

Innovation Diffusion in Blekinge, Sweden

A Regional Approach



**Information Note:**

This report was prepared as part of an OECD project to develop a self-assessment toolkit for barriers to regional innovation diffusion that aims provide policy makers a tool to assess strengths and weaknesses of innovation diffusion channels in their regions. It is based on data analysis, surveys and workshops among stakeholders and further desk research. The report was prepared by OECD officials as a background document and should not be reported to reflect the views of OECD member countries or those of the European Union who co-finance the project.

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1 Introduction

1.1. The concept of innovation diffusion

Innovation is of crucial importance for countries and regions, to strengthen economic growth and find solutions to societal challenges. Innovation does not only take place by “creating” knowledge (for instance through research and development) but also by learning from others. Such learning processes enable the diffusion of innovation, and can help companies, regions or countries to catch-up to higher productivity levels. Innovation diffusion is of particular importance for small- and medium-sized enterprises (SMEs) and start-ups and reflects the process through which these firms gather knowledge, information and innovations from outside and use them to introduce their own innovative products or processes. It refers for instance to the adoption of new-to-the-firm technologies, the introduction of new management techniques, the digitalisation of certain processes, or the introduction on the market of a new product.

1.2. What drives innovation diffusion?

Innovation diffusion is a complex phenomenon that relates to three sets of factors:

- The local and national **framework conditions**, which affect firms’ incentives and capacities to adopt innovations. Examples of framework conditions are the regulatory framework, market conditions, access to finance and skills, and infrastructure.
- The functioning of the **channels** through which the diffusion can take place. These channels include supply chains, workers careers and mobility, academic-business collaboration or knowledge intensive business services.
- The presence and functioning of a variety of **intermediary organizations** that help companies build the capacity for innovation adoption, identify external resources, and share knowledge among peers. Intermediaries include peer-network building intermediaries (e.g. employer associations, chambers of commerce, managed clusters, science & technology parks), partnership-building intermediaries (e.g. technology transfer offices, RTOs, investment promotion agencies), and capacity-building and funding agencies.

Understanding innovation diffusion in a region, and the potential to foster this, requires an assessment of the strengths and weaknesses in these three sets of factors (framework conditions, diffusion channels and intermediaries), and the possibilities for policies to strengthen this.

1.3 Purpose and overview of the report

The aim of this report is to apply the concept of innovation diffusion and provide insights into its enablers and barriers within Blekinge, in particular with respect to SMEs and start-ups.

This report is divided into four different sections. After the introduction, section 2 discusses the framework conditions that impact the creation and spread of knowledge in Blekinge, followed by an overview of the main channels through which innovation diffusion takes place and the main intermediaries that support

innovation diffusion in Blekinge. Section 3 brings together relevant suggestions for policy that have been brought forward by the project. Finally, further background on the analytical framework, methodologies and data used can be found in Annex.

1.4. The report is part of a wider project

The output is part of a wider European Commission-OECD project to develop an interactive policy self-assessment toolkit on innovation diffusion across regions and cities. The aim of this overall project is to help policy makers in the European Union and beyond to gain a view of the strengths and weaknesses of their regional innovation challenges and policy support that is provided.

The self-assessment toolkit will provide each region with a regional innovation profile (relative to other OECD and EU-27 regions), quantifying the strengths of different innovation diffusion channels in the region and allowing policy makers to engage local stakeholders to gather their views on the (regional) innovation system that the toolkit summarises and consider actions for improvement.

Regional innovation diffusion processes and obstacles in Blekinge have been assessed as part of this exercise with the support of regional authorities and stakeholders. The repeated interactions with key stakeholders in the country at the regional level, and this report summarising main findings, will serve as input to identify the dimensions to be examined in the toolkit and on how to get the questions right. It will also support Blekinge to design future regional innovation policies based on an evidence-based assessment and stakeholder consultation.

1.5. Process and methodology

A number of consultation meetings, discussions and workshops between the OECD and relevant stakeholders of Blekinge took place in the first half of 2021, underpinning this report. Contacted stakeholders include policy makers in the region, representatives of higher learning institutions, cluster organisations, accelerators and incubators, entrepreneurs and business owners. The process included:

- The filling-in of a **background survey** by the regional counterparts, with information on the innovation ecosystem, intermediary organisations and existing policies, in combination with desk research by OECD staff.
- Three **virtual workshops** on innovation diffusion in the region, focused on i) regional innovation diffusion in the region, ii) the impact of framework conditions, and iii) the role of networks and proximity. In total, 15 stakeholders participated in the workshops. The workshops generated valuable insights on innovation diffusion through structured discussion and polls on aspects of innovation diffusion among participants.
- A detailed **questionnaire** on the framework conditions for innovation diffusion, the different actors and how they interact, the channels through which innovation diffusion takes place, and the relevant policy initiatives, from different levels of government in this area. Approximately ten responses were received. Half of respondents indicated that they were from the public sector while the remaining respondents were from private sector, academic, and other types of institutions.

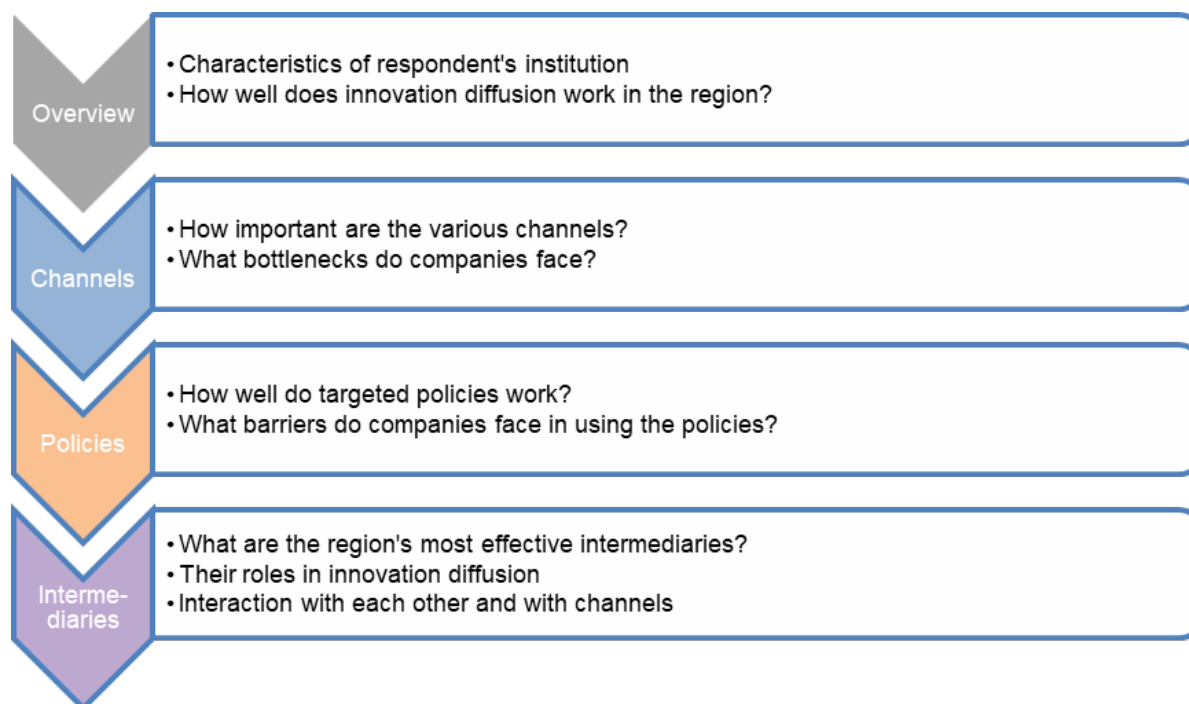
The information collected this way was processed and scrutinised by analysts of the Centre for Entrepreneurship, SMEs, Regions and Cities (CFE) at the OECD. This report reflects their insights and opinions, complemented by desktop research and independent analysis.

Stakeholder questionnaire

A stakeholder questionnaire was developed and tested during the pilot study. The survey includes questions on the state of play of innovation diffusion in the region, the functioning of innovation diffusion channels, and views on intermediaries and policies in support of innovation diffusion (Figure 1.1.).

Figure 1.1. Survey overview

Questionnaire about innovation diffusion sent to stakeholders in a region



Innovation diffusion indicators

The report shows a variety of indicators related to innovation diffusion. Below is a guide to interpreting the regional-level and national-level graphs, which illustrate the position of the considered region relative to other OECD regions for each indicator. The higher the figure in the circle, the higher (better) the ranking.

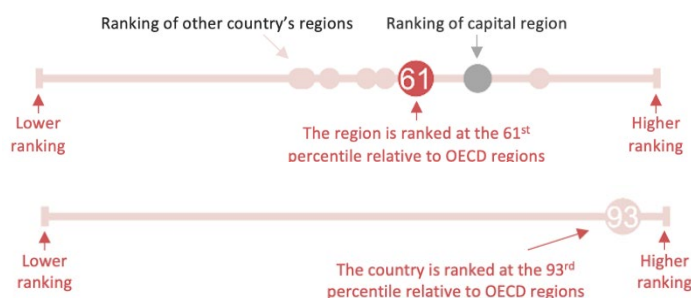
- **Red** plain dot indicates the considered region
- **Light red** dots indicate the other regions of the country
- **Grey** dot indicates the capital region of the country

Regional indicators: one dot per region

The region is in position 3/8 (above the median) of all regions in the country; it is in the top 40% compared to the OECD.

National indicators: one dot only

The country is in the top 10% compared to the OECD. There is no data on the region's position within the country.



2 Assessing innovation diffusion in Blekinge



2.1 Background and setting

Economic structure

Blekinge is a small (160,000 inhabitants) and tightly knit county in the south-east of Sweden, which is part of the wider region Sydsverige (South Sweden).

South Sweden is an innovation leader according to the European Commission 2021 Regional Innovation Scoreboard.¹ GDP per capita is on par with the EU average, slightly below the Swedish national level.

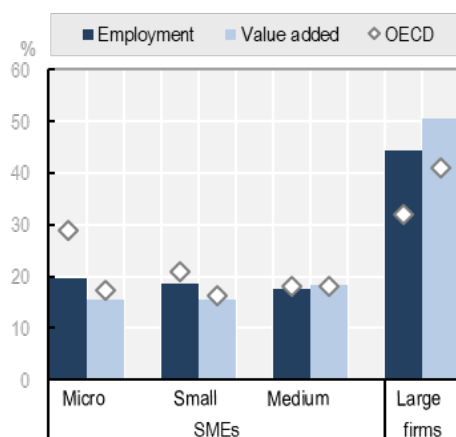
Blekinge has an economy anchored in heavy, military-based industry, and an eco-system that is oriented to support that large firm and heavy industry dominated economic structure, with a lesser presence of SMEs.

SMEs

In Sweden at large, SMEs account for a smaller share of businesses (56% of employment and 49% of value added, compared to an OECD average of 68% and 59%), and with a smaller share of micro-enterprises in employment (Figure 2.1) (OECD, 2021^[1]). In many heavy industries (which play an important role in Blekinge), the share of SMEs in Sweden in employment is lower than in other OECD countries (OECD, 2019^[2]).

¹ https://ec.europa.eu/growth/industry/policy/innovation/regional_en

Figure 2.1. Size of the SME sector in Sweden



Source: (OECD, 2021^[1])

Data on SME regulations and financing conditions are only available at a national level. For Sweden, regulations and financing conditions appear to be middling relative to other OECD countries – not overly burdensome but not particularly supportive (Figure 2.2).

Figure 2.2. SME financing and regulations (national data)



Note: Number in circle is percentile compared to OECD.

