10 The contribution of the *Mittelstand* to innovation for the digital transition

The *Mittelstand* is the backbone of the German economy and a key component of the science, technology and innovation system. The "hidden champions" of the Mittelstand help drive and sustain innovation, but the digital transformation changes what they can and should contribute to future innovation. This chapter assesses the innovation contribution of the Mittelstand, focusing on two factors that may constrain the private sector's contribution in the years ahead. The first concerns its shortcomings in terms of digital transformation. The second is the lack of business creation and the limited contribution to innovation of new, potentially disruptive firms in Germany. Recognising the importance of data as an intangible asset for business sector innovation, the chapter introduces a recommendation on improving business data infrastructure and access.

Introduction

The German business sector – particularly the *Mittelstand*, the term used in Germany for SMEs, which can include slightly larger firms – plays an integral role in the German and international innovation system. Given its size and internationalisation, it can act as a locus of industrial transformation both domestically and abroad, as the private sector shapes both upstream and downstream business processes in leading manufacturing industries beyond Germany's borders.

German small and medium-sized enterprises (SMEs) account for 59% of the country's total employment and 48% of value added (OECD, 2021[1]). Many of the country's most innovative firms work in the export-oriented manufacturing sectors, producing internationally competitive and often highly specialised goods (Gnath, McKeon and Petersen, 2018[2]). The ability of the German manufacturing base to sustain such high levels of internationally competitive production is a reflection of the highly innovative and specialised firms that make up its private sector. Business-sector innovation therefore both drives and sustains international economic competitiveness and domestic socio-economic well-being, notably by guaranteeing jobs.

Historical success is no guarantor of future competitiveness, and the ability of the German business sector to act as engine of change depends on the ability of all the actors in its innovation system – from the smallest start-ups to the largest corporations – to address the structural challenges posed by the sustainability and digital transformations. If, for example, a large export-oriented machinery firm wishes to embed more digital technologies in its products, then the socio-economic benefit of such a decision for the German economy depends on the ability of SMEs and service-sector firms in its value chains and industrial ecosystem to adapt and provide intermediary inputs to that effect.

This chapter focuses on several issues affecting the contribution of the German *Mittelstand* to innovation. The first section introduces a recommendation on data access and infrastructure for the German private sector, reflecting the importance of data as a key asset for business innovation and for improving the ability of business to retain its competitiveness in export-oriented sectors. Three analytical sections follow. The first reviews the contribution of the *Mittelstand* to German innovation. The second examines the importance and extent of the digital transformation in the German private sector. The third section concludes with a short discussion of business dynamics and entrepreneurship.

Recommendation 4: Improve data infrastructure and data access, especially for industry

Overview and detailed recommendations

This recommendation highlights the particular importance of data as a necessary input for all other areas of this review, from supporting greater agility in policy making and more innovative use of procurement, to processing data at the firm level to enhance research and efficiency.

Improving the coherence and interoperability of the data infrastructure for future digital innovation should be a government policy priority. Effective collaboration between research institutions and firms for purposes of innovation also depends on the presence of an accessible and well-designed data infrastructure.

From the perspective of Germany's innovation strengths and international comparative advantages, the strategic use of more industrial data for innovation should be a priority for the public and private sectors, with a focus on the innovation-intensive automotive, machinery, chemical and pharmaceutical industries. This requires top-down and framework-related approaches, complemented by policies to improve the bottom-up uptake of data-producing and data-dependent technologies at the firm level. Open innovation platforms and collaborations to exploit those data are necessary to help activate this potential.

R4.1 **The government should support a programme to improve the country's data infrastructure, and increase the public and private sectors' absorptive capacity of both infrastructure and human capital**. This programme should have a clearly defined mission, with a strong focus on the use of data produced by the business sector and during research to support STI. The programme would be responsible for rationalising and eliminating the soft and hard infrastructure issues constraining the development of better data infrastructure and data access.

R4.2 **The government should consider the data generated by the business sector as a strategic dividend that can strengthen German innovation and competitiveness**. Having recognised the centrality of data for innovation in the Data Strategy of the Federal German Government (BKAmt, 2021[3]), Germany could exploit its position as Europe's largest economy to ensure that high-quality, interoperable and accessible industrial data become an additional strength of its innovation system and economy. From an infrastructure perspective, the GAIA-X and Important Projects of Common European Interest (IPCEI)-CIS programmes – both of which aim to support European-based cloud infrastructure services – are first steps in this direction. The same is true, to a greater extent, for the ongoing efforts to digitalise the automotive sector's value chain through initiatives such as the CATENA-X platform. While these initiatives are important, they must be scaled, the scope broadened, and the speed with which they are rolled out increased. A whole-of-industry strategy will require a coherent and systemic approach to leverage industrial data effectively for innovation, and should be pursued with the relevant actors at both the national and transnational levels.

R4.3 **To promote data-driven innovation, the German Federal Government should address barriers to SMEs' use of the data they produce and enhance SMEs' access to data produced across the economy**. Specifically, the Federal Government should support rationalising regulatory differences across the *Länder* and provide support for implementing the General Data Protection Regulation. It should increase legal certainty and, where appropriate, promote flexibility in using data for innovative processes, encouraging businesses to make the necessary intangible investments to produce, store and process data for innovative purposes. At the same time, the government should recognise the urgency of ensuring that firms are equipped with the necessary connectