcement, defence etc.) however, the number of women has increased while the number of men has decreased. The natural resource-based sector has decreased by more than twice the number of women as men.

Figure 7. Change in the number of employed women and men by industry cluster 1993–2000.
Source: RAMS, Statistics Sweden.



4. THE GEOGRAPHICAL STRUCTURE OF INDUSTRY CLUSTERS

Let us now turn to the geographical distribution and structure of Swedish industry clusters. Thus far, we have discussed clusters as national bundles of industries, which we envisage as being characterised by internal links in the shape of the flow of knowledge and goods. However, the concept of clusters also has a more specific spatial dimension, since the idea is that the dynamics and development power in a cluster increase if the activities are also located close to one another, i.e. if the industry clusters are also agglomerated in individual labour market regions or adjacent regions. In this section, we will initially consider the location patterns of national industry clusters in a general manner. Using a simple yardstick, we will measure how the degree of spatial agglomeration or spread varies between clusters. Then we will illustrate, using a selection of maps, some types of regional patterns. Finally, we will study some local labour market regions which function as "gathering places" for groups of similar and related activities in various areas, i.e. the presence of what we call local clusters.

4.1. AGGLOMERATION AND SPREAD

In the two figures on the next page, we start from a calculation of what we call the agglomeration coefficient (Ac.) of the 38 industry clusters. This coefficient measures how the distribution of employment between regions (in this case, Sweden is divided into 81 local labour market regions, LA regions) in a given industry cluster differs from the distribution of overall employment (in all 38 clusters) between LA regions. By adding up all deviations from an imaginary even (proportional) distribution, a measure of the "skewness" of the localisation pattern is obtained. The more skewed the distribution (i.e. the closer to 1), the more agglomerated the pattern of localisation. The more even the distribution (i.e. closer to 0), the more spread out the pattern of localisation.

Figure 8 shows the agglomeration coefficient for the 38 industry clusters. We find that some ten industry clusters show coefficients of 0.6 or more, indicating that they are clearly overrepresented in some regions. The approximately ten clusters with a value between 0.5 and 0.4 are unevenly spread as well, while at the other end of the scale, the industry clusters with a coefficient of less than 0.2 are so spread out that they can hardly be expected to show any obvious examples of local or regional clusters . Note that the coefficient of the local sector is extremely low (0.02), confirming the local nature of these activities.

1 There are a few exceptions. For instance, Hospitality is evenly spread, yet shows a local cluster in Åre.

Figure 8. Agglomeration coefficient by industry cluster in 2002. Source: CFAR, Statistics Sweden

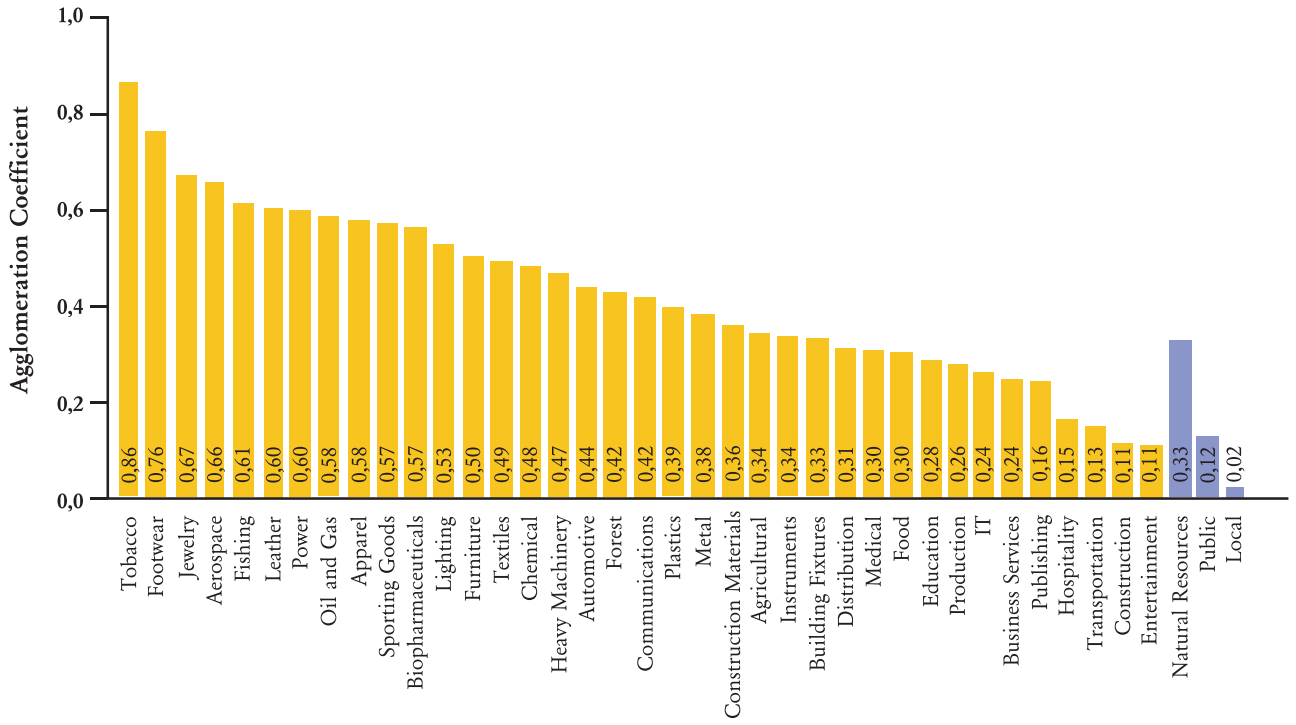


Figure 9. Agglomeration coefficient and number of employees by industry cluster, 2002. Source: CFAR, Statistics Sweden.

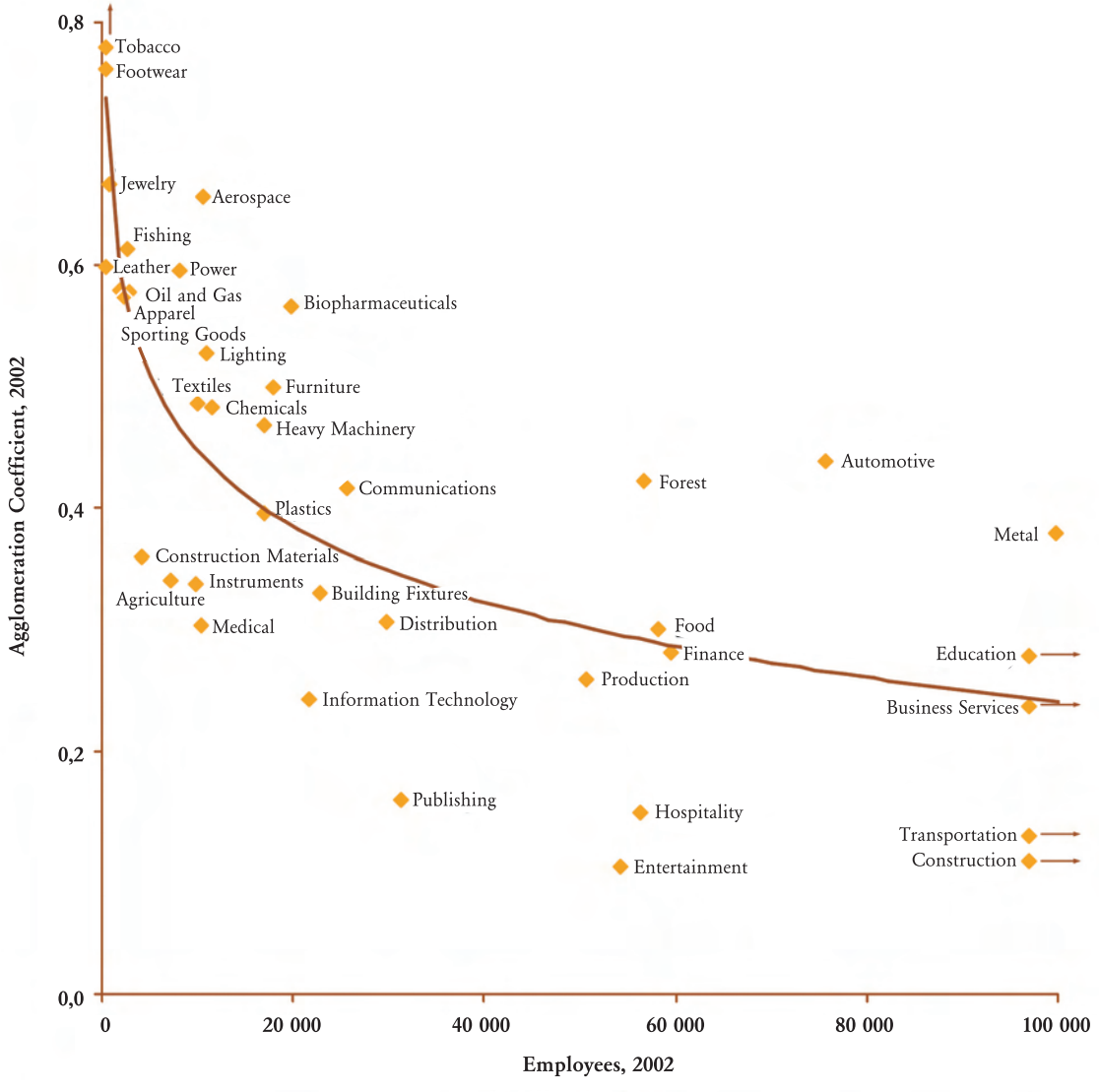


Figure 9 shows a pattern which complicates the image. There is an obvious correlation between the importance (the size) of a industry cluster and its degree of agglomeration as measured by Ac. Small industry clusters, with few employees and few work sites, generally score high. This is easy to understand if one imagines the extreme case where an industry aggregate consists of one single work site, in which case Ac by definition will approach 1. Unsurprisingly, the highest agglomeration coefficients are therefore to be found in the three very smallest industry aggregates. The industry clusters which seem to show the type of agglomeration coefficient of interest in this context are rather those evidencing higher values than would be expected from their size, such as Aerospace, Biopharmaceuticals, Furniture, Forest products, Automotive and Metal manufacturing.

4.2. SOME EXAMPLES ON THE REGIONAL DISTRIBUTION OF INDUSTRY CLUSTERS

In order to describe the localisation of clusters, we have elaborated a number of maps. Here we show how each region has specialised. We have called the measure we use the Location quotient, a measure which when equal to 1 indicates that the region has a percentage of a cluster work force consistent with its size (normal quotient values range from 0.5 to 2). If the value is 2, the region has twice the percentage expected, and if the value exceeds 10 the region has an extreme specialisation in a given cluster. Using area proportional circles, the maps also indicate industry cluster employment in the labour market region in question in absolute numbers.

The industry clusters of Sweden show varying patterns of geographical localisation. Some industry clusters are fairly evenly distributed across the country. In others, e.g. Furniture or Automotive, several adjacent LA regions form larger cohesive regional clusters. In yet other cases, we see how a limited number of LA regions form separate, more local clusters.

Accordingly, the furniture industry (wood laminates etc.) forms a clear regional cluster, spanning a cohesive belt of LA regions in Småland and West Götaland all specialising in this area.

Sweden's sixth largest cluster is Automotive (see map), which includes cars, buses and lorries in addition to surrounding suppliers. Some 75 000 persons work in this cluster which is focused in West Sweden and in Småland. The Mälar region is also home to a number of enterprises. There is a minor cluster around Umeå.

Metal manufacturing, comprising almost 100 000 jobs, is relatively evenly spread over Sweden, above all in Central and Southern Sweden (see map).

Lighting and electrical equipment is to be found in the Bergslagen region (Västerås, Köping, Fagersta, Ludvika) and in South Sweden (see map). This is a medium-sized cluster. Power generation and transmissionis concentrated in the same region of Bergslagen and in Norrköping (Finspång) and Söderhamn.

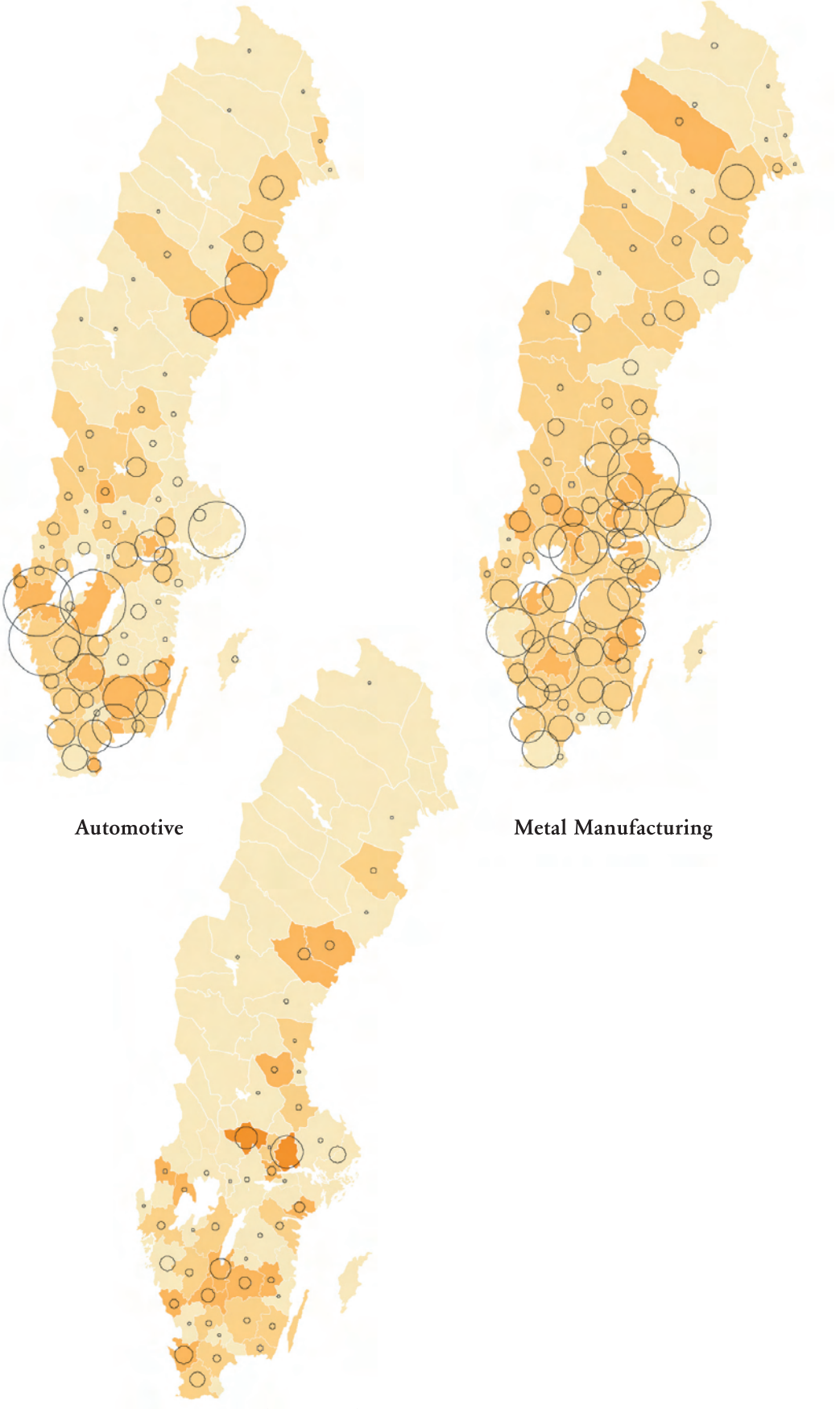
Medical devices (such as medical apparatus and wheel chairs) shows clusters in Skåne, the Stockholm area and the Norrland regions of Östersund and Umeå. The pharmaceutical industry is strongly concentrated in Stockholm-Uppsala and Skåne. This cluster is fairly large comprising some 20 000 employees.

Location Quotient

- > 10
- 2 to 10
- 0,5 to 2
- < 0,5

Employees 2002

- 5 000
- 2 500
- 500



Automotive

Metal Manufacturing

Lighting and
Electrical Equipment

Sweden's sixth largest cluster is Automotive (see map), which includes cars, buses and lorries in addition to surrounding suppliers. Some 75 000 persons work in this cluster which is focused in West Sweden and in Småland. The Mälar region is also home to a number of enterprises. There is a minor cluster around Umeå.

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Medical devices (such as medical apparatus and wheel chairs) shows clusters in Skåne, the Stockholm area and the Norrland regions of Östersund and Umeå. The pharmaceutical industry is strongly concentrated in Stockholm-Uppsala and Skåne. This cluster is fairly large comprising some 20 000 employees.

The Swedish aerospace industry (see map) is concentrated in three regions: in the Mälar region, the Linköping area and in Gothenburg (including Trollhättan). The cluster is medium-sized comprising some 10 000 employees. Another medium-sized cluster is Plastics and paint, concentrated in Gothenburg and Skåne (see map in Annex).

Unsurprisingly, the two industry clusters of Textiles and Apparel show similar patterns of localisation (see map in Annex). There is a bit of spread, but the focus remains in South Sweden, particularly in the Borås area. The Textile cluster is almost five times the size of the Apparel cluster.

The Processed food cluster and the Agriculture cluster show different patterns of localisation, with Agriculture remaining fairly evenly spread across the country (see map in Annex). The food industry, one of Sweden's ten largest clusters, is to be found in South and West Sweden and in the Stockholm area. Fishing and fishing products, one of Sweden's smallest clusters, is to be found along the West Coast and the Bay of Hanö, in addition to some regions in Norrland (see map in Annex).

One of Sweden's smallest clusters is Footwear, today employing less than 500 persons. The focus is in South Sweden, Örebro and Åre (see map in Annex). Sporting, recreational and children's goods is also a minor cluster, concentrated in Småland and West Dalarna.

Maps of all industry clusters are to be found in Annex 2.

4.3. LOCAL CLUSTERS

As seen earlier, industry clusters may exist on a national level. Metal manufacturing is an example of this type of cluster, represented in all parts of the country, and where it can be assumed that national cluster effects are present. In other industry clusters, there are regional cluster formations, where activities are concentrated in a certain part of the country. The Furniture cluster in Småland and Västergötland exemplifies this.

In some cases, however, it is justified to talk about clusters on a purely local level, i.e. within one given LA region. In many industry clusters, there is so much activity in one LA region that it can be considered a local cluster.

We have tried to map these local clusters by establishing two definitions. A local cluster is assumed to exist if one of the following two criteria is met:

- an LA region accounts for not less than 15% of the nation's employees in a industry cluster, and employs a minimum of 1 000 persons distributed over at least two work sites or

- an LA region has a location quotient of at least 10 for a industry cluster, and employs at least 100 persons distributed over at least two work sites.

The first criterion is intended to identify LA regions important in absolute terms, while the second one identifies regions with a relative specialisation within a given industry cluster.

Using these criteria, 99 local clusters can be identified. The result is shown in Figure 10. According to the first criterion, 30 local clusters can be identified and an additional 69 clusters answer to the second criterion.

Stockholm, due to its size, shows 14 local clusters, all conforming to the first criterion. With almost 25% of all employees in the nation, Stockholm can relatively easily account for more than 15% of several industry clusters. The same reasoning applies to Gothenburg, with 11% of the nation's employees. The smaller LA regions satisfy the second criterion instead.

Data underlying the map in Figure 10 are shown in Table 3.

Figure 10. Local clusters 2002

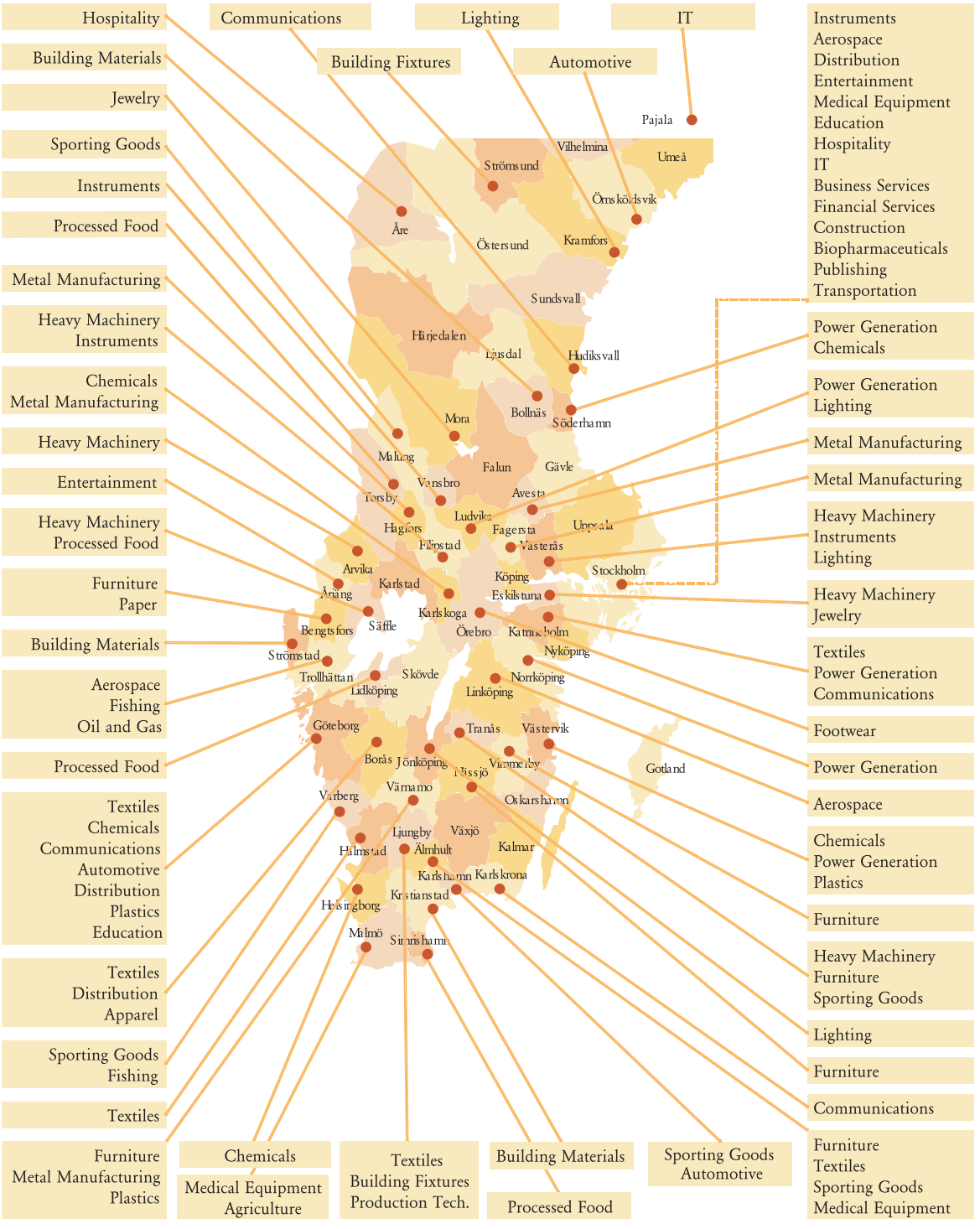
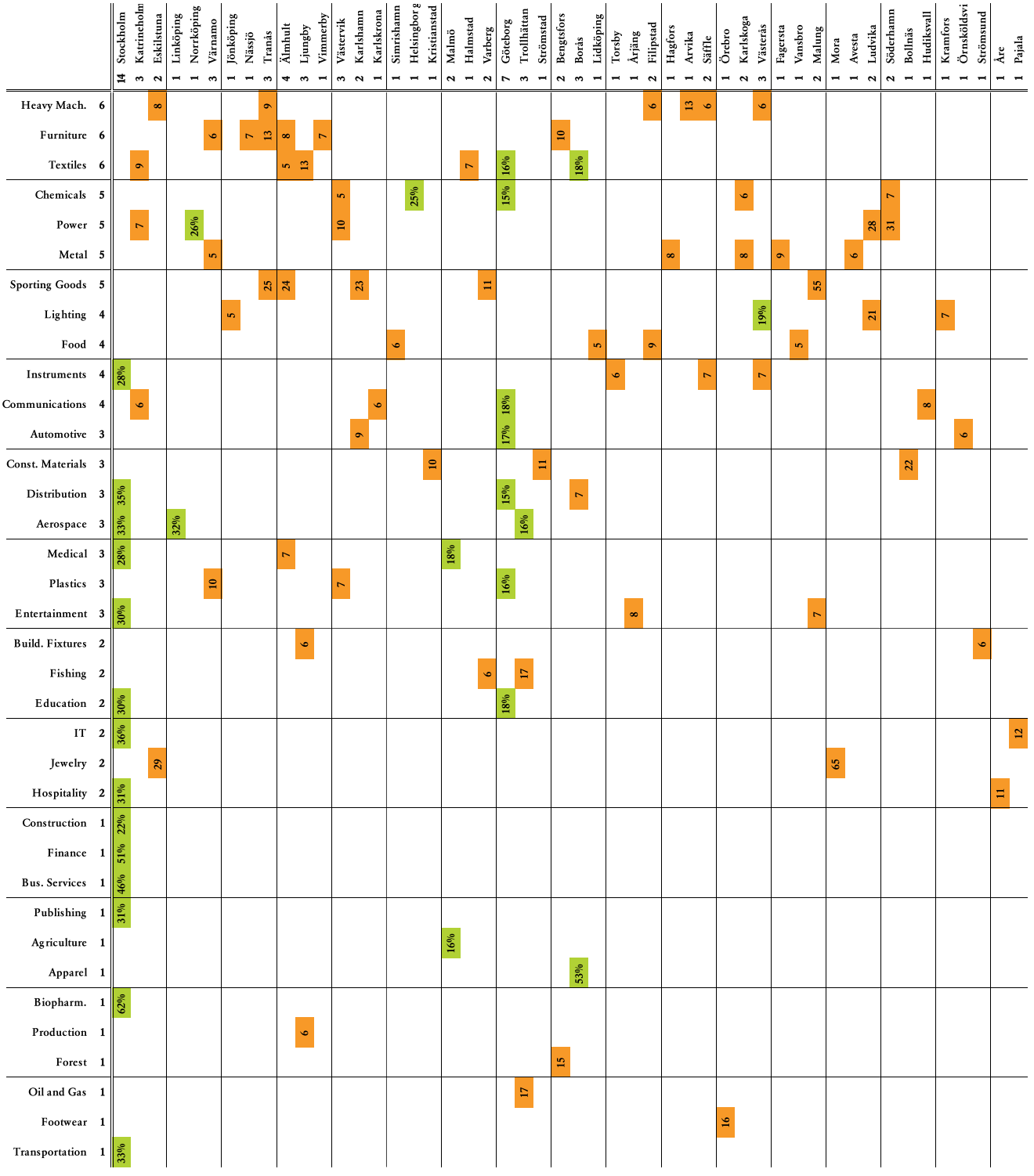


Table 3. Local clusters 2002. Green squares mark local clusters with at least 15% of employees nationally in a given industry cluster and at least 1 000 employees at at least two work sites. The number in the square indicates the region's percentages of employees in that industry cluster. Yellow squares mark local clusters with a location quotient greater than 5 and at least 100 employees at at least two work sites. The number in the square indicates the region's location quotient. Source: CFAR, Statistics Sweden.



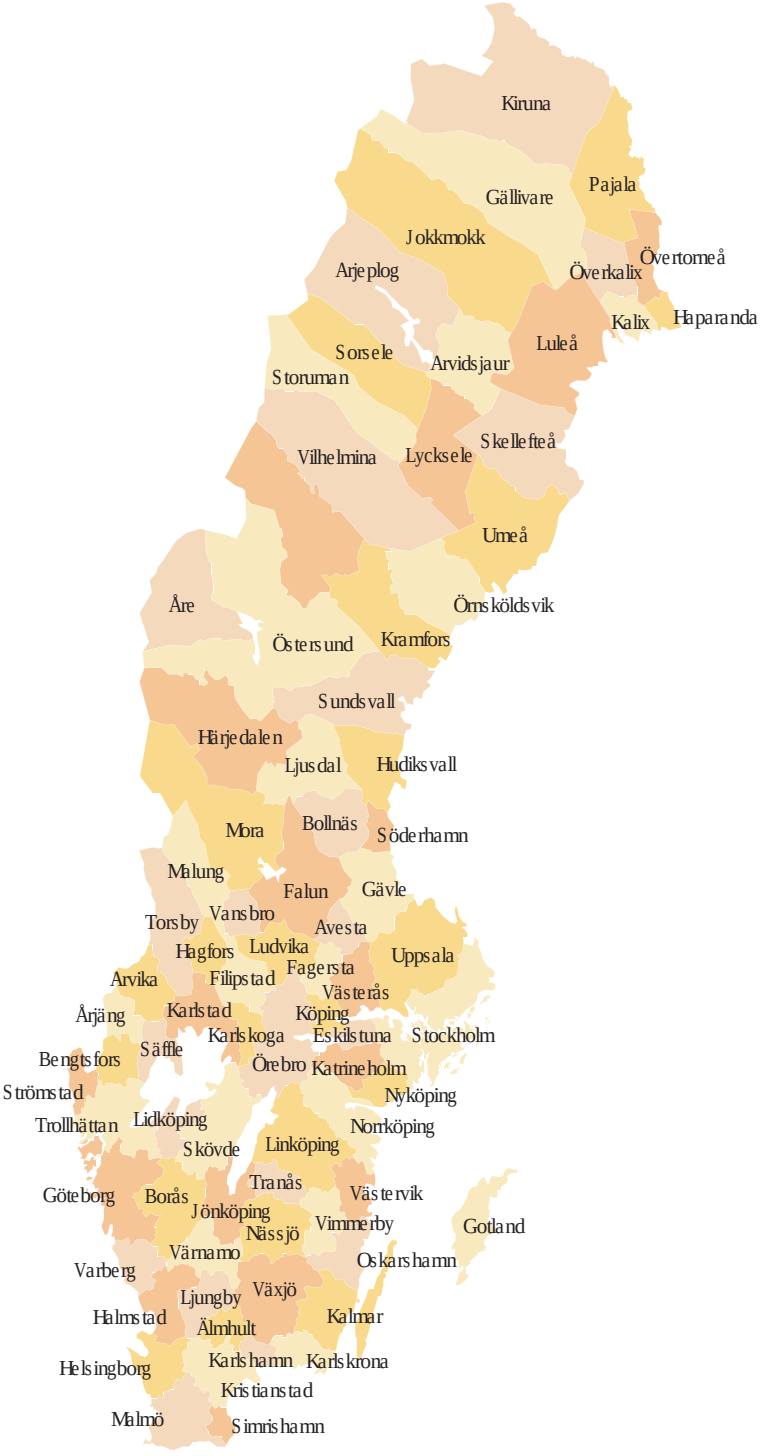
Of course, it can be said that the criteria used here to define what we consider a local cluster have been chosen arbitrarily. We maintain, however, that they are reasonable. No matter where the limits are drawn, there are always problems with marginal cases falling just below the limit. This applies to, for example, Bioharmaceuticals in Uppsala and Automotive in Skövde. In both cases we are dealing with local LA regions which we earlier placed in a wider regional context (the Mälar region Pharmaceutical cluster and the Automotive cluster in West Sweden respectively), but when considered as separate local LA regions they have neither the importance nor the degree of specialisation defined by our criteria.

In closing, we also would like to reiterate that the industry grouping used in this report for building up clusters is still far from finished. However, continued methodology development will in time give a more nuanced and correct image. The probable outcome is that none of the 99 local clusters identified here will fall away, but rather that additional local clusters will be added.

What the present report clearly shows is that it is possible and useful to create an image of regional and local cluster structures in Sweden using publicly available business statistics. This is important, as experience clearly shows that a cluster-based regional business and development policy has greater chances of succeeding if it departs from, builds on and is aimed at increasing dynamism in the competence and activity concentrations actually existing in the regions.

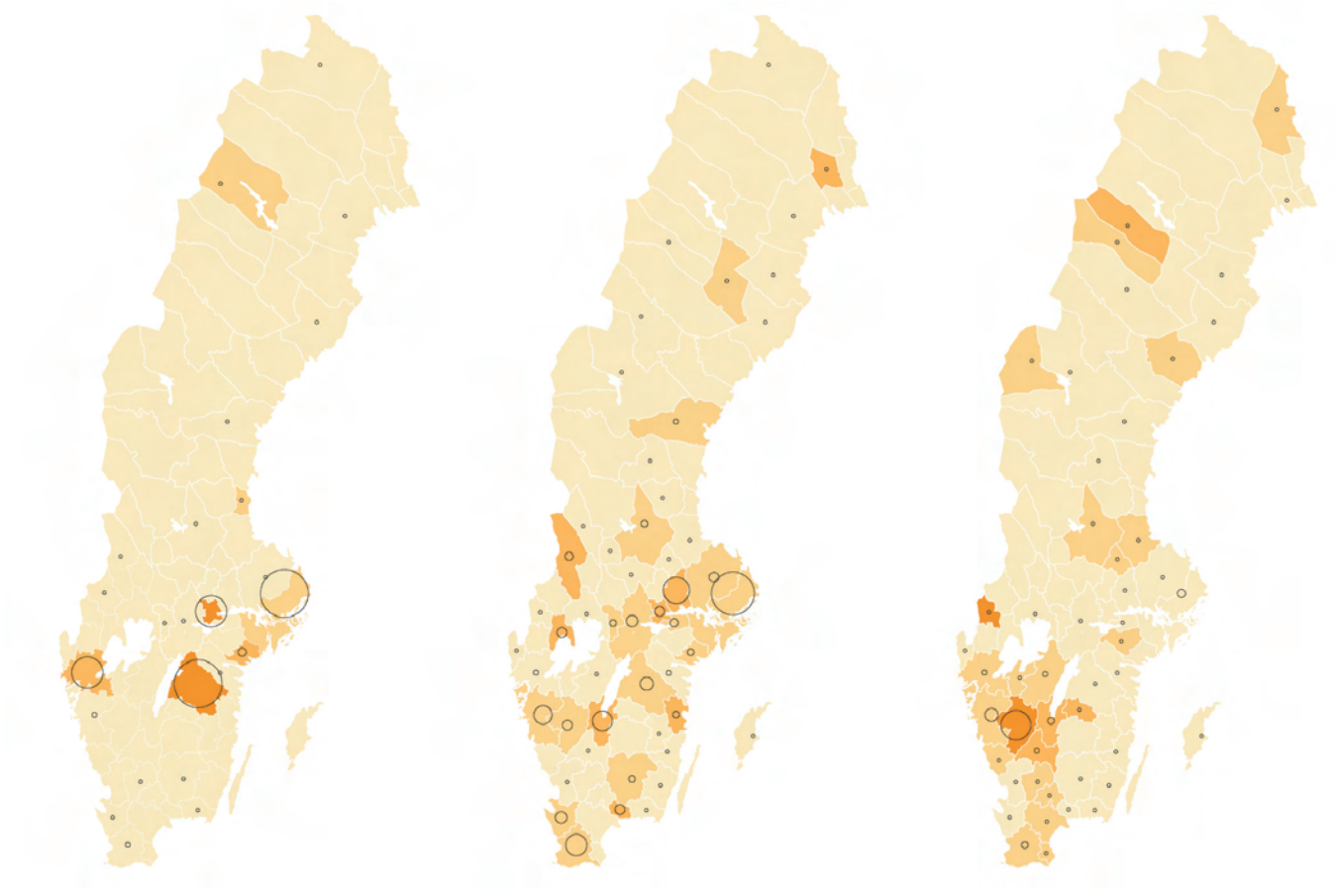
5. ANNEXES

5.1. REGIONAL MAP



5.2. CLUSTER MAPS

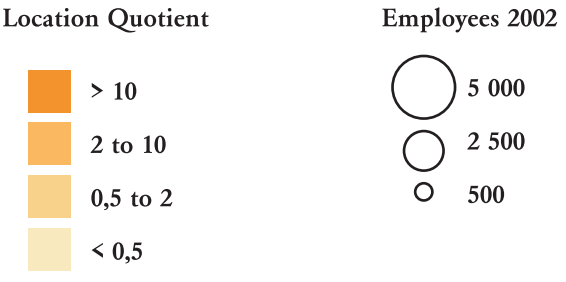
These maps indicate, for each industry cluster, the outcome of the statistical analysis based on data from the CFAR database of Statistics Sweden. Area proportional circles are used to indicate the number of persons employed in the industry cluster and colour denotes the location quotient.

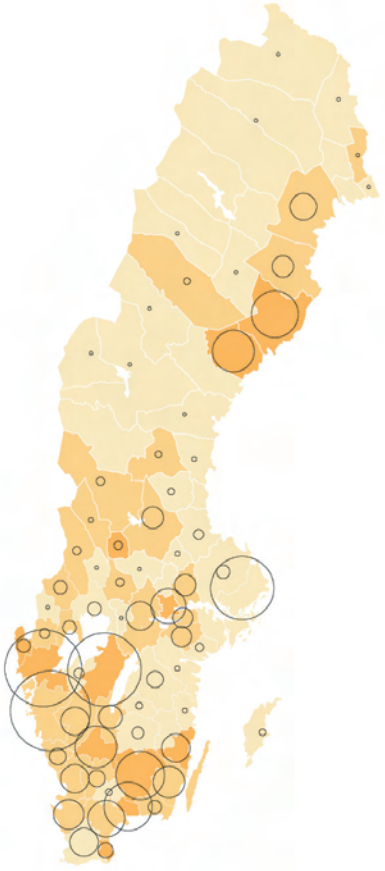


Aerospace

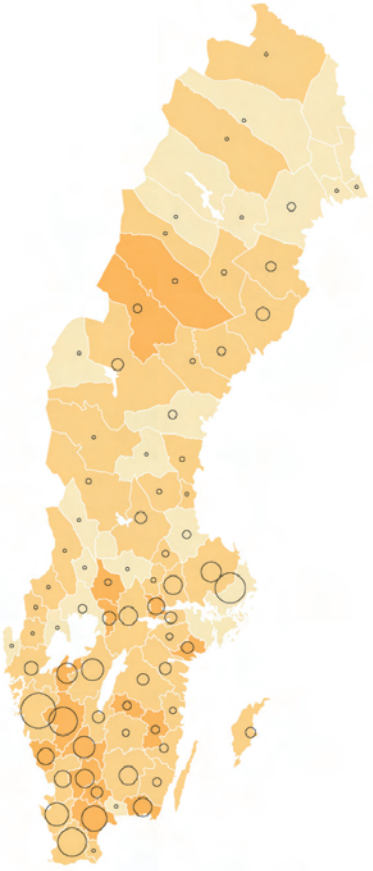
Analytical Instruments

Apparel

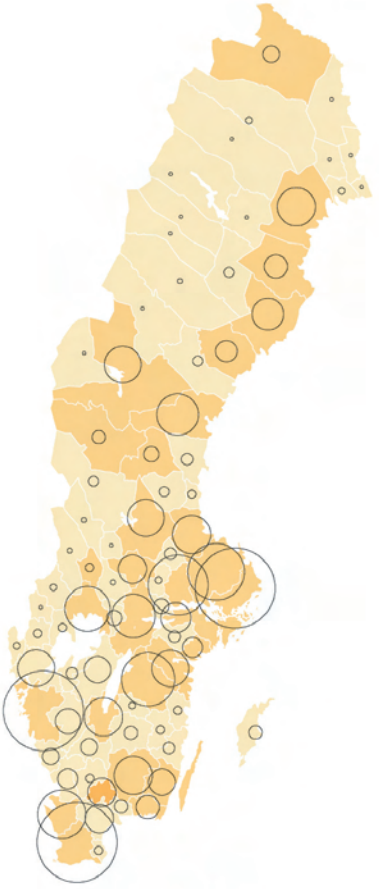




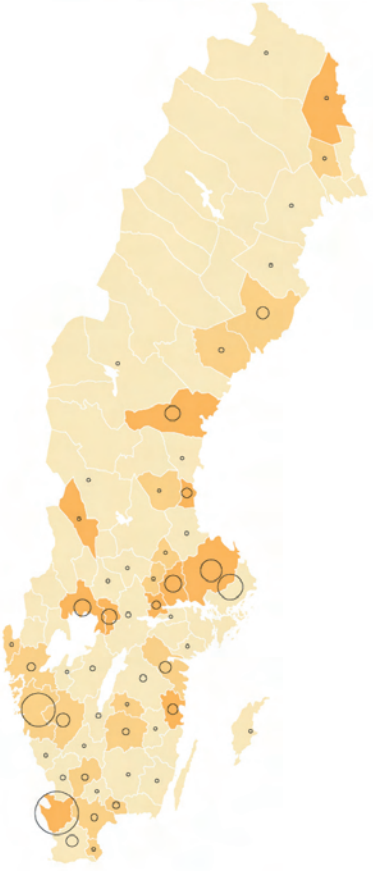
Automotive



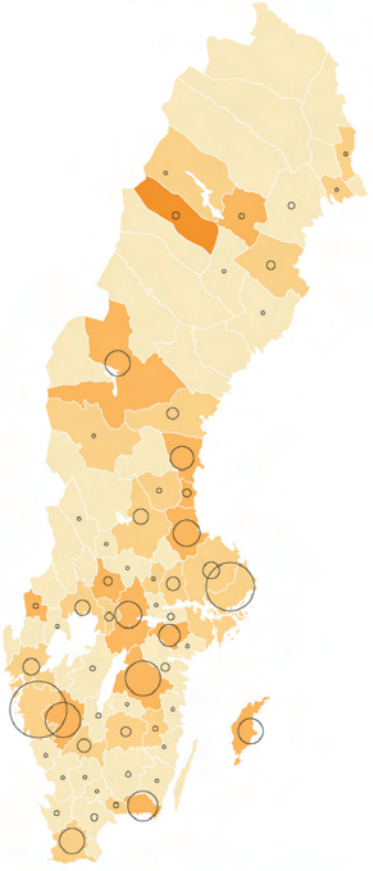
Building Fixtures



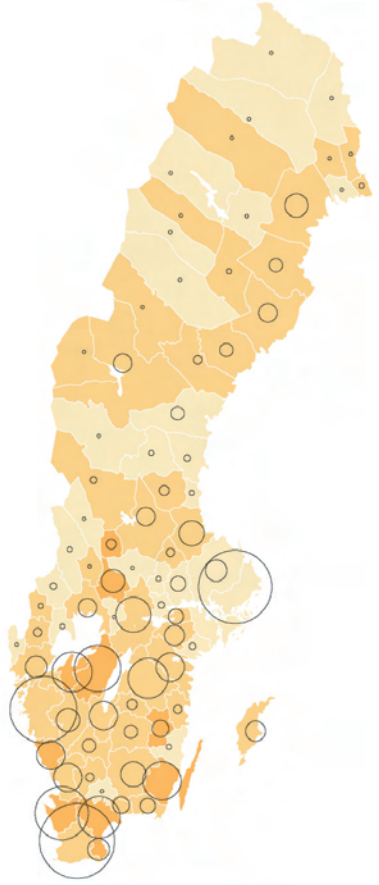
Business Services



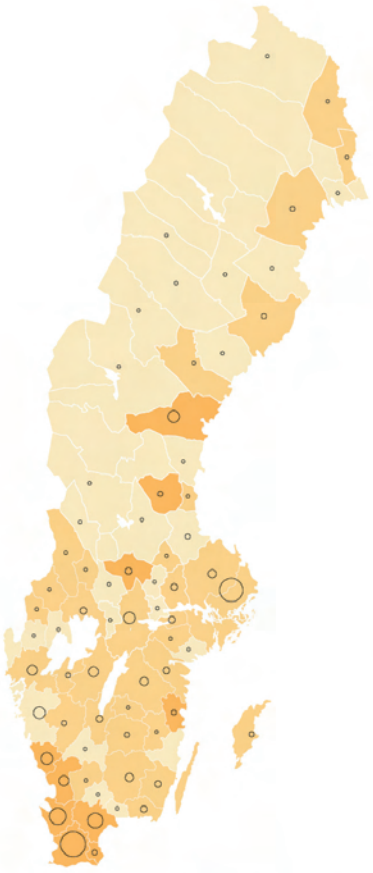
Chemical Products



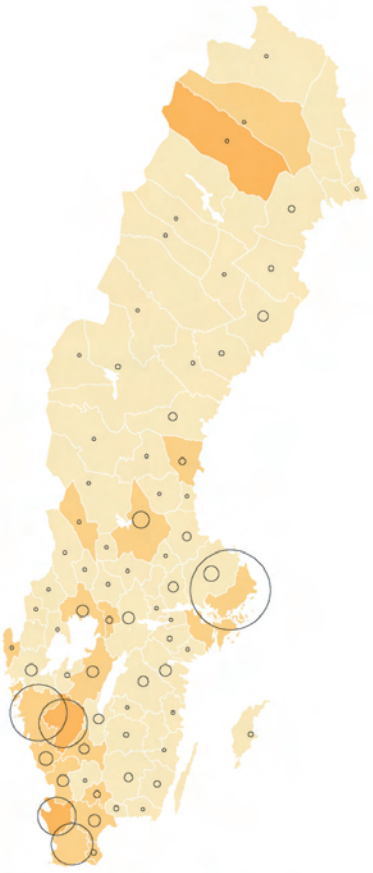
Food



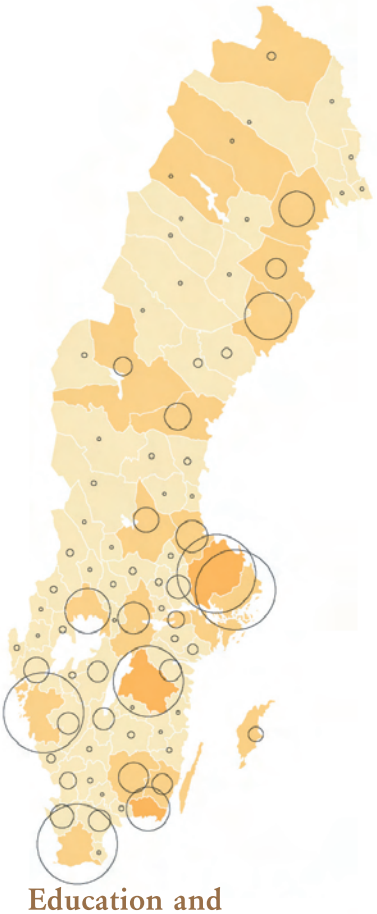
Communications Equipment



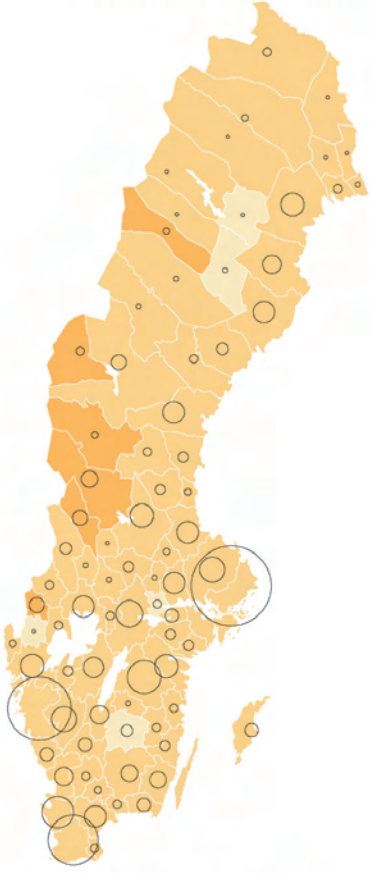
Agricultural Products



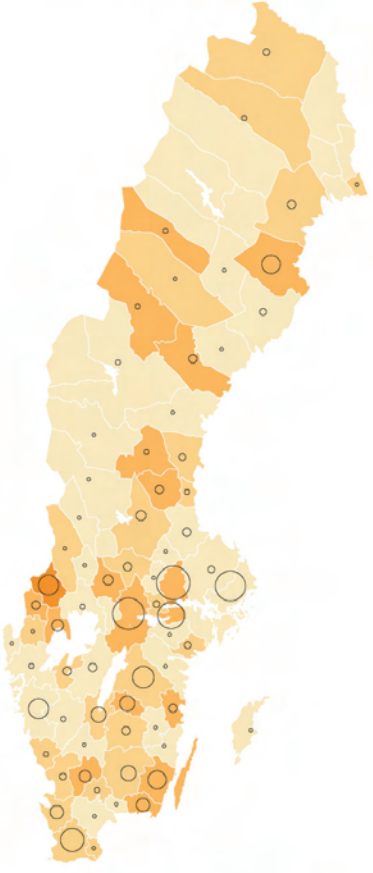
Distribution Services



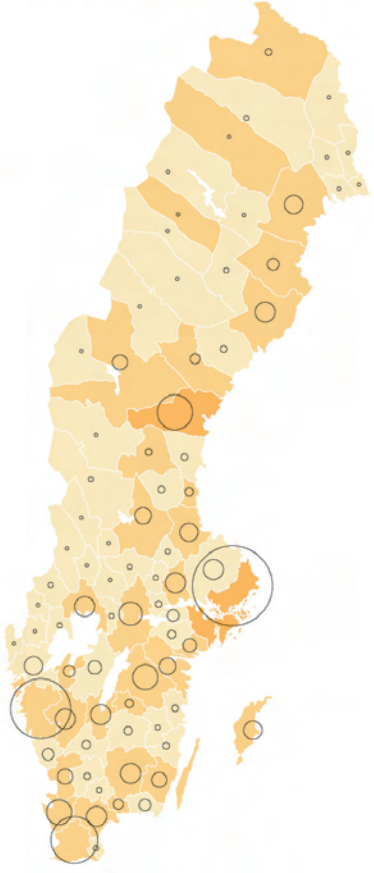
Education and
Knowledge Creation



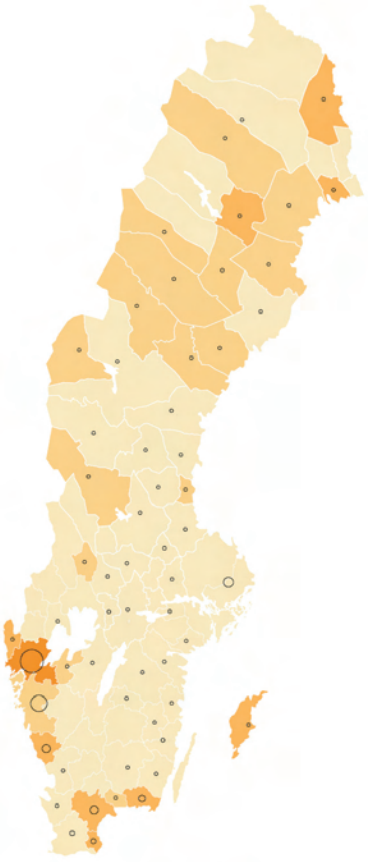
Entertainment



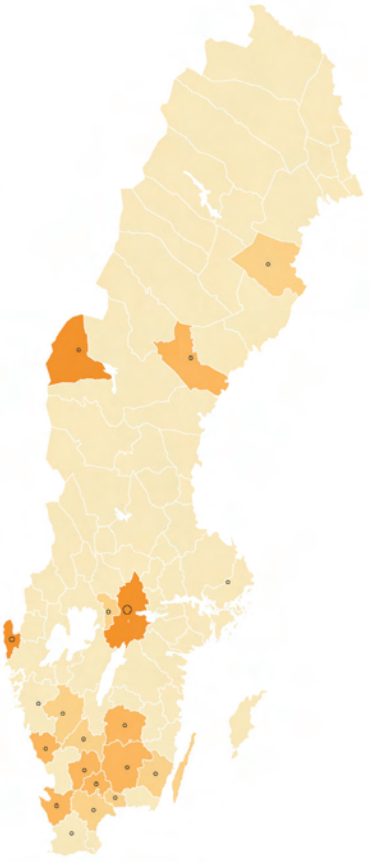
Heavy Machinery



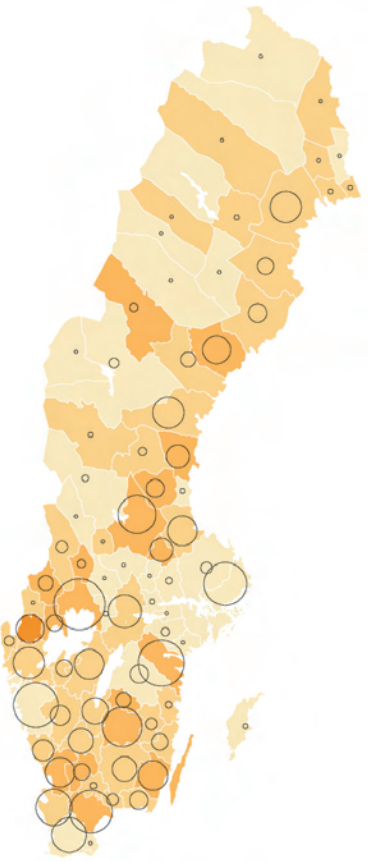
Financial Services



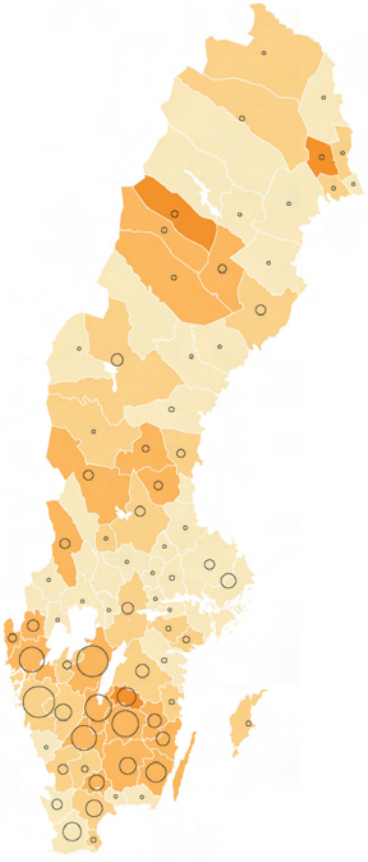
Fishing



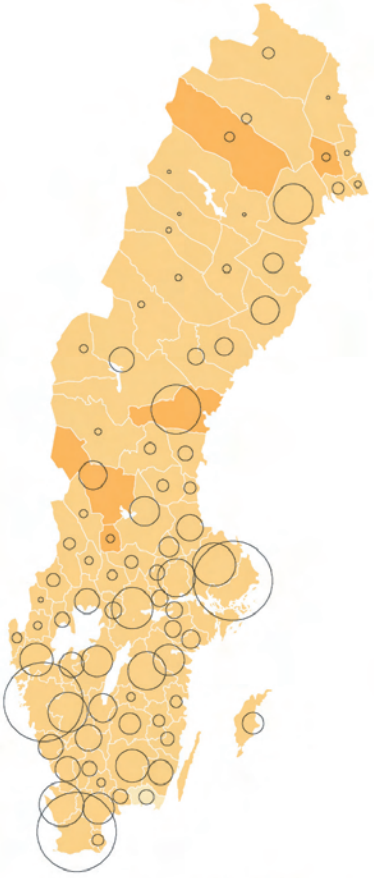
Footwear