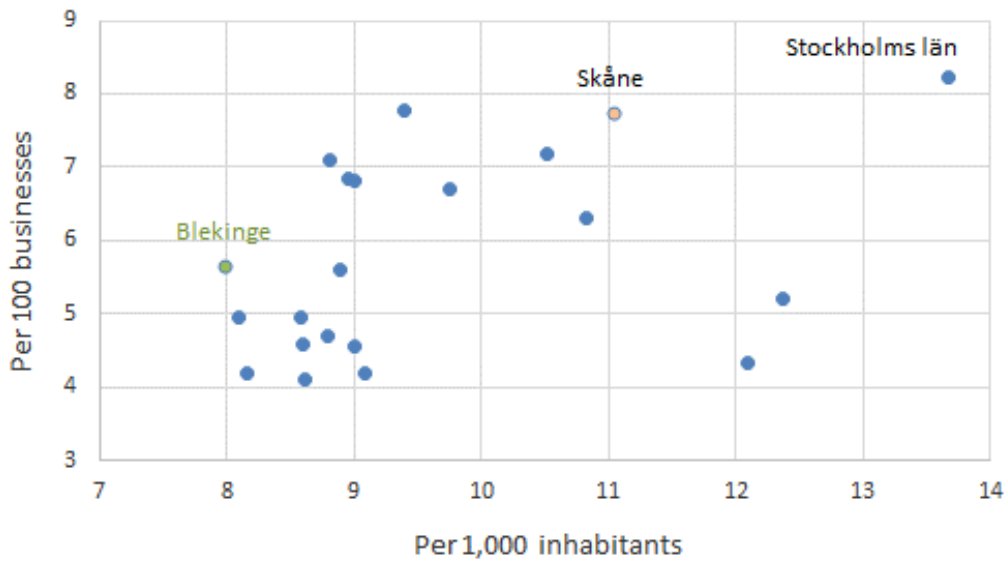
Sources: SME financing from OECD SME Financial Scoreboard https://stats.oecd.org/Index.aspx?DataSetCode=SMES_SCOREBOARD#A
Administrative regulations from OECD Product market regulation indicators <https://www.oecd.org/economy/reform/indicators-of-product-market-regulation/>

Start-up rates

Start-ups can embody innovation diffusion because innovative entrepreneurship often brings existing ideas to new places or industries. A higher rate of new business creation can therefore indicate higher innovation in a given region if it involves innovative start-ups.

Start-up rates as a percentage of the population in Blekinge are low – the lowest compared to other Swedish regions – although average when measured relative to the number of businesses (Figure 2.3). This suggests that the region has fewer businesses per capita than elsewhere in Sweden. It may also indicate a weak entrepreneurial culture.

Figure 2.3. Business start-up rates in Swedish counties

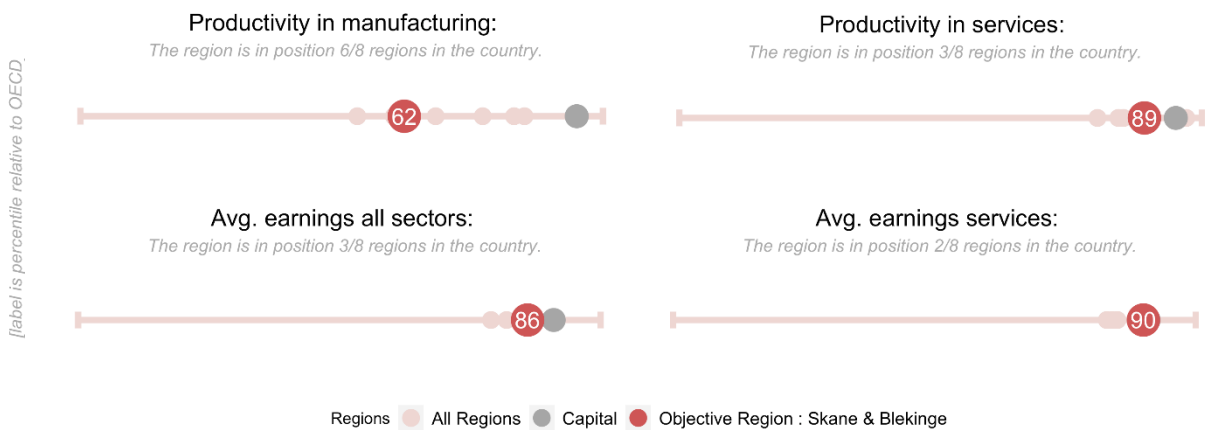


Source: Tillväxtanalys, Nystartade företag (Newly started companies) <https://www.tillvaxtanlys.se/publikationer/statistik/statistikserien/2020-06-18-nystartade-foretag-i-sverige-2019.html>

Productivity and wages

All regions in Sweden have high productivity levels relative to the rest of the OECD. Productivity in South Sweden, which encompasses both Blekinge and Skåne counties, lies below the average of regions in Sweden. This is particularly the case in manufacturing, less so in services (Figure 2.3). Over the last five years, after a long period of falling behind in relative terms, productivity growth in Blekinge county accelerated again and its growth rate lies in the top three of Swedish counties (Figure 2.4).

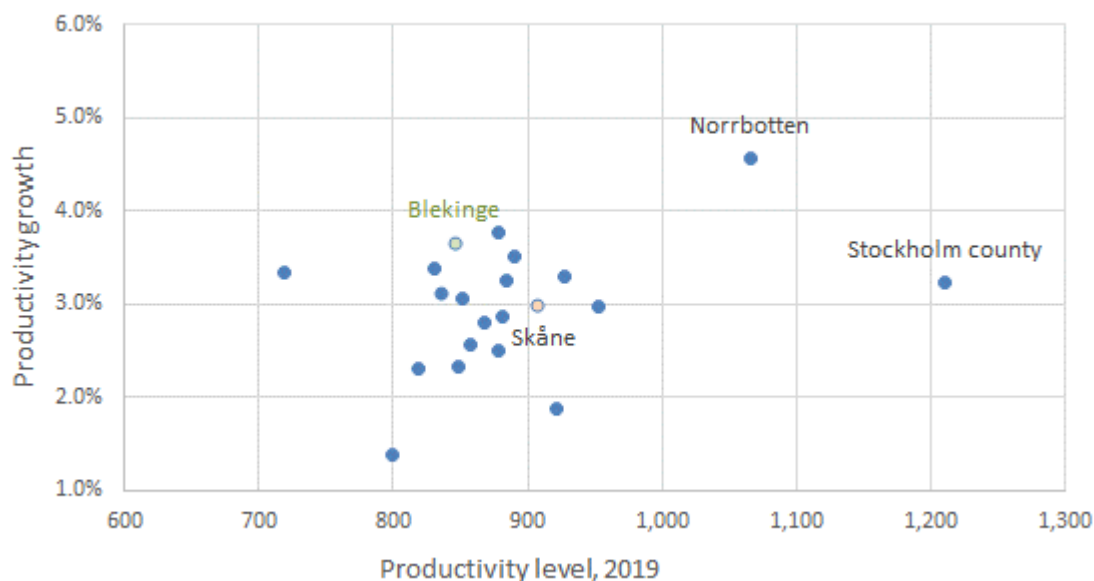
Figure 2.4. Productivity and earnings levels in South Sweden (regional data)



Note: Number in circle is percentile compared to OECD.

Source: OECD calculations based on Regional Economy database https://stats.oecd.org/Index.aspx?DataSetCode=REGION_ECONOM

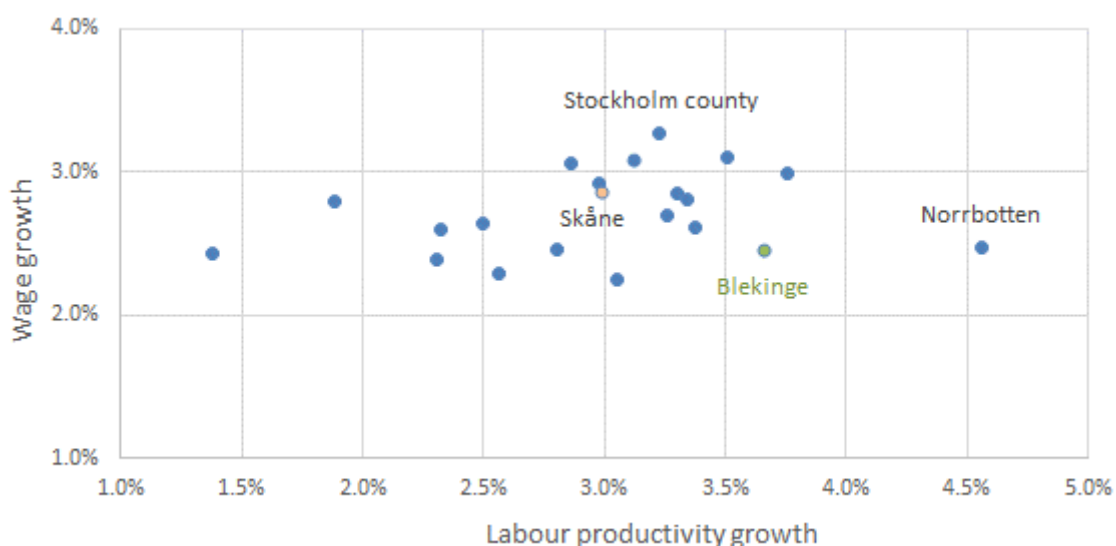
Figure 2.5. Productivity growth rate versus productivity level, by county



Source: OECD calculations of five-year annualised growth rates, 2014-2019. Based on Statistics Sweden, Gross Regional Domestic Product (GRDP), Number of employed and Wages & salaries, available at <https://www.statistikdatabasen.scb.se/pxweb/en/ssd/>

Wages in Sweden, including Blekinge County, are high compared to OECD countries (Figure 2.5). Although typically growth in wages is closely linked to growth in productivity, productivity in Blekinge has been growing faster than most other counties in Sweden over the last five years but the pace of its wage growth has been slower than many other counties in Sweden (Figure 2.6).

Figure 2.6. Wage growth versus productivity growth, by county



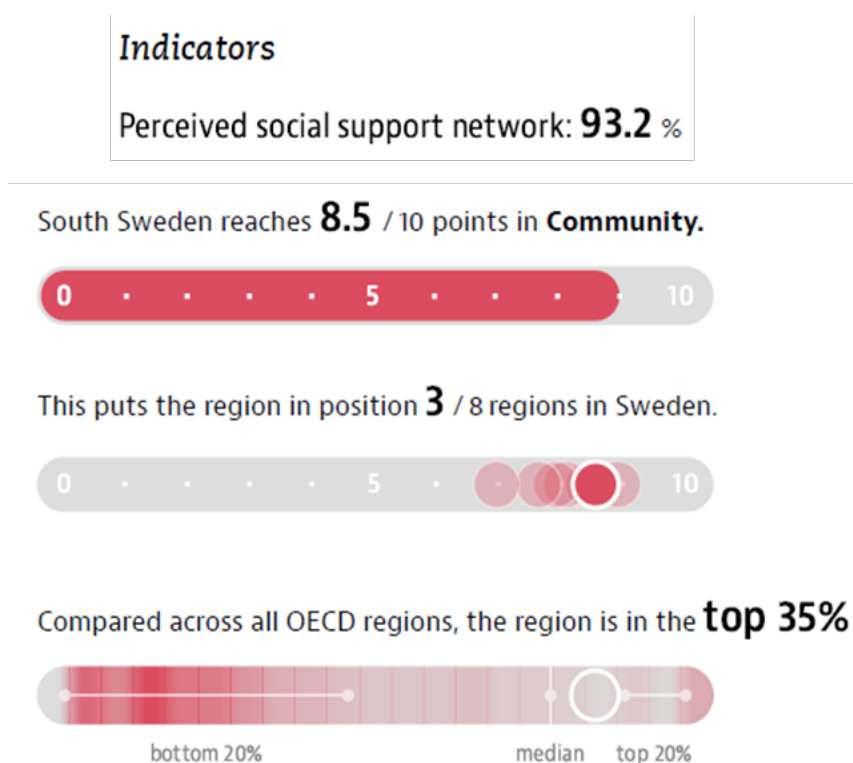
Source: OECD calculations of five-year annualised growth rates, 2014-2019. Based on Statistics Sweden, Gross Regional Domestic Product (GRDP), Number of employed and Wages & salaries, available at <https://www.statistikdatabasen.scb.se/pxweb/en/ssd/>

Linkages and social capital

There are strong linkages in Blekinge between industry, higher education institutions and universities (for instance the Blekinge Institute of Technology – the region’s ‘mothership for innovation’) and support intermediaries, which are centred on Blekinge’s heavy industrial and technological base. Many of the county’s intermediaries, detailed in Table 2.1, focus on capacity building for SMEs and start-ups (such as the Blue Science Park, the Netport Science Park, Almi, the Blekinge Business Incubator, Coompanion and Tech Tank). Proximity is an asset for innovation diffusion in such a small region.

These strong linkages also reflect the region’s social capital and the strength of local networks. Social cohesion in Sweden is high compared to other OECD regions, with the region being among the top third across regions in the OECD and the third highest in Sweden. Inequality in Sweden is low compared to other OECD countries, gender relations relatively well balanced and well-being generally high. Furthermore, Sweden is a frontrunner in pursuing environmental and climate objectives (OECD, 2019^[3]).

Figure 2.7. Social cohesion in South Sweden



Source: OECD Regional Well-Being indicators for South Sweden, <https://www.oecdregionalwellbeing.org/SE22.html>

A central question put forward during the workshops, was if these strong internal linkages help or hinder the development of innovation diffusion linkages with actors outside the region, as well as more disruptive forms of innovation. These questions were seen as particularly important against the background of Blekinge’s ambition to become a test bed and demonstration location for innovations developed elsewhere. At the same time, as was shown in the workshops, there was some concern that this ‘opening-up’ of linkages would go to the detriment of the quality of the existing social fabric.

2.2 The functioning of innovation diffusion

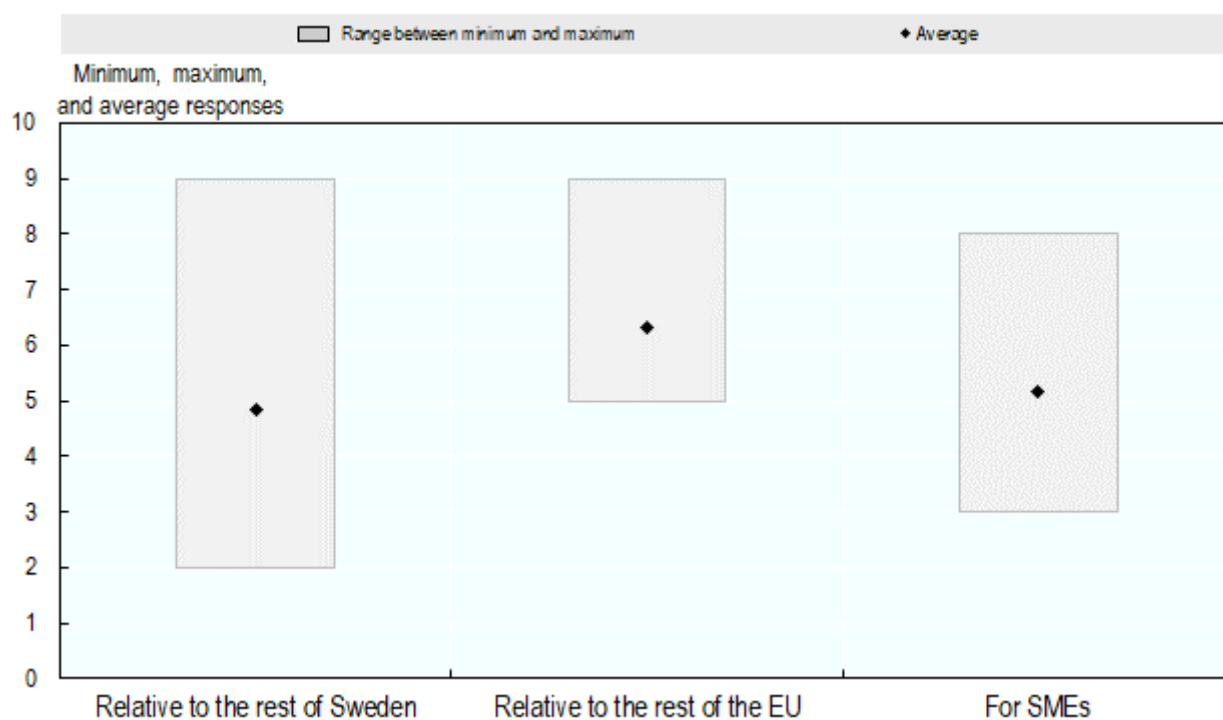
The initial block of questions in the OECD survey ask respondents about their general views on innovation diffusion. These questions capture the subjective experience and perceptions of the region's stakeholders.

On average, respondents indicated that Blekinge County has very good innovation diffusion performance relative to the rest of the EU (score 6/10) but only average performance (score 5/10) relative to the rest of Sweden (Figure 2.8). The range of answers was larger for Blekinge's performance relative to the rest of Sweden, with some respondents selecting high scores and others selecting low scores. For SMEs, innovation diffusion was seen as middling (average score 5/10) in Blekinge County, with some variation across respondents. Industries where (in particular large) companies excelled in adopting innovations that were developed elsewhere include ICT, automotive and further heavy industries.

In the workshops, most participants took a neutral position on the question of whether innovation diffusion in the region worked well, with a small majority indicating that the functioning of innovation diffusion to SMEs and start-ups was not working well. At the same time, many participants indicated that Blekinge was successful in learning from innovation developed elsewhere. Participants saw skills as the region's strongest asset in innovation diffusion.

Figure 2.8. Stakeholder views on innovation diffusion in Blekinge County

Survey responses to the question, "How well does innovation diffusion work in your region..."



Source: OECD Stakeholder survey

2.3 Framework conditions

Framework conditions in a region influence the pace and probability of innovations being widely disseminated and adopted by firms. Important framework conditions include the availability of finance for

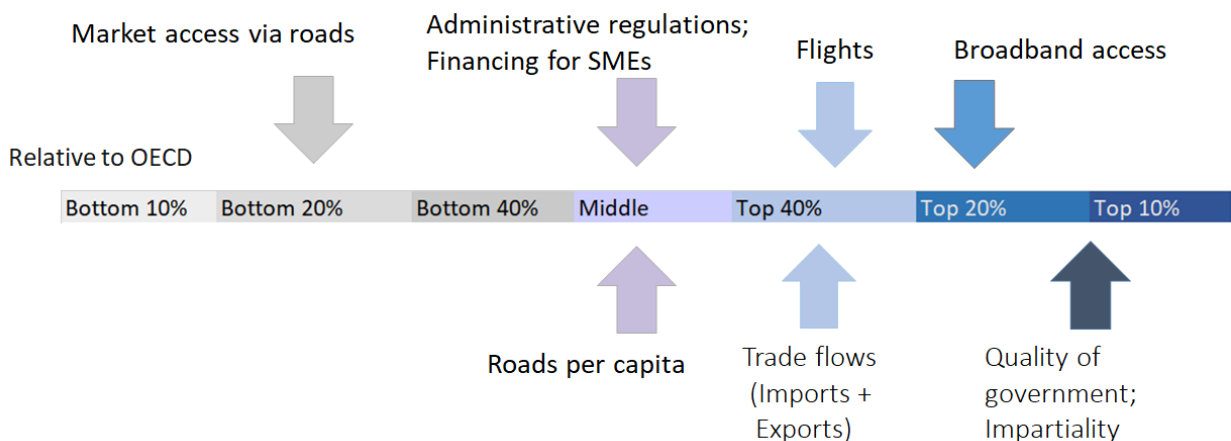
SMEs and start-ups, access to foreign and domestic markets, availability of skilled labour, digital infrastructure and entrepreneurial culture. The most pertinent of these enablers and bottlenecks for innovation diffusion in Blekinge will be discussed below.

During the first workshop, framework conditions were seen as important, although less on people’s radars than some other issues as influences on innovation diffusion. A second workshop was organised that focused explicitly on framework conditions to assess their relevance in the context of drafting the new smart specialisation strategy. The discussion pointed at two issues in particular. First, a lack of an entrepreneurial culture as a barrier for innovation diffusion. Second, a certain fragmentation of the institutions and arrangements that jointly make up the framework conditions and the need to better connect and make them more coherent as a main message.

Institutions and physical infrastructure

South Sweden (SE22) is a region with strong institutions. Its **quality of government** and impartiality measures are in the top 10 percent of OECD regions (Figure 2.9). However, businesses in South Sweden face some challenges in transportation and **regulatory red tape**, with the latter affecting SMEs disproportionately. In the workshop, it was mentioned that start-up barriers are not too high but companies find it difficult and costly to scale up due to high taxes and labour force rigidities that impact hiring.

Figure 2.9. South Sweden’s framework conditions relative to other OECD regions



Sources: Road indicators from [Adler et. al](#); Administrative regulations from OECD Product market regulation indicators <https://www.oecd.org/economy/reform/indicators-of-product-market-regulation/>; Flight connection calculations based on <https://www.seo.nl/en/publications/airport-industry-connectivity-report-2018/>; Trade flows and broadband access from OECD Regional Statistics <http://dx.doi.org/10.1787/region-data-en>; Government quality and impartiality from European Regional Competitiveness Index data (Quality of Government Index, University of Gothenburg) https://ec.europa.eu/regional_policy/en/information/maps/regional_competitiveness/

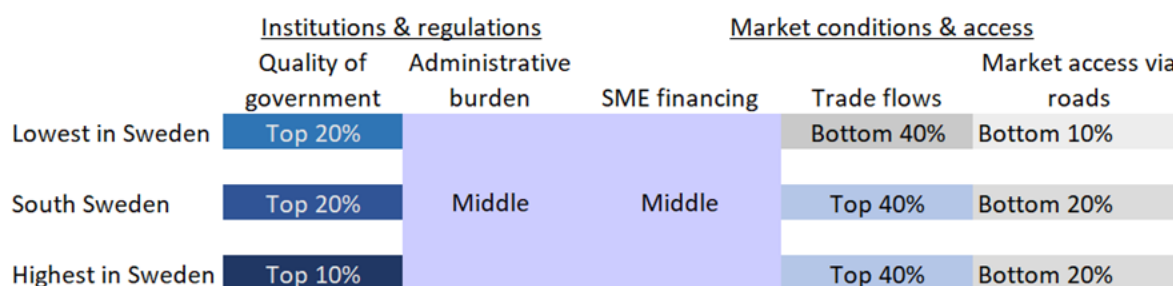
Regarding **transportation**, South Sweden ranks below the median OECD region for indicators that relate to geography such as market access via roads. It is possible that this lack of road connectivity also dampens **trade flows** (Figure 2.9). Nevertheless, even on those measures for which all regions of Sweden are below the OECD median, such as market access, South Sweden compares favourably to the rest of Sweden (Figure 2.10).

Access to finance

Financing conditions throughout Sweden are close to the OECD median (Figure 2.10) – although such conditions may vary by region, they are only measured at a national level. Highly innovative and productive

countries such as Sweden may find that financing conditions close to the OECD median are overly restrictive. Indeed, nearly all survey respondents in Blekinge identified bottlenecks in companies' use of financial institutions and investors. The most common bottleneck for financing was not "high cost" but rather that it is "difficult to access" (Figure 2.22). Access to finance challenges were also identified as the main barrier for innovation diffusion in the workshops, including for SMEs and start-ups.

Figure 2.10. Framework conditions in South Sweden

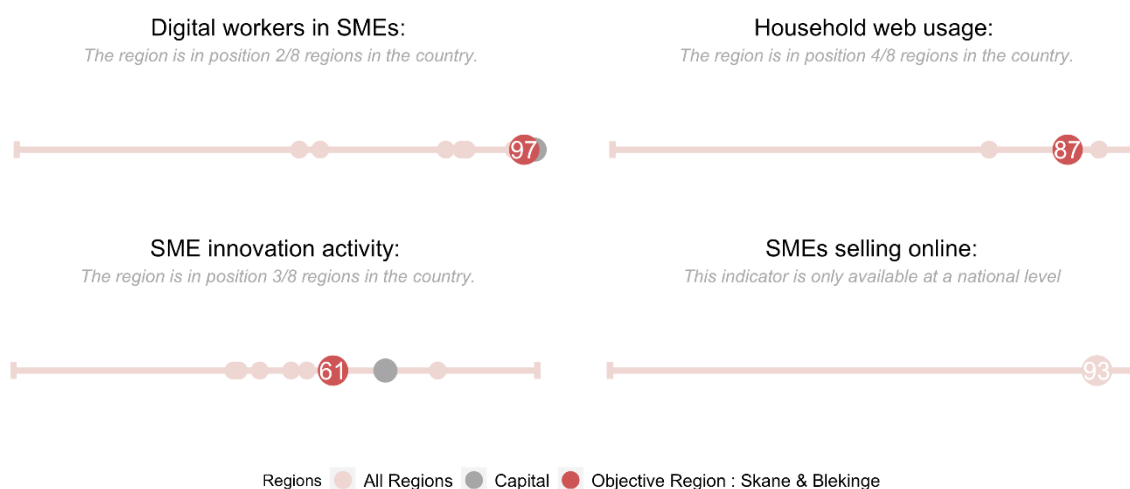


Note: Percentiles are relative to other OECD regions.
 Sources: Government quality from European Regional Competitiveness Index data (Quality of Government Index, University of Gothenburg) https://ec.europa.eu/regional_policy/en/information/maps/regional_competitiveness/; Administrative regulations from OECD Product market regulation indicators <https://www.oecd.org/economy/reform/indicators-of-product-market-regulation/>; SME financing from OECD SME Financial Scoreboard, https://stats.oecd.org/Index.aspx?DataSetCode=SMES_SCOREBOARD#; Trade flows calculated from OECD Regional Statistics <http://dx.doi.org/10.1787/region-data-en>; Road indicators from [Adler et. al](#)

Digital infrastructure

Digital infrastructure emerges as a key strength of Sweden. SME digital adoption in Sweden – measured as its percent of SMEs selling online – is in the top 10 percent of the OECD (Figure 2.11). The percent of households using the internet in South Sweden is also very high, similar to most other Swedish regions. The share of digital workers (such as programmers) in South Sweden's SMEs is near the top of OECD regions, although the Stockholm region has an even higher share.

