

The Future of Rural Manufacturing

Case Study of Germany



OECD Rural Studies

The Future of Rural Manufacturing: Germany Case Study

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Contact: Jenny Vyas | Policy Analyst | jenny.vyas@oecd.org

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1 Rural Manufacturing in Germany

Key Findings

Assessments:

Germany has a well-developed and strong manufacturing sector, which makes an important contribution to rural productivity and the well-being standards of rural citizens. Manufacturing employs on average 23% of the rural workforce and contributes to 28% of rural GVA in Germany. However, regional contributions can vary significantly based on the regional economic profile. In terms of the OECD rural manufacturing typology, which is based on transition probabilities, Germany is dominated by *traditional manufacturing hubs* (e.g. regions that used to be in the top quintile back in 2000 and are still so 20 years after) followed by *upgrading manufacturing hubs* (e.g. regions that moved to a higher quantile). Most of the *traditional manufacturing hubs* are situated in southern Germany while *upgrading hubs* emerged in eastern parts of Germany.

Germany does not have a specific rural manufacturing policy. Policies that are relevant for rural manufacturing can broadly be categorised into (i) regional economic development policies, which focus largely on addressing disadvantaged areas and building bottom-up structures, and (ii) rural development policies, which focus on raising well-being standards and service delivery. In addition, industrial policy support structures that do not have a region-specific components but focus on SMEs also have an impact on manufacturing. This report finds that the different policy areas relevant to rural manufacturing are gradually complementing each other, a welcomed and important development to address rural development challenges in a holistic manner.

Ongoing megatrends and structural change pose challenges to German's policy-making process, exposing a lack of agility and dynamism in both its design and implementation. To ensure rural firms remain competitive, policies need to adjust and respond more quickly to changing external conditions that are shaped by digitalisation, amongst other factors.

Main challenges for the German rural manufacturing sector include:

- Recruitment challenges and lack of relevant skills. Although regional needs vary, the firms in the manufacturing of data processing equipment, electronic and optical products, face the biggest challenges.
- Continuous rural-urban divide in digital high-speed connectivity and availability, and support for the development of digital skills within companies. Germany's metropolitan regions experienced speeds 11% slower than the OECD average and regions far from the metropolitan areas experience speeds 30% slower.
- Limited availability of land for development and significant delays in permitting processes.
- Limited capacity to take up support programmes (with high levels of bureaucracy and low levels of digitalisation) and difficulty navigating the support system from the side of "Landkreise" (TL3 regions or district) as well as SMEs.
- Low collaboration between companies to harness synergies and address above-mentioned common challenges as well as limited entrepreneurial culture.

General recommendations

Increase policy agility and experimentation in policy making to accommodate for fast-paced change and potential future shocks by:

- Integrating strategic foresight initiatives into rural and regional policy making at the ministerial and state levels. Findings and methodologies used as part of the existing federal foresight office, based in the Ministry of Education and Research, should be used to inform policy design through increased information and service sharing across the Ministries for Economic Affairs and Climate Action and the Ministry for Food and Agriculture. At state level, the Cluster Agencies, like the one present in Baden Württemberg, are good ways to monitor trends and offer businesses more customised and constantly updated solutions, other states should adopt similar structures.
- Make sure outcomes of evaluation and monitoring of programmes that identify barriers and bottlenecks are used to redefine, update and adjust existing policy and programmes regularly at all government levels.
- To assure sufficient coordination for overlapping policy areas emerging between economic policy and policies for rural development. At federal level, the interministerial working group for an all-German support system should consider expanding to strengthen the focus on strong rural regions. At state level, institutionalised interministerial working groups can help to reduce policy overlap or fragmentation, not all states have this.
- Expand the use of regulatory sandboxes and living labs in rural places and reduce entry barriers for SMEs for instance through awareness raising campaigns and setting-up one-stop-shops to lower the threshold of utilisation.

Increase availability of skills by:

- Ensure that skills mappings take place on a regular basis and update policy at state and regional levels. Setting up structured platforms of exchange between education institutions and companies are crucial in this regard. Developing cross-cutting skills in digitalisation (E-Literacy) and sustainability need to be integrated in any training.
- State and regions need to incentivise firms to put in place flexible models of work (homeoffice) and to recruit a more diverse workforce including women and people from minority backgrounds. Policies should also support regional branding.
- At regional level, making sure that public administrations can deliver on quality of life and attractiveness, for example adjusting kindergarten services to manufacturing schedules.
- Help districts to develop programmes to attract and connect young people to rural places by setting up local re-integration strategies and creating interactions between firms and youth during career orientation.
- Continue to pursue reforms on the migration system to attract skilled workers and reduce burden such as accreditations of qualifications at federal level.

Make the most of available land for development by:

- Allow more flexible approaches to land-use planning at state and regional levels. This can be done through the establishment of specific zones in a community which are more open to experimentation and temporary uses as well as fostering inter-communal cooperation for land-development. In cases where regular planning and appeal procedures are considered inadequate to deal with development needs, it is preferable to reform these procedures to facilitate better regional development.

Enhance digitalisation and digital skills:

- Shorten administrative approval times for communication network deployment, including obtaining rights of way, and improve coordination between different public authorities.

- Ensure that measures to strengthen digital skills also reach rural manufacturing firms that are not covered by existing federal programmes. Multiply learnings from centres, such as the one in Meschede, to other regions. Where not possible, states can use service vouchers to help firms access services offered by other partners.

Built vibrant business ecosystems:

- Improve entrepreneurship education and training to create an entrepreneurship culture in schools and create more links between established firms and start-ups for funding opportunities, knowledge exchange and skills development at state and regional levels. Potentially, invest in co-working spaces to foster urban-rural linkages.
- State-run structural programmes that follow a bottom-up development approach have proven successful, because they develop goal-oriented collaboration across districts, beneficial to businesses. Learnings from these programmes should be systematically shared and exchanged between states, including helping states that might not have them develop similar ones, as it is currently happening in Brandenburg.
- Facilitate access and uptake of support programmes by reducing bureaucratic barriers and increasing digitalisation (EU, federal and state level) and facilitating navigation (state and regional levels).

Box 1.1. Recommendations for “Landkreise” (TL3 regions or districts)

Sigmaringen

Sigmaringen has a heterogeneous manufacturing profile without a clear hub or centre, as most companies are dispersed and from different sectors. This makes it both more resistant to sector-specific shocks, but also reduces benefits due to limited cluster activities. Manufacturing includes a variety of mechanical engineering activities from vehicle construction to aerospace technology as well as the production and processing of rubber and plastic goods. Sigmaringen has an above-average manufacturing GVA (32%) and employment shares (30%), with the share of employment increasing over the past years, making it an *upcoming manufacturing hub*. Labour productivity is just below the rural manufacturing average and has increased since 2005. One of the biggest challenges in the district is the lack of high-speed broadband connectivity for companies. Only 50% of firms have access to internet speeds of 200 Megabits per second (Mbps), and just 63% to 100 Mbps. Thus, it lags behind other rural regions that typically have an 80-90% coverage to these speeds. Infrastructure connections also represent a bottleneck with the closure of some train lines and transport relying heavily on private vehicles, making commuting difficult. Like many rural regions, Sigmaringen is facing demographic pressures with an elderly dependency rate standing at 35%, which is just below the rural German average of 40%. Companies already report difficulties in the recruiting and poaching of skilled workforce in the district. Consequently, the local economic development agencies put in place programmes for the retention of young people and seeks to support a start-up and innovation culture. Moving forward, recommendations for Sigmaringen include:

- Advancing on developing digital connectivity in the region as fast and as efficient as possible to create baseline conditions for innovation within companies as well as for attracting new companies and workforce.
- Leveraging research, innovation, and entrepreneurial activities of the newly founded Innovation Campus to foster innovation and development in the local manufacture industry, for instance through knowledge transfer activities and/or work placements of researchers or entrepreneurs.

- Exploring a better collaboration with the neighbouring district of Tuttlingen to benefit from cluster effects and potentials to for shared service delivery, land or infrastructure development. Part of this could also advocate for better cross-district train connections, sharing on demand commuting services or merging efforts for identification of industrial land.

Tuttlingen

Tuttlingen is Germany's manufacturing champion, with a highly specialised economy. In the district manufacturing accounts for 57% of GVA and 49% of employment, higher than any other industry or other rural district in Germany or the OECD. Labour productivity in its manufacturing sector (USD 98,751) also outperforms other rural German (USD 91,312) and OECD regions (USD 93,752). The district's manufacturing sector can be classified as traditional and innovative with high potential for scalability and tradability and is especially known for producing medical devices, surgical instruments, orthopaedic solutions and diagnostic systems. The district records above-average company birth rates and a growing population. The district also experiences lower elderly dependency ratios (33.08%) than in other Germany rural regions (39.28%). The industry exports more than 65% of its products outside of Germany, making its economic base quite dependent on external demand. Besides medical technology, Tuttlingen is also specialised in the production of parts for the automotive sector and machining industry. A significant challenge for Tuttlingen's manufacturing sector is the new EU Medical Device Regulation. It requires manufacturer to produce new clinical evidence to demonstrate compliance. Especially in small companies this captures a significant amount of resources and can limit innovation. As a result, some companies are considering serving only markets outside the EU or move production out of the EU. Local companies are increasingly working together to adapt to these regulatory pressures by leveraging their collaborative strengths to advocate for regulatory changes, adjusting to the requirements and continue innovating despite the more limited resources. The city of Tuttlingen and the district are building more knowledge exchanges and cluster structures to support this process. To deepen its competitiveness in manufacturing Tuttlingen should:

- Continue efforts to further strengthen local company collaboration and support small companies, especially to adjust to the EU Medical Regulation. These efforts should be aligned to further digitalise local companies, as leading digitalisation support is currently limited locally. To achieve this, both the district as well as the local chamber of commerce need to become more strategic and increase capacities to attract EU funding and channel it where it is most needed. The existing Medical Mountains initiative can be an asset demonstrating successful collaborations culture, but it needs to actively recruit new members.
- Support to embrace cultural change within existing, successful companies to enhance innovation, risk-taking and a new way of work. Attracting investors will be important to filling in funding gaps for entrepreneurs.

Hochsauerlandkreis

Hochsauerlandkreis (HSK) is the largest geographically district, with the second lowest population density in the state of North-Rhine Westphalia. It has a robust economic base with an above-average specialisation in manufacturing. Manufacturing accounts for 30% of HSK's regional GVA and 27% of its employment share. Traditionally, the building industry, in particular lighting, is strong, serving around 65% of the European market. Likewise, the automotive and medical technology manufacturing as well as timber production have a strong presence. The region has seen an absolute increase in manufacturing employment of 3,127 between 2007 and 2019. At the same time, HSK sees increasing levels of labour productivity and can be characterised as innovative and differentiated manufacturing type, providing high scalability and tradability. A significant asset for the region is the presence of a university of applied sciences that runs a federally funded programme on digitalisation for SMEs. Yet, compared to other rural places in Germany the district shows below average performance in

manufacturing labour productivity (USD 86,112 compared to USD 91,312 rural average in 2019) and has lost employment shares in manufacturing over time (27% in 2019 compared to 29% in 2005). One of the biggest challenges for local companies is that many young people move to larger cities in the surrounding state. The elderly dependency ratio stands at 38%, just below German rural average (40%) but higher than OECD average. To tackle these challenges, HSK has benefited from state support and set-up important bottom-up policy programmes to increase regional branding in collaboration with neighbouring districts, which allowed for it to tackle land-use challenges and increase attractiveness. HSK also hosts manufacturing of paper and chemicals industry which are heavy GHG emitting industries, which will require significant efforts to transition to a net-zero carbon economy. To assure future prosperity of its manufacturing sector the district should:

- Leverage the collaborative regional strength created through the South-Westphalia Agency to foster local branding and increase attractiveness for “returnees”. It can also build on the newly received support through the “REGIONALE 2025” programme to develop its digital profile, linking approaches of smart cities with private sector digitalisation initiatives and market itself for people who would like to enjoy a rural yet modern lifestyle.
- Assist SMEs to reduce emissions through use of local facilities and knowledge transfer. For instance, the local digital skills centre and its student factory for digital production can be used to tackle upcoming sustainability challenges. Investigate the possibility of a rural living-lab or regulatory sandbox, to further push the boundaries of innovation for sustainable production with local firms. Advancing on sustainable production processes could become a comparative advantage for local companies and add to the local branding done by the South-Westphalia Agency.
- Continue to push for swift solution of transport connection issues with state government as to ensure viability of manufacturing businesses that rely on exporting goods from the region.
- Encourage large firm to further up-scale smaller business and help them improve productivity and move towards higher value added in the value chains, including on adding services to their portfolio.

Ostprignitz-Ruppin

Ostprignitz-Ruppin (OPR) located in Brandenburg is experiencing new economic dynamism since German reunification. In recent years it has particularly benefited from the proximity to the federal capital of Berlin, reachable within approx. an hour both by train and car, as well as its location along the A24 Berlin-Hamburg highway. The district was able to significantly reduce unemployment between 2005 and 2020 from 16% to 3% and has experienced a fast increase in manufacturing labour productivity from around USD 62,000 to USD 87,000 (over the period of 2005 until 2020), thus catching up to other manufacturing regions. At the same time OPR is remote and has a lower population density (40 inhabitants per square kilometre) than the rural average in Germany (138 inhabitants per square kilometre) and a greater focus on agriculture and forestry industries than other regions. Consequently, manufacturing employment shares are lower than in other regions with 14% and the contribution of manufacturing to regional GVA (19%) is also below the rural German average (28%). Despite these lower figures, Ostprignitz-Ruppin is considered an *upgrading manufacturing hub* because of the increase in the share of manufacturing employment over the past 20 years and decrease in agricultural and service industries. Manufacturing in OPR is heterogeneous including a variety of food processing and timber production as well as the plastic, chemical and metal industries. The biggest challenges for OPR are the sharp increase in elderly-dependency ratio of 15% between 2005 and 2020, which current stands 45% higher than the German rural average, as well as low numbers of company births. The district can also improve in high-speed internet availability for firms, which stands at 62% for 200 Mbps and 85% for 100 Mbps. Recommendations to improve the competitiveness of the manufacturing sector include:

- Increasing its attractiveness and marketing targeted at young people and families to stay in the region. Developing a returnee service like “Heimvorteil” or “Comback Elbe Elster” to offer information about work and life in the district. Good connectivity to Berlin is an advantage in this regard and can be utilised to attract people looking for a rural lifestyle close to the city.
- Continuing to leverage the highway connection and relatively high availability of land to attracting businesses and offering development potential for manufacturing firms, when suitable in terms of environmental considerations.
- Increasing its innovation potential and entrepreneurial culture by establishing Makers Spaces or Living Lab and combining them with increasing digital skills. Specific innovation opportunities present themselves in the bioeconomy linking to already present agricultural and forestry industries.

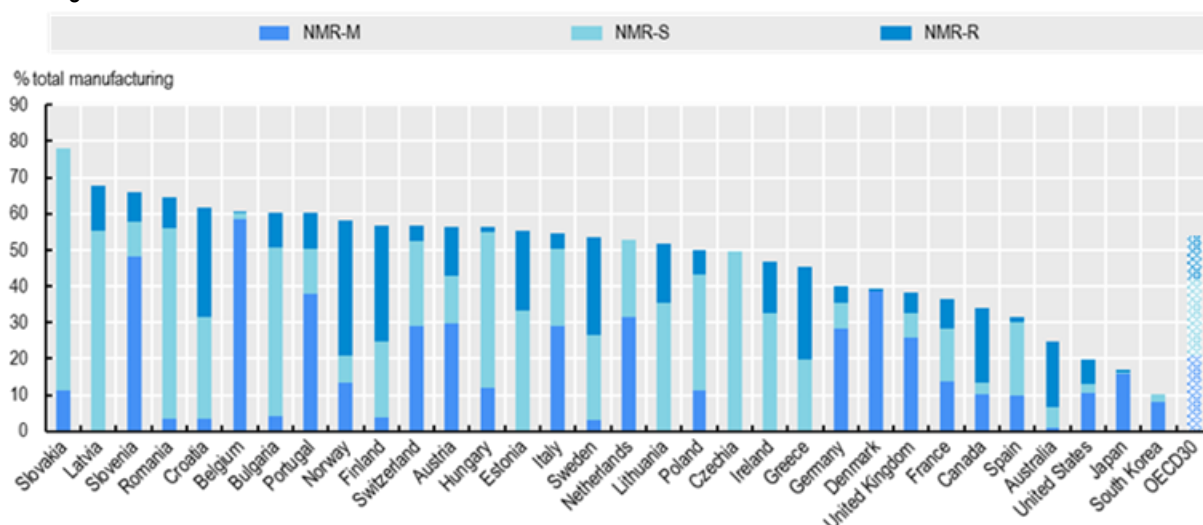
The current landscape of rural manufacturing in Germany

Tradable activities and manufacturing remain essential for rural regions. On average across the OECD, manufacturing represents 14% of GDP (OECD, 2022^[1]). And whilst rural regions represent about 30% of the population among OECD countries (OECD, 2020^[2]), about 45% of manufacturing jobs are located in rural areas among the countries studied in this initial analysis (30 OECD countries, plus Bulgaria, Croatia and Romania). Across the OECD, manufacturing accounts on average for about 14% of regional employment (Figure 1.1). In rural Germany, the average share of manufacturing employment amounts to 23% (Figure 1.2). The aggregate regional contribution to national manufacturing workforce averages 40%. Manufacturing jobs thus account for a relatively large share of total employment and play an important role in Germany and its economy. 3 out of 4 employees come from rural regions close to a metropolitan area, while 5% come from remote regions (Figure 1.1).

Recent global shocks have opened the re-industrialisation debate and reinforced the desire to improve capacity. Among governments, there is a growing desire for countries to retain and strengthen their capacity to make things. The manufacturing sector is a key driver of development, exhibiting high productivity, high and increasing multiplier effects and a high propensity to innovate. Whilst employment in manufacturing has been declining notably in OECD countries (OECD, 2019^[3]), production processes increasingly make use of technology and automation. Manufacturing has also played a critical role in the social fabric and identities of rural regions. Making use of this can play a key role in identifying the region’s unique selling points and competitive advantages. To better understand how manufacturing has been transforming over the past decades, the following sections undertake analyses showcasing the role and forms of manufacturing in rural areas in Germany, setting a basis for the case studies undertaken. A description on the choice of the case study regions can be found in Box 1.2.

Figure 1.1. Manufacturing employment across the OECD

Aggregate regional manufacturing employment as a share of total national manufacturing employment, by type of rural region



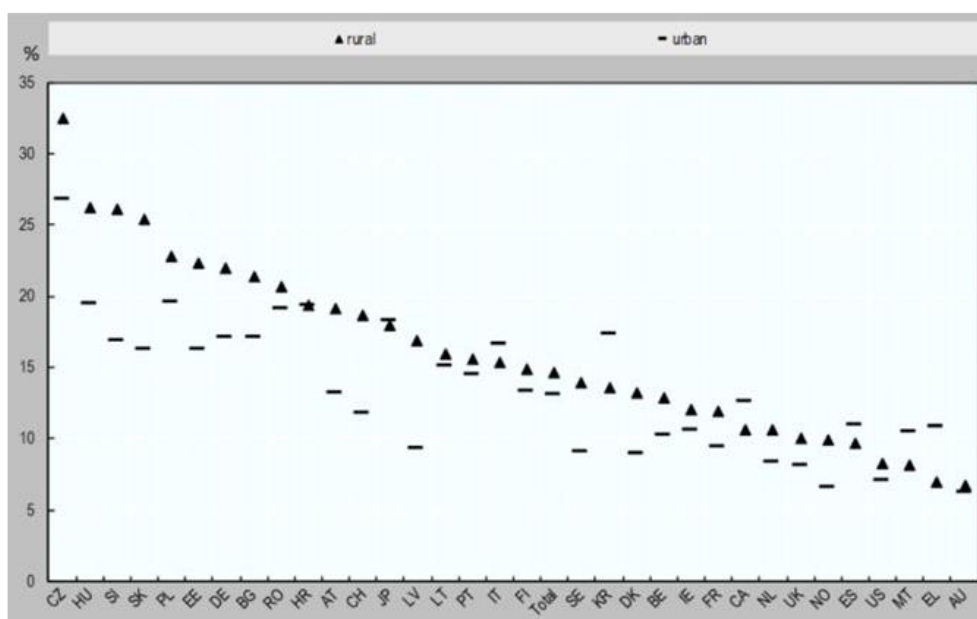
Note: OECD average includes only countries for which regional typology or employment data are available at TL3 level. Geographical typology refers to OECD TL3 typology of Metropolitan regions – large, metropolitan regions – medium, non-metropolitan regions – medium, non-metropolitan regions – small, and non-metropolitan regions – remote. See Box 2.1 for further details.

The year for which information is available is 2017 for most of the countries, except Switzerland, Poland, France, Canada and Japan (2016), Slovenia, Belgium, Hungary, Estonia, Denmark, United Kingdom and the United States (2018), Australia and South Korea (2019).

Source: Authors' elaboration based on the OECD Regional Database (last access: April 2021).

Figure 1.2. Regional manufacturing employment

Mean regional manufacturing employment as a share of total regional employment, by urban or rural regions



Note: Countries are included based on data availability. Rural and urban regions are defined through the geographical OECD typology of metropolitan and non-metropolitan regions. See Box 2.1 for further details.

Source: Authors' elaboration based on the OECD Regional Database (last access: April 2022).

Box 1.2. Description of methodology choosing the relevant case study regions, classification and reasoning

The form of manufacturing conducted in rural areas is not all the same. It differs across sectors, across value chain functions, by technologies and the degree to which manufacturing is tied to the local area (e.g. by reliance on the natural resources). To better understand which regions are particularly specialised in manufacturing and how manufacturing evolved in these places (direction of growth and decline) a classification was developed. An overview of all classification covering different types of manufacturing and non-manufacturing hubs is shown in Figure 1.4.

The basis of the classification are shares of manufacturing employees in rural regions in 2000 and 2017 that are divided into quantiles. Following that, the probabilities of regions moving or remaining in any quantile were calculated. Based on these transition probabilities, six categories of regions can be identified (Figure 1.3), three of which are manufacturing hubs from top quintile regions:

- Traditional manufacturing hubs are those regions that used to be in the top quintile back in 2000 and are still so 20 years after, showing a path dependency behaviour.
- Upcoming manufacturing hubs are regions that used to occupy a lower quintile in their respective countries back in 2000 and today are in the top quintile. Among those, there are leapfrogging hubs, that is regions that managed to climb to the highest quintile in their country while starting from a very low one.
- Vanishing manufacturing hubs are regions that used to occupy the highest quintile in 2000 and slid down the distribution 20 years after. Among those, there are falling stars, that is regions that fell from the top quintile to a much lower quintile.

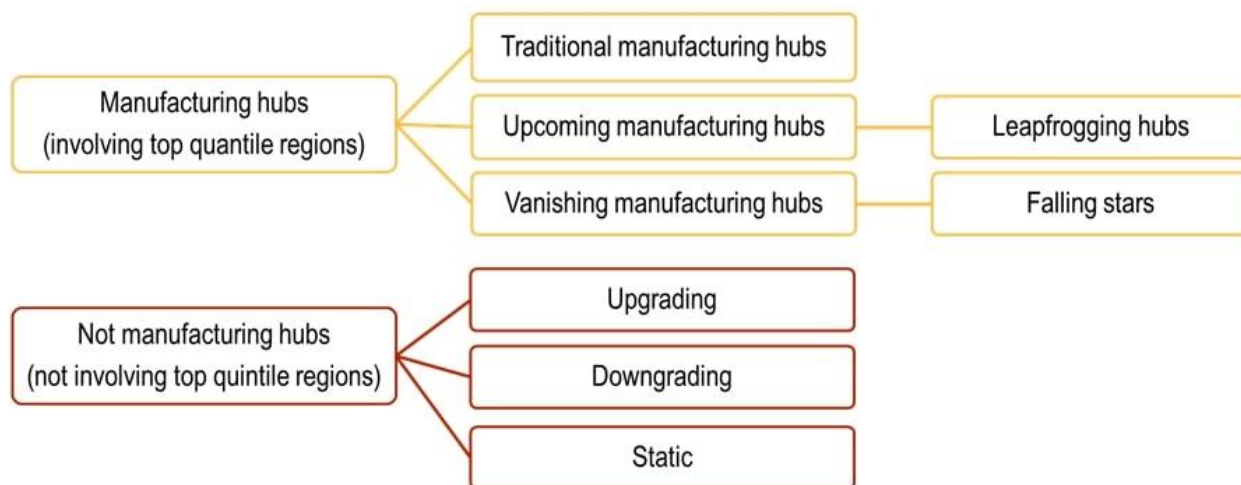
Regions that are not in the top quintile, are not considered to be manufacturing hubs. Rather, upgrading regions are those that moved to a higher quintile, outside of the top quintile. Downgrading regions are regions that moved to a lower quintile in recent years, but that were not in the top quintile back in 2000. Static regions have not changed quintile between 2000 and 20 years after.

The analysis overall showed that traditional manufacturing hubs are dominating Germany followed by upgrading manufacturing hubs. Most of the traditional manufacturing hubs are situated in southern Germany while upgrading hubs emerged in eastern parts of Germany. Upcoming manufacturing hubs are spread in the southern part of the country and in the central east. On the contrary, six vanishing hubs are spread throughout west and southern Germany. Downgrading regions occupy more the central west (see also Figure 1.4).

In choosing the relevant case study regions, variety was a key factor. It was important to ensure that regions in different classifications of manufacturing were covered in addition to a variety of German geographies, covering south, west, north and east as best as possible. In addition, based on the access to cities typology, at least one representative region of each category was chosen. Finally, four regions were picked in coordination with academic advice from the Thünen-Institut who served as a link into the Federal Government in this study. The four regions are districts, which, according to the Cambridge Dictionary, are an administrative unit in a state comprising several municipalities (Cambridge Dictionary, 2023^[4]). Moving forward this report will use the word district and regions interchangeably. The picked districts are shown on map Figure 1.4 and circled in green.

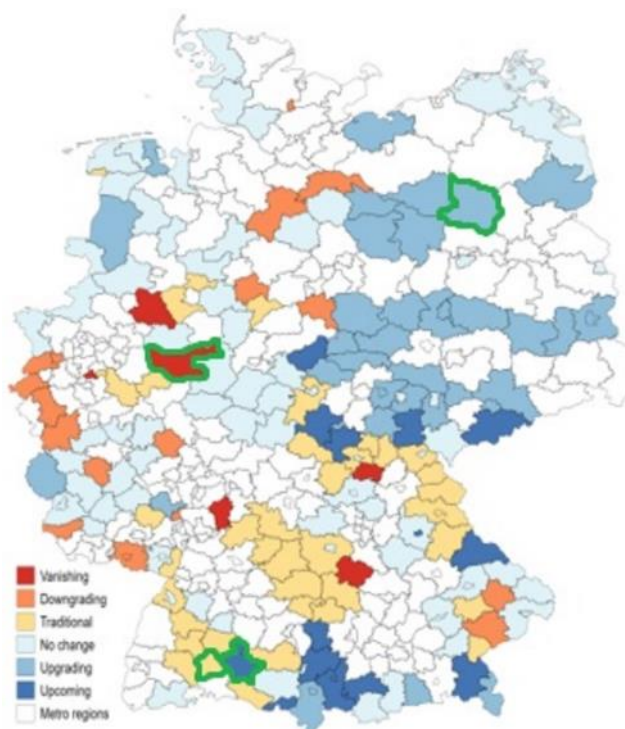
Source: Author's own elaboration

Figure 1.3. Typology of regions based on transition probabilities



Source: OECD Elaboration

Figure 1.4. Typology of regions based on their manufacturing hub



Source: OECD Elaboration

Note: Regions circled in green are the selected case study regions: Hochsauerlandkreis, Ostprignitz-Ruppin, Sigmaringen and Tuttlingen

Cultural and historical context of case study regions

Hochsauerlandkreis

Flown by the Ruhr and Lenne rivers, the district of Hochsauerland is the largest in the state of North-Rhine Westphalia with 1,955 square kilometres of surface area (OECD, 2023^[6]). According to OECD classification, Hochsauerland is a non-metropolitan region with access to a metropolitan TL3 region (NRM-M). Wooded low mountains with lakes and river valleys characterise the geography of the region. With 12 municipalities, the district has a population of approximately 250,000 people, whose population has been trending downward since the beginning of the century. With 133 people per square kilometre, the district is relatively as densely populated as to the German rural average (138 people per square kilometre in 2020) (Hochsauerlandkreis, 2021^[6]; Ministerium für Wirtschaft, Arbeit und Tourismus, 2020^[7]). The population of Hochsauerland decreased by 8.1% since 2001 and a further loss of 11.45% is expected by 2050, while regions in the neighbouring south-west of North-Rhine Westphalia forecast population growth creating a gap between growing and shrinking regions inside the state (OECD, 2023^[8]). Low unemployment and medium-high productivity are what characterise the quite robust economy of Hochsauerlandkreis: the district registered only 2% unemployment of 15 to 64 years (Figure 1.7) and USD 71,163 of total GVA per worker in 2019, which is lower than the rural and German average (USD 74,741 and USD 82,696 respectively according to Figure 1.6). With more than 4 million overnight stays per year, the region is the most important vacation area in the state (WFG Hochsauerlandkreis, 2023^[9]).

A long tradition of medium-sized family-run companies, market proximity to internal clusters and local ties are what characterise the local economy and have made it successful. Together with the districts of Olpe, Siegen-Wittgenstein, Soest and the Märkischer Kreis, Hochsauerland forms South Westphalia. South Westphalia has a population of around 1.4 million people and a large business hub in which around 45% of all employees work in the manufacturing sector (IHK Arnsberg, Hellweg-Sauerland, 2018^[10]). Germany's third strongest industrial region (after Villingen-Schwenningen and Heidenheim-Aalen in Baden-Württemberg) is home to many hidden champions in industries such as automotive, metal fabrication, mechanical engineering and healthcare (SIHK zu Hagen, 2022^[11]; Hochsauerlandkreis, 2021^[6]). The Hochsauerlandkreis is characterised by an innovative and differentiated manufacturing type, providing high scalability and tradability (Table 1.1). Traditionally, the lighting industry has a particularly strong position in the district, serving around 65% of the European market. Of great supra-regional importance is the "Lichtwoche Sauerland" fair, which every year presents the products and production facilities of this branch of industry to around 5,000 trade visitors (Lichtwoche Sauerland, 2023^[12]).

Still, according to the OECD classification, the Hochsauerlandkreis is considered a vanishing hub (Figure 1.3) because its decrease of labour force share in the manufacturing sector over the last 20 years. Shortage of skills and restricted land use are also increasing challenges (Hochsauerlandkreis, 2021^[6]).

Ostprignitz-Ruppin

Ostprignitz-Ruppin is in the state of Brandenburg and is experiencing new economic dynamism since German reunification. It is close to the federal capital of Berlin, reachable with roughly an hour both by train and car. According to OECD classification, Ostprignitz-Ruppin is a remote region (NMR-R). The district is encompassing the eastern part of the Prignitz, the main part of the Ruppiner Land as well as the Ländchen Bellin of the Havelland. Flat landscape and the Ruppiner Seenland characterise the geography of the region which is covered about one half of agricultural land and one third of forests (Landkreis Ostprignitz-Ruppin, 2023^[13]). With 23 municipalities, the region counts around 98,000 inhabitants, which has been declining since the German reunification. In 2001, it still had about 112,900 inhabitants, which represents a population decline of around 12% (OECD, 2023^[14]). The district is sparsely populated counting around 40 people per square kilometre compared to the German rural average (138 people per square kilometre in 2020) according to Figure 1.10. In comparison to the other districts of this case study, the district has a

lower level of productivity with USD 65,406 of total GVA per worker in 2019 compared to USD 74,741 in rural Germany, according to Figure 1.6.

Agriculture and forestry play an important role in the region, although decreasing in terms of employment share. Around 126,000 hectares of agricultural land cover the region and are farmed both conventionally and organically by approximately 600 companies (Landkreis Ostprignitz-Ruppin, 2023^[15]). Manufacturing in Ostprignitz-Ruppin has been rather heterogenous and includes a variety of food and wood as well as the plastic, chemical and metal industries. Small and medium-sized companies characterise the predominantly rural economic structure of the district. According to the typology of manufacturing firms elaborated by the OECD (Table 1.1), the district's manufacturing covers a range of activities that are both commoditised and innovative, both offering high potential for scalability and tradability.

Ostprignitz-Ruppin is considered an upgrading hub (Figure 1.3) because the share of employment in manufacturing has increased over the past 20 years. While it still stood at 16% in 2005, Ostprignitz-Ruppin registered 3.1% of unemployment of the 15 to 64 years working age population in 2020, which is just slightly higher than the rural average of 2.6% (Figure 1.7) (Bundesagentur für Arbeit, 2023^[16]). This change also goes hand in hand with a strong increase in value added in industry and export-oriented development. Continuous active marketing of commercial space for years has stabilised the economic development and raised its attractiveness, leading companies to settle in the district. Companies appreciate the district's proximity to Berlin and Hamburg and its location along the A24 Berlin-Hamburg highway, where infrastructure is being expanded. The joint regional innovation strategy between Brandenburg and Berlin leverages Brandenburg's innovative potential to expand the framework into a cross-cluster cooperation with Berlin to build a leading innovation hub (Innovatives Brandenburg, 2022^[17]).

Sigmaringen

Centrally located in southern Germany, situated on the upper Danube and on the edge of the Swabian Alb, Sigmaringen is at the intersection of the Stuttgart metropolitan region and the economic region of Lake Constance. Within the OECD classification, Sigmaringen is a non-metropolitan region, with/near a small-medium city (NMR-S). The district has 25 municipalities and an overall population of approximately 130,000 people. Population growth has been trending downward since the beginning of the century and elderly dependency ratios have increased (Figure 1.11). With 109 people per square kilometre, the district is more sparsely populated than the German rural average (138 people per square kilometre in 2020) according to Figure 1.10. Sigmaringen's economy is characterised by low unemployment (2% for the working age population in 2020 according to Figure 1.7) and high productivity with USD 84,751 of total GVA per worker in 2019, which is higher than the rural average of USD 74,741 in Germany (Figure 1.6).

Within the OECD classification, Sigmaringen is an upcoming manufacturing hub (Figure 1.3), meaning that it has increased the share of employment in manufacturing over the past 20 years. It is a historically strong industrial region based on its numerous medium-sized craft companies. 30% of the workforce, most of whom have vocational training, are working in the manufacturing sector (Statistisches Landesamt Baden-Württemberg, 2023^[18]). Together with the districts of Ravensburg and Bodensee, Sigmaringen is part of the economic region Bodensee-Oberschwaben characterised by typical medium-sized companies specialised in machinery and vehicle construction as well as aerospace technology (IHK Bodensee-Oberschwaben, 2023^[19]). Manufacturing in Sigmaringen has been rather heterogenous and includes a variety of mechanical engineering as well as the production and processing of rubber and plastic goods. Within the OECD definition of the types of products manufactured in the region (Table 1.1), Sigmaringen's manufactures innovative goods offering high potential for scalability and tradability. Many companies are being passed down from generation to generation and the younger generations finding ways to combine traditional processes with modern methods.

Tuttlingen

Neighbouring the district of Sigmaringen, Tuttlingen geographically encompasses the southwestern foothills of the Swabian Alb with its highest elevations. Within the OECD classification, Tuttlingen is a non-metropolitan region with access to a metropolitan region (NRM-M) region. Around 143,000 people live in the 35 municipalities of the district, attracting additional 15,000 commuters every day from outside (Stadt Tuttlingen, 2023^[20]). With 192 people per square kilometre in 2020, the district is quite densely populated compared to German rural average (138 people per square kilometre in 2020), according to Figure 1.10. The district experienced a positive economic and population growth in recent years: the population grew by 7.2% between 2011 and 2020 and the number of employees subject to social insurance contributions grew by 21.7% (Ministerium für Wirtschaft, Arbeit und Tourismus, 2020^[21]). Besides its success in the medical technology industry, Tuttlingen is known for the production of parts for the automotive sector and machining industry. Tuttlingen's economy outperforms other rural German regions in terms of productivity: both total GVA per worker (USD 85,161) and manufacturing GVA per worker (USD 98,751) is higher than the rural average (USD 74,741 and USD 91,312) according to Figure 1.6.

Already known for its textile industry in the 19th century, today more than 400 medical technology companies shape the internationally renowned cluster of Tuttlingen. According to Table 1.1, the district is classified as being traditional and innovative with high potential for scalability and tradability and especially known for producing innovative medical devices, surgical instruments, orthopaedic solutions and diagnostic systems. With more than 65% of the products exported worldwide it also has strong dependencies on foreign markets (Stadt Tuttlingen, 2023^[20]). Tuttlingen has an above-average job share in manufacturing with 49% of the workforce active in the manufacturing sector (Landkreis Tuttlingen, 2019^[22]; Ministerium für Wirtschaft, Arbeit und Tourismus, 2020^[21]). It has a positive commuter balance of 9.2%, meaning that it faces an oversupply of jobs in relation to the resident population. Tuttlingen is a traditional manufacturing hub (Figure 1.3). Over 90% of Tuttlingen's manufacturing businesses in the medical cluster are SMEs (Figure 1.8).

Table 1.1. A typology of manufacturing firms

Manufacturer Type	Differentiated			Commoditised	
	Artisanal	Heritage	Innovative	Anchored by natural resources	Anchorless
Characterised by	Highly skilled, small-scale production leveraging a historic process with longstanding ties to the region	Products with a longstanding traditional link to a region, but not a particular production process	High-technology products at the cutting edge of both production technology and product features	Products created from locally-sourced natural resources	Lacking differentiating features, competing on price
Examples	Cottage industries, handmade, premium bespoke products	Swiss watches, Scottish Whisky, Italian fabrics	ICT, pharmaceuticals and medical devices	Agri-food, forestry and mining processors	Small household appliances
Tradability	High	High	High	Variable	High
Scalability	Low	Medium	High	Low	High

Source: OECD Elaboration

Comparative statistics on the four regions in the German context

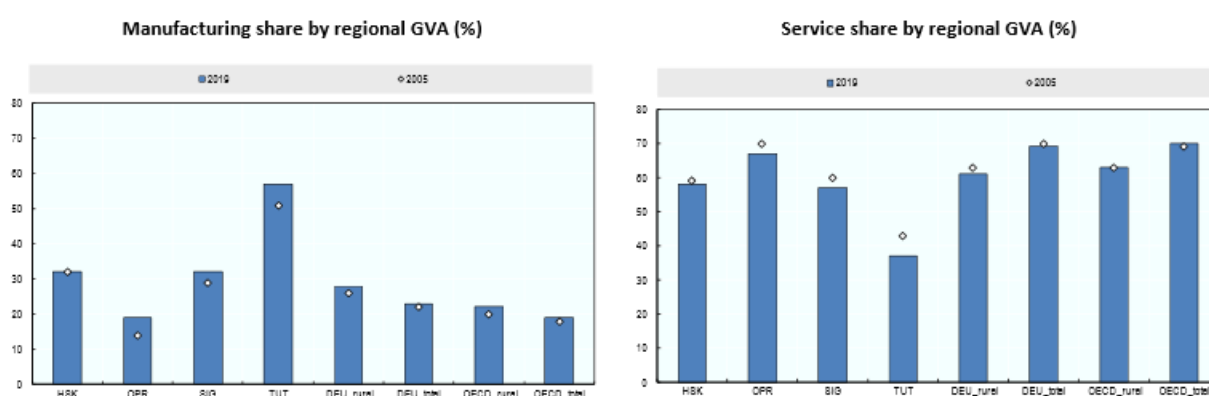
Economy

Manufacturing is essential for local economies – both in terms of productivity and job creation

It comes as no surprise that manufacturing is important for the German economy. It is, however, also significant for its rural region, demonstrating an overall slight increase in both productivity and employment share. Figure 1.5 depicts the contribution of manufacturing to regional GVA, showing an overall higher GVA in German rural regions as well as a higher level of increase between the years of 2005 and 2019 for rural regions compared to the national average. Three of the four case study regions have an above-average GVA in manufacturing, with highest shares in Tuttlingen (57%). Ostprignitz-Ruppin is the only region with below average manufacturing GVA. Increases in the manufacturing GVA are most pronounced in Sigmaringen, Tuttlingen and Ostprignitz-Ruppin, while Hochsauerlandkreis remains stable. While the service industry's GVA is on average higher than manufacturing in rural places, the service industry has also seen a decline in productivity over the years, across Germany, but particularly in rural places. All regions except Ostprignitz-Ruppin have a below average service GVA. The only region demonstrating lower levels manufacturing GVA than service is Tuttlingen. This highlights the importance for manufacturing for rural economies and particularly in the regions covered in this chapter.

Similar patterns can be observed for employment. Manufacturing shares in employment are higher than the German rural average (23%) for all regions except Ostprignitz-Ruppin. Highest numbers are recorded in the two regions in Baden-Württemberg, with 30% in Sigmaringen and 49% in Tuttlingen. Furthermore, manufacturing shares in employment have increased a couple of percentage points in Ostprignitz-Ruppin, Sigmaringen and Tuttlingen, and slightly decreased in Hochsauerlandkreis, yet overall remained stable. Compared to the services sector employment shares for manufacturing are lower, except for Tuttlingen, yet still just below the German rural average (66%), with 65% in Hochsauerlandkreis, 61% in Sigmaringen and 45% in Tuttlingen. In Ostprignitz-Ruppin the employment share is higher for services (70%) than manufacturing (14%).

Figure 1.5. Contribution of the most important sectors to regional GVA

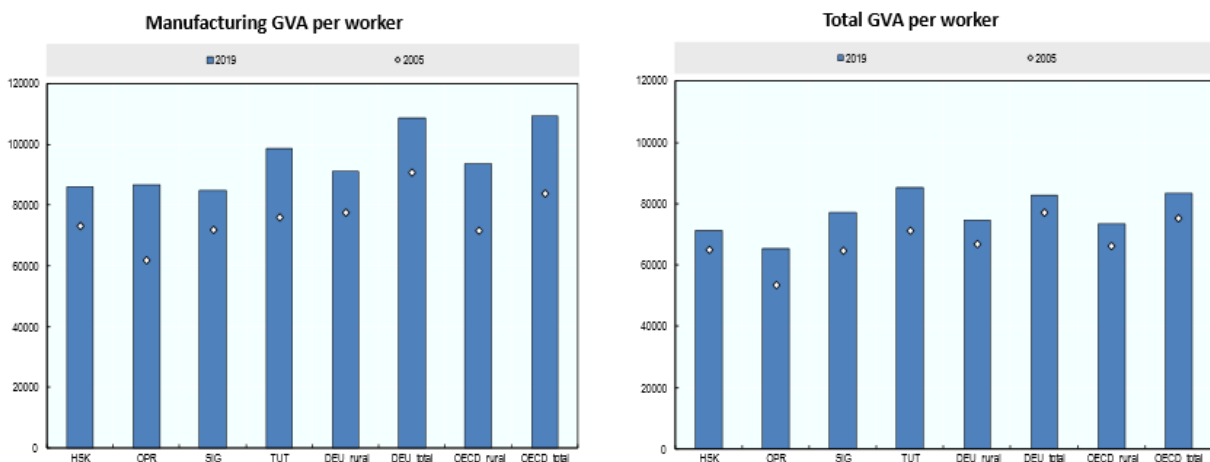


Source: OECD.stats (Regional dataset)

Productivity is a crucial measure in terms of development because it is a key determinant of long-term standard of living. The increase in productivity over time allows companies to produce more goods and services per unit of input. In the end, this increases wages, promotes economic growth, and increases

profitability and tax revenue. Labour productivity measures the amount of output per unit of workforce, for example by worker. Higher productivity means that a company produces more output for each worker it employs. Figure 1.6 presents the labour productivity of the regions in question. It is interesting to see that manufacturing as a sector is more productive than other sectors of the economy and has seen higher average increases than all sectors combined between 2005 and 2019. This confirms the idea that it is the manufacture that will be the engine of growth. Particularly high increases of productivity in the past 14 years can be recorded in Ostprignitz-Ruppin as well as Tuttlingen. Still, productivity per worker is lower in rural places than for the German average. Furthermore, German rural manufacturing GVA per worker is also slightly below the OECD average for rural, while total averages being nearly the same.

Figure 1.6. GVA per worker

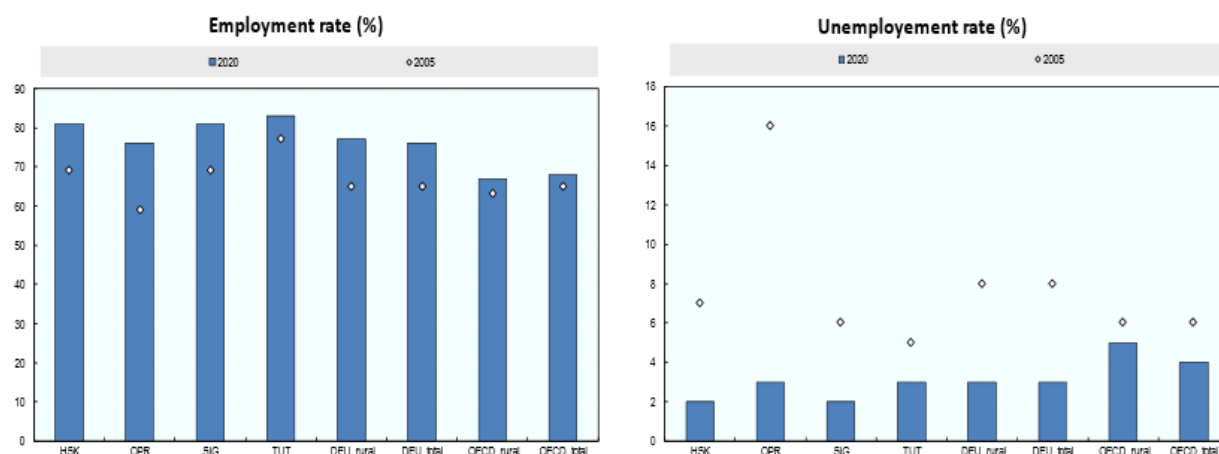


Note: Measure in Millions USD, constant prices
Source: OECD.stats (Regional dataset)

Robust economies - high employment and low unemployment rates

German manufacturing regions have low rates of unused human resources and capacities. Figure 1.7 shows that employment is above-average or on par with rural and total German averages. Employment numbers have also increased over the last 15 years, leaving all regions between 75% and 85% of employment. Similarly, unemployment is low, especially in Hochsauerlandkreis and Sigmaringen, which are below the German averages. A staggering decrease of unemployment can further be observed in Ostprignitz-Ruppin where it dropped from 16% to 3% in the past fifteen years. This signifies rather healthy regional economies but can also explain the difficulties in recruiting labour in rural regions.

Figure 1.7. Regional employment and unemployment rates



Note: % of (un-)employment 15-64 years over working age population (15-64 years)
Source: OECD.stats (Regional dataset)

Close to 90% of companies in Germany are very small with 0 to 9 employees, see Figure 1.8. Only 10% of companies have between 10 and 49 employees and even smaller percentages account for 50 to 249 (2%) and more than 250 employees (0.5). State as well as regional variations are also limited in terms of company size. The largest shares of bigger companies are to be found in North-Rhine Westphalia, at regional scale Tuttlingen has the lowest share of micro firms and comparably slightly more medium to large firms compared to the other rural regions and the German average. Hence, support for firms needs to be targeted at SMEs and concerns and limitation of SMEs such as limited resources and capacities to participate in support programmes reflected in policy making.

Figure 1.8. Number of companies by size, 2018

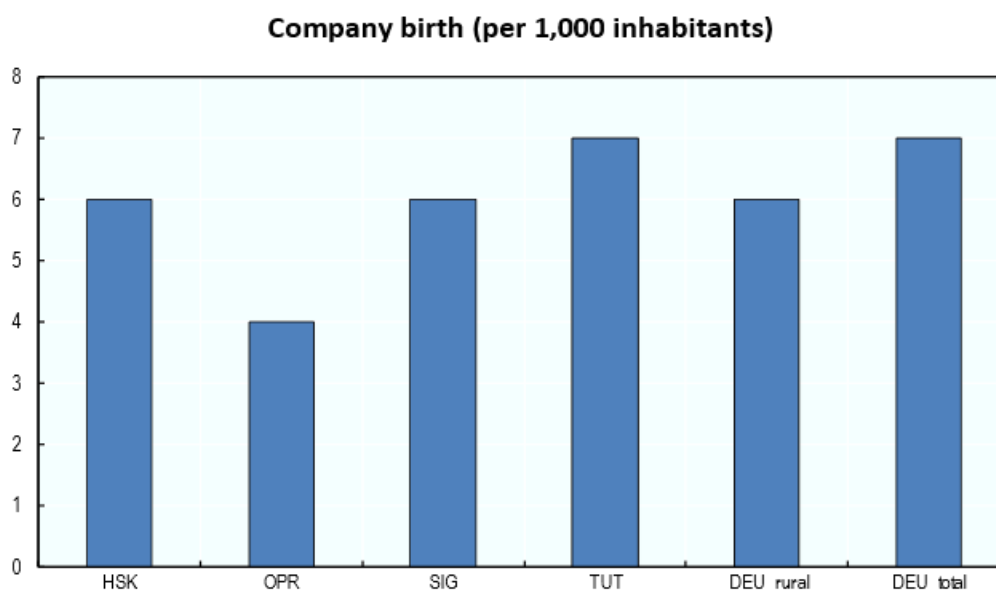


Note: Size of the company measured in number of employees

Source: Regionaldatenbank

Entrepreneurial activity in rural Germany is lower than the national average. Yet not all rural regions struggle with company births. The highest company birth rate is recorded in Tuttlingen, while Sigmaringen and Hochsauerlandkreis are on average while Ostprignitz-Ruppin falls behind on the scales (see Figure 1.9).

Figure 1.9. Company births, 2020

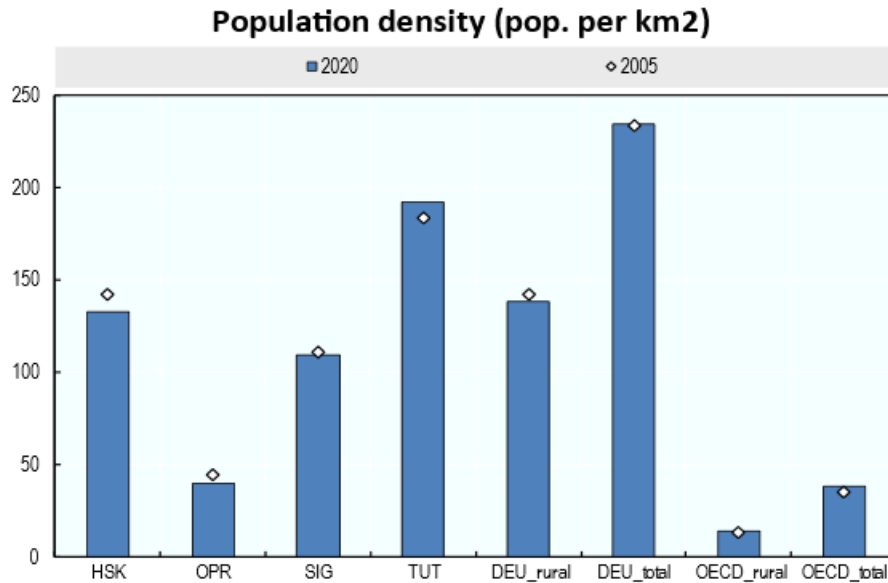


Source: Wegweiser Kommune

Demography

From a geographical point of view, the case study regions for this review are diverging quite a bit in terms of population density, as shown in Figure 1.10. Tuttlingen has the highest population density per square kilometre and is well beyond the rural German average. Ostprignitz-Ruppin, on the other hand, can be considered the most sparsely populated region, while Sigmaringen and Hochsauerlandkreis are close to the German rural average. Furthermore, only small changes can be detected in the past fifteen years. In all rural places, except for Tuttlingen, population density slightly decreased, suggesting out-migration from the places to more urbanised centres and consequently limitations in terms of skills supply. On the other hand, lower population density can also be an advantage considering that land-use patterns might be different and offer alternatives in terms of economic activities. OECD averages are considerably lower, because of comparatively very low population densities from present I countries like Canada, Australia, and the United States.

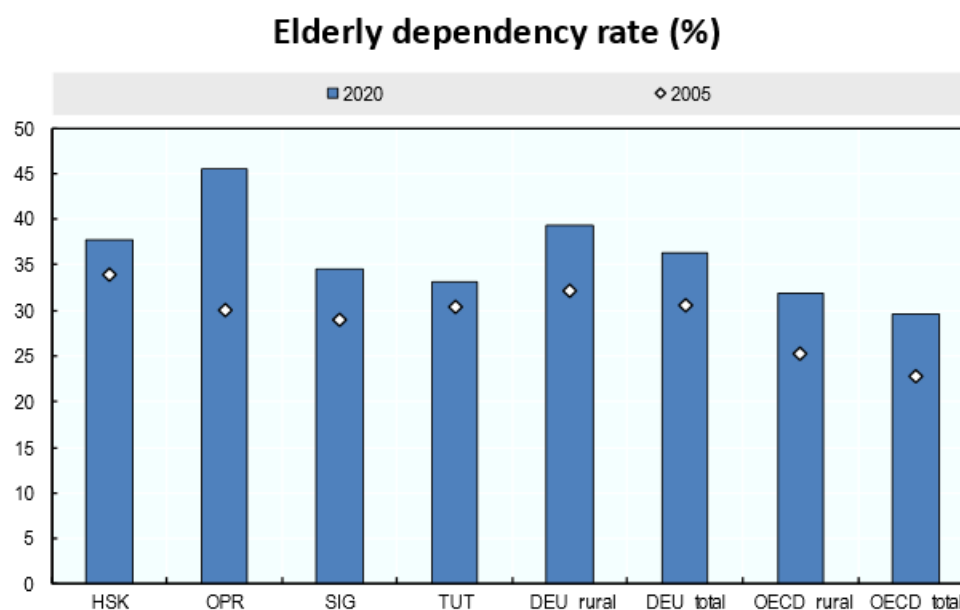
Figure 1.10. Regional population density development



Source: OECD.stats (Regional dataset)

Elderly dependency ratio is an important indicator when trying to understand the demographic outlook of rural regions and their economic development, because it gives insights on the regional age structure and the level of dependency on the working age population. Compared to other OECD countries and regions Germany has high rates of elderly dependency in both overall and rural averages, see Figure 1.11. Rural Germany also has higher rates than the rest of the country. Hochsauerlandkreis, Sigmaringen and Tuttlingen, however, have a healthier age structure than many other rural regions in the country. Only Ostprignitz-Ruppin has very high levels with 45% and records the highest increase between 2005 and 2020 (15%), while other regions record slower increase of below 10%. Overall, this points to significant demographic pressures due to significant out-migration from younger people as well as a potentially lower fertility rates.

Figure 1.11. Elderly dependency rate

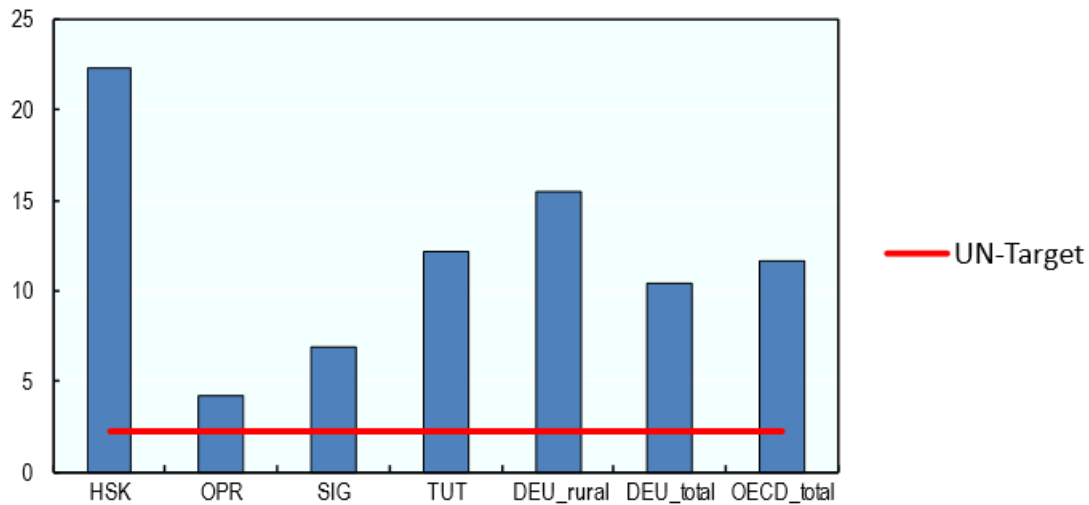


Note: Elderly dependency rate = $\text{Pop}(65+)/\text{Pop}(20-64)$

Source: OECD.stats (Regional dataset)

To address the climate crisis the reduction of greenhouse gas emissions (GHG) is essential. Emissions often vary across regions and are often linked to regional economies and the industries present, see Figure 1.12. In per capita terms rural places in Germany emit more than the German average. With regards to the different regions however challenges to reduce emissions are uneven, while the region of Ostprignitz-Ruppin emits the least and is close to the UN target of 2.3 tonnes of CO₂ per year set for 2030. Hochsauerlandkreis will need to make most efforts to reduce emissions in coming years. This is likely to be linked to the manufacturing of paper and chemicals located in the region. Thinking about the future of rural manufacturing consequently also means integrating strategies that help to reduce emissions in companies to ultimately enable Germany to realise the UN target it ascribes to.

Figure 1.12. Estimates GHG emissions in all sectors per capita, 2018



Note: In t of CO₂ equivalent per capita; target of 2.3 tonnes of CO₂ per year set for 2030; more information on the methodology of regional greenhouse gas emission data can be found in the Annex <https://www.oneauthor.org/-RegionalGHG>.
Source: OECD.stat

Policy Analysis: Visions and strategies

Germany's visions and strategies touching upon rural manufacturing are generally designed, developed or managed in coherence with EU policies. In recent years the "European Green Deal" and "Next Generation EU" have been particularly relevant for steering the European post-pandemic economic recovery programme and as a response to increased impact of climate change. Rural manufacturing, when considered within the European policy framework, is directly linked to two main policy areas that embrace the territorial perspective - or place-based approach – to economic and social development: rural development, which is a component of the Common Agricultural Policy (CAP), and cohesion policy, which addresses territorial development, socio-economic disparities and imbalances between European regions.

These policies are complemented by other EU programmes that can also be beneficial for manufacturing in rural contexts, although the latter are not designed according to a place-sensitive approach but have a thematic focus. The most relevant programme in the latter case is Horizon Europe, the EU's research and innovation programme.

The EU industrial policy recognises the importance of industrial SMEs, which is essential for rural manufacturing SMEs to stay competitive. Many of the SMEs in Germany's regions have the potential to drive innovation and it is important to support them with respective policies. Especially challenges with regards to supply-chains have shown how important the European market and production is for manufacturing companies in these regions. To secure their future, the EU is required to act in a consolidated and collaborative way. International dependencies are a challenge for small companies, it is hence important for the EU to drive this topic in its policies.

At the same time EU policy making can also challenge rural manufacturing business as well as their regions. Exemplary for this is the new EU Medical Device Regulation (MDR). The district of Tuttlingen, significantly specialised in this area and faces difficulties, as the MDR requires renewed clinical data to be collected. For small companies producing basic instruments this translates to additional financial and human resource burden.

Policies relevant for rural manufacturing in Germany

Federal

Germany has a constitutional mandate to support the creation of equivalent living conditions across its geographies and enable equal opportunities, participation in economic and social development. Based on the principle of subsidiarity and the constitution, policy for rural and regional development in Germany is primarily the responsibility of the states (Länder) and local authorities. At the national level, the federal government supports the federal state and regional level in overcoming their specific problems and challenges. Policy relevant for rural manufacturing, in Germany, can broadly be categorised into (regional) economic policy, which is focused on regional disadvantages, or more boarder rural development policy, focused on well-being and service delivery. Furthermore, there are also industrial policy support structures without any regional component. Germany does not have a policy specifically dedicated to rural manufacturing.

In terms of industrial policy, the federal government elaborated an industrial strategy for 2030, which was published under the previous government in 2019. The Federal Ministry for Economic Affairs and Climate Action (BMWK) is currently working on a new industrial strategy.

A large part of German industrial policy focuses on the so called “Mittelstand” (small and medium-sized companies), because the share of SMEs is large, and they provide over 50% of employment in the country. In the summer of 2022, the German government launched the dialogue and work process “SMEs, Climate Protection and Transformation” in dialogue with associations and companies in the SME sector to develop measures helping companies to become “future proof”. One specific action relevant to manufacturing is “Manufacturing-X” an initiative for digital transformation in industry and supply chains, seeking to set cross-sectoral open interoperable Industry 4.0 standards, to advance for instance circular economy or CO² footprint calculation in value chains. Taking into account international value chains, “Manufacturing-X” will be open for international collaboration. Concrete measures for “Manufacturing-X” will be published in spring 2023. Furthermore, several industry specific measures are mentioned, for manufacturing that concern the automotive industry, shipbuilding industry, aerospace industry and textile industry (BMWK, 2022^[23]).

At the national level, responsibilities for rural and regional development are largely split between the Federal Ministry for Economic Affairs and Climate Action, that delivers the general structural development policy together with the state governments, and the Ministry for Food and Agriculture (BMEL) that delivers development support specifically for rural places. The main difference between the focus of programmes delivered by these ministries is that the federal policy instrument for improvement of regional economic structures (Verbesserung der regionalen Wirtschaftsstruktur, GRW) focuses on firm specific economic support and municipal commerce-related infrastructure, and non-investment-related activities and further measures to boost the attractiveness of areas and competitiveness for lagging regions, not necessarily rural, and has recently been reformed (see also Box 1.3). Furthermore, there is an additional 21 support programmes from federal departments targeted at structurally weak regions. The federal government bundles and coordinates the programs of the funding system under a common conceptual umbrella across ministries in order to strengthen the effectiveness of funding in the structurally weak regions. The technical and financial autonomy of all programs is preserved.

Box 1.3. Reform of the Germany Policy instrument for improvement of regional economic structures (GRW)

The GRW has been the central instrument of regional economic policy in Germany since 1969. Its aim is to support structurally weak regions (defined on the basis of a regional indicator model in line with regional aid guidelines for 2022-2027 by the European Commission), helping them to compensate for locational economic disadvantages, and provide incentives for regional sustainable development in order to reduce economic disparities. As a collaborative measure between federal government and federal states the financing for this instrument is shared equally. Since its beginnings in the 1970s, the programme provided EUR 79 billion has supported over 150,000 investment projects, primarily in the commercial sector and the expansion of local infrastructure closely linked to economic development. Overall, the instrument has created and safeguarded a total of 4.8 million jobs and a total investment of EUR 380 billion, considering public and private investments. It was proven to have improved the employment and incomes of the supported regions.

In 2022 the federal government and the federal states agreed on a significant GRW reform, largely induced by a change in government and the political will to adjust the policy to changed framework conditions, including the transformation to a net-zero economy by 2045, economic implications of the energy crisis and demographic change. The reform process was conducted through four working groups and included the extensive involvement of external stakeholders. As part of the process, a public consultation collected around a hundred statements from municipalities, economic development agencies, associations, academia and numerous other experts.

Through the reform, changes were made to its overall goals, scope of support and support logic as well as implementation methodology. For instance, the existing main goal of assuring and increasing employment was enlarged to increasing prosperity and growth, and two additional goals were added. The first one being the levelling out of location disadvantages, and the second one of further advancing the climate and environmental transformation. Based on the new coordination framework, it will be easier for businesses wanting to invest in projects to accelerate the transformation to a climate-neutral and sustainable economy to receive support. In the area of promoting business-related infrastructure, climate-friendly and sustainable measures are also rewarded. For example, the continued use or conversion of already used industrial and commercial sites will be promoted more extensively than the development of new sites.

The criteria for business support, were also changed from an export-oriented focus towards the potential contribution of an investment to regional development including the development of local value chains. It is required that the investment is either associated with the creation of at least 10% new jobs or that the investment volume is at least 50 per cent higher than the average amount of write-offs earned over the past three years (excluding special write-offs) with reliefs for R&D intensive firms and investments in climate neutrality and sustainability. The reform also includes a new support pillar in which certain aspects of regional general interest services (regionale Daseinsvorsorge) can be supported to assure that regions stay attractive for investors and employees. This pillar can cover up to 10% of the funds. In terms of methodology, states are aiming to digitalise application processes by the end of 2023 and new evaluation mechanisms were introduced.

Source: (BMWK, 2022^[24]) (BMWK, 2022^[25])

The rural development programme has a different approach than the regional policy, since it's limited to rural places, and focuses on aspects like digitalisation, mobility, civil society, housing and other aspects of social development through pilot projects, model regions, research support, competitions, and dialogue

initiatives. At the core of this approach is the Federal Programme Rural Development and Regional Value Creation (BULE+) aiming to support ideas that contribute to being able to live and work well in rural areas in the future. Examples for the support given include model regions for the programmes “Rural Recovery” (Land(auf)Schwung) covering 13 rural regions particularly affected by demographic change and by the funding measure “Land.Digital”, where the ministry is promoting digital transformation in rural regions by testing practical concepts (BMEL, 2022^[26]). Hochsauerlandkreis and Sigmaringen are part of this support programme with a focus on the expansion and safeguarding of good medical care for Hochsauerlandkreis and a focus on entrepreneurship among young people for Sigmaringen. While focus on model regions and projects chosen by BMEL is important to gain insights into the success factors, it is equally vital to mainstream successful approaches across the board. For many of the models and programmes mentioned it remains unclear if these will be scalable to other regions, or if they will be able to continue after the model is concluded. In the interest of sustainability of programmes, there is a potential for continuation if it’s successful. Moreover, alternative funding for models should be considered and developed in a timely manner.

Through ongoing reform processes and development of policy approaches, the borders between strictly regional economic policy and rural development policy increasingly complement each other. For instance, with the reform of the GRW, the programme also has the opportunity to support aspects of regional general interest services if these have a clear economic focus and contribute to enhancing attractiveness and competitiveness of the regional economic structure. At the same time, rural development policy also supports value creation, for instance through business services or strategies that help to develop local value chains or marketing of local products. In this process it is important that ministries keep exchanging information on ongoing initiatives and assure complementarity instead of duplication, which can create confusion on the side of recipients. An interesting way of merging regional economic develop policy and rural development exists in Italy, where the national level has a dedicated project for “Inner areas – furthest away from urban centres” involving both vertical and horizontal coordination mechanism, see Box 1.4.

In the current support structure, there seems to be some concern within manufacturing businesses of smaller sub-sectors that they might be somewhat overlooked in the policy response for transition processes because focus is either placed on lagging regions or industries with a strong lobby such as the automotive industry. This can lead to situations, where new challenges arise, for instance via new EU Regulations, and small manufacturers face significant challenges in being able to adjust in time. This in turn can threaten regional economies. While it is important to lift up places that currently face socio-economic limitations, the national government and its states should pay equal attention in offering enough support for SMEs that are face with transformational challenges too big for them to lift by themselves although they are generally performing well.

Box 1.4. The National Strategy for Inner Areas, a bottom-up approach harnessing the development and endogenous potential in Italy

The rationale

The Inner Areas National Strategy is a territorial policy aimed at improving the quality of services to citizens and economic opportunities in inner territories that are at risk of marginalisation, are weaker territories affected by depopulation, low economic vitality and distance from the main centres where basic services such as education, health, mobility and digital services are made accessible to the citizens.

Integrative approach to rural development

The Inner Areas Strategy involves six cornerstones:

- It has a national dimension based on strong partnership, horizontal across various ministries as well as vertical between different levels of government.
- It operates through two interrelated actions. The first is focused on improving the quality of life in the selected area through enhanced access to services. The second deals with local development promotion through sustainable and inclusive economic development projects.
- It is a step-by-step process. Among the project areas for 2014-2020 (the first phase of design and implementation of the strategy), one area per region was selected (called “prototype”) to evaluate the strategy’s potential success and trigger a positive learning mechanism. All the selected areas are part of a network, named “project federation”, to encourage networking, exchange, and mutual learning.
- Project areas were selected through a public and transparent process. Dataset, meetings, results, synthesis reports were published online.
- The strategy actions also follow a bottom-up approach in which municipalities and regions are directly responsible for implementation. Coordination is ensured through a vertical participatory approach in which local municipal associations are the focal point enabling institutional bodies to work together. The partnerships between municipalities are used to share related management costs.
- Attention to outcome indicators and monitored results. Project areas’ development strategies must focus on expected results and achievable outcomes clearly formulated. Each project area had to identify indicators to monitor and evaluate the results achieved in implementing the own strategy.

One of the principles of the strategy is to foster the coordination between national and local interventions, actions and investments under the unifying concept of the local development plans and the corresponding financial agreement.

The procedure leading to the funding of individual projects in the area consists of three main phases:

1. *Selection of the areas*, through a public procedure, jointly carried out by all the national ministries and agencies members of the national Technical Committee for Inner Areas and by the region concerned;
2. *Approval of the Area Strategy* by the Department for Cohesion Policies;
3. *Signature of the Framework Programme Agreement*, through which the national Government, the regions and the territories commit for the implementation of the action.

The results and prospects

The mapped areas across Italy, meeting the inner areas' eligibility criteria under 2014-20 programming, cover 60% of the entire national territory, 52% of the municipalities and 22% of the population.

In total, in the 2014-2020 period, 72 areas were selected. They involve 1,077 municipalities with approximately 2,072,718 inhabitants. The total budget committed for these areas, through the Framework Programme Agreements, is EUR 1,127 million.

The Italian institutions undertook an analysis on the typology of the projects funded by the inner area strategy, covering 54 of the 72 areas. The results highlight how inner areas strategies focus on competitiveness: about 29% of the total number of interventions are addressed to the competitiveness of businesses absorbing 39% of the resources. In addition, approximately one third of the interventions are directed at context determinants that positively impact on the competitiveness of enterprises; 34% of the total resources are devoted to these interventions.

For the 2021-27 programming, 43 new areas have been identified as beneficiaries of the inner area strategy, two per region. The national budget equals EUR 310 million allocated to the strengthening and expansion of the National Strategy for Inner Areas, working on old and new ones. Out of that, a share of EUR 172 million was earmarked to finance 43 new areas.

Source: [Agency for Territorial Cohesion](#). [Department for Cohesion Policies](#). [Presidency of the Council of Ministers](#)

Federal States

Overall responsibilities and support structures

Similar to the national level, aspects of rural manufacturing are typically split between ministries responsible for economy and those responsible for agriculture and rural development. The state of Baden-Württemberg (BW) is the only state with a ministry dedicated to rural areas.

Table 1.2. Responsibilities of rural and regional development per federal state

	Baden-Württemberg	North-Rhine Westphalia	Brandenburg
Regional Development	<ul style="list-style-type: none"> Ministry of Economics, Labour and Tourism (General Regional Development Policy, Interreg, support on ERDF) Ministry for Regional Development and Housing Baden-Württemberg (Regional planning and geoinformation according to the state development plan (LEP)) 	<ul style="list-style-type: none"> Ministry of Economic Affairs, Industry, Climate Action and Energy (Regional Development Policy, ERDF, JTF, Regio.NRW) Ministry for Regional Identity, Local Government, Building and Digitalization (REGIONALE) 	<ul style="list-style-type: none"> State Chancellery (Lead on Regional Development) Ministry of Infrastructure and Regional Planning (Contributions to rural planning, Interreg) Ministry of Economic Affairs, Labour and Energy (Sectoral support and ERDF funds)
Industrial Policy	<ul style="list-style-type: none"> Ministry of Food, Rural Areas and Consumer Protection (Structural development of rural areas, managing authority for ERDF funding, interdepartmental committee on rural regions, REACT-EU, RegioWIN, LEADER, ELER) Ministry of Economics, Labour and Tourism (General Regional Development Policy, Interreg, support on ERDF) Ministry for Regional Development and Housing Baden-Württemberg (Regional planning and geoinformation according to 	<ul style="list-style-type: none"> Ministry of Economic Affairs, Industry, Climate Action and Energy (ERDF, JTF, Regio.NRW) 	<ul style="list-style-type: none"> Ministry of Economic Affairs, Labour and Energy (Sectoral support, ERDF funds, JTF)

	the state development plan (LEP)		
Rural Development	<ul style="list-style-type: none"> Ministry of Food, Rural Areas and Consumer Protection (Structural development of rural areas, ERDF funding, interdepartmental committee on rural regions, REACT-EU, RegioWIN, LEADER, ELER) Ministry for Regional Development and Housing Baden-Württemberg (Regional planning and geoinformation according to the state development plan (LEP)) 	<ul style="list-style-type: none"> Ministry for Agriculture and Consumer Protection (Rural Development Policy, ELER, LEADER) 	<ul style="list-style-type: none"> Ministry of Infrastructure and Regional Planning (Rural planning, Interreg) Ministry of Agriculture, Environment and Climate Protection (Rural development, ELER, LEADER)

Source: Author's own elaboration based on: (Baden-Württemberg, 2023^[27]; Landesregierung Nordrhein-Westfalen, 2023^[28]; Land Brandenburg, 2023^[29])

Baden-Württemberg

The state government of Baden-Württemberg has made the development of its rural areas a priority, noting the economic performance of rural areas defines the well-being in the overall state in the long term. Compared to other states and the national level it conceptualises and administers rural development less through the classical split of economically focused regional development policy and more well-being focused rural development. Rather, it incorporates rural development needs, and those of the industry located in rural regions, continuously high on the general political agenda and has created governance structures that support cross-cutting policy discussions targeting different political realms. As such, it is the only state from the three case studies, which has a dedicated ministry for rural areas and has institutionalised interministerial horizontally coordination exchange on rural development issues - the Cabinet Committee on Rural Areas (for more details see Box 1.4).

Box 1.5. Cabinet Committee on Rural Areas

The Cabinet Committee on Rural Areas links all issues directly affecting rural areas within the state government. This interdepartmental body, develops future-oriented objectives and concrete recommendations for action for the development of rural areas, especially taking into account structural change, demographic developments, globalisation and liberalisation of markets and technical progress. It also focuses on the state objective to promote equal living and working conditions throughout the country. The basis for the conceptual work on the topics of the current Cabinet Committee on Rural Areas (2021-2026) is formed of so-called interministerial working groups (IMA). Currently, five IMAs have started work on the topics of care and health, education, economy, culture and resilience. The Cabinet Committee on Rural Areas is also accompanied by a regular exchange with the cities and municipalities in rural areas. Within the framework of a series of local dialogue meetings, ideas, suggestions and perspectives are collected together with the county councillors and mayors on how the further development of rural areas can be shaped for the future. This way also a direct vertical link into rural places is created.

Examples for different interministerial working groups on rural development in BW

Interministerial Working Group “Resilient Rural Areas”

One of the topics the newly established Cabinet Committee is dealing with is the future viability and resilience of rural areas. In order to meet challenges such as demographic, economic and climate change as well as current crises such as the Corona pandemic and the Ukraine war, rural areas must continuously be adaptable. Issues such as services delivery, the economy, mobility, prosperity, quality of life and value creation throughout the rural area will also play a role. The Ministry of Regional Development and Housing is chairing this Working Group.

Interministerial Working Group “Economy in Rural Areas”

In the interministerial working group "Economy in Rural Areas", concepts for business succession, securing skilled labour and business start-ups in rural areas are discussed. As part of the working group a series of events was launched to secure business succession in rural areas. In addition, a special event (Special Cup) for the category "Products and Services for Rural Areas" is to be held as part of the "Start-up BW Elevator Pitch" competition series. This is intended to give start-ups the opportunity to highlight and present the particular benefits of their innovative business idea for strengthening rural areas.

Source: (Landtag von Baden-Württemberg, 2022^[30])

The general wealth of Baden-Württemberg gives many rural places a head-start into dealing with future challenges. Still, also regions in BW are not spared by the various common rural challenges (remaining attractive for skills and investors, creating an entrepreneurial culture and assuring digital infrastructure) many German rural places face. In light of additional pressures from new EU regulations, increasing energy and climate crisis, the state will need to secure fast policy implementation, remain agile and continue its bottom-up approach to support rural manufacturing industry into the future and assure well-being of its communities.

To this end the state government is developing an overarching strategy for the development of rural areas and has anchored this as an objective in the coalition agreement (BÜNDNIS 90/DIE GRÜNEN Baden-Württemberg; CDU Baden-Württemberg, 2021^[31]). The objective is to adapt rural policy to future challenges and helping them increase their resilience and deal with structural change including demography,

digitalisation, and economic transformation to net-zero. An essential element of the strategic development is a participatory process that is taking place online and offline. A dialogue process titled "Integrated Policy for Rural Areas - Perspectives for a Strategic Reorientation" was launched in November 2022. While it is difficult to say, at this stage, what benefits the strategy might have for rural manufacturing, it is likely that the cross-cutting policy approach taken allows the state to target many of the important enabling conditions including, innovation support, infrastructure and skills that manufacturing businesses need to flourish.

On the industrial policy side, the Ministry of Economy, Labour and Tourism of BW is also seeking to shape its industrial policy more to upcoming local needs. In 2015, it engaged in an industrial dialogue to better understand how they can support companies reap future development opportunities. Four key elements were identified around the attraction of skilled labour, inspire companies, especially SMEs to innovate, entrepreneurs to found, remaining attractive for investors including through infrastructure, and bringing industry closer to the people (Ministerium für Wirtschaft, Arbeit und Tourismus Baden-Württemberg, 2015^[32]). Two years out of the completion of the vision, it remains unclear, what has been achieved. It would be good for the ministry to take stock and address the remaining challenges through a continued dialogue process and action plan. Quite surprisingly the document only touches upon the challenge of climate change marginally, and it seems like an update in this regard would be needed to adjust industry policy to current obstacles.

Brandenburg

The development of rural areas in Brandenburg and, in particular, the promotion of equal living conditions in the state is currently being re-developed. The goal of the reform is to interlock support projects for the development of rural areas and the development of regional growth centres, which have been separated so far because Brandenburg's development process has taken place at different paces in different areas. While some rural regions benefit from the agglomeration effects of Berlin, others are struggling with depopulation. Development opportunities and challenges overlap differently in the individual geographies and produce a very diverse picture. The state chancellery coordinates the overall process since 2019.

Brandenburg's development policies are seemingly focused on realising rural-urban linkages with the capital Berlin. Since 1996, the states of Berlin and Brandenburg agreed on a permanent joint state planning. The close ties between the two have intensified in view of the digitalisation, the high demand for skilled workers, and the increasing shortage of land in Berlin. The recently updated Regional Development Plan Berlin-Brandenburg (2019) sets the spatial planning framework for sustainable rural and regional development by balancing out disparities across regions, creating equal living conditions, protecting rural areas and reducing land consumption in the so-called "capital region" Berlin-Brandenburg. The key development initiatives interact and are used in conjunction with each other to benefit from the respective strengths of Berlin and Brandenburg (Land Brandenburg, 2023^[33]). In addition, the capital region agreed in April 2021 on a joint Strategic Framework for the Capital Region where eight fields of action were identified to better address common challenges and to expand and intensify cooperation. The programme intends to join forces in various areas such as mobility, housing, energy and climate protection to make the capital region more competitive on the German and European market (Land Brandenburg, 2021^[34]). Another example of interconnection of the capital region is the attraction of digital nomads in Brandenburg's rural areas, who were the first ones to capitalise on this concept. The initiative is seen as a way to deal with the consequences of demographic change and support rural-urban linkages (Land Brandenburg, 2017^[35]).

Brandenburg has successfully experienced a shift in its development approach from a mentality dominated by subsidies and transfers towards one more focused on growth potential. The region established Core Regional Growth Areas with high growth potential that receive preferential financing and are required to display endogenous growth potential. The state deliberately targets enough growth poles to create a diverse development pattern and induce other areas in the region to focus on their own growth potential

and potentially also become growth poles (OECD, 2012^[36]). Along these growth poles, infrastructures, housing, commercial space, new value creation and digital infrastructure are being developed. In order to update this approach, Brandenburg set up a new strategy in 2021 (“Stärke verbinden” – “combine strengths”) that combines the regional growth poles with rural areas along different axis of transformation, including with new, digital forms of living and working (see also Box 1.8). The goal is to better tap the growth potential of the region and development opportunities in all parts of both states. In order to implement key structural policy projects, so-called “Regional Discussions” are carried out in all parts of Brandenburg with key regional stakeholders via the state’s economic development agency. The strategy insists that state government and key regional players work closely and constructively together to better leverage development potential (Land Brandenburg, 2022^[37]).

In addition to regional development policy, Brandenburg has strategies for cross-cutting issues including sustainability, digitalisation, climate and climate adaptation. Furthermore, concerning economic and labour policy, there are department-specific strategies in the priority areas of “Digitisation”, “Growth and Innovation”, “Sustainability” and “Skilled Workers and Good Work”, each of which pursue specific objectives and provide the framework for funding. The aim of the above-mentioned strategies is to establish future-proof and sustainable economic structures in Brandenburg and, in doing so, to even out the spatial disparities between rural and urban areas.

The districts and municipalities ensure the coordination of rural manufacturing policies at the regional level. They are supported by the relevant chambers of commerce and the economic development agency. As manufacturing is less prominent in Brandenburg compared to other states, it does not have an assigned Ministry as in Baden-Württemberg, for instance. Rather it is incorporated in the work of the Ministry of Infrastructure and Regional Planning and the Ministry of Agriculture, Environment and Climate Protection. Brandenburg is seeking for a stronger orientation towards the specific profile of an industrial location with its special features and its regional differences such as land use and availability. With the development of Industrial Policy Guidelines in 2019, Brandenburg made a step towards strengthening the state by mastering economic, ecological and social challenges. One challenge for the design of the Industrial Policy Guidelines was that the overarching strategic directions had to be broken down into implementable thematic areas, initiatives and measures. To this end, a clear structure and clear prioritisation were crucial from the outset. Therefore, the Industrial Policy Guidelines as well as the measures were developed openly with all stakeholders in a broad dialogue process and communicated in a targeted manner through various channels after publication (Ministerium für Wirtschaft und Energie, 2019^[38]). As part of the Strategic Framework for the Capital Region, Berlin and Brandenburg also agreed in 2021 on intensifying the project-related coordination in their industrial policies more closely to increase the region’s competitiveness and future viability (Land Brandenburg, 2021^[34]). To this end, the two governments have defined eight fields of action in which they want to initiate strategic cooperation, including attractive transport solutions for commuters, expansion of digital infrastructure, economic development and climate protection (Land Brandenburg, 2021^[39]).

North Rhine-Westphalia

Rural areas in North Rhine-Westphalia (NRW) live in close connection and intensive exchange with and next to huge agglomeration centres. The highly metropolitanised state of NRW is the biggest state in Germany in terms of population size. The agglomeration of Rhein-Ruhr in the centre makes the state a highly urbanised area and one of the densest in Europe. Nowhere else in Germany are industrial and rural regions so close to each other. The spatial structure of the state includes both economically prosperous rural regions with growing populations and rural areas with projected population declines. Demographic change and loss of business activity in rural areas are ongoing challenges rural regions are facing. Structural-policy support programmes such as the state-specific REGIONALE programme (see Box 1.8)

or the support programme “Home. Future. North Rhine-Westphalia” are being used by actors in rural areas to drive forward place-based regional development that takes into account different development paths in comprehensive governance processes and taps into innovation potential.

Since 2014, the NRW Rural Area Programme sets the guidelines for the development of rural areas and acts as the centrepiece for support policy. The state’s goal is to maintain and develop liveable rural areas and move towards sustainable rural areas. The programme was drawn up in consultation with over 70 economic, social and environmental partners and supports local and regional projects for quality of life in rural communities, such as village renewal and broadband expansion. It also aims to strengthen networks in rural areas, particularly with a view to strengthening social cohesion and preventing precarious living conditions for children, young people and families. Although the programme is geared to the challenges facing rural regions in NRW, it is very focused on agriculture and forestry and the role manufacturing can play in addressing these challenges is not well utilised. Still, some of the critical enabling conditions of rural manufacturing are being addressed, especially hard factors that support the development of infrastructure and innovation that manufacturing businesses need to thrive. Funded by ERDF, the current grant period 2014-2022 is extended by two years due to the delays in the new Common Agricultural Policy and the associated new funding phase (Ministerium für Umwelt, Naturschutz und Verkehr, 2023^[40]).

Regional Development Plans mainly focused on metropolitan regions, large cities and their surrounding areas, but in 2019 strengthening rural areas has been added as an objective. As the most important steering instrument of regional planning, the goal is also to set out spatial and structural requirements for the development of rural manufacturing while promoting innovation and growth. Informal networks, legislative acts and the coordination between the chambers, associations, interest groups and municipalities set the coordination of rural manufacturing at the regional level (Ministerium für Wirtschaft, Innovation, Digitalisierung und Energie, 2019^[41]).

In order to secure the competitiveness of industry, the Industrial Policy Guidelines of NRW sets intersecting targets in the topics of digitalisation, education, skilled workers, internationalisation and energy and raw materials (Ministerium für Wirtschaft, Innovation, Digitalisierung und Energie, 2019^[42]). In addition to its Sustainability Strategy, NRW’s Regional Innovation Strategy 2021-2027 creates a common framework for the diverse activities of research and innovation promotion in the state. The aim of the above-mentioned strategies is to adapt to the current urbanisation trend and heavy land consumption and bring new solutions in urban and rural areas (Ministerium für Wirtschaft, Innovation, Digitalisierung und Energie, 2021^[43]).

Areas of policy challenges and actions to advance on rural manufacturing

Policy Action: Assuring agility, experimentation, learning and future orientation in policy making

The shocks caused by the COVID-19 pandemic and Russia’s war against Ukraine have highlighted structural vulnerabilities in Germany’s export-oriented economy and highlighted the need for agility in policy design to avoid damages to the economy in period of crisis, especially to its manufacturing industry. Furthermore, the pace of technological change and the nature of the transformative challenges from the shift to net-zero emissions require high agility and experimentation in policy making – both at national and regional levels. Currently, policy planning processes, both at national as well as at regional levels, could increase agility in order to make sure policies are adjusted and improved at a regular basis corresponding to learnings from changing needs.

Integrating strategic foresight and monitoring and evaluation into programme development and implementation

Strategic foresight is one tool to help with policy agility. Specifically, strategic foresight is one tool to help with policy agility which is essential when dealing with the increase in external shocks such as those from COVID-19 and the oil crisis as well as more predictable megatrends such as the increase in automation and climate crisis. Specifically, foresight can help identify new threats and opportunities to assess if the current policies are fit to face the changes of the future. Such exercises can aid in forming an active rather than reactive policy approach; not only increase a region's ability to resist and repel shocks, but also build capacity to adapt and reorient its structures to create new economic, social and cultural pathways (for further insights on the strategic foresight exercise conducted on rural manufacturing as part of this study, please refer to the synthesis report accompanying this study).

In Germany to date, federal foresight approaches are largely led by the Ministry for Education and Research (BMBF)-Foresight Unit ("Vorausschau"). This unit looks at individual cases and questions and is largely designed to enhance policy decision with regards to education and research. It seems rather unclear how information produced is used for policy making in other domains and how links between different policy areas are made. Especially how it might be used in regional and rural development policy. It could be useful for Germany's federal level to utilise foresight methodology more strategically to assure policy agility and adaptation to ongoing challenges. In Japan, for instance, the government is carrying out foresight activities through regional consultations, looking into the impact of science and technology on regions in Japan that influence the national R&D agenda and is conducted in regular intervals (see also Box 1.6).

At sub-national level, the state of Baden Württemberg is already quite advanced in its forward-looking policy making. In 2021, it began considering forward-looking policies through its RegioClusterAgency that is supporting regional innovation systems in response to the ongoing structural change in Baden-Württemberg and the associated regional transformation challenges. It's specifically aimed at helping companies adjust quickly to new trends and innovations. It's "analyse, coordinate and implement" methodology results a range of services, including analysing and measuring the transformation processes of regional economic areas and developing transformation partnerships in which cluster initiatives and economic development institutions work together with other regional innovation actors to drive cluster development in strategic growth fields. This empowers cluster initiatives to offer their members more highly customised and constantly updated solutions and business support (Clusterportal Baden-Württemberg, 2023^[44]). It may be appropriate to develop similar activities in other countries to allow for more forward-looking approaches that enable co-creation to take hold and keep policies up to date.

Box 1.6. Strategic foresight for policy making

Science and Technology Foresight Centre, National Institute of Science and Technology Policy (NISTEP), MEXT, Japan

Looking beyond the next 20 years, the Japanese government is carrying out foresight activities through regional consultations looking into the impact of science and technology on regions in Japan. Involving policy makers across several government ministries, from universities and public research institutes, the business sector, civil society organisations, citizens and international participants, the initiative practices horizon scanning, trend analysis, scenario planning, the Delphi method, visioning and back casting among other exercises.

The initiative started with a survey to identify trends in science, technology and society by horizon scanning and then created multiple future visions of society (desirable future visions to be realised by 2040) by visioning. Concurrently, seven disciplinary committees identified 702 medium- to long-term R&D agendas (as “science and technology topics”). After consulting with more than 5,000 experts, the initiative attempted to extract eight cross-cutting areas and another eight areas based on “close-up science and technology”. These areas are expected to have a possible high impact in solving social issues and/or also serve as common fundamental technologies and systems.

In total, 5,352 respondents from industry, academia, and government took part in the survey. The priority was placed on support for problems such as the reduction in population and the ultra-aging society, as well as the recent and frequent climate-related disasters, and lifestyle or work support robots. The report showed that 90% of the science and technology topics can be realised by 2035. Before the next round, expected in 2024, the initiative plans to conduct several in-depth scenario analyses for several “close-up science and technology areas” defined in the 2019 exercise. It also plans to experiment with new methodologies and outreach by holding several regional workshops.

Source: (NISTEP, 2023^[45]; Urashima, 2021^[46])

Monitoring and evaluation are another tool to promote institutional dynamism. To date, formalised learning and set goals and timelines that allow for monitoring and evaluation do not occur in a systematic manner in all policy tools or strategies. One example for positive change is the policy instrument for improvement of regional economic structures (GRW). After being fundamentally reformed for the first time since 1969, it now in 2022 includes more formalised evaluation structure to be able to adjust more quickly. The establishment of a learning culture is important because it permits easier identification of barriers and bottlenecks that can be addressed in a second step, redefining and adjusting policy and programmes accordingly. Evaluations and learning also help to make policies more flexible and allows them to adjust. This is essential in a fast-changing world.

Consequently, strategies and programmes need to:

- Define measurable outcomes with an intervention logic that links them to policy levers,
- Provide funding for context-specific data collection and analysis,
- Have regular monitoring and communication of progress toward achieving outcomes,
- Clarify accountabilities for outcomes,
- Ensure learnings are translated into practice in a constant manner.

Expanding Regulatory Sandboxes and Living Labs

Rural places have an advantage in the use of experimental tools, such as regulatory sandboxes, living labs, or other experimentation processes that can provide new public services to a changing economy. This is because they, in comparison to more urban counterparts, have the benefit of available space, function as a rather independent system, and have lower living expenses. Consequently, by creating a regulatory environment that eases other pressures on firms, individuals in rural regions may experiment more easily than in high-income, high-turnover regions. Likewise, the provision of public innovation services by the government cannot only benefit through learnings but also use businesses that have found the practice useful for building consensus and ownership. To develop and foster a culture of experimentation living labs have provided good results across the globe and allow innovators to test solutions for the future at local level mimicking real live situations. These sandboxes are particularly important in the manufacturing sector for the creation of goods that can make use of technologically advanced production processes.

Germany's adoption of the Regulatory Sandbox Strategy has been a decisive step in the use of regulatory sandboxes (OECD, 2022^[47]). One element of support for sandboxes has been an innovation prize for policy labs, in which the winners are awarded a quality seal. (BMW, 2021^[48]) At the state level, governments have also supported policy laboratories in various ways for instance in Baden Württemberg.

The BMWK defines sandboxes (Reallabore) as follows:

“Regulatory sandboxes enable in a real-life environment the testing of innovative technologies, products, services, or approaches, which are not fully compliant with the existing legal and regulatory framework. They are operated for a limited time and in a limited part of a sector or area. The purpose of regulatory sandboxes is to learn about the opportunities and risks that a particular innovation carries and to develop the right regulatory environment to accommodate it. Experimentation clauses are often the legal basis for regulatory sandboxes (BMW, 2021^[49])”

To further improve the use of regulatory sandboxes they need to be organised in a more collaborative manner across policy areas and facilitate participation especially of smaller businesses. To this end, regulatory cooperation across various federal regulators – as well as among municipal, state, and federal authorities – should be strengthened when implementing regulatory sandboxes: this is particularly important because emerging innovative areas often cut across traditional industrial sectors, and thus the mandates of regulatory authorities and federal ministries.

Furthermore, SMEs and start-ups need to be targeted in particular to ensure they have access to regulatory sandboxes and that the eligibility criteria do not exclude younger or smaller firms: regional and local government should continue to organise awareness-raising activities (such as competitions) on the opportunities and possibilities of sandboxes, with a particular focus on SMEs and citizens (OECD, 2022^[47]). One-shop-shops to advice for SMEs on how to use living labs could also be useful to further expand information and networking services and lower the threshold for utilisation of these labs.

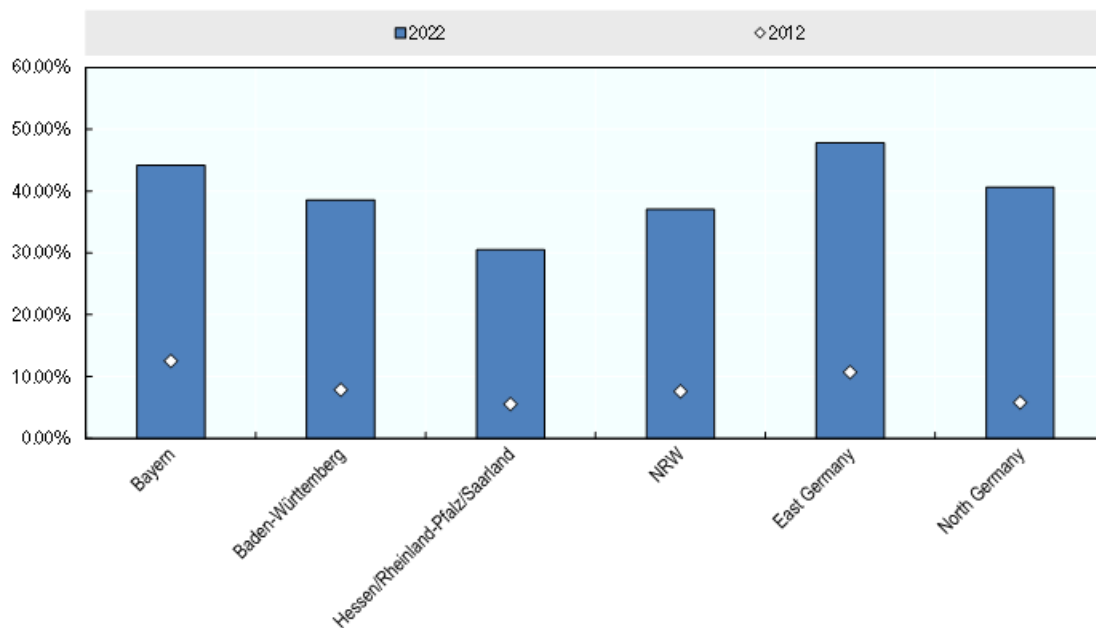
Policy Action: Assuring regions have the skills they need to be viable in the future

Germany's labour market is overall characterised by well-educated and highly skilled workforce. While the country has a below-average share of university graduates (32%) compared to other OECD countries (44%), tendencies to pursue a university education are rising quickly, increasing 12% between 2008 and 2018. Despite this progression, skills needs are largely compensated by Germany's highly developed and widely respected vocational training system, which integrates vocational schools and training in the workplace (OECD, 2019^[50]). More than 50% of adults aged 25-64 have an upper-secondary or post-secondary qualification which have played an important role in expanding the skills and capacities. To the concern of manufacturing firms, however, the supply of workers with VET degrees related to manufacturing, handicraft and professional services has declined by 19% between 2005 and 2019. With

regards to specific industrial sector, the number of passed exams in occupations related to R&D-intensive manufacturing declined by 10% between 2012 and 2019 and even more sharply in other manufacturing occupations (27%) (OECD, 2022^[47]).

The reduction of VET graduates together with wider demographic changes pose a challenge to many manufacturing firms. According to the quarterly survey¹ conducted by KfW Research Group, 40% of manufacturing businesses consider skills as a barrier to their business development. This percentage has drastically increased in the past ten years from only 9% in 2012. Highest levels of lacking skills are reached in manufacturing of data processing equipment, electronic and optical products (54.40 %), manufacture of other goods (50%) and metal products (49.9%) (KfW Research, 2022^[51]; KfW-ifo, 2022^[52]). Regionally, the eastern parts of Germany² experience the biggest skills shortage in manufacturing, followed by Bavaria and Northern Germany³. The biggest increase since 2012 is in Northern Germany followed by Hessen/Rheinland-Pfalz/Saarland and Baden-Württemberg (see also Figure 1.13). Concerning companies, SMEs have a bigger skills shortage with 44.80% in 2022 in comparison to large companies (34.30% in 2022) although both experienced a massive increase since 2012 (large companies experiencing a bigger one than SMEs).

Figure 1.13. Percentage of firms reporting skills shortages hamper business activities by region in Germany, 2012 and 2022



Note: Northern Germany: Niedersachsen, Bremen, Hamburg und Schleswig-Holstein, Eastern Germany: Brandenburg, Mecklenburg-Vorpommern, Sachsen, Sachsen-Anhalt, Thüringen, Berlin

Source: (KfW-ifo, 2022^[52])

In rural places this challenge is even more pronounced, as qualified young people move to the bigger cities to complete higher education. This further complicates the challenge of providing the required skill base and many companies struggle with acquiring and retaining. For instance, one company visited reported they had around 150 applications for two to four apprenticeships positions ten years ago, and now they have roughly ten. The limited supply of some core skills will likely become a greater challenge in the future owing to population ageing and pose a barrier to rural development.