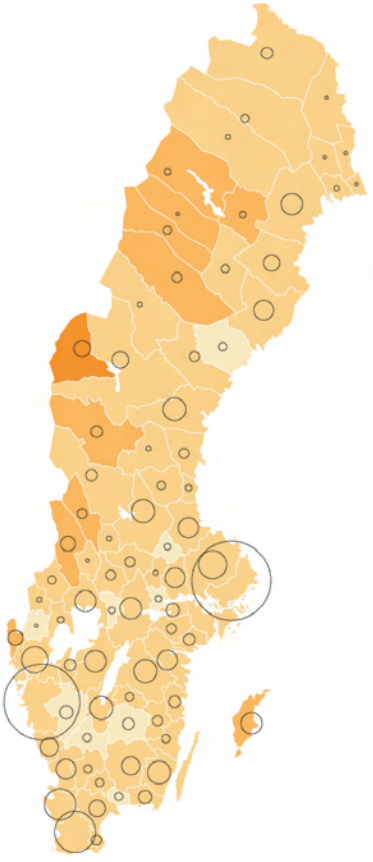
Forest Products



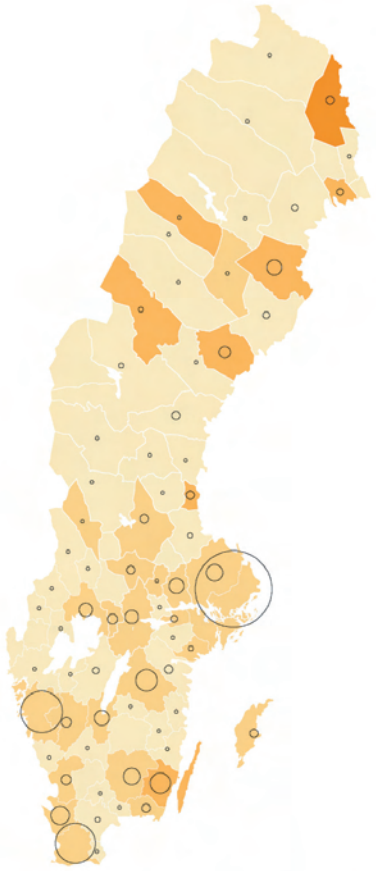
Furniture



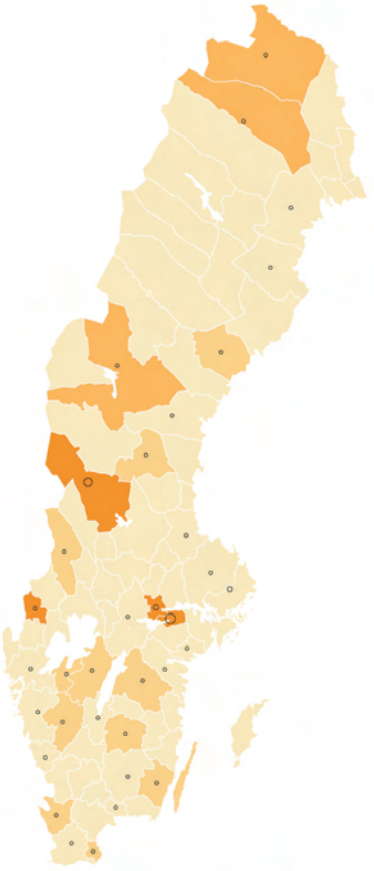
Heavy Construction



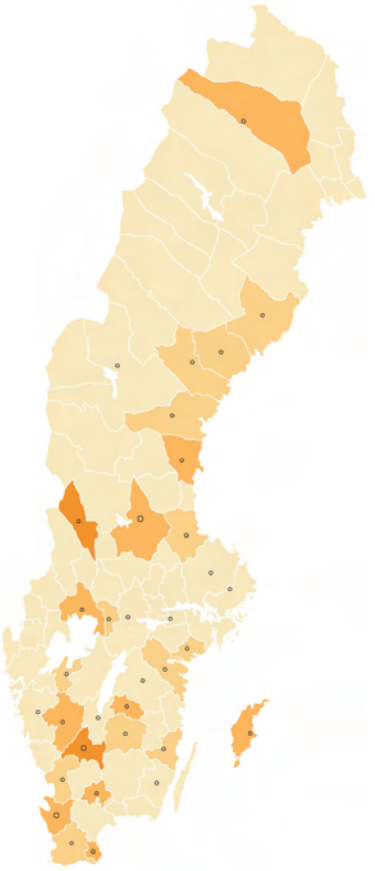
Hospitality and Tourism



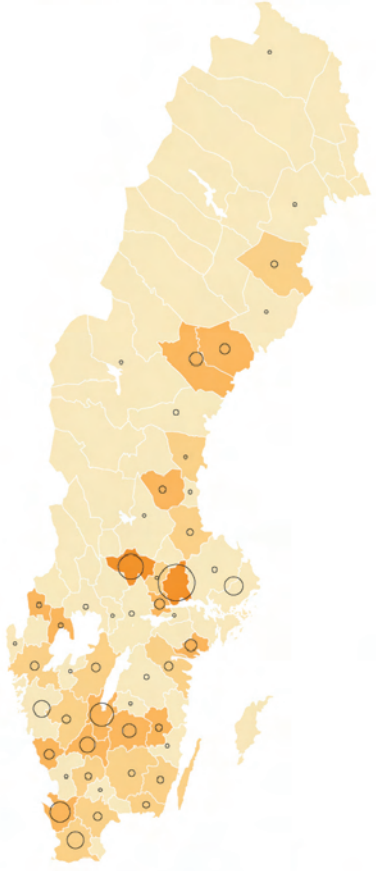
Information Technology



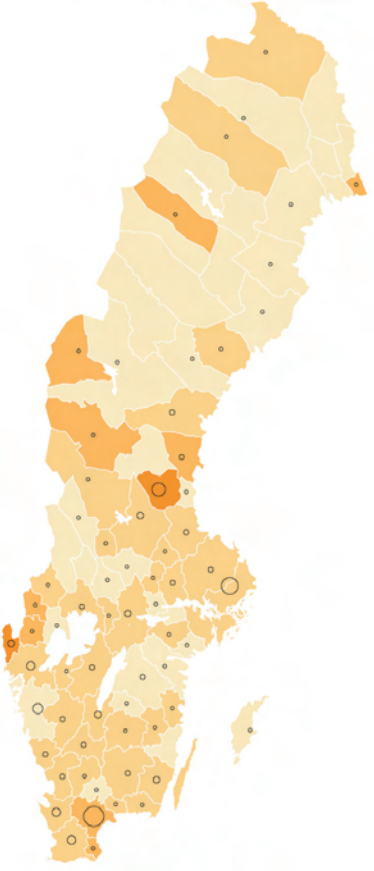
Jewelry and
Precious Metals



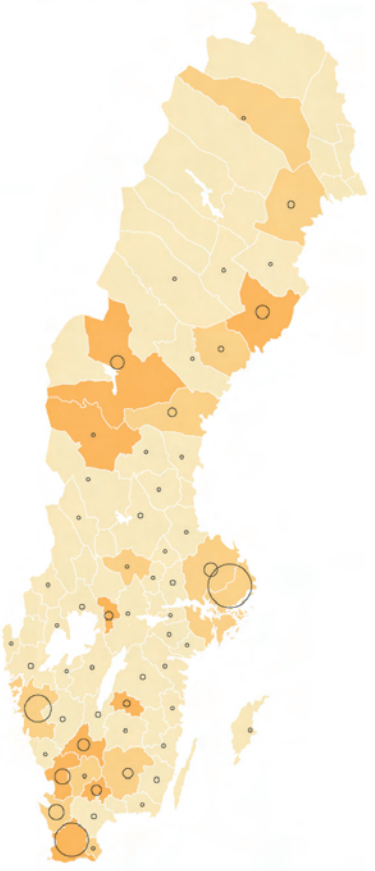
Leather Products



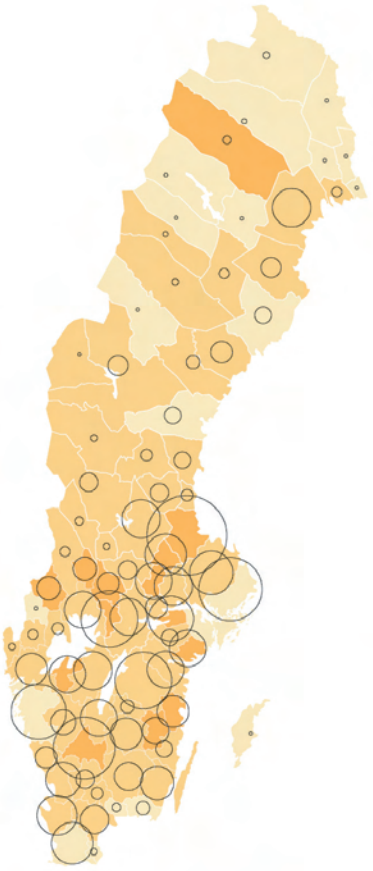
Lighting and
Electrical Equipment



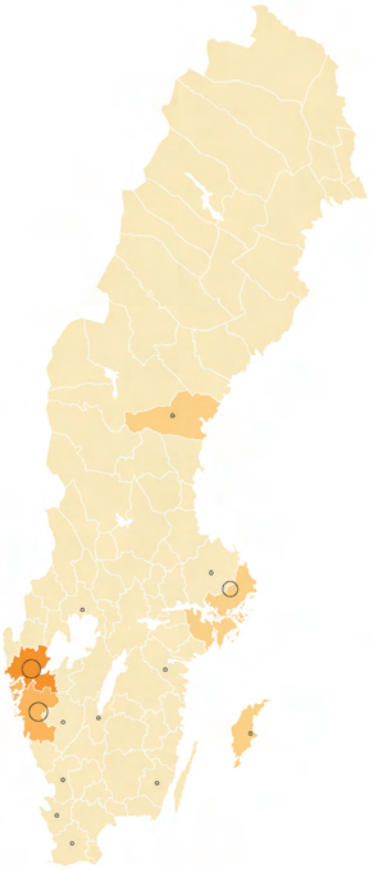
Construction Materials



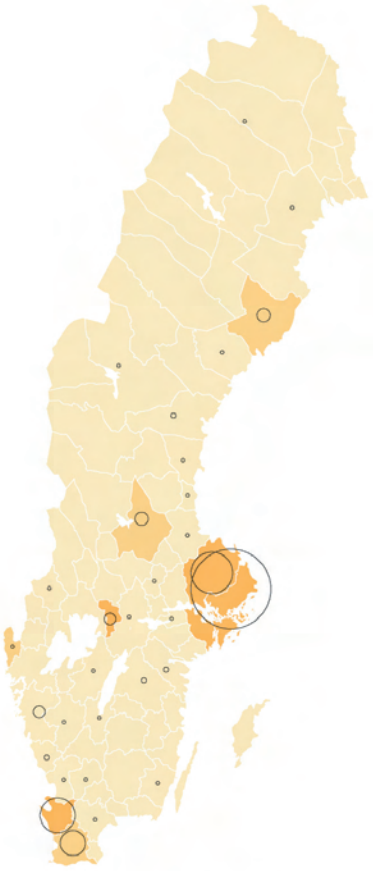
Medical Devices



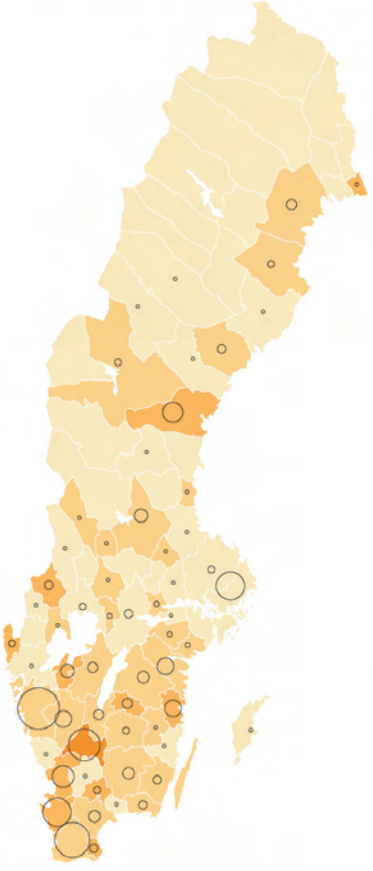
Metal Manufacturing



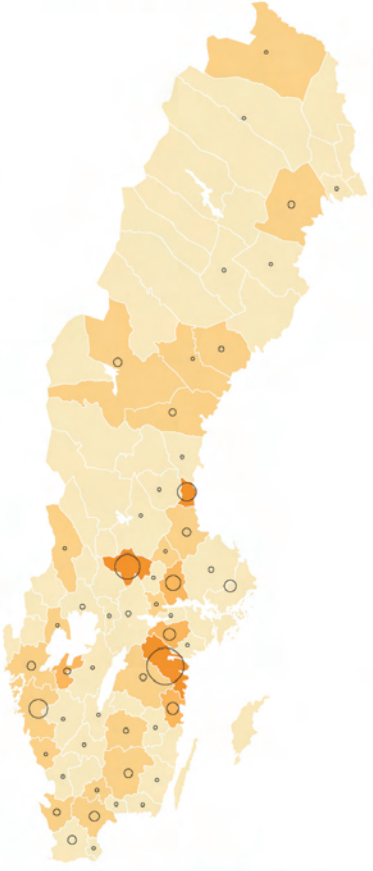
Oil and Gas



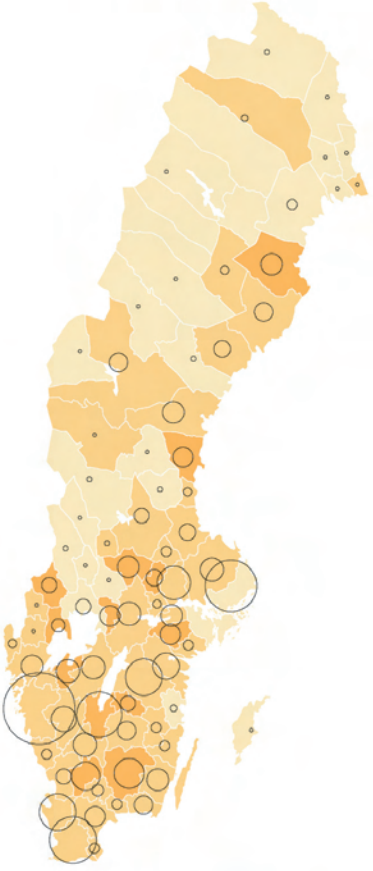
Biopharmaceuticals



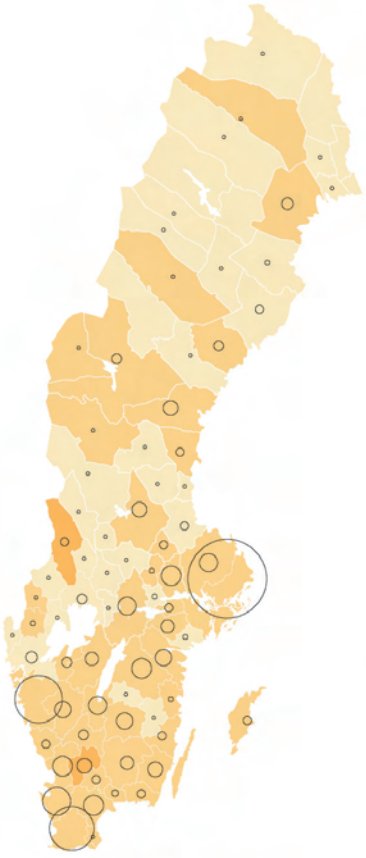
Plastics



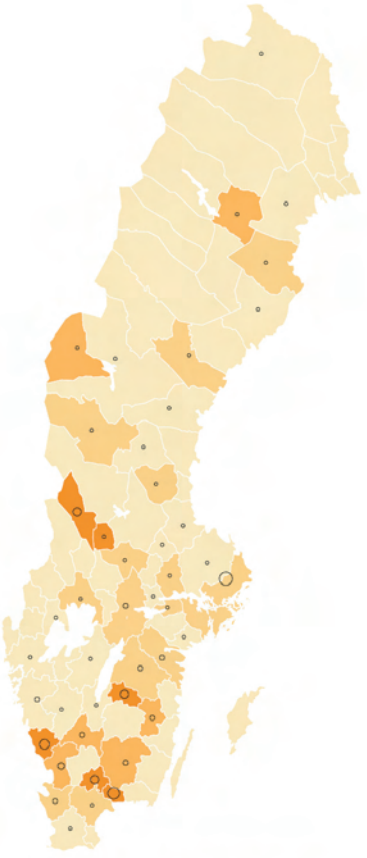
Power Generation



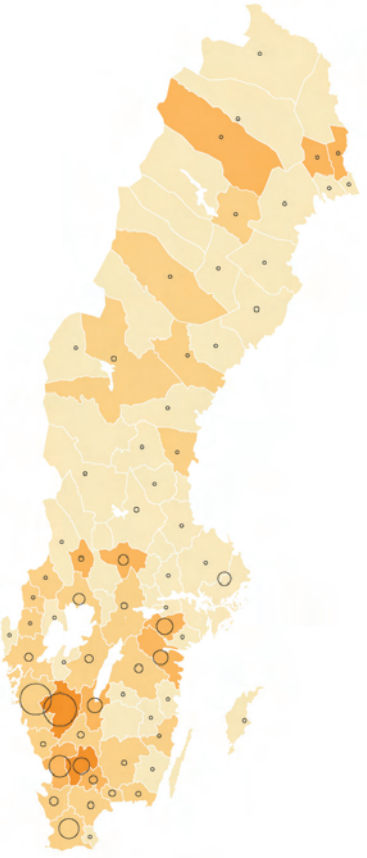
Production Technology