Figure 2.11. Digitisation of households and SMEs



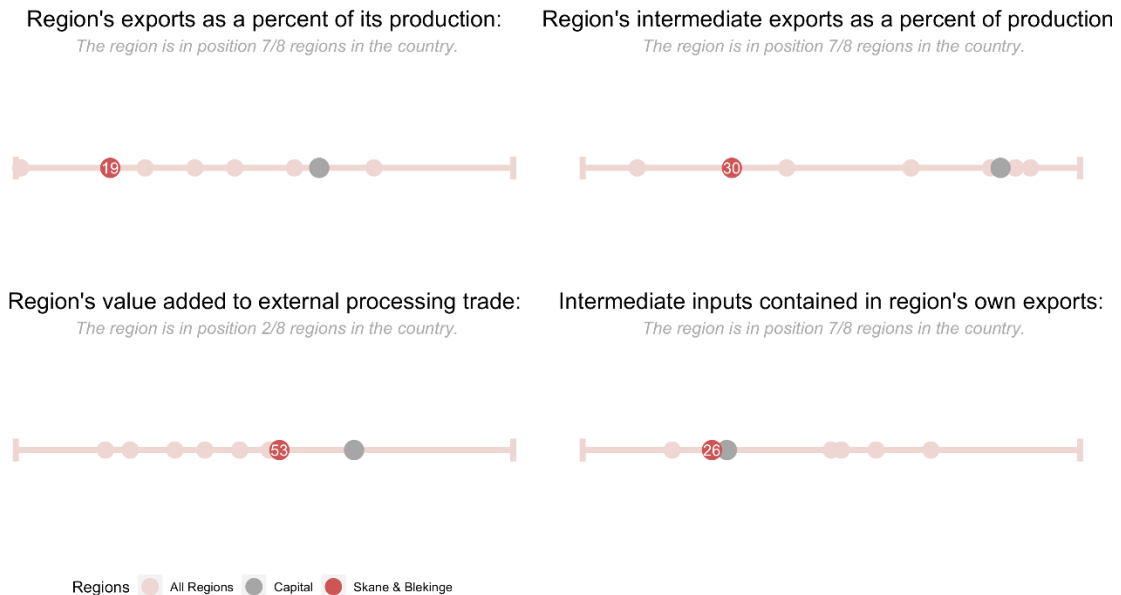
Note: Number in circle is percentile compared to OECD.

Sources: Digital workers calculated from EU Labour force survey microdata ; Web usage from OECD Regional Statistics <http://dx.doi.org/10.1787/region-data-en>; SME innovation activity from EU Community Innovation Survey RIS data https://ec.europa.eu/growth/industry/policy/innovation/regional_en; SMEs selling online from OECD ICT adoption database https://stats.oecd.org/Index.aspx?DataSetCode=ICT_BUS

Global value chains

The region is very manufacturing-oriented and its share of goods exports in regional GDP is the highest among regions in Sweden (Figure 2.13); however, integration in **global value chains** is not (bottom 40% within OECD). The region sources intermediate inputs at a lower intensity than other places in the OECD and it also provides (i.e. manufactures) fewer intermediate inputs (Figure 2.12). South Sweden underperforms slightly on these measures relative to other regions of Sweden.

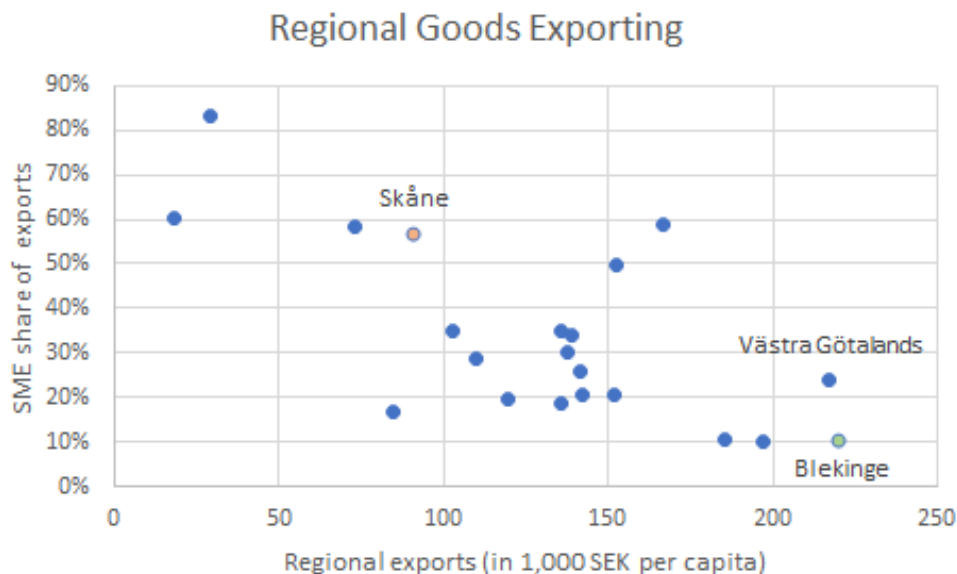
Figure 2.12. Trade and integration in global value chains



Source: OECD calculations from Trade in Value Added data. All trade data (imports, exports, and intermediates) include estimates of trade across regions within the same country.

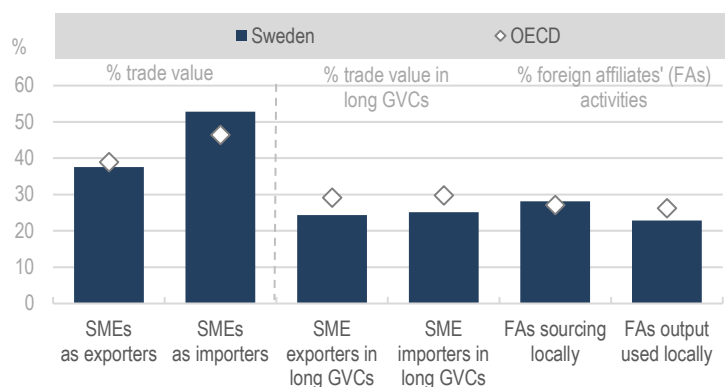
Furthermore, the share of SMEs in exports in Blekinge ranks among the lowest in Sweden (Figure 2.13). More generally, SMEs in Sweden are less integrated in global value chains as importers and exporters. Foreign affiliates are slightly less integrated in the local economy.

Figure 2.13. Exports and the role of SMEs in Sweden's counties



Source: Tillväxtnalys, Regional Statistik Varuexport <https://tillvaxtverket.se/statistik/regional-utveckling/regional-statistik-om-varuexport.html>

Figure 2.14. International trade and GVC exposure of SMEs

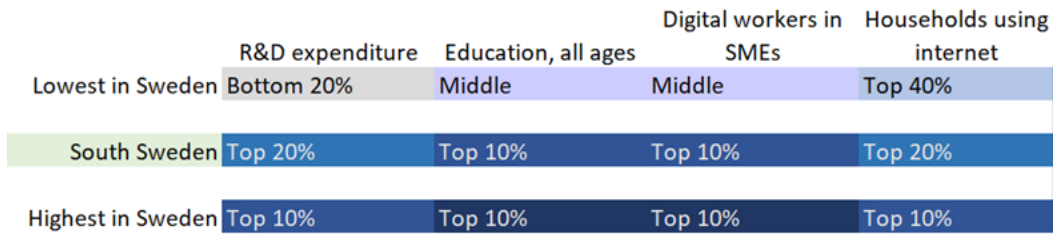


Source: (OECD, 2021^[1])

Innovation assets

R&D spending indicates the extent to which the public and private sector invests in the production and diffusion of innovation. R&D activities are heterogeneous across Sweden but high in South Sweden. The region is in the top 20% of OECD regions on a variety of measures of innovation assets, including R&D expenditures. The region also compares favourably to other parts of Sweden in terms of education and the prevalence of digital workers (Figure 2.15).

Figure 2.15. Innovation assets in South Sweden



Note: Percentiles are relative to other OECD regions.

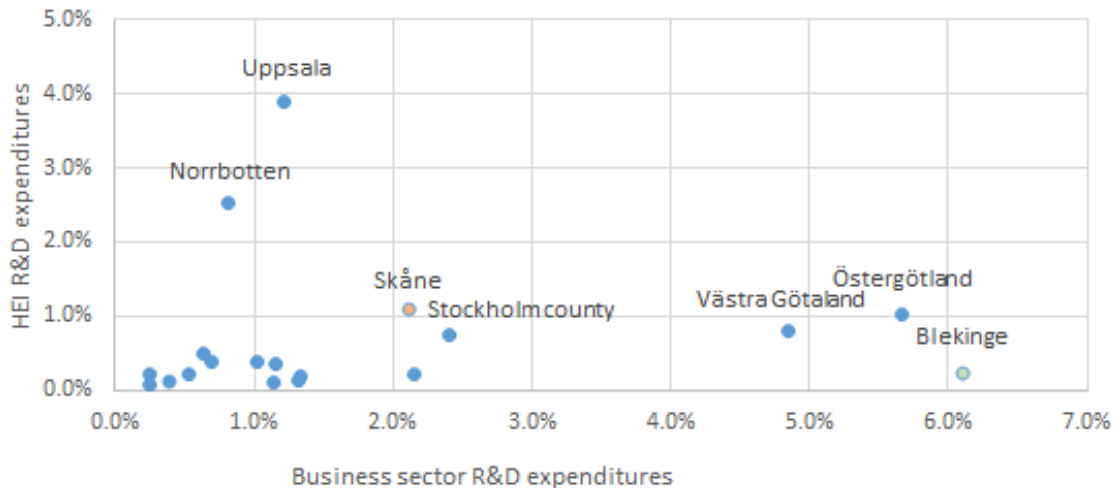
Sources: R&D expenditure from https://stats.oecd.org/Index.aspx?DataSetCode=REGION_INNOVATION

Education from OECD Regional Education database https://stats.oecd.org/Index.aspx?DataSetCode=REGION_EDUCAT; Digital workers calculated from EU Labour force survey microdata; Web usage from OECD Regional Statistics <http://dx.doi.org/10.1787/region-data-en>

However, while Blekinge County excels in business sector R&D expenditures, it has lower-than average R&D expenditures from higher education institutes (Figure 2.16)

Figure 2.16. R&D expenditure for businesses and HEIs, by county

Percent of county GDP



Source: Statistics Sweden, Research and development, available at <https://www.statistikdatabasen.scb.se/pxweb/en/ssd/>

Entrepreneurial culture

An insufficiently entrepreneurial culture was mentioned several times during the workshops as a factor inhibiting innovation diffusion in Blekinge. Sweden ranks below the OECD average on various indicators regarding entrepreneurial attitudes and skills (OECD, 2019^[2]). This may be a barrier to innovation diffusion in the region.

Regarding entrepreneurial culture, data from the Global Entrepreneurship Monitor show that Sweden scores considerably lower than the global average on various indicators of entrepreneurial culture, for

instance the entrepreneurial intentions rate ($\frac{1}{3}$ of global average) and total early stage entrepreneurial activity (half of global average).² No regional data on entrepreneurial culture for Blekinge were available.

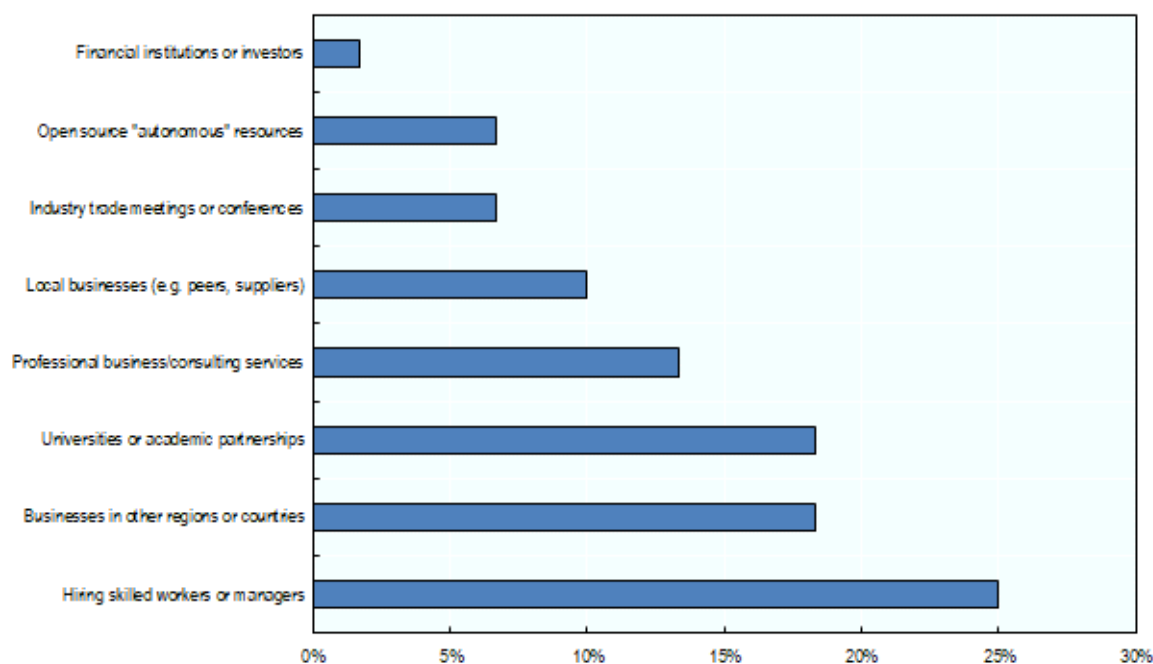
2.4 Channels

Knowledge and ideas can flow through different channels. These channels include diffusion of knowledge between higher education institutions (HEIs), public research institutions (PRIs) and firms (including through university spin-off enterprises); collaboration between firms in supply chains (including linkages between SMEs and foreign direct investors (FDI)), and workers changing jobs among firms, HEIs and PRIs as well as graduates joining the labour force.