In addition to demographic change and competition with metropolitan areas, the increasing academisation and the decline in the number of employees with vocational training pose a challenge in rural areas (Sprint, 2021^[53]). According to the Hanns-Seidel-Stiftung, 54.4% of companies in rural areas face recruitment difficulties compared to 43.4% in urban areas (Kempermann, 2015^[54]). Overall, the demand for vocationally qualified in rural regions is significantly higher than academically qualified workers. In the Hochsauerlandkreis and its neighbouring district Soest, 176,000 vocationally qualified were in demand in 2021 against 8,560 academically qualified workers. In 2021, there was a shortage of 5,000 vocationally qualified and 560 academically qualified, which means a supply-demand-bottleneck of 6.5% for the latter and 2.8% for vocationally qualified. According to the forecast, the bottleneck will respectively increase to 18.2% and 20.3% for vocationally and academically qualified workers in 2033 (IHK NRW, 2023^[55]). In the manufacturing sector, occupations in metal production and processing show the largest shortages in 2022 (12.7%), followed by mechanical and industrial engineering (8%). The same phenomenon is to be observed in Ostprignitz-Ruppin and its surrounding districts, where the bottleneck for vocationally qualified was 8.4% in 2021 and is expected to rise to 24.6% by 2033, and from 6.1% to 17% for academically qualified workers. Jobs with the highest bottlenecks are mostly in the tertiary sector, with the exception of mechanical and industrial engineering occupations, which reported a shortage of 12.4% in 2021 (IHK Potsdam, 2023^[56]). Overall, the gap between supply and demand of skilled workers in rural areas is forecasted to widen exponentially in the forthcoming years.

Automation is well underway in Germany which has increased skills pressures. With 399 robots for every 10,000 workers in the industrial and manufacturing sectors, Germany has the highest level of robot density (the number of industrial robots per 10,000 workers) in Europe and the fourth-highest level globally, behind only Korea (1,000), Singapore (605) and Japan (390). The International Federation of Robotics expects demand for robots in Germany to grow owing to demand for low-cost robots outside the manufacturing industries (International Federation of Robotics, 2022^[57]). Still, not all tasks can be automated, and robots also need supervision and maintenance, which is why policies to support the generation of skills are needed.

Creating attractive places to work and life and building connections to youth

To remain as attractive as possible, firms increasingly need to offer more than a good salary and work towards developing additional benefits responding to changing employee expectations with regards to compatibility of family and job, general work-life-balance, flexibility on work schedules and telework as well as other benefits, for instance with regards to providing support to commuters or providing fresh and regional cooking within facilities for low costs. In addition, collaborating with municipalities and districts becomes more important to assure sufficient public service delivery including options for childcare, during relevant work hours, and schooling as well as opportunities for housing.

To avoid companies poaching people from one another in small labour markets, further collaboration can help to provide shared services to attract new or returning talents into the region. In this context, districts should strategically try to support this trying to discuss the topic of skills and skills needs with companies, municipalities, and educational provider to attract interested and develop programmes that seek to develop personal connections between youth and companies to demonstrate opportunities either for apprenticeships right after high school or to build connections with people who are going away to complete their studies.

One successful example for such a programme was developed in the district of Hochsauerlandkreis in NRW that developed a career network for young people from the regions and is actively trying to promote “coming back”, giving local businesses the opportunity to present themselves and communicate the potential of the local economy (see also Box 1.7). Other examples include the development of a “Five sense tour” in the district of Sigmaringen. This special kind of company tour seeks to make the business tangible to the broader public, especially young people, in the phase of career orientation who might be

attracted to working in a local manufacturing business (Staatsministerium Baden-Württemberg, 2016^[58]). Where possible, these individual projects should be part of a broader regional marketing strategy that can serve to attract young people as well as mid-career workers to motivate them to build their career in rural places. Furthermore, the development of local welcome agencies can help people settle and facilitate integration by supporting search for accommodation or property, childcare, and schools as well as leisure activities. An innovative model is also practiced on the Swedish Island of Gotland where people can “test” rural life for some months if they want to. To that end, houses that are empty over the off-season, when tourism is low, are rented out to “long-term” visitors for a low price. Families are guaranteed a place in the local kindergarten or school for their children during that time. A similar model can be found in Germany, where digital nomads live for six to twelve months in ready-made apartments and use a coworking space free of charge. “Summer of Pioneers” not only offers people to live and work in a rural area, but also to implement their own project. At the core of the project are pioneers that bring their knowledge and networks to the rural areas as well as enrich the cultural offerings, making rural life more attractive for young, connected people without necessarily being integrated into the local labour market (Neulandia, 2023^[59]).

Box 1.7. Initiative Heimvorteil, Hochsauerlandkreis

Today, every third person from the district of Hochsauerlandkreis (HSK) leaves the region for studies or work after graduation from high school. This happens despite the fact that job prospects and career opportunities in the region are good and business are looking for skilled employees. To address this mismatch and promote the return of skilled workers to their home region, the economic development agency of the Hochsauerlandkreis joined forces with the Südwestfalen Agentur (South Westphalia Agency) to launch the project Heimvorteil HSK (“home advantage” – reference to the psychological and physiological advantage that the home team has over the visiting team in sports).

In addition to regional marketing and consulting, the distribution of boxes that are meant to represent the local economy and create a positive connection between the region and its graduates are at the core of the Heimvorteil project. Together with companies and partners from the region, Heimvorteil HSK distributes around 2,500 Heimvorteil2Go boxes per year to around 20 high schools, vocational colleges, and technical colleges in the district. The box is equipped with products of local companies representing the region’s versatile local economy. For the companies, this offers an attractive opportunity to present themselves to the skilled workers of tomorrow and to draw attention to their offerings.

In addition to the boxes, Heimvorteil HSK, has grown into a full-fledged agency for returnees, offering an exclusive career network, information about work and life in HSK through a blog and social media. Interested parties can find a steadily growing list of contacts for return and relocation initiatives throughout the region to exchange suggestions and know-how.

In 2022, the Federal Minister of Labor awarded the project as “Innovative Network 2022” together with Comeback Elbe-Elster. Similar to Heimvorteil HSK, Comeback Elbe-Elster is an initiative that, among other things, offers advice for returnees and supports young founders with co-working spaces. It is located in Brandenburg. The cooperation project of Comeback Elbe-Elster and Heimvorteil HSK has been active for two years under the name “Hüben & Drüben” (“Here & Over there”). Overall, 39 networks across Germany took part in the competition. Hüben & Drüben was recognised for its special work and commitment to strengthening rural regions and creating synergies to promote attractiveness of rural life. An internet platform was created on which return and immigration initiatives can present themselves, and network meetings and joint communication channels were build. From 2015 to 2019, Heimvorteil HSK was funded by the Federal Ministry of Agriculture and Food through the project “Land(auf)schwung” (“land(up)lift”). Today the project is financed by the business development agency of the Hochsauerlandkreis and the Südwestfalen Agentur.

Source: (Heimvorteil HSK, 2023^[60]; Hüben & Drüben, 2023^[61])

Increasing diversity and facilitating migration

There exist opportunities to expand Germany’s skill and capability base by increasing diversity. Currently, manufacturing industry in Germany is still dominated by men, perpetuating the under-representation of women in this sector (Statistisches Bundesamt, 2023^[62]). Attracting and encouraging individuals from under-represented groups, including from minority households, to engage in manufacturing should be one component of a strategy to address skills shortages. This can also be practiced at the local level through engagement in schools and early interaction.

In addition, Germany needs to do more to attract workers from abroad with skill profiles that are in particular demand. While this is nothing that can be solved at state or regional level the federal government needs to ease administrative burdens, for instance with regards to the acceptance of foreign qualifications to increase inward migration. The new government’s coalition agreement furthers the issue by introducing a

point system for immigration in which applicants who have not obtained a job prior to immigrating will be scored according to (among others) their education and language skills. This is very much needed as a 2021 survey of 7,500 companies with more than 10 employees showed that only 16% said they were recruiting skilled personnel from abroad as a way to prevent skills shortages. The 501 responding firms that opted not to recruit foreign skilled workers despite reporting shortages cited language barriers (45%) and uncertainties regarding foreign qualifications (45%) – especially for non-EU workers – as the main reasons for their choice; firms that had actually recruited foreign skilled workers also pointed to language barriers (39%) and foreign qualifications (28%) as major obstacles (Mayer, M., 2021^[63]).

The German government is currently debating reforms to its immigration system. In February 2023 a bill was presented to modernise immigration law in order to facilitate the recruitment of skilled workers to counteract the prevailing shortage of skilled workers. In the focus are measures such as the intensification of advertising measures to attract skilled migration; improvements in placement and matching; expansion of the offer of German language courses, and faster administrative procedures. Changes are also foreseen in recognition procedures for foreign qualifications, such as carrying out the recognition already from foreign countries, so that skilled workers can take up their work in Germany from the very first day (BMI, 2023^[64]).

Assure skills match future needs

Rural areas often suffer from a loss of new talent that may either migrate elsewhere because of work or training opportunities. In addition, demographic change reduces the available working age population. Yet, a skilled population is important for manufacturing companies a skilled workforce is needed to bring innovations to the market. While R&D investments are often thought of as critical for economic development for some regions, investments in human capital, education and training is just as important for well-being of rural regions and their manufacturing industries.

Skills anticipation and assessment exercises (e.g. skill needs assessments, forecast and foresight exercises) can provide information to more effectively tailor the offer of education and training programmes to local needs. Germany's rural places seem to have a limited assessment and vision on what future skills are needed where and how to support developing of these skills. While close collaboration exists between universities of applied sciences and industry, these often are bound to more current developments and do not project further ahead than a couple of years. Especially in light of the green and digital transitions, regional and local governments need to make better use of available data and should seek to understand future local labour market needs together with companies. State level should further assist local level governments in this monitoring.

The Scottish Government for instance has developed a powerful strategy on green skills in its Climate Emergency Skills Action Plan (CESAP). The plan sets out a clear direction for the changes needed in the skills system and signals the role that industry, communities and individuals across Scotland will play in achieving this (Box 1.8).

Box 1.8. Green skills in Scotland

The Climate Emergency Skills Action Plan (CESAP) sets out a clear direction for the changes needed in the skills system and signals the role that industry, communities and individuals across Scotland will play in achieving this. The CESAP was published in December 2020 and focuses on the key actions needed over the next five years to 2025, with an update of the plan by the end of 2023.

CESAP provides a new evidence base on the skills needs of a net-zero economy with consideration of demographics, population and the availability of people, specific skillsets and geographies. It identifies potential opportunities for job growth across five broad areas of economic activity and notes priority areas for activity to drive economic change. The CESAP has been developed through engagement with industry leadership groups and an expert group comprising Skills Development Scotland, the Scottish Funding Council, Zero Waste Scotland, the Scottish Cities Alliance, NatureScot, the Scottish Government's Domestic Climate Change and Skills Divisions, Highlands and Islands Enterprise, Scottish Enterprise, South of Scotland Enterprise, the Universities of Edinburgh and of Strathclyde.

Three categories of green jobs have been identified, providing a framework against which to gauge likely skills demands and develop and focus interventions when the CESAP moves to its implementation phase. These are:

- New and emerging jobs that relate directly to the transition to a net-zero economy, e.g. hydrogen cell technicians, carbon monitoring technicians and urban miners.
- Jobs affected by the transition to a net-zero economy that will need enhanced skills or competencies, e.g. architects and environmental consultants.
- Existing jobs that will be needed in greater numbers as the result of the transition to a net-zero economy, e.g. insulation installers, energy assessors and designers and multiskilled onsite operatives.

Two important measures defined in the plan are the establishment of a Green Jobs Skills Hub that will cascade intelligence into the skills system on the numbers and types of green jobs that will be needed over the next 25 years and a Green Jobs Workforce Academy. The academy will support existing employees and those who are facing redundancy to assess their existing skills and undertake the necessary upskilling and reskilling they need to secure green job opportunities as they emerge. Various other activities and in-depth descriptions can [be found here](#).

Source: (Scottish Government, 2020^[65])

Policy Action: Delivering on an important enabling condition – land

Spatial and land use and special planning is closely connected to much broader agendas such as the transition to a zero-carbon economy and the creation of opportunities for economic growth and prosperity. Defining how spaces are used also determines if objectives such as producing renewable energy, providing affordable housing, producing goods and services can be reached. It is therefore linked to policy ambitions at multiple scales, extending across sectoral issues and involving an ever-wider array of actors in structures of governance.

Germany is characterised by increased use of land, often to the detriment of nature. Every day roughly 55ha will be newly designated (greenfield) as settlement and traffic areas, which includes residential, industrial and commercial land as well as land for public facilities, areas for sports, leisure and recreation.

This corresponds to a new use of land of around 78 football pitches a day. To deal with this increase and its negative effect on the natural world the German government has decided to limit the average addition for land for settlement and transport to 30ha per day by 2030 and aims to achieve a circular land economy by 2050. This means that no further land is to be used for settlement and transport purposes from then onwards (Statistisches Bundesamt, 2021^[66]). To assure future viability of the manufacturing sector it is crucial for Germany to make better use of old industrial sites in line with circular economy principles, especially in regions where land is already scarce.

The demand for commercial and industrial space can currently not be met in many municipalities, including in rural areas. In some municipalities, no industrial sites are available at all. The region of Hochsauerlandkreis, for instance, will be able to dedicate its last remaining industrial space for re-development in the coming year. After that no more sites will be available. Further, this development was only possible because it was able to collaborate closely with surrounding municipalities. In other municipalities, approved sites can often not be used (among other things, due to topographical and natural constraints, problematic land acquisition, expansion sites owned by third parties), or the actual sites are too small for industrial use or are subject to too many restrictions such as being zoned for long period of times (Stadt-und Regionalplanung, 2016^[67]). This means that change is difficult to realise, with long timelines and significant administrative hurdles.

One example for this is the creation of the Innovation Campus in Sigmaringen. The site is a pervious military site, which was re-developed and now houses an accelerator, a research centre as well as an academy for further education. The 280ha land belonged to the federal state, which made it relatively easy to re-develop as it only had one owner, yet the process still came with mayor hurdles and delays. These were largely related to planning processes and permits on biodiversity and archaeological findings that had to be obtained. According to local stakeholders, development was only possible because it was a publicly funded project. Any private investor would have pulled out because of waiting times of over three years for plans to get approved.

In places and times where quick responses to changing conditions are needed, traditional statutory instruments of land-use planning are not fit for these circumstances. It is therefore important to allow for more flexible approaches to land-use planning. One example for measures to create more flexibility can be observed in Poland where Special Infrastructure Acts suspend common planning laws for key projects (OECD, 2017^[68]).

Other measures that can increase flexibility in land use include:

- The establishment of specific zones in a community which are more open to experimentation and temporary uses. With greater planning flexibility there are fewer rules about how land is used and each project is judged on the basis of its own merit, typically framed by overarching guidelines and objectives about community needs and aspirations. Under such systems, more upfront efforts are needed to collaboratively define projects and reach consensus between investors, developers, governments, residents and other actors. If this is done well, it can breed experimentation and innovation and respond in a timelier way to emerging trends and needs. An important caveat is that more flexibility should not be embraced everywhere. For example, historical districts and environmentally sensitive areas need more stringent rules than transitional spaces such as brownfield sites.
- Increasing the local capacity since a broader range of considerations has to be taken into account in the decision-making process. Decision makers must be accountable and need to be trusted by the public in order to ensure that land-use decisions are accepted, even by those who would prefer different outcomes. Flexible systems therefore need effective monitoring and evaluation to ensure that key objectives are achieved.
- Inter-communal cooperation for land-development is important to serve diverse needs. In the process the needs of individual municipalities as well as land exchange potential and the disposition of land are they into account. Aside from identification of new potentials these collaborations can also be beneficial

in terms of development of additional required infrastructure such as waste management, joint marketing and increasing advertising effectiveness to other larger regions, bundling human and financial resources within the participating municipalities and reduction of risk in not being able to sell closed sites. One example of many is the Oberbergischen District, which engaged in such a process in 2016. Following a decision by all municipalities, co-developed industrial and commercial land concept informed the new regional plan.

- Planning must also be subject to timely and adequate oversight by the legal system. If regular planning and appeal procedures are considered inadequate to deal with specific developments or different needs, it is preferable to reform these procedures instead in order to facilitate better regional development.

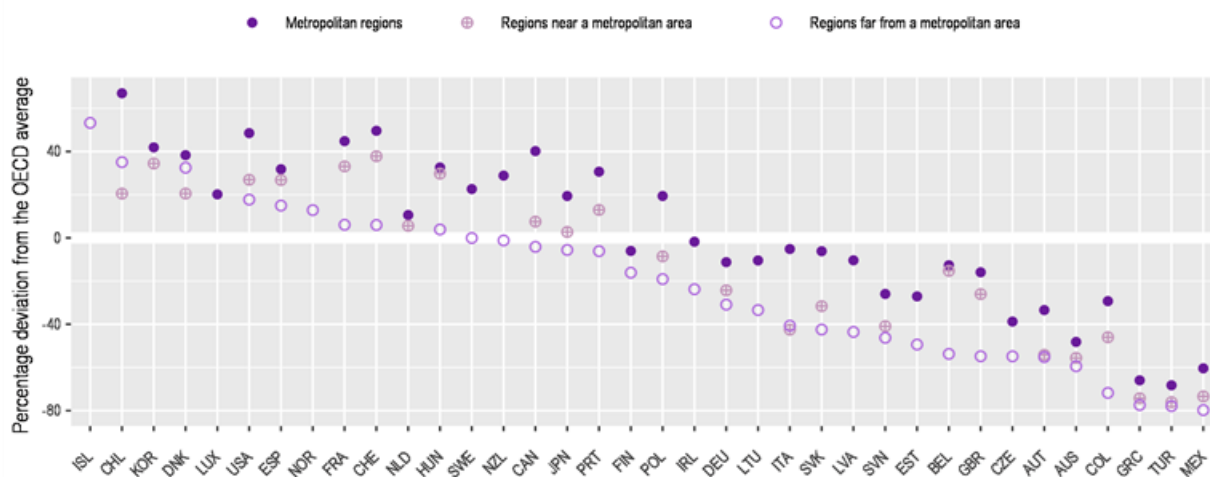
Policy Action: Advancing on the frontier of digitalisation

Closing the digital infrastructure divide on coverage and speeds

The latest OECD Economic Survey of Germany highlighted that while Germany is a world leader in technology and engineering, it lags behind in the digital transformation and that high-speed broadband networks need to be improved, particularly in rural areas (OECD, 2020^[69]). Relatively low levels of digital connectivity, particularly in terms of fixed high-speed broadband networks, limit the economic development, especially in rural places. Germany experiences significant rural-urban connectivity divide. Figure 1.14 shows differences in internet speeds per region type. German metropolitan regions experienced speeds 11% slower than the OECD average and regions far from the metropolitan areas experience speeds 30% slower.

Figure 1.14. Disparities in fixed download speeds, 2022

Percentage deviation from OECD average, by type of region, weighted averages of small regions (TL3)

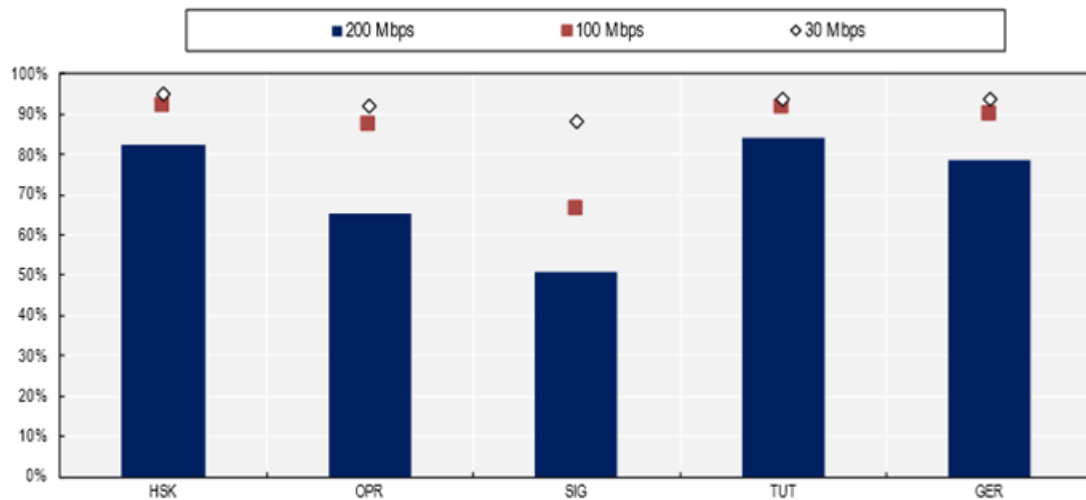


Source: Regions and Cities at a glance, 2022.