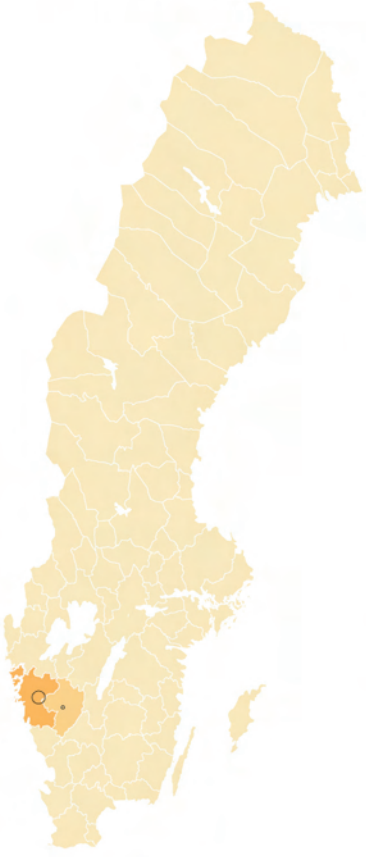
Publishing and Printing



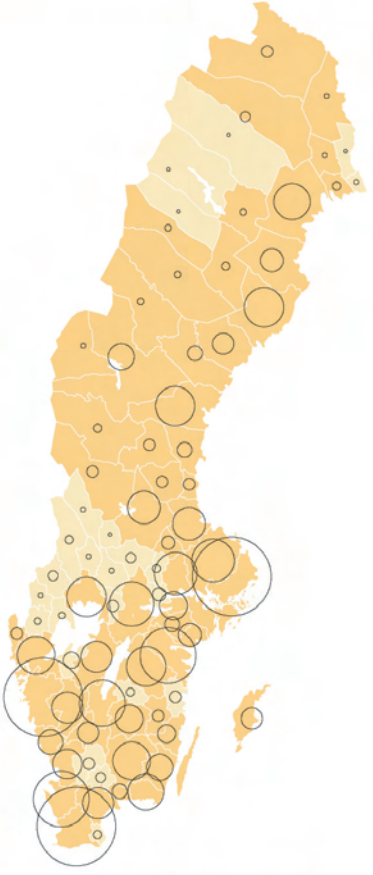
Sporting, Recreational, and Children's Goods



Textiles



Tobacco



Transportation and Logistics

5.3. LIST OF LA REGIONS

This table comprises all 81 LA regions. The table contains the following data:

- Name of region; percentage of all employees nationally to be found in the region.
- Percentage of employees in a region working in the cluster sector; industry coefficient (Ic), indicating how evenly cluster sector employees are spread over the various industry clusters.
- The industry cluster where the region has the highest percentage of all employees nationally; number of employees of the industry cluster; the region's share of all employees nationally in that industry cluster; the corresponding location quotient (Skv).
- The largest industry cluster in the region in terms of number of employees; number of employees in the industry cluster; the region's share of all employees nationally in the industry cluster.