Based on responses to the OECD survey, stakeholders in the region identify skilled workers as the most important channel of innovation diffusion (Figure 2.17). Businesses in other regions of Sweden or in foreign countries were also highly-regarded sources of information, followed by university/academic partnerships.

Figure 2.17. Importance of channels in the region

Weighted average of stakeholders' ranked survey responses



Source: OECD Stakeholder survey

However, nearly all respondents said that there were bottlenecks in finding skilled workers and many said it was difficult to access academic institutions (Figure 2.22).

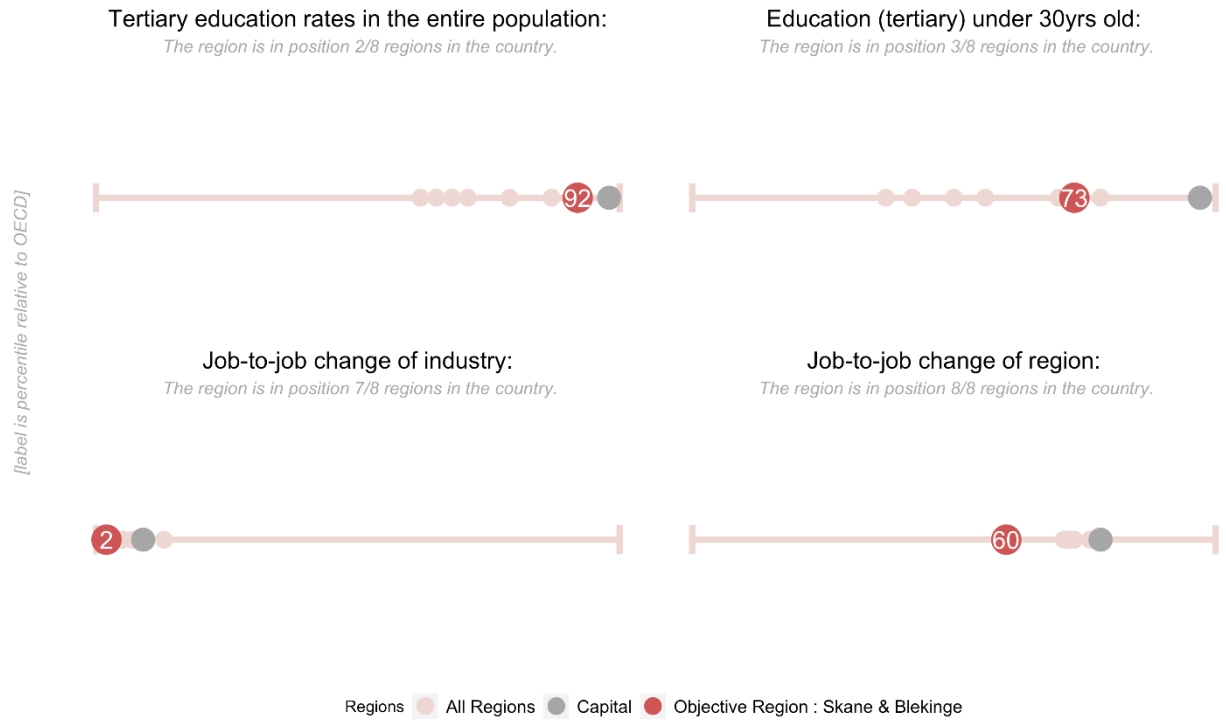
Hiring skilled workers

South Sweden's **tertiary education** rate is in the top 10 percent of OECD regions; thus the supply of skilled workers is likely high. In terms of worker **mobility**, inter-regional mobility in Sweden is high but

² <https://www.gemconsortium.org/economy-profiles/sweden-2>

industry mobility is low throughout the country, including in South Sweden (Figure 2.18). Finally, the share of digital workers in SMEs is very high (near the top of OECD regions) in South Sweden although not as high as in the Stockholm region.

Figure 2.18. Educational attainment; worker skills and mobility



Source: OECD calculations from EU Labour Force Survey data

International **immigration** is high throughout Sweden (Figure 2.19). The South Sweden region has an average share of international immigration relative to the rest of the country but above-average relative to the rest of OECD regions. In terms of migration within Sweden (across counties), Blekinge has a slightly below-average share of internal migration from Stockholm, Sweden’s most productive county.

Figure 2.19. International immigration into South Sweden; Domestic immigration into Blekinge County from Stockholm County



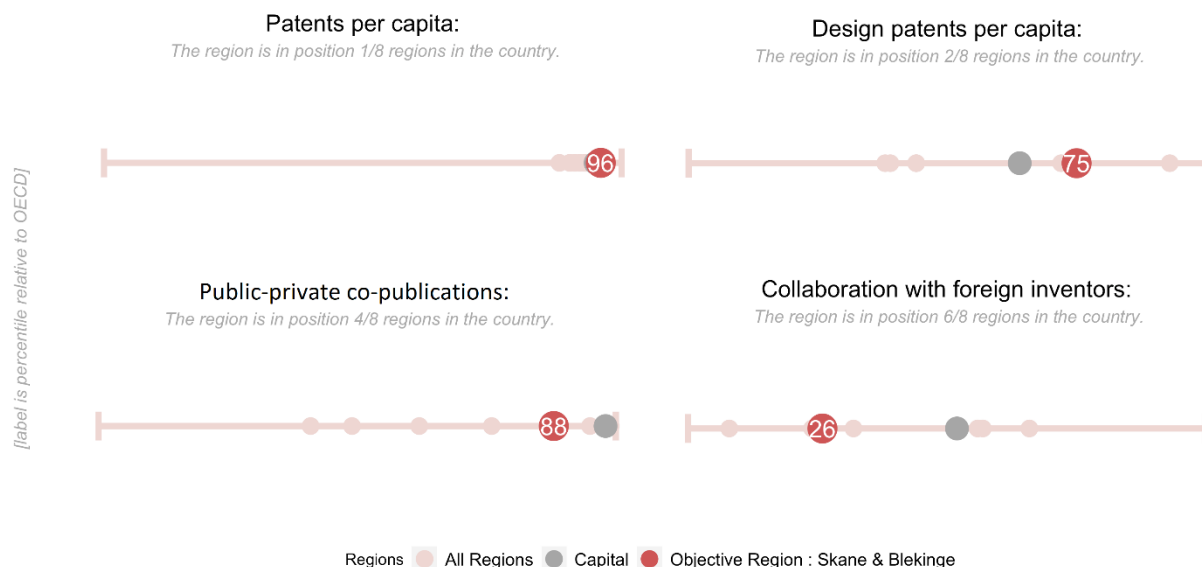
Source: Statistics Sweden and OECD Regional Migration database

Learning from other businesses

While the number of **patents per capita** reflects a region’s frontier innovations, places with effective innovation diffusion also have more patenting activity. Since innovation knowledge is often local, places that produce patents can also help encourage adoption. Moreover, the production of patentable inventions often requires substantial knowledge about previous innovations; thus successful patents indicate spillovers of embodied knowledge from other places.

Patenting is high throughout Sweden. Similar to the rest of Sweden, inventors in South Sweden are very successful in patenting (Figure 2.20). South Sweden also has high rates of design patents and public-private co-publications but low rates of foreign collaboration.

Figure 2.20. Patenting activity

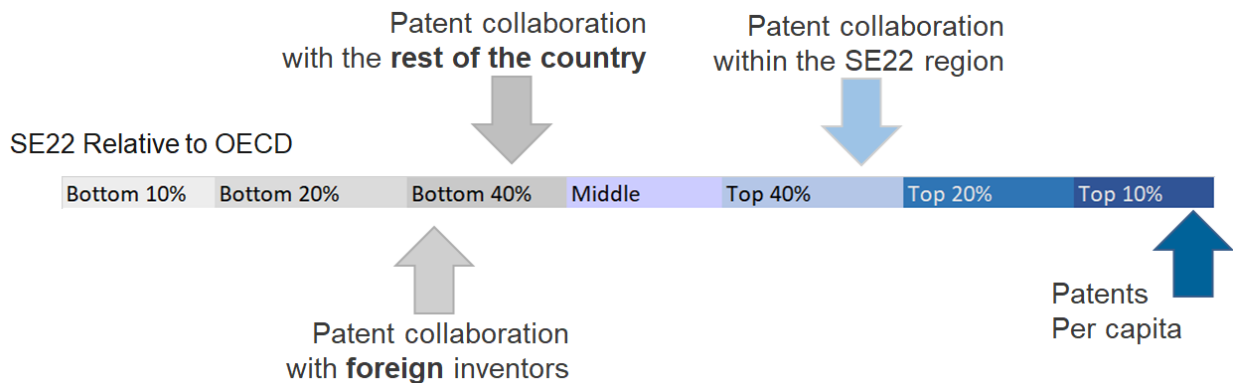


Source: OECD calculations from PATSTAT and OECD Regional Innovation database

https://stats.oecd.org/Index.aspx?DataSetCode=REGION_INNOVATION

Co-patenting patterns can capture the degree of research and innovation collaboration across firms and with other innovating entities.³ Patent collaboration (co-patenting) *within* South Sweden is very high. However, relative to other OECD regions, South Sweden has less collaboration outside of the region with inventors in other parts of the country and abroad (Figure 2.21). During the workshops, participants expressed concern that there were insufficient linkages between local large and smaller firms, with insufficient orientation of local large firms on SMEs.

Figure 2.21. Patent collaboration



Source: OECD calculations from PATSTAT and OECD Regional Innovation database
https://stats.oecd.org/Index.aspx?DataSetCode=REGION_INNOVATION

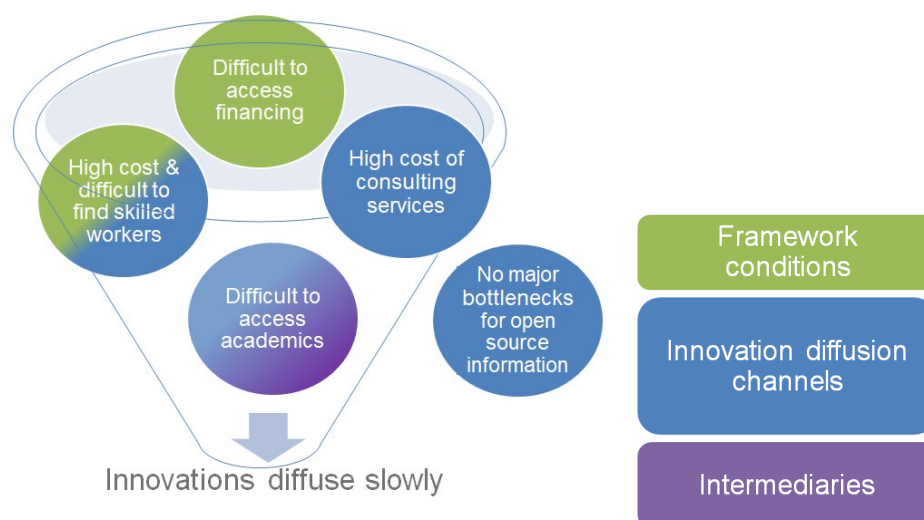
Academics, consulting, and open sources

In Blekinge County, links to academics appear to highly important (Figure 2.17). However, many survey respondents said that there were **bottlenecks** making it difficult to access academic institutions. In addition, some respondents cited high costs of consulting services as additional bottlenecks to channels. On the other hand, respondents indicated that there were few bottlenecks to accessing open sources for innovation information (Figure 2.22).