In the case study regions, firms in Sigmaringen and Ostprignitz-Ruppin have internet speeds of 200 Mbps are below the German average Figure 1.15. Internet speeds are important as many important business processes including simple processes such as enterprise resource planning and customer relationship management, to more complex applications such as big data analysis, social media and cloud computing – may be affected by limited high-speed broadband (OECD, 2022^[47]). Firms in Germany are behind in the adoption of key ICT tools required to create value with data, such as high-speed broadband and cloud

computing Figure 1.16. This means that Germany’s firms are currently, impeded by connectivity barriers, that hinder them to capitalise on data rich and technology intensive services, which can lead to productivity gains and the opportunity to pursue important innovation activities.

Figure 1.15. Internet speed availability for all firms, 2022

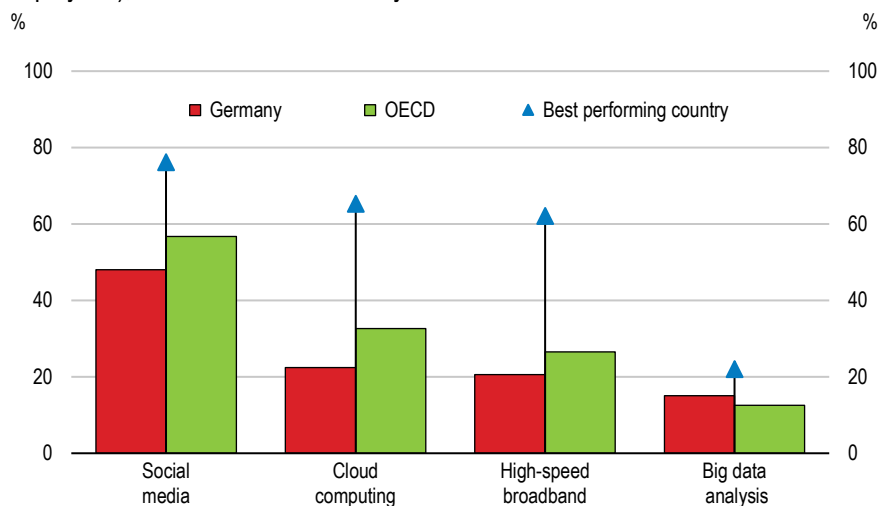


Note: Mbps stands for the capacity to transfer 1 million bits per second, or one small photo per second. Very high-capacity connectivity has at least 100 Mbps. A video streaming platform recommends having 25 Mbps for one 4K video stream. A standard personal video call (e.g. Skype) needs 1 Mbps and file downloading needs 10 Mbps. For most uses, 100 to 200 Mbps is sufficient. This enables a few people to use the internet at the same time. (European Commission, 2023^[70])

Source: Breitbandatlas

Figure 1.16 German firms lag in the adoption of advanced ICT tools and activities

% of firms (10+ employees), 2019 or latest available year



Note: Excludes firms from the financial sector. High-speed broadband are subscriptions with 100+ Mbps.

Source: OECD ICT Access and Usage by Businesses database.

On household level the rural-urban divide is similar pictures is similar. In 2019, 94% of households in large cities had access to fixed broadband with download speeds of over 100 Mbps, compared to only 53% of households in rural municipalities (OECD, 2020_[69]) Furthermore, on household level, most fixed broadband subscriptions are digital subscriber lines (DLS) technology, largely covering lower-speeds. Optic fibre connection for households accounts only 4.1% of the broadband mix, which is significantly below the OECD average of 28%. DSL technology, also remains prevalent in many rural areas, but was designed for low-speed analogue voice services and not for many modern ICT and data-intensive activities which is struggles to support (OECD, 2020_[69]). Limited internet availability and speeds hamper attractiveness of rural places, especially considering the increased trend towards full-or part time teleworking.

To improve connectivity, administrative processes should be streamlined disbursement of funds has been slow and long approval processes delay progress. It is necessary to shorten administrative approval times for communication network deployment, including obtaining rights of way, and improve coordination between public authorities. Furthermore, to address the regional connectivity divide it is important that that municipal authorities are given the power to distribute funds set aside at the federal level to upgrade their connectivity infrastructure, an objective that is sometimes hindered more by administrative barriers.

Fostering digital skills in rural firms

Digital connectivity alone is not enough to capitalise on the potentials of digitalisation. One of the key challenges for rural regions is shortages in skills, and in particular digital skills. In a 2021 survey of regional government officials in OECD countries, skills shortages were one of the top barriers to innovation and therewith regional development in rural regions (OECD, 2020_[71]).

Historically, digitalisation has not played a major part in many of Germany's traditional manufacturing sectors. This is changing at a fast pace in an economic context where value added and innovation are increasingly data-driven and the "servicisation" of manufacturing is taking hold based on data. Furthermore, it is unthinkable for businesses without well-functioning ICT tools to support energy efficiency and climate management effectively, highlighting the links between the digital and green transitions. To best utilise opportunities from a comprehensive digital transformation, manufacturing firms will need to adopt newer and more advanced digital tools that will enable them to collect, store, exchange, and process large amounts of data.

The importance of the digital transformation in Germany is recognised at all government levels, and policy makers have developed several policy programmes to support the digitalisation, especially of SMEs. Policy support has taken a number of forms, from direct finance to networking bodies. Recent examples of such initiatives include the Federal Ministry for Economic Affairs and Climate Action (BMWK)'s "GoDigital" programme, which ran from 2017 to 2021 and provided eligible SMEs with grant financing for skill development to support digitalising business processes, developing digital markets and IT security; and the SME Digital Competence Centres, which support the adoption by SMEs of information and communication technology (ICT) and Industry 4.0 applications (OECD, 2022_[47]).

The SME Digital Competence Centres offer neutral, cost-free information, demonstration, qualification, and accompaniment, including workshops, visits of demonstration plants, meetings with experts and practical support for SMEs developing their own digital solutions. The competence centres are accompanied by a range of different partners including universities and universities of applied science, Fraunhofer institutes and other external partners (like chambers of commerce), each partner takes on a specific role tied to its area of competence and sometimes have a thematic focus such as (e.g. 3D printing, flexible manufacturing or new business models). Collectively all partners promote the overarching topic of digital transformation. So far internal evaluation reports from competence centres show positive effects emanating from the centres. SMEs who were involved report to have specifically benefited from the support of the affiliated experts. However, while widely spread in Germany with 26 centres located through, their rural reach is difficult to assess. Most of the centres are located on the vicinity of larger cities or regional

capitals and hence probably largely attract SMEs close to them (BMW, 2020^[72]). An evaluation based on the location of firms participating in the programme could be important to better understand the geographical element of this support provided. Digital concerns of rural areas are reflected in a dedicated competence centre located in the town of Siegen, which focuses on strengthening regional innovation systems and collaborates with the university of applied sciences in “South Westphalia” on how to better support rural regions in their digitalisation processes. The “TransferFactory” in Meschede works as a “Demonstrator” for Industry 4.0 applications. It remains unclear on how learnings from this centre are supposed to spread into other rural regions in Germany.

Specifically manufacturing related support programmes for digitalising SMEs can be found in South Korea and the Netherlands and Belgium. In Korea, the SMEs Programme for Smart Manufacturing helps SMEs modernise their production facilities by financing up to 50% of the costs of digital technology adoption. Furthermore, service design vouchers for manufacturing SMEs in the Netherlands are an experimental scheme to help these SMEs develop services related to their products, to remain competitive in a context of increasing “servicisation of manufacturing”. In Wallonia (Belgium), the vouchers for digital transformation cover between 50% and 75% of the cost of advisory services aimed at auditing the digital maturity and needs of SMEs and then designing a tailored action plan (Planes-Satorra and Paunov, 2019^[73]). Baden-Württemberg and Brandenburg have a similar voucher system aimed at innovation and digitalisation within SMEs funded by ERDF. In Baden-Württemberg, SMEs receive between 10% and 20% subsidy for their investment, depending on their employee size and if the companies focus on advancing the state in the areas of circular economy and bioeconomy (Ministerium für Ernährung, Ländlichen Raum und Verbraucherschutz Baden-Württemberg, 2023^[74]). The Brandenburg innovation voucher system supports SMEs in the areas of research and development with various grants ranging from 50% to 100% of eligible costs (Investitionsbank des Landes Brandenburg, 2023^[75]). The state of North Rhine-Westphalia funds so-called “Innovation and Digitization Voucher”, with a funding rate between 30% and 50% depending on the size of the company, to support SMEs in technology transfer with their own innovative business model as well as the digitalisation of products, processes and production processes (Landesregierung Nordrhein-Westfalen, 2018^[76]).

In addition, maybe strategically chosen rural locations could be added to the list of Digital Competence Centres to better serve rural areas and white spots that are currently not sufficiently covered. In places where there is a dedicated cluster, as for instance in Tuttlingen, a specific focus on a certain type of manufacturing industry might be particularly important, utilising the already existing university facilities. For places in Germany that do not benefit from the Digital Competence Centre close by, vouchers for accessing other digital transformation facilities might be helpful to further spread the reach.

Policy Action: Building a collaborative, inclusive business support system

A comprehensive business environment and a well-functioning entrepreneurial “ecosystem” for business depends on a range of conditions, including institutional and regulatory settings, access markets and finance, risk-taking and experimentation by entrepreneurs and sufficient links to knowledge creation. Strengthening the business environment and entrepreneurial ecosystem is important for rural manufacturing businesses to prosper and address future challenges not as individuals but as a community, drawing on collective strength existing assets that can enable competition. Competitiveness in the end will contribute not only regional but also national prosperity.

Considering the ongoing challenges including the shift to a net-zero economy and demographic pressures, the strengthening of collaborative approaches to foster transfer of knowledge and sharing of resources not only between businesses but also between administrations and the private sector is even more important. In the district of Tuttlingen has embraced this concept triggered by external factors. While companies were not used to collaborating a lot before, increased urbanisation, competition from cities and a new EU Medical Regulation left them with a lack innovation capacity. In response to that, local companies and the

municipality decided to take an additional step in the further development of the cluster. In 2009, a separate university campus was established, where, in addition to other courses of study, the Industrial Medtec engineering degree programme is offered. In the neighbouring district of Sigmaringen, where the heterogeneous and geographically dispersed economy makes it difficult for companies to access cluster benefits, such as increased productivity and accelerated innovation. Still, in order to develop attract and to strengthen the innovative capacity of the district, Sigmaringen cooperates with the newly established Innovation Campus at the Albstadt-Sigmaringen University of Applied Sciences to promote the development of a cluster and create an entrepreneurship culture in the district (Küpfer et al., 2021^[77])

Developing a culture of collaboration and sound-multi-level governance systems.

The rural manufacturing business environment in Germany is not renowned for its collaborative spirit, especially in places where companies are not patenting their products and the fear a leakage on innovation or copying from competitors is high. This mistrust can lead companies to produce many value chain elements in house instead of looking out for synergies (Agyemang et al., 2017^[78]). In other cases, geographical distances as well as separation across, rather small, administrative areas can also play a role in missed collaboration and therewith missed transfers of knowledge, innovation, and synergy effects.

Public entities are often not better in collaborating and this although individual towns or districts are often limited in their administrative and financial capacity, lacking knowledge and management structures needed to deal with larger challenges. Multi-district collaborations to implement regional projects are helpful and increasingly necessary to overcome larger development challenges. Otherwise, missing links can emerge. The Innovation Campus in Sigmaringen, for instance, is somewhat disconnected from local companies and there seems to be limited understanding of how research conducted can be relevant for or utilised. Furthermore, also exchange between the district of Sigmaringen and Tuttlingen is limited, while the two districts are bordering each other, they have little exchange of their regional development strategies and concerns of their business community.

To overcome these collaborative barriers outside impetus is needed. This can come in multiple ways. In the case of Tuttlingen, the new EU Regulation on Medical Devices has significantly changed the business environment and resulted in increased collaborative organisation to tackle the implementation of the regulation but on the side-lines also addresses additional issues of innovation, for instance through establishment of the 'Medical Mountains' Initiative, which operates at a platform for dialogue and support in the local medical industry. In other cases, collaboration is the dedicated goal of state delivered regional development policies. Most of which have a dedicated collaborative bottom-up angle seeking to create more integrated development across districts as well as across industries to foster innovation (see Box 1.8).

An important outcome of these state policies is not only the creation of regional development plans that incorporate voices from across a broad spectrum of stakeholders but also the creation, of regional branding agencies, initiatives, or networks. One successful example is the Südwestfalen Agency in North Rhine-Westphalia. The agency acts as an operational unit for regional branding, project coordination and implementation across districts and facilitates dialogue between businesses and the public sector. The agency was initially supported by a state grant but is now funded by its members, five districts as well as an association of 386 local companies. Maturing to a self-supporting structure was essential for its success and proves that it was able to demonstrate its value added to the region in a broader sense. This sustainability collaborative structures necessitates their future independence from one-off a kind grant funding. To assure this, potential viability beyond grant timelines needs to be considered from an early stage onwards and partnerships continuously developed and mobilised once the concept has proven a success. This is also important to assure that, regional strategies are not written with a view to funding eligibility or compatibility in the selection process but foster innovative and region-specific solutions (Küpfer et al., 2021^[77]).

At state level, smart specialisation strategies have been an important tool to bringing individual stakeholders around the table and to promote innovation responding to ongoing megatrends based on regional strength. A list of the strategic innovation fields of the three states visits as part of this are listed below Table 1.3. At district level (TL3), smart specialisation strategies are neither recognised as important no considered a guiding tool for rural development policy making. This begs the questions whether their existence is only relevant in relation to receiving EU funding for state governments but lacks implementation across the vertical multi-level governance systems. Especially, at smaller regional levels smart specialisation is not guiding regional development work.

It might also be possible that there is a lack of institutional or clarity around the smart specialisation agenda and that some of activities are 'homeless' at local level and miss clear contact points or allocations. This fragmentations in policy making can hinder coordination and more efficient public intervention. In addition, the emerging of cross-sectoral and cross-technological activities require multi-level communication and policy coordination across a higher number of different agencies (local, regional, national, and supranational) and across a higher number of policy areas (e.g. industrial, innovation, education, energy, transport, and entrepreneurship).

To increase the impact of smart specialisation strategies, links should be created to other smaller regional development strategies and initiatives developed through state-led programmes such as REGIONALE and "Stärken Verbinden". While some of these might go beyond what is strictly considered "innovation", there are many overlapping thematic elements which need to be addressed in coherence to assure the largest policy impact. Furthermore, more integration can also allow for more experimentation and links between seemingly unconnected industries and asure entrepreneurship happens the vicinity of specialisations that are developed in clusters or similar entities.

Table 1.3. Overview smart specialisation strategic innovative fields

Baden Württemberg	North Rhine Westphalia	Brandenburg
Digitalisation, AI, Industry 4.0	Energy & Innovative Construction	Optics and Photonics
Sustainable Mobility (alternative Fuels, linked to digitalisation, automation, and general transport concepts)	Key Technologies of the Future & ICT	Clean technologies
Healthcare	Environmental & Circular Economy	ICT
Resource Efficiency and Energy Transition	Culture, Media & Creative Industries, Innovative Services	Synthetic Materials and chemistry
Circular and Bio-Economy	Innovative Materials & Intelligent Production	Metal
	Connected Mobility & Logistics	Tourism
	Innovative medicine, health & life science	Food and nutrition industry
		Materials
		Media and Creative Industry
		Healthcare
		Production and automation technology
		Transport mobility and logistics
		Power engineering

Source: (European Commission, 2023^[79])

Box 1.9. State Level Regional Develop Initiatives designed to foster bottom-up development and cooperation

Regio Win – Baden-Württemberg

One of the key elements of the states' support to assure future readiness in regions is the RegioWIN competition. The competition is a programmatic element of the states' ERDF strategy with the aim to improve competitiveness (W for "Wettbewerbsfähigkeit") in the regions through innovation (I for "Innovation") and sustainability (N for "Nachhaltigkeit") and thus contribute to sustainable regional development. In the programme, regions, counties, cities, and municipalities are called upon to work out individual development concepts and project proposals for their self-defined functional area together with actors from business, science, society, and administration to identify how to improve their future viability based on their respective strengths and weaknesses.

This bottom-up controlled process of regional development in functional areas was initiated for the first time in the funding period 2014-2020. As stakeholders continued the process throughout the entire funding period. This was one of the reasons why the strategic approach based on the counter current principle gained a high degree of acceptance among stakeholders and beneficiaries. The combination of sectoral policy and regional approach of RegioWIN will be continued in 2021-2027. Existing regional development concepts can be updated with the new perspective for the period until 2030. This includes projects with regional leverage. The experience and feedback with the implementation of the "Smart Specialisation Strategy" within the framework of the "RegioWIN" competition can be considered very positive. In the process, RegioWIN will be further developed with the vision of RegioWIN 2030 at least until the year 2030. RegioWIN is managed by the Ministry of Economics, Labour, and Housing in cooperation with the Ministry of Science, Research and the Arts and the Ministry of Rural Areas and Consumer Protection.

REGIONALE – North Rhine-Westphalia

One of the key tools to promote regional cohesion and future viability as a special format of regionalised structural policy is the REGIONALE programme. This unique structural programme focuses on regions in which districts voluntarily join forces and work together across their borders. Based on common strengths and weaknesses, the participating cities, communities, and districts jointly develop a concept and projects creating innovative solutions for future challenges. They focus on certain regionally specific topics and needs. At its core they are ambitious, structurally effective measures in the areas of city, landscape, culture, and economy, which are developed in a determined time. In the REGIONALE year, the results are presented to the public and the professional audience. Funding is not provided on a "equal distribution" basis, but rather quality and regional appeal are the yardsticks for selection and further actions within the framework of each project.

Each individual REGIONALE was and is designed to be a role model for other regions. This project-oriented approach of cross-regional development was initiated for the first time in 1997. Since then, the programme has been developing steadily for 25 years. Eight REGIONALE have taken place and two more programmes are underway. With its philosophy of continuous improvement, REGIONALE is based above all on adaptability and future readiness. In the process, East Westphalia-Lippe held one in 2022 and South Westphalia and Bergisch Rhineland are the next two for REGIONALE 2025. Overall, around 150 projects are in development or have already been partially realised for 2025. The programme is managed by the Ministry for Regional Identity, Local Government, Building and Digitalization of the state of North Rhine-Westphalia.

Stärken verbinden – Brandenburg

In 2021, the state of Brandenburg launched a new regional development strategy under the leitmotif “Stärke verbinden” (“connecting strengths”). The core element of the new strategy is that cities and rural regions agree among themselves and together on specific key projects in their respective regions. This is intended to advance the development of the entire country while taking regional strengths into account. The goal is to expand cooperation, which leads to new perspectives and ideas, and to create a new way of working together that goes beyond boundaries of the district and the city.