Region	Percentage of All Employees Nationally	Percentage in Cluster Sector	Industry Coefficient	Highest Percentage of All Employees Nationally				Highest Number of Employees		
				Industry Cluster	Employees	% of All Empl. Nat.	Location Quotient	Industry Cluster	Employees	% of All Empl. Nat.
Stockholm	24,5%	38,0%	0,27	Biopharmaceuticals	12 246	62,0%	2,5	Business Services	89 710	45,6%
Uppsala	2,8%	32,7%	0,25	Biopharmaceuticals	2 662	13,5%	4,7	Education/Knowledge	8 062	6,8%
Nyköping	0,6%	32,3%	0,33	Lighting	265	2,4%	3,9	Metal	2 160	2,2%
Katrineholm	0,6%	34,7%	0,40	Textiles	489	4,9%	8,7	Communications	861	3,4%
Eskilstuna	0,9%	37.5%	0,32	Jewelry	193	25,5%	28,6	Metal	3 039	3,0%
Linköping	2,6%	41,0%	0,29	Aerospace	3 329	31,7%	12,1	Education	6 620	5,6%
Norrköping	1,8%	32,6%	0,30	Power	2 142	26,4%	14,6	Transportation	4 425	3,0%
Varnamo	1,0%	53,3%	0,50	Leather	82	18,3%	18,9	Metal	5 228	5,2%
Jönköping	1,6%	40,1%	0,26	Lighting	940	8,7%	5,3	Transportation	3 192	2,1%
Nässjo	0,9%	34,7%	0,42	Furniture	1 146	6,4%	6,8	Forest	2 479	4,4%
Tranås	0,3%	43,2%	0,50	Sporting Goods	154	7,1%	25,3	Furniture	645	3,6%
Älmhult	0,3%	40,8%	0,42	Sporting Goods	161	7,3%	24,1	Business Services	1 328	0,7%
Ljungby	0,4%	41,6%	0,46	Textiles	553	5,5%	12,7	Production	1 301	2,6%
Vaxjo	1,5%	39,7%	0,20	Automotive	3 378	1,5%	3,0	Automotive	3 378	1,5%
Vimmerby	0,3%	40,7%	0,46	Sporting Goods	61	2,8%	9,4	Metal	1 240	1,2%
Kalmar	1,2%	37,8%	0,29	Heavy Machinery	677	4,0%	3,2	Food	1 915	3,3%
Oskarshamn	0,5%	30,4%	0,40	Furniture	398	2,2%	4,5	Automotive	1 388	1,8%
Västervik	0,4%	34,3%	0,51	Power	311	3,8%	9,6	Metal	1 606	1,6%
Gotland	0,6%	31,7%	0,40	Leather	20	4,4%	7,4	Communications	1 081	4,2%
Karlshamn	0,5%	38,5%	0,50	Sporting Goods	268	12,2%	23,0	Automotive	3 443	4,5%
Simrishamn	0,3%	35,1%	0,43	Fishing	66	2,5%	9,4	Food	852	1,5%
Helsingborg	3,1%	37,1%	0,24	Chemicals	2 851	24,7%	8,0	Transportation	4 572	3,1%
Kristianstad	1,7%	33,5%	0,30	Construction Materials	689	16,3%	9,6	Forest	2 908	5,1%
Malmö	6,9%	36,5%	0,18	Medical	1 850	17,9%	2,6	Education/Knowledge	13 885	11,7%
Halmstad	1,2%	35,1%	0,29	Textiles	859	8,5%	7,0	Metal	1 962	2,0%
Varberg	0,9%	29,8%	0,31	Sporting Goods	224	10,2%	11,3	Food	1 203	2,1%
Göteborg	10,8%	40,2%	0,16	Tobacco	371	97,4%	9,0	Business Services	26 533	13,5%
Trollhättan	2,1%	36,1%	0,34	Oil and Gas	656	36,3%	17,1	Automotive	7 583	10,0%
Strömstad	0,2%	33,7%	0,38	Footwear	60	15,5%	70,0	Hospitality and Tourism	410	0,7%
Bengtsfors	0,2%	25,9%	0,55	Forest	1 349	2,4%	14,6	Forest	1 349	2,4%
Borås	1,7%	42,1%	0,36	Apparel	1 522	53,0%	31,6	Distribution	3 469	11,6%
Lidköping	0,8%	37,8%	0,46	Food	2 461	4,2%	5,4	Food	2 461	4,2%
Skövde	1,9%	38,5%	0,39	Automotive	6 985	9,2%	4,8	Automotive	8 985	9,2%
Torsby	0,3%	27,2%	0,41	Instruments	153	1,6%	5,7	Hospitality and Tourism	443	0,8%
Karlstad	1,7%	32,2%	0,24	Forest	3 812	6,7%	4,1	Forest	3 812	6,7%
Årjäng	0,1%	36,2%	0,54	Jewelry	16	2,1%	23,4	Entertainment	403	0,7%
Filipstad	0,2%	48,1%	0,55	Food	960	1,6%	9,0	Food	960	1,6%
Hagfors	0,1%	39,7%	0,55	Metal	923	0,9%	7,6	Metal	923	0,9%
Arvika	0,3%	34,9%	0,45	Heavy Machinery	735	4,3%	12,6	Metal	993	1,0%
Saffle	0,3%	28,6%	0,44	Instruments	210	2,2%	7,2	Forest	574	1,0%
Örebro	2,3%	30,9%	0,17	Footwear	146	37,8%	16,2	Transportation	3 072	2,1%
Karlskoga	0,6%	43,4%	0,58	Metal	4 515	4,5%	8,1	Metal	4 515	4,5%
Västerås	1,9%	40,1%	0,27	Lighting	2 076	19,2%	10,1	Business Services	5 101	2,6%
Fagersta	0,2%	44,8%	0,58	Metal	2 058	2,1%	8,7	Metal	2 058	2,1%
Köping	0,5%	39,2%	0,52	Aerospace	1 605	15,3%	28,4	Automotive	1 931	2,5%
Vansbro	0,1%	36,3%	0,52	Sporting Goods	38	1,8%	24,5	Food	224	0,4%
Malung	0,1%	38,0%	0,50	Leather	45	9,9%	82,9	Entertainment	454	0,8%
Mora	0,4%	33,5%	0,46	Jewelry	175	23,1%	65,0	Heavy Construction	1 308	1,3%
Falun	1,5%	30,8%	0,18	Leather	49	10,8%	7,2	Forest	2 281	4,0%
Avesta	0,4%	34,0%	0,52	Metal	2 698	2,7%	6,2	Metal	2 698	2,7%
Ludvika	0,5%	41,0%	0,49	Power	1 062	13,1%	28,2	Business Services	1 362	0,7%
Gävle	1,7%	34,8%	0,34	Metal	8 192	8,2%	4,8	Metal	8 192	8,2%
Ljusdal	0,2%	28,8%	0,28	Furniture	99	0,5%	2,5	Business Services	458	0,2%
Söderhamn	0,3%	31,5%	0,39	Power	671	8,3%	31,0	Power	671	8,3%
Bollnäs	0,4%	30,4%	0,39	Construction Materials	362	8,6%	22,1	Forest	635	1,1%
Hudiksvall	0,5%	28,3%	0,39	Communications	906	3,5%	7,6	Forest	991	1,7%

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Region	Percentage of All Employees Nationally	Percentage in Cluster Sector	Industry Coefficient	Highest Percentage of All Employees Nationally				Highest Number of Employees		
				Industry Cluster	Employees	% of All Empl. Nat.	Location Quotient	Industry Cluster	Employees	% of All Empl. Nat.
Stockholm	24,5%	38,0%	0,27	Biopharmaceuticals	12 246	62,0%	2,5	Business Services	89 710	45,6%
Sundsvall	1,7%	30,7%	0,26	Plastics	763	4,5%	2,7	Heavy Construction	3 531	3,4%
Kramfors	0,4%	22,4%	0,33	Lighting	325	3,0%	7,5	Heavy Construction	513	0,5%
Örnsköldsvik	0,6%	41,2%	0,34	Automotive	2 571	3,4%	5,7	Automotive	2 571	3,4%
Strömsund	0,1%	21,8%	0,45	Building Fixtures	161	0,7%	5,8	Building Fixtures	161	0,7%
Åre	0,1%	37,8%	0,57	Footwear	28	7,2%	83,8	Hospitality and Tourism	532	0,9%
Härjedalen	0,1%	31,5%	0,36	Hospitality and Tourism	301	0,5%	1,6	Business Services	352	0,2%
Östersund	1,0%	30,3%	0,22	Communications	1 143	4,4%	4,3	Business Services	2 059	1,0%
Storuman	0,1%	30,7%	0,50	Heavy Machinery	67	0,4%	6,3	Hospitality and Tourism	139	0,2%
Sorsele	0,0%	36,7%	0,60	Furniture	89	0,5%	17,9	Communications	95	0,1%
Vilhelmina	0,1%	22,3%	0,38	Hospitality and Tourism	195	0,3%	2,9	Hospitality and Tourism	195	0,3%
Umeå	1,4%	35,1%	0,26	Automotive	3 246	4,3%	3,0	Automotive	3 246	4,3%
Lucksele	0,2%	20,9%	0,29	Furniture	150	0,8%	3,8	Metal	210	0,2%
Skellefteå	0,8%	33,1%	0,22	Heavy Machinery	624	3,7%	4,5	Business Services	973	0,5%
Arvidsjaur	0,1%	20,5%	0,52	Sporting Goods	7	0,3%	4,3	Transportation	113	0,1%
Arjeplog	0,0%	18,2%	0,54	Hospitality and Tourism	86	0,2%	4,3	Hospitality and Tourism	86	0,2%
Jokkmokk	0,0%	36,1%	0,46	Heavy Construction	204	0,2%	4,1	Heavy Construction	204	0,2%
Överkalix	0,0%	33,7%	0,52	Furniture	73	0,4%	10,9	Heavy Construction	141	0,1%
Kalix	0,2%	20,5%	0,41	Fishing	16	0,6%	3,4	Heavy Construction	279	0,3%
Övertorneå	0,0%	23,8%	0,47	Textiles	31	0,3%	7,8	Heavy Construction	51	0,0%
Pajala	0,1%	24,4%	0,45	Information Technology	134	0,6%	11,9	Information Technology	134	0,6%
Gällivare	0,2%	16,9%	0,36	Jewelry	8	1,1%	4,6	Heavy Construction	241	0,2%
Luleå	1,6%	29,9%	0,20	Forest	1 677	3,0%	1,9	Heavy Construction	2 390	2,3%
Haparanda	0,1%	22,1%	0,41	Plastics	34	0,2%	2,6	Heavy Construction	113	0,1%
Kiruna	0,3%	21,9%	0,31	Jewelry	6	0,8%	3,0	Business Services	509	0,3%

5.4. REFERENCES

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Porter, Michael E, 1990, The competitive advantage of nations, Simon & Schuster: New York.

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5.5. EXPLANATION OF TERMINOLOGY

Below, some important concepts are explained. In cluster research and practice, there are many concepts used in various senses. Our intention is not to give a generally valid definition of these concepts, but rather to state the sense in which the concepts have been used in the present report.

Location quotient (LQ): The ratio of a certain region's percentage of employees in a given industry to the region's percentage of all employees nationally. A quotient greater than 1 means that the region has a disproportionately large number of employees in that industry. The location quotient LQ for an industry i in a region r is calculated as:

$$LQ_{b,r} = \frac{a_{i,r} / A_i}{t_r / T}$$

where

$a_{i,r}$ = number of employees in industry i in region r

A_i = number of employees in industry i nationally

t_r = total number of employees in region r

T = national total number of employees

Example: Region r has 35% of all employees nationally within the industry cluster b, but only 5% of all employees nationally in all industry clusters. Thus, the location quotient is 7. (In economic-geographical literature, this is occasionally referred to as "specialisation quotient").

Agglomeration coefficient (AC): This measures the skewness of the distribution of labour in a given industry. The agglomeration coefficient is in the range of 0 to 1. An industry in which the agglomeration coefficient is 0 is perfectly evenly distributed across the nation, i.e. the industry has an equal percentage of employees in each region. In this case, noting indicates that the industry has formed any clusters. An industry with a high agglomeration coefficient (close to 1) has most employees concentrated in few and/or small regions. The agglomeration coefficient AC for an industry i is calculated as:

$$AC_b = \frac{1}{2}\sum_{n=1}^{R}\left|\frac{a_{i,n}}{A_i} - \frac{t_n}{T}\right|$$

where

R = number of regions

$a_{i,n}$ = number of employees in industry i in region n

A_i = national number of employees in industry i

t_n = total number of employees in region n

T = national total number of employees

(In economic-geographical literature, this is occasionally referred to as "location coefficient").

Industry cluster: A group of business activities which tend to be co-located and can be assumed to be interdependent in a way that may lead to the formation of clusters. Industry clusters are thus aggregates of businesses connected to one another by the flow of knowledge and products. The definition encompasses the part of the cluster which can, with reasonable ease, be identified and described using public statistics, i.e. companies – one of four cluster components (companies, higher education, public authorities, associations).

Industry coefficient (IC): Measures how skewd the labour distribution is in a given region. The industry coefficient ranges from 0 to 1. A region with an industry coefficient of 0 has its labour distributed as a perfect average between industries, i.e. the region has an equal percentage of employees nationally in each industry. In this case, nothing indicates that the region has any local clusters. A region with a high coefficient (close to 1) has most of its employees concentrated in few and/or small industries. The industry coefficient IC of a region r is calculated as:

$$IC_r = \frac{1}{2}\sum_{n=1}^{B}\left|\frac{a_{n,r}}{t_r} - \frac{A_b}{T}\right|$$

where

B = number of industries

$a_{n,r}$ = number of employees in industry i in region r

t_r = total number of employees in region r

A = number of employees in industry i nationally

T = total number of employees nationally

LA region (Local labour market region): Municipalities grouped by outgoing commuting pattern. Municipalities which, by virtue of a high percentage of commuters, share a significant part of their labour can be considered as part of the same labour market. Groups of such municipalities form an LA region.

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