³ Patent applicants can be registered in different locations; therefore, for each region one can calculate the shares of patent co-applicants registered in the same region, different regions of the same country, and those registered in foreign countries.

Figure 2.22. Main bottlenecks in region's channels

Based on modal survey responses



Source: OECD Stakeholder survey

Similar to patenting, there are indications that while linkages within the region are strong, those outside the region are less well-established. For instance, the polls held during the workshops suggest that local companies benefit from innovation diffusion from universities, but are less able to tap into innovation developed outside the region.

2.5 Intermediaries and policies

This section explores the role of innovation diffusion intermediaries, i.e. organisations that are key in facilitating the transfer of innovation, such as chambers of commerce and business associations, public business support providers, technology transfer offices and accelerators, incubators and technology parks. Key attention is paid to how these organisations link different actors together and allow innovation to flow from one segment of the economy to another.

Blekinge has nine main intermediaries, detailed in Table 2.1. Region Blekinge is the regional development authority for Blekinge County whereas Coompanion and Almi are intermediaries with significant presences in other parts of Sweden. Aside from the Blekinge Institute of Technology, many of the remaining intermediaries in Blekinge are focused on specific companies or industries.

Table 2.1. Blekinge's intermediaries

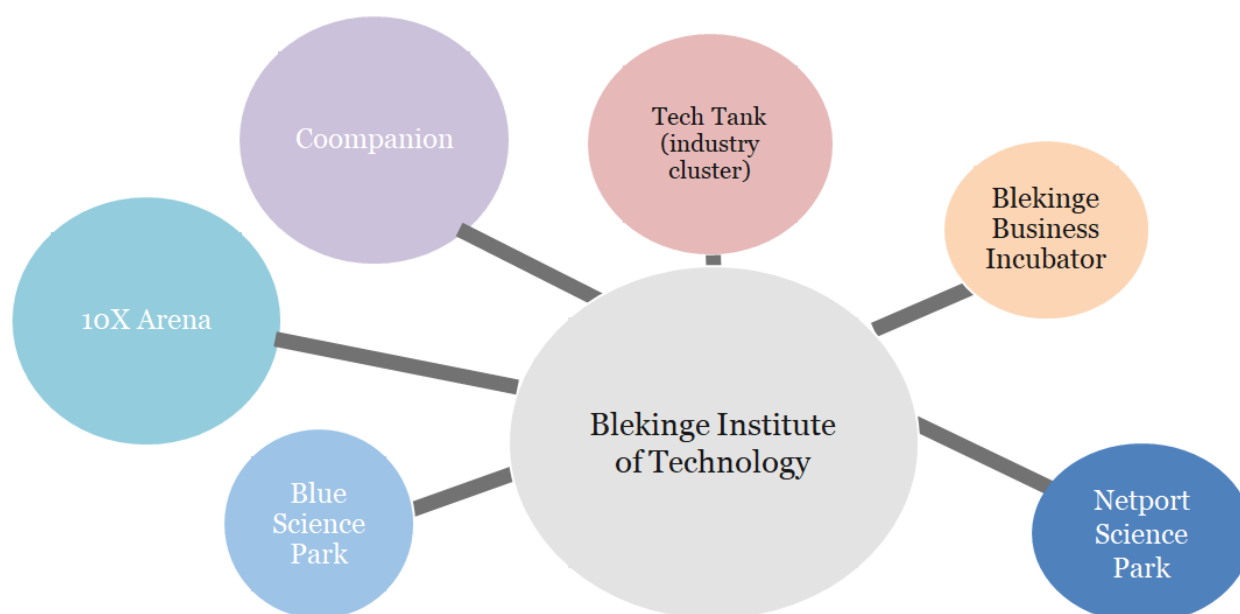
| Organisation name | Type | Website |
|-----------------------------|--------------------------------------|--|
| 10X Arena | Environmental innovation support lab | https://www.10xlabs.se/ |
| Almi | SME-focused financing agency | www.almi.se/blekinge |
| Blekinge Business Incubator | Incubator | www.bbi.se |

| | | |
|---|--------------------------------------|---|
| Blekinge Institute of Technology (BTH) | Higher education institution | www.bth.se |
| Blue Science Park | Science & technology park | www.bluesciencepark.se |
| Coompanion | Social business support organisation | https://coompanion.se/blekinge/ |
| Netport Science Park | Science & technology park | www.netport.se |
| Region Blekinge, regional development authority | Local/regional development agency | www.regionblekinge.se |
| Tech Tank | Industry cluster | www.techtank.se |

The stakeholder survey asked about links between several of the larger intermediaries (Almi, Region Blekinge, and Blekinge Institute of Technology) and the remainder. For example, Figure 2.23 shows that all intermediaries are linked to Blekinge Institute of Technology, the county's main higher education institution (HEI). Indeed, survey respondents indicated that Blekinge Institute of Technology was the most relevant intermediary for diffusion and also the one that could ideally play a bigger role in the region.

Figure 2.23. All intermediaries have links to the Blekinge Institute of Technology

Based on survey responses and informational interviews



Source: OECD Stakeholder survey

In the workshops, some stakeholders thought that larger companies could be more involved in the region's innovation ecosystem.

Table 2.2. Policy strategies and documents

| Policies | Leading intermediary | Website |
|-------------------------------|----------------------|--|
| Regional Development Strategy | Region Blekinge | www.regionbleking.se |
| Blekinge Strategy for Smart | Region Blekinge | www.regionblekinge.se |

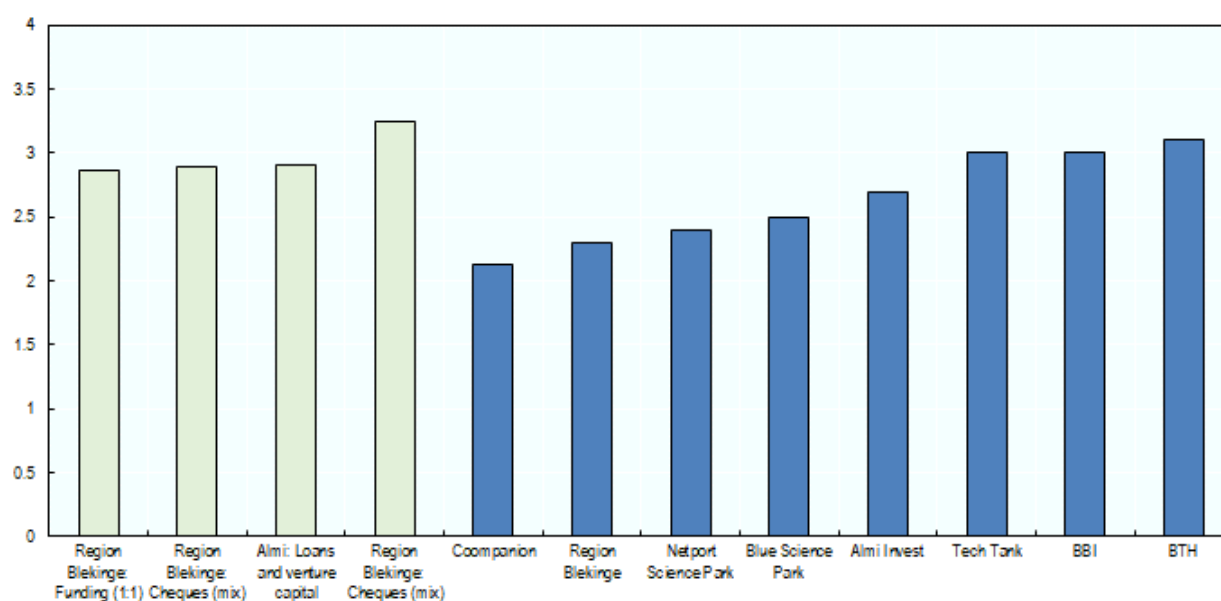
| | | |
|--|---|--|
| Specialisation | | |
| European Regional Development Fund, Skåne-Blekinge | Swedish Agency for Economic and Regional Growth | www.tillvaxtverket.se |

When asked about the role of **policies**, most stakeholders had positive views (Figure 2.24), although the workshops showed somewhat more negative views. In terms of bottlenecks, stakeholders often cited a lack of participation by companies as a main bottleneck in policies' effectiveness – particularly for Region Blekinge's policies. For Almi's policies, survey respondents also said that the participation requirement is too high. For Blekinge Business Incubator, many respondents indicated that there were no major bottlenecks.

In the workshops, participants expressed a clear preference for an extension in policy initiatives to support innovation, in particular in finance, and underlined the importance of both national and regional policies for innovation diffusion. However, stakeholders also mentioned that too many policy initiatives were relatively isolated from each other.

Figure 2.24. Stakeholder views of policies and intermediaries

Stakeholders' average assessment of effectiveness *for innovation diffusion*



Note: 10X Arena was identified as a relevant intermediary only after the survey was conducted; thus it was not included in this question. In both questions, the minimum score was=1; the maximum score was=4.

Source: OECD Stakeholder survey

Box 2.1. Connecting social purpose enterprises to intermediaries in Blekinge County, Sweden

Although Blekinge county is more productive and innovative than many OECD regions, its productivity and start-up rates are slightly below Sweden's national average, suggesting that Blekinge faces challenges in innovation diffusion. In the workshops, some stakeholders asked, do companies and intermediaries in Blekinge have incentives to collaborate? Many stakeholders expressed interest in defining common goals such as working towards environmental sustainability or climate change solutions. While 10X Arena is already supporting environmentally-focused initiatives, Coompanion is taking a leading role coordinating intermediaries to help a variety of social purpose entrepreneurs.

A number of intermediaries support Blekinge's Region Development Strategy

Blekinge's Regional Development Strategy aims to increase entrepreneurship and innovative R&D activities in the region. The realisation of new ideas, spurred by business creation and innovation diffusion, is a key determinant of economic growth. Innovative activities can also address social problems such as inequality, climate change, and unsustainable consumption. This broader concept, so-called social innovation, prioritizes social objectives just as much as profits. Progress on social objectives can help ensure environmental sustainability, health and well-being, and social cohesion.

Policy efforts take many forms and, in Blekinge, these efforts materialize by collaborative actions led by Region Blekinge, Almi, BBI (Blekinge Business Incubator), several science parks, Coompanion, and 10X Arena. Region Blekinge, formed in 2019 through a merger of the Blekinge County Council and Blekinge Region's initiatives, is a main intermediary working towards regional long-term sustainable development. Besides providing state funds for regional growth, Region Blekinge also provides business support with a special focus on projects related to health and medical care, public health, regional growth, infrastructure, public transport, culture and education. Almi, a state-owned business developer that provides loans and business orientation to SMEs, is another important actor in guiding social innovation in the region. The Blekinge Business Incubator (BBI) supports entrepreneurship by providing strategy and technical expertise to business that challenge society with new ideas and solutions. Several science parks also encourage collaboration between academic researchers and private sector firms.

Coompanion is an intermediary that supports many types of social innovation in Blekinge. This cooperatively-owned intermediary receives public funding and has twenty five sites across Sweden. It promotes idea-driven cooperative companies, organised through joint ownership, and commonly started to work on a societal challenge. These companies have equal and democratic ownership, in which sustainability from a social, economic and environmental perspective is prioritised. While some social enterprises have a non-profit structure, others are traditional businesses but with a well-defined social purpose. 10X Arena is another intermediary in the Blekinge region that supports entrepreneurs who are focused on a specific type of social innovation: technological solutions to large-scale environmental challenges. Both 10X and Coompanion promote not only knowledge creation, but also knowledge diffusion.

The Social Business Board initiative brings different intermediaries together for a common purpose

Coompanion Blekinge has launched the Social Business Board to connect individuals, companies and other organizations that support socially-beneficial ideas. The initiative is aimed at early-stage social entrepreneurs. It gives them an opportunity to present their proposal and then receive guidance and feedback from the region's innovation support system (ALMI, BBI, Coompanion, NetPort Science Park and Region Blekinge). By participating in an SBB, social purpose entrepreneurs share information about their ventures with policy makers and learn how to find resources to help their new businesses succeed. The first SBB took place on September 29, 2020.

Source: <https://coompanion.se/2021/04/14/anmal-dig-till-social-business-board-och-ta-din-samhallsnyttiga-affarside-tillnasta-niva/>

3 Conclusion and policy discussion

Innovation diffusion in Blekinge functions well in many respects...