One year after the launch, the first twelve key projects are confirmed. Among them is the key project “Brandenburger Tor” (“Brandenburg Gate”) active in north-western Brandenburg along the transport and development axis between Berlin and Hamburg. It aims to create new opportunities for living and working as well as for innovation locations in rural areas. Now positioned in the implementation and qualification phase, the programme carries out concrete sub-projects planned. Further municipalities and local partners are to be involved. The programme is managed by the state government of Brandenburg who accompanies the implementation of the decided key projects by the regions and checks the funding possibilities of the subprojects.

Comparative Analysis

All three structural programmes follow a bottom-up development approach designed to improve the regions' future viability. A key element of the policies is that strategy and development concepts of the programmes are spatially integrating inter-municipal, cross-district, cross-thematic and cross-stakeholder. The regions distinguish themselves from other ones through this extended cooperation and shape structural change according to their regional strengths and challenges. RegioWIN has a pronounced focus on innovation and competitiveness whilst REGIONALE and “Stärke verbinden” have a rather broad perspective allowing more thematic flexibility. RegioWIN and REGIONALE are carried out as a competition on which regions must apply. In Brandenburg, the state government selects candidates based on their relevance and on key projects defined by the cabinet. While RegioWIN is part of the 2021-2027 ERDF funding period, REGIONALE and “Stärke verbinden” are solely financed by the respective state governments of North Rhine-Westphalia and Brandenburg. It is to note that the latter is still at a very early stage of the process while REGIONALE and RegioWIN can be considered established development programmes. Launched in 2000, REGIONALE is the eldest programme with a total investment of around EUR 2.3 billion. Around 400 projects have already been realised, and 150 are currently under way. RegioWIN first launched in 2014 and enrolled 32 projects until 2020 with a budget of EUR 107 million. 24 projects supported by an 80 million euros-investment are planned for the funding period of 2021-2027. Brandenburg, on the other hand, just confirmed at the end of 2022 the first twelve key projects that are to be implemented in the forthcoming years. Its programme structure and focal points were inspired by REGIONALE.

The common and most important outcome of these programmes is the foundation of a goal-oriented networking culture in the regions. (Self-)sustaining cooperation structures and networks have created a basis for further policy development not only reflecting regional interrelationships, but also shaping strategic communities. The RegioWIN network has committed itself to a general regional policy claim and has become a bottom-up organ for regional development in Baden-Württemberg. In North Rhine-Westphalia, REGIONALE-agencies, which have been created as a result of the policy process, act as an additional operational unit for project coordination across districts and have become self-supporting cooperation structures and networks.

Source: (Ministerium für Wirtschaft, Arbeit und Wohnungsbau Baden-Württemberg, 2022^[80]; Ministerium für Heimat, Kommunales, Bau und Digitalisierung des Landes Nordrhein-Westfalen, 2022^[81]; Land Brandenburg, 2022^[37])

Developing a culture of entrepreneurship

A functioning entrepreneurial ecosystem requires entrepreneurial actors that can support incubation, acceleration, coaching and mentoring services, providers of financial resources (e.g. banks, business angels) and knowledge and opportunities for collaboration (e.g. large firms, research institutions) as well as connectors that can foster linkages in the ecosystem (e.g. professional associations, business brokers) and entrepreneurial mindset and openness across actors (Brown and Mason, 2017^[82]). Further, fostering an entrepreneurial culture can make regional economies more productive, more resilient, and adaptive to change. It is hence important to build healthy business ecosystems in rural places.

In rural places, the above-mentioned criteria are often not all in place or are only available with limitations. In such a context, it is important for rural places to identify these gaps and then find ways to bridge them or find creative solutions to assure the required needs are met. For instance, government can also leverage its role as a funder to foster the creation of meaningful rural-urban linkages between non-governmental organisations through a relatively simple contracting process. This way, services that already exist in cities can be transferred to the rural context, enriching institutions that already exist there. Strengthening these types of linkages between cities and surrounding rural areas can support economic development and inclusion for rural residents, particularly if linkage programming is adapted to the characteristics of the rural communities, while at the same time strengthening the cluster by expanding the available talent pool and idea pipeline. An example for such an initiative can be found in Canada, see Box 1.9.

Furthermore, it has to be taken into account that research has shown that policies aimed at increasing the level of entrepreneurship in regions will often require considerable periods of time before significant improvements are observed. This is often at odds with the electoral cycle, which incentivises politicians to promote policies that can offer observable impacts within a three- to five-year cycle. Policy makers need to make it clear to stakeholders that the policies being pursued are for long-term benefit of the region and might take longer to take hold. (OECD, forthcoming^[83]). Programmes that support youth in realising their entrepreneurial potential and developing an entrepreneurial culture are important considering current demographic developments. Important barriers for youth entrepreneurs include lack of experience and skills, low levels of collateral and savings and under-developed professional networks. To improve levels of awareness and encourage understanding of entrepreneurship for youth, rural regions should do more to promote youth entrepreneurship in the formal education system. The aim of this should be to inform youth about the role of entrepreneurship in the economy and explain what it takes to start and run a business to inspire and interest them. This can be done in two ways: i) integrating it into educational programmes; and ii) through extracurricular activities. In Finland, for instance, at the secondary school level, the Youth Entrepreneurship Theme Year was organised in the Helsinki-Uusimaa Region in Finland. As part of the European Commission (EC) European Entrepreneurial Region (EER) project, the region organised a multitude of events with the aim of increasing high school students' exposure to entrepreneurship. These types of activities are important because it makes entrepreneurship more tangible and creates links to role models that come to speak in schools about their stories. To appeal to the youth, this can also be complemented by social media campaigns (OECD/EU, 2021^[84]).

The district of Sigmaringen has identified the lack of youth entrepreneurship and, as part of the Federal Ministry of Food and Agriculture's Land(auf)Schwung funding program (2015-2020), developed a youth start-up strategy with the participation of the local university and regional companies. With the guiding principle "Young, creative, value-adding & best networked", Sigmaringen deliberately focused on strengthening the previously low start-up dynamics through new cultural formats for young people and their greater participation in communal and local work. To promote entrepreneurship in the regions and keep good business ideas in the district, a "Foundation Ideas Factory" was created as an advisory and support structure. People who have a business idea can get advice on the feasibility of their project from a panel of experts in business, patent law and the media. To promote networking between students and local companies and keep well-trained academics in the region, a "School of Entrepreneurship" was founded

together with Albstadt-Sigmaringen University. A start-up manager supports young founders in the implementation of their entrepreneurial ideas and shows the opportunities of starting a business in the region. The overarching goal of the funding programme, which finished in 2020, was to gain knowledge for future federal and state funding measures for rural areas and to provide impetus on the ground (Bundesministerium für Ernährung und Landwirtschaft, 2020^[85]).

Success factors for entrepreneurship education include the incorporation of experiential learning and practical activities (e.g. model firms, entrepreneurship clubs, business plan competitions) into theoretical teaching to enable students to generate viable business ideas and equip them with the tools for the start-up process. This process should be accompanied by practice-oriented student start-up programmes that support students who wish to engage with the start-up process with training, coaching and access to resources. Involving local firms in this process can help break through a sometimes “saturated” mindset present with rural manufacturing firms and help them see the benefits of directly interacting with youth but also questioning and re-assessing their own business model.

In addition, co-working spaces and makerspaces offer the opportunity for start-ups and businesses to directly interact with other professionals, promoting the cross-fertilisation of ideas which spurs innovation. Considering the high concentration of micro enterprises in rural regions, co-working spaces can provide a valuable mechanism for social interaction and networking. Makerspaces are similar to co-working environments but typically involve more direct support for collaboration and the provision of equipment for collective use. These spaces operate on diverse business models, including paid and unpaid memberships, voluntary or employed staffing and greater or lesser reliance on government support (Niaros, Kostakis and Drechsler, 2017^[86]). They also lower barriers to entry for entrepreneurs as they gain access to tools, equipment and technology which would be costly to purchase (Holm, 2015^[87]). To finance these hubs and make them economically viable, they can be branded as hubs for “digital nomads” to telework in rural places for some time. Brandenburg has developed a range of these efforts capitalising on its proximity to Berlin. Its first and most well-known rural co-working space is situated in Bad Belzig. The Community and Concentrated Work in Nature (Coconat) functions as a temporary workstation in a remodelled estate. Since 2017, it has become a meeting place for digital nomads, urban working tourists and regional dwellers working for the digital and knowledge industry (Coconat, 2023^[88]).

Facilitate access and uptake of support programmes by reducing bureaucratic barriers and facilitating navigation

Many support programmes from state, federal and regional levels seek to enhance innovation capacity, support digitalisation or skills development. Some are geographically focused while others target specific sectors. Research has shown that this can result in confusion on the side of potential beneficiaries (SMEs) (Küpper et al., 2021^[77]). If the number of interfaces, regulations, offers and actors becomes too great, this can create hesitancy and can make picking the right one a barrier or simply too heavy in terms of administrative. In rural places these challenges can be exacerbated, as businesses might not be targeted with the right communication, points of contact are not locally present or too difficult to access. In addition, rural needs are not always reflected in project requirement or definitions. For instance, innovation works differently for micro businesses in rural places than it does for large technology, so funding for innovation that is new to the region might be sufficient to fulfil requirements.

The consolidation and new orientation of programmes for lagging regions at national level is hence a step into the right direction to reduce complexity (BMWl, 2021^[89]). Especially the interministerial working group on an all-German support system (Interministerielle Arbeitsgruppe (IMAG) „Gesamtdeutsches Fördersystem“) will be an important platform to foster exchange and create synergies. Albeit the risk of increased transactional costs, it is advisable to also have state and regional representation as part of the discussion.

With regard to EU support, it could be considered to rationalise the processes required for certain government-to-business services and support programmes, including administrative steps required for firms to receive policy-support measures (such as grants). Some SMEs and start-ups shy away from applying for support schemes because the application procedures are not easily accessible or straightforward. This especially holds true for rural firms who are often smaller and already have limited resources and capacity because of their size. In addition, the public administrations that could help them are often equally limited. Governments, together with the EU, should undertake a review of the changes required to streamline access condition and facilitate uptake. A few elements to consider are:

- The provision of complete draft regulations at the time of the start of programming and to not set additional requirements after the start of programming (such as do-no-significant-harm test, climate impact assessment),
- Continuously updated reference documents relating to state aid (general block exemption regulation),
- Reduction in the volume of data transmission and effort for beneficiaries, especially with small grants,
- Coherence in communication from GDs with final decisions transferred through REGIO.

At national level, the German government should also pursue a programme of digitalising government policies, services and processes. At present, processes lag far behind other countries. According to the Digital Economy and Society Index (DESI) from the European Commission, Germany ranks 16th out of 27 member states in the provision and delivery of eGovernment services. Germany's index score of 67.5 lags behind the EU average of 68.1 (European Commission, 2022^[90]). Yet, the digitalisation of government services should proceed in tune with the rationalisation of existing procedures. Furthermore, more than digitalising existing analogue processes, this requires improving them (by reducing the number of intermediary steps), and collecting and analysing data from interaction with digital services to further improve and inform policy making. The integration of new tools, such as machine learning and semantic analysis, could both improve the quality of government policy and regulation, and enable the government to take an active lead in the digital transformation of the public and private sectors.

At regional level, regional development agencies are essential to help navigate the system, encourage applications and support administrative processes and build personal relationships. An example of the intensive support is the programme Land(auf)Schwung. At the same time, countries and regions have opted for a simplification of the provision of business services by developing online services that allow easy navigation according to particular needs. This can reduce complexity and help direct people to the "right" offer in their geographic location without having to relocate. Brandenburg is leading the investigated case study in this regard, as they have already set-up their own online navigation tool to find funding (see description and further examples Box 1.10). In the turn of digitalisation, these services could be complemented through a full-fledged digital one-stop-shop for policy engagement of SMEs, start-ups and entrepreneurs, which would improve access and use of the support schemes. This digital one-stop-shop should also allow firms to easily check its eligibility for different innovation-support instruments. Instead of just listing different options and contact points. It would also integrate the existing consultation activities by centralising and digitalising the back-office application processes for these instruments. The platform could also serve as a vessel for goal- and challenge-oriented innovation, increasing firm-level awareness of and participation in support programmes seeking to strengthen socio-economic policy objectives.

Box 1.10. Online navigation tool for support structures and funding

Business Benefits Finder, Canada

The Canadian federal government has set up a Business Benefits Finder, which aims to provide businesses with a list of tailored support. The tool is designed on the basis of questions and answers that help filter through hundreds of federal, provincial and territorial programmes. A key objective of the tool was to develop a site that is fun, interactive and as user-friendly as possible while providing the best results. It also aims to reach people who might not know what they are looking for and equip them with information on what the government can do for them. Importantly, the process does not collect or track individual information. The more questions are answered, the more customised and accurate the results will be. Behind the tool sits a team of four people working on keeping information up to date, summarising programmes and creating the right tags for the programmes. While the page was largely oriented toward business growth in the beginning, due to the COVID-19 pandemic, it was expanded towards resilience to economic shocks. The tool currently provides information on 16,000 programme streams (some programmes have multiple sub-services) and is advertised through sustained marketing efforts.

Fördernavigator Brandenburg, Germany

The Ministry of Economic Affairs, Labour and Energy in Brandenburg has set up an online funding portal which is meant to assist firms, municipalities and public actors as well as not-for-profit organisations., by assisting them in finding a suitable funding programme. The support is structured according to different themes covering: Covid-Support; New Business Projects; Growth and Expansion; Succession or Takeovers; Innovation, Research and Technology; Energy, Environment and Mobility; Market Development and Export Activities; Advisory projects, and Work and Skills development. It also categorises according to different instruments including grants and advisory services, loans, guarantees and investments as well as competitions. Programme descriptions include purpose, type and amount of support are specified and contact information is provided. The portal is available in English and German and is accompanied by a brochure listing all available programmes, which complements the search tool.

Source: (Ministerium für Wirtschaft, Arbeit und Energie des Landes Brandenburg, 2023^[91]; Gouvernement of Canada, 2023^[92])

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Annex A.

Annex Table Error! No text of specified style in document..1. Basic manufacturing-related statistics for case study regions

Characteristic	HSK	OPR	SIG	TUT	GER		GER rural		OECD		OECD rural	
					Latest year	Change over time	Latest year	Change over time	Latest year	Change over time	Latest year	Change over time
Manufacturing share of regional GVA	32% (2019)	14% (2019)	20% (2019)	51% (2019)	22% (2019)	0.31% (05-19)	26% (2019)	+0.60% (05-19)	18 (2019)	+0.04% (05-19)	20% (2019)	+0.40% (05-19)
Agricultural share of regional GVA (including forestry & fishery)	1% (2019)	4% (2019)	2% (2019)	1% (2019)	1% (2019)	-0.85% (05-19)	2% (2019)	-0.76% (05-19)	2% (2019)	-0.91% (05-19)	3% (2019)	-0.57% (05-19)
Industry share of regional GVA (including energy)	35% (2019)	17% (2019)	31% (2019)	52% (2019)	25% (2019)	0.31% (05-19)	29% (2019)	+0.60% (05-19)	23% (2019)	+0.04% (05-19)	26% (2019)	0.40% (05-19)
Share of all firms with 1-9 employees	87.7% (2018)	89.7% (2018)	89.1 (2018)	86.8% (2018)	89.1% (2018)	-1.53% (14-18)	No Data	No Data	No Data	No Data	No Data	No Data
Share of active firms with 250 employees or more	0.5% (2018)	0.3% (2018)	0.4% (2018)	0.7% (2018)	0.4% (2018)	+2.87% (14-18)	No Data	No Data	No Data	No Data	No Data	No Data
Population	256,777 (2020)	98,861 (2020)	130,849 (2020)	140,766 (2020)	83,651,225 (2020)	+0.16% (05-20)	25,979,781 (2020)	-0.20% (05-20)	1,371,480,000 (2021)	+1.26% (01-21)	401,062,147 (2020)	+0.41% (05-20)
Population density (pop. per square kilometer)	133 (2020)	40 (2020)	109 (2020)	192 (2020)	235 (2020)	+0.05% (05-20)	138 (2020)	-0.23% (05-20)	38 (2020)	+0.63% (05-20)	14 (2020)	+0.42% (05-20)
GDP per capita	39,863.04 (2020)	28,723.55 (2020)	40,315.52 (2020)	51,194.4 (2020)	47,703.83 (2020)	+0.81% (01-20)	11,373.87 (2020)	+3.58% (01-20)	45,342 (2020)	3.09% (01-20)	No Data	No Data
Labour Productivity (Regional GVA per worker for total activities, USD per worker)	71,163 (2019)	65,406 (2019)	77,287 (2019)	85,161 (2019)	82,696 (2019)	+0.51% (05-19)	74,741 (2019)	+0.06% (05-19)	83,478 (2019)	+0.74% (05-19)	73,481 (2019)	+0.75% (05-19)

Employment rate (% employment 15-64 over working age population 15- 64)	69% (2020)	59% (2020)	69% (2020)	77% (2020)	65% (2020)	+1.02% (05-20)	65% (2017)	+1.10% (05-20)	65% (2020)	+0.33% (05-20)	63% (2020)	+0.37% (05-20)
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Source: (OECD, 2023^[8]; Statistisches Bundesamt, 2023^[62]; Statistische Ämter des Bundes und der Länder, 2023^[93]; Bertelsmann Stiftung, 2023^[94])

Annex Box Error! No text of specified style in document..1. Regional greenhouse gas emission data

In this report, regional emissions are estimated on the basis of the Emissions Database for Global Atmospheric Research of the EC's Joint Research Centre. Production-based or territorial emissions correspond to GHG emitted within a region and enable to set reduction targets. Emissions were estimated using the Emissions Database for Global Atmospheric Research (EDGAR), version 6 (Crippa et al., 2021^[95]) and expressed in CO₂-equivalents by considering the three main GHGs, namely CO₂, CH₄, and N₂O, and a 100-year global warming potential (GWP).

National GHG emissions are attributed to locations according to about 300 proxies for 26 main sectors and subsectors, depending on the type of technology and International Energy Agency (IEA) fuel types, following Intergovernmental Panel on Climate Change (IPCC) reporting formats and guidelines. Locations of emissions are identified with various sources of spatial research (Janssens-Maenhout et al., 2019^[96]). The proxies capture a substantial part but not all of the local emission determinants. For example, residential emission estimates capture buildings and population but not the degree of building insulation. Location estimates of agricultural emissions, capture the number and species of ruminant animals but not how they are fed.

The emissions are attributed to five sectors:

1. The power supply sector contains all combustion of fuels for electricity and heat generation.
2. The industry covers the whole value chain from mining primary materials to manufacturing and recycling products. They include energy use process emissions and fugitive emissions.
3. Agriculture includes agricultural soils, agricultural waste burning, enteric fermentation and manure management.
4. The residential sector includes buildings and waste.
5. Transport encompasses freight and passenger ground, sea and air transport.

Some care is needed in looking only at production-based emissions as reductions can occur through outsourcing/offshoring of carbon-intensive activities to other regions or countries, and subsequently importing the goods and/or services provided. Often these shifts are made to countries/ regions with more carbon-intensive production processes and less stringent regulations on carbon abatement. Currently, most OECD countries are net importers of GHG emissions (i.e. their consumption, including through imports, accounts for larger emissions than the emissions generated through their production of goods and services, including those for export markets).

Source: (OECD, 2021^[97]) (OECD, 2022^[98])

¹ Around 9,000 companies from the manufacturing, construction, trade and services sectors (excluding the banking, insurance and government sectors) are surveyed once a quarter, including around 7,500 SMEs. In addition to an overall indicator of the shortage of skilled workers in the German economy and indicators for various sectors and regions, the data can also be analysed separately for SMEs and large companies in terms of company size. In principle, SMEs include companies with no more than 500 employees and annual sales of no more than EUR 50 million.

² East Germany comprises the states of Berlin, Brandenburg, Mecklenburg-Vorpommern, Sachsen, Sachsen-Anhalt and Thüringen.

³ North Germany comprises the states of Bremen, Hamburg, Niedersachsen and Schleswig-Holstein.