The pilot use of the innovation diffusion tool in Blekinge has shown that innovation diffusion functions well in the region in many respects, building on the strength of its highly educated population, well developed digital infrastructure and innovative industrial base, as well as its social networks. Skilled workers are seen as the key channel for innovation diffusion, followed by linkages among companies and university-academic partnerships. Blekinge has a well-developed network of intermediaries that support innovation diffusion, embedded in a supportive set of regional and national policies, the coherence of which could be further improved.

...although a number of challenges exist

Framework conditions for innovation diffusion are generally functioning well in Blekinge. However, access to finance, attitudes to entrepreneurship and networks could be improved and coherence increased across the innovation intermediaries.

The project revealed that access to finance for SMEs and start-ups is seen as a main barrier to innovation diffusion. The entrepreneurialism of the region's economy also needs to be reinforced. Perceived bottlenecks to start-ups and innovative entrepreneurship need to be addressed, including strengthening the linkages (a 'bridge') between enterprise and academia. This includes social enterprises and 'ideas based sectors'...However, stakeholders are concerned that the boosting of entrepreneurship must be achieved without loss of existing certainties and welfare state institutions.

Additional barriers for innovation diffusion to SMEs and start-ups lie in the areas of access to skills and difficulties in accessing academics. More generally, a lack of resources on the part of SMEs was mentioned as a reason for suboptimal innovation diffusion.

There are close linkages among innovation actors within the region, but linkages are lacking to players outside of the region. An important response would be opening up the networks in the region and connecting them to relevant networks and groups outside the region to facilitate learning and find partners. This could also contribute to the needed 'critical mass' to leverage innovation. However, there is some fear for a trade-off between this opening up and a loss of the social capital and networks within the region.

There is also a perception that there are various support intermediaries and measures, but that these are isolated from each other and sometimes overlap and target the same group.

Overall, in the workshops, stakeholders were mostly neutral on the question of whether policies to support innovation diffusion work well. Most participants would welcome further policy initiatives to support innovation diffusion, favouring mostly national but also regional/local initiatives and with emphasis on improving access to finance, skills and the reduction of red tape.

To address these challenges, stakeholders favour the formulation of a broadly shared ambition and objectives for innovative change through a mission based innovation approach

Compared to other OECD regions, economic and innovative performance in Blekinge is already strong, including aspects of innovation diffusion within the region. That is first and foremost a strength to build upon, in particular in recovering from COVID-19. But at the same time it underlines that taking Blekinge

to the next level requires more transformational change, which is not only more complex to achieve but may also involve potential changes in the institutional environment that stood at the basis of Sweden's inclusive society. For such transformational change to succeed, it is important to have 'all on board' and formulate joint and widely shared objectives, which was also underlined in the survey and workshops (Box 2.1). Blekinge's ambition to take a 'mission based' approach to innovation in its smart specialisation strategy aims to address the complexity and interrelatedness of the desired change as well as to create wide support and ownership for this.

Blekinge aims to be a test bed region for innovations

The key challenges and aspirations of the region lie in the wish to continue to foster the catching up of Blekinge by diversifying and strengthening Blekinge's economic base. Strengthening innovation diffusion can play an important role in this. As part of this ambition, the region wants to make use of its small scale and close linkages to position itself as a test bed region for innovations within Sweden and Europe.

The ambition to be a test bed region could function as one of the innovation missions to pursue. It includes a wide variety of actors in the eco-system (university, HEI, the private sector, regional and local government) and should be pursued through a coherent set of measures. The test bed ambition should not 'just' be explored from a technological perspective, but include regulatory aspects and framework conditions, and experimentation. There are various examples of regions and organisations that successfully transformed themselves into demonstration labs for innovative solutions, by using instruments such as innovation deals, sandboxes and regulation low zoning (German Federal Ministry for Economic Affairs and Energy, 2019^[4]). Taking a start-up perspective into account seems important, given the importance of start-ups and the barriers to start-ups that exist in the region, for example in terms of finance and culture. It is also important to have a clear focus in the test bed ambition in terms of technological domain and (possible) partners, also given the size and relatively limited capacities of the region.

Towards a more entrepreneurial ecosystem

It is likely that further raising productivity growth and strengthen innovation requires more than incremental steps with the current innovation system, and should focus on strengthening the entrepreneurial potential of the regions, which was also the outcome of the workshops and survey. To foster innovative start-ups and leverage the potential of SMEs for scaling up some measures appear relatively straight forward, such as improving framework conditions in access to finance, including through (quasi) equity, and making the regulatory framework less burdensome in particular for start-ups. Other measures, such as the strengthening of entrepreneurial skills and a more entrepreneurial culture will take a concerted longer term perspective. A focus on technology domains and business models that can benefit from Blekinge's existing strengths but at the same time helps to reduce path dependency on the existing large firm and heavy industry dominated structure could be explored, including further sectoral diversification in the direction of tourism and other services.

Broadening partnerships, entering GVCs

The project suggests that a renewed positioning of the Blekinge innovation ecosystem should go hand in hand with the broadening of partnerships and linkages. This could focus on building linkages to actors outside the region in Sweden or nearby countries, that offer possibilities for learning and cooperation, for instance in the test bed ambition. Various instruments and formats exist for supporting such network development between entrepreneurs, academics, policy makers and others, for instance in the context of the EU, but also the recently developed STRING network among regions in northern Europe developed in cooperation with the OECD.⁴ Also within the region, the existing network of partnerships and relationships could be further mapped to identify how 'newcomers' and 'outsiders' could be given a place,

⁴ <https://stringnetwork.org/oecd/>

whilst of course maintaining the merits of existing social capital. Various examples exist, for instance, of how policies can support the participation of SMEs in supply chains of larger companies within and outside the region, and thus in wider GVCs.

Transition and inclusion

As discussed above, a mission based approach to innovation requires broadly shared ownership and support, not only at the beginning with regard to the objectives to be pursued, but also in the process, changes and trade-offs this may bring forward. Although OECD studies suggest that win wins between pursuing productivity growth and radical innovation and well-being are possible, distributional effects are likely to occur. The approach should therefore consider how the transition of the path towards the realisation of the mission is monitored and how measures are being put in place to counter negative distributional effects.

Intermediaries need to work more closely together

Intermediary organisations in the region already know how to find each other in this small region. With many focusing on similar stakeholders and on aspects of capacity building of SMEs a mapping and review of focus activities could be worthwhile. At least as importantly, is to strengthen cooperation around an agreed joint ambition/mission for transformative change. Key to this is not to operate (only) from the perspective of each intermediary's mandate and competences, but rather from the demand side of what SMEs and other actors need to participate in the required change and make the innovation a success. This also enables a conversation among intermediaries on how support (and cooperation thereto) needs modified given the new ambitions.

Multilevel governance

The transformational course Blekinge aims to take requires action on various levels, local, regional, national and European. Some challenges or opportunities need to be addressed at national level (such as regulatory issues), others at more local and regional level (for instance skills and entrepreneurialism), whereas connecting to networks outside Sweden in particular has a European dimension. The workshops suggested that national agencies could have a stronger regional focus. For the mission approach to be a success, it is not only necessary to have all levels of government to be on board from the start, but also to ensure governance during the execution that ensures an effective, efficient and coherent approach.

4 Annex: Methodology and data sources

Methodology and analytical framework

Innovation diffusion can be defined as the process through which firms gather knowledge, information and innovations from outside and use them to introduce their own innovative products or processes. It is a broad concept, referring, among other things, to the adoption of new-to-the-firm technologies, the introduction of new management techniques, the digitalisation of certain processes, or the introduction on the market of a new product.

According to the Oslo Manual 2018 “*innovation diffusion encompasses both the process by which ideas underpinning product and business process innovations spread (innovation knowledge diffusion), and the adoption of such products, or business processes by other firms (innovation output diffusion)*”. (OECD/Eurostat, 2018).

Innovation diffusion is a complex phenomenon that relates to three sets of factors:

- The local and national **framework conditions**, which affect firms’ incentives and capacities to adopt innovations.
- The functioning of the **channels** through which the diffusion can take place.
- The presence and functioning of a variety of **intermediary organizations** that help companies build the capacity for innovation adoption, identify external resources, and share knowledge among peers.

Framework conditions

Local and national framework conditions shape the environment for innovation diffusion. These conditions affect firms’ incentives and capacities to adopt innovations. The six framework conditions for innovation diffusion are:

1. The **institutional and regulatory framework** (e.g. judicial system, patents, taxes, administrative rules) for business investment.
2. **Market conditions**, such as product demand (domestic and foreign), along with uncertainty and interest rates.
3. **Access to financing** for firms in general and start-ups and SMEs in particular (e.g. loans, debt, various forms of equity).
4. Physical and digital **infrastructure** (e.g. transportation and logistics networks; fast, reliable internet connections, and digital assets such as retailing platforms and cloud computing).
5. **Access to skills**, which includes managerial skills, technical and digital skills and entrepreneurial know-how.

6. Presence of **innovation assets** such as R&D and innovative businesses that contribute to an entrepreneurial culture.

The first three framework conditions characterise the business or regulatory environment; the other three conditions describe infrastructure and innovation assets. The business/regulatory environment affects firms' costs and benefits of adopting innovations. Infrastructure and innovation assets are another important factor for innovation diffusion, as they shape firms' technological capacity and define the quality of their interactions with other companies, workers, and markets. These framework conditions all form a region's innovation ecosystem that determines firms' ability and willingness to learn about and adopt existing innovations.

Channels

Innovation diffusion channels are sources of information that firms may encounter in their normal business operations. Channels expose companies to new ideas and help them develop (or find) the know-how to source and implement the innovations. They represent direct ways through which businesses acquire ideas from outside and use them to adopt innovations.

This report highlights five channels:

1. **Workers' career mobility** through which workers and managers changing jobs or firms can draw upon the knowledge acquired in previous jobs to the benefit of their new firms.
2. **Supplier relationships** through which firms exchanging products or services can share their knowledge with each other to increase the competitiveness of the supply chain. Customers can also provide critical feedback that make firms aware of innovations at the frontier.
3. **Academic-business collaboration (ABC)** that helps firms source the knowledge needed for R&D.
4. **Knowledge-intensive services** (e.g. consulting, IT, accounting), which can help firms identify and adopt innovative practices.
5. **Autonomous learning**, which relies on open knowledge, and as such does not typically require direct interaction with other firms or innovating entities. It could be websites, publications, or indirect observation and imitation of competitors.

Intermediaries

The final pillar of innovation diffusion, **intermediaries**, consists of entities that facilitate the diffusion of innovation without being directly involved in its production or adoption. Instead, intermediaries facilitate connections between companies and diffusion channels and also support collaboration. The three types of intermediaries are:

- a) **University and research-related intermediaries** facilitate knowledge transfer from higher education institutions (HEIs) and public research institutions (PRIs) to businesses and other actors in the surrounding innovation ecosystem. Indeed universities and HEIs perform a variety of functions for innovation diffusion; some host incubators or accelerators that play all three roles in supporting diffusion. Governments can use policy to encourage the formation and success of university and research-related intermediaries.
- b) **Public sector innovation and local development agencies** aim to increase the innovation output and uptake of technologies by the business sector. A survey of innovation agencies in ten different countries finds that the main tasks of innovation agencies are providing support to other intermediaries such as business incubators or science and technology parks, and organising capacity- and institution-building activities. In Europe these agencies are often partly or jointly

responsible for administering innovation vouchers aimed at encouraging academic-business collaboration (ABC) partnerships.⁵

- c) **Private sector-led intermediaries** include many types of “enterprise-led” networks. These networks include chambers of commerce, science parks and cluster associations. Large “anchor” firms can also serve as intermediaries that coordinate private sector businesses within the regional innovation system.⁶ Industry clusters and science and technology parks often play multiple roles in diffusion.

Intermediaries help connect firms to innovation channels but they are not institutions that companies necessarily encounter during their normal business operations. Unlike individual businesses, intermediaries may be very responsive to policy interventions because their missions are usually connected to innovation creation and diffusion. Their roles in diffusion include:

- a) **Funding.** Some intermediaries specialise in mediating academic-business or business-business investment relationships for small and large businesses. Other intermediaries administer public funding to promote innovation production and diffusion.
- b) **Capacity building.** Many public agencies and higher education institutions provide advice and workshops to support business development, especially for smaller businesses.
- c) **Networking.** Employer associations and chambers of commerce often help businesses learn about innovations and share knowledge with their peers. In addition, public sector and academic institutions and even individual firms — ranging from small entrepreneurs to large established “anchor” firms — can serve as intermediaries.

Sources of data

The analysis relies on different sources of data that are generally available at the subnational level, using NUTS2 (also known as TL2) regional classifications. The measures displayed in the report were chosen in part based on data availability because some measures are not available for particular countries or regions.

Framework conditions

A broad range of indicators can be used to measure the strength of framework conditions at the regional level (Table 4.1). These indicators reflect the business and regulatory environment and a variety of infrastructure and innovation assets that are relevant for innovation diffusion at a regional level. Measures of regulations are generally based on survey responses while the other measures are based on economic indicators such as trade patterns, labour force characteristics, financing conditions, and R&D expenditures.

Table 4.1. Indicators measuring framework conditions in regions

| Name of indicator | Notes | Data sources (see table note) |
|---|-------|----------------------------------|
| Institutional and regulatory framework | | |

⁵ Specifically, innovation vouchers are “small lines of credit provided by governments to small and medium-sized enterprises to purchase services from public knowledge providers with a view to introducing innovations (new products, processes or services) in their business operations”.

⁶ The presence of a large, R&D-intensive “anchor” firm helps the regional innovation system better absorb university research output and stimulate local R&D.

| | | |
|--|---|-------|
| Institution fairness and quality | Regional indicators of governance quality. Measures are based on surveys administered by the University of Gothenburg and include (1) Lack of corruption; (2) Quality and accountability; and (3) Impartiality. | RCI |
| Administrative burdens on start-ups* | Component of the composite index "Barriers to domestic and foreign entry". Covers the administrative burden on joint-stock companies and personally-owned enterprises, as well as administrative burden related to licenses and permits procedures. Higher values indicate lower administrative burdens. | PMR |
| Complexity of regulatory procedures* | Composite index that captures the government's efforts to reduce and simplify the administrative burden of licenses and other administrative procedures. Higher values indicate less complexity. | PMR |
| Quality of judicial process* | The quality of judicial processes index measures whether each economy has adopted a series of good practices in its court system in four areas: court structure and proceedings, case management, court automation and alternative dispute resolution. Higher values indicate a more sophisticated and streamlined court structure. | DBI |
| Market conditions | | |
| Trade openness | (Imports + Exports)/ GDP | Reg |
| Share of exports by SMEs** | Exports by SMEs/Total exports | TBE |
| Barriers to trade facilitation* | The barriers to trade facilitation index captures the extent to which a country recognizes foreign regulations, uses international standards and has international transparency of domestic regulation. Scores from most to least restrictive. | TFI |
| Services Trade Restrictiveness* | Composite index that quantifies restrictions on trade in services across five standard categories: 1) restrictions on foreign entry, 2) restrictions on the movement of people, 3) barriers to competition, 4) regulatory transparency, and 5) other discriminatory measures. Scores from completely closed to completely open. | STR |
| Public procurement market** | Expenditure on public procurement/GDP | GG |
| Infrastructure | | |
| Population accessible via highways | Total population residing in the neighbouring regions of a given region where regions count in a way that is inversely related to their reciprocal distance. | Adler |
| GDP accessible via highways | Ibid. | Adler |
| Employment accessible via highways | Ibid. | Adler |
| Share of population ... | | |
| ...with internet broadband access | Population with internet broadband access/Total population | Reg |
| ... with download speed greater than 200mbps | Population with download speed greater than 200mbps/Total population | Reg |
| ... using internet | Population using internet /Total population | Reg |
| Access to skills | | |
| Share of prime-age population with tertiary education | Population between 25 and 64 years old with tertiary education/Population between 25 and 64 years old | Reg |
| Share of young adult population with tertiary education | Population between 25 and 34 years old with tertiary education/Population between 25 and 34 years old | Reg |
| Share of population within 10km of a higher education institution | Population near a higher education institution (within 10km)/Population | ETER |
| Share of workers with tertiary education | Workers with tertiary education/Total employment | LFS |
| Share of workers that received training in the past four weeks | Workers that received training in the past four weeks/Total employment | LFS |
| Difference between SMEs (including self-employed) and the entire economy in... | | |
| ... the share of workers with tertiary education | SMEE Employment with tertiary education/SMEE Employment - Employment with tertiary education/Employment | LFS |

| | | |
|--|---|----------|
| ... the share of workers that received training in the past four weeks | SMEE Employment that received training in the past four weeks/SMEE Employment - Employment that received training in the past four weeks/Employment | LFS |
| Shortage of digital workers | Ratio between the number of vacancies in digital occupations and employment in digital occupations | BG & LFS |
| Access to financing | | |
| Difference between small and large firms in... | | |
| ... the implicit tax subsidy rate on R&D expenditure** | Model-based estimates of implied marginal R&D tax subsidy rates | RDTI |
| ... the interest rate on loans | Exact definitions differ by country. | SMEE |
| Share of total business lending going to SMEs** | Business lending to SMEs/Total business lending (amounts in local currency) | SMEE |
| Share of total loan applications going to SMEs** | Loan applications by SMEs/Total number of SMEs | SMEE |
| Access to innovation assets | | |
| R&D expenditure... | | |
| ... in the business sector | R&D expenditure in the business sector/GDP | Reg |
| ... in higher education institutions | R&D expenditure in higher education institutions/GDP | Reg |
| ... in the business sector | R&D personnel in the business sector/Total employment | Reg |
| R&D personnel in higher education institutions | R&D personnel in higher education institutions/Total employment | Reg |

Note: (*) = indicator available at national level, (**) = indicator available at national level, could be constructed analogously at the regional level. LFS indicators refer to workers aged between 25 and 64.

Data sources: (Adler et al., 2020^[4]) (**Adler**), Burning Glass Technologies (**BG**), World Bank Doing Business Indicators (**DBI**), **ETER** Database, OECD Government at a Glance (**GG**), OECD **ICT** Access and Usage by Businesses Database, Labour Force Survey (**LFS**), **PATSTAT**, OECD Product Market Regulation Indicators (**PMR**), European Regional Competitiveness Index (**RCI**), OECD R&D Tax Incentive Indicators (**RDTI**), OECD **Regional** Database, Regional Innovation Scoreboard (**RIS**), OECD SMEE Financial Scoreboard (**SMEE**), OECD Services Trade Restrictiveness Indicators (**STR**), OECD Trade by Enterprise Characteristics Indicators (**TBE**), OECD Trade Facilitation Indicators (**TFI**)

Innovation diffusion channels

A variety of indicators can be used to measure the functioning of innovation diffusion channels across regions. These indicators measure trade linkages, worker flows, and the presence of academic institutions and business services that could help companies learn about and adopt innovations (Table 4.2). Most of the measures are available at the regional level.

Table 4.2. Indicators measuring the strength of innovation diffusion channels

| Name of indicator | Notes | Data sources (see table note) |
|---|---|-------------------------------|
| Supplier relationships | | |
| Domestic value added content of gross exports | Value added embodied in gross exports of the region divided by total gross exports of the region | Los |
| Participation in GVC – backward linkages | Intermediate inputs produced abroad embodied in the region's exports | Los |
| Participation in GVC – forward linkages | Value added produced in the region embodied in trading partners' exports | Los |
| Inter-regional trade patterns | Export shares and trade in intermediate goods by industry sector. Each region is viewed as independent from other domestic regions. | RegI-O |
| FDI penetration in terms of GDP*** | Ratio between FDI turnover and total turnover in the region | *** |

| | | |
|---|--|---------|
| FDI penetration in terms of employment*** | Ratio between FDI employment and total employment in the region | *** |
| Local linkages with MNE affiliates/subsidiaries*** | Share of turnover of SME located in the region exported to local MNE affiliates/subsidiaries | *** |
| Worker and researcher mobility | | |
| Job-to-job transitions*** | Share of workers having changed job since the last period | *** |
| Job-to-job transitions from large to small firms*** | Share of workers having moved during the last period from a large to a small firm | *** |
| Job-to-job transitions from MNE affiliates/subsidiaries to local firms*** | Share of workers having moved during the last period from a MNE affiliate/subsidiary to a small firm | *** |
| Geographical and cross-industry mobility | Share of workers working in year y in a different region (within the same country) or different industry from the one they worked in year y-1 | LFS |
| Share of mobile academics | Share of academics who do not have the nationality of the higher education institution in which they work. | ETER |
| Share of mobile researchers | Share of researchers who do not have the nationality of the higher education institution in which they work. | ETER |
| Share of mobile students | The share of students who have physically crossed a national border for their tertiary degree studies | ETER |
| Academic-business collaboration | | |
| Access to higher education institutions | Number of HEIs per capita | ETER |
| Access to higher education institutions with high student mobility | Number of HEIs with high student mobility (per capita). Mobile students are those studying in a different country than their previous residence. | ETER |
| Share of university-industry patent applications | Number of patent applications filed jointly by (at least) a university and (at least) a business/Total number of patent applications | PATSTAT |
| Public-private co-publications per capita | Number of public-private co-authored research publications (excluding medical and health industries) divided by total population. | RIS |
| Share of academic start-ups** | Number of start-ups with at least an academic among its co-founders/Total number of start-ups | |
| Knowledge-intensive business services | | |
| Share of employment in knowledge-intensive services | Number of employees in knowledge-intensive services divided by total employees | Reg |

Note: (*) = indicator available at national level, (**) = indicator available at national level, could be constructed analogously at the regional level, (***) = not existing indicator, could be constructed – better if at regional level.

Sources: European Tertiary Education Register (ETER), Labour Force Survey (LFS), (Los and Chen, 2016^[5]) (Los), PATSTAT, OECD Regional Database, Regional Innovation Scoreboard (RIS), Regional Input-Output Data for Europe (RegI-O)

Innovation diffusion outcomes

A number of indicators can be used to measure the extent of regional growth and sustainable progress (Table 4.3) and the strength of innovation diffusion at the regional level (Table 4.4).

Table 4.3. Indicators measuring the extent of regional growth and sustainable progress

| Name of indicator | Measures | Data sources (see note) |
|---|---|-------------------------|
| Productivity | | |
| Productivity level | Total economy; Manufacturing; Services (all ex-finance) | Reg |
| Productivity growth rate (ten-year annualised) | Total economy; Manufacturing; Services (all ex-finance) | Reg |
| Wages and earnings | | |
| Average wages (Total compensation per employee) | Total economy; Manufacturing; Services (all ex-finance) | EUROSTAT |

| Environmental progress | | |
|-----------------------------|--|-----|
| Renewable energy generation | % capacity used of renewable energy generation | Reg |
| Greenhouse gas emissions | GHG from generated electricity per capita | Reg |

Data sources: EUROSTAT SBS, OECD Regional Database

The table below shows indicators of innovation production and adoption of existing innovations. It uses the Oslo Manual definition to group innovation adoption indicators into those that are: (a) not at the frontier but (b) build on outside knowledge. Finally, many of the outcome indicators relate to the activity of SMEs because smaller firms play important roles in a region's innovation diffusion ecosystem and typically have a great need to catch up to larger firms.

Table 4.4. Indicators measuring the extent of regional innovation diffusion, especially for SMEs

| Name of indicator | Does it capture (1) innovation that is (a) not at the frontier but (b) builds on outside knowledge? | Data sources (see table note) |
|--|---|-------------------------------|
| Adoption of products or processes with no or little modification | | |
| Average share of small and medium enterprises... | | |
| ... selling orders via computer networks** | a, b | ICT |
| ... with broadband speed at least >100 Mbit/s** | - | ICT |
| ... purchasing cloud computing services** | a, b | ICT |
| ... using electronic SCM systems** | a, b | ICT |
| ... selling orders via computer networks** | a, b | ICT |
| Innovation building on but differing substantially from products or processes offered or used by other firms | | |
| Number of patents per capita | 1, b | Reg |
| Share of SMEs introducing a product or process innovation | 1 | RIS |
| Share of SMEs introducing a marketing or organisation innovation | 1 | RIS |
| Share of workers in digital occupations | - | BG |
| Difference between the share of workers in digital occupations among SMEs and self-employed and the share of workers with tertiary education across the entire economy | - | BG & LFS |
| Share of SMEs collaborating in research and innovation | 1, b | RIS |
| Share of patent applications... | | |
| ... filed together with other patent applicants | 1, b | Reg |
| ... filed together with applicants located outside of the region | 1, b | Reg |
| ... filed together with applicants located outside of the country | 1, b | Reg |
| ... citing other patents | 1, b | PATSTAT |
| ... citing other patents filed also outside of the region | 1, b | PATSTAT |

| | | |
|--|------|---------|
| ... citing other patents filed also outside of the country | 1, b | PATSTAT |
| Number of patents per capita in specific high-tech fields (biotech, nanotech, medical, ICT, pharmaceuticals) | 1, b | Reg |
| Entrepreneurship | | |
| Birth rate of employer firms | 1 | Reg |
| Growth rate of young firms | - | Reg |

Note: (*) = indicator available at national level, (**) = indicator available at national level, could be constructed analogously at the regional level, Data sources: Burning Glass Technologies (BG), OECD ICT Access and Usage by Businesses Data, Labour Force Survey (LFS), PATSTAT

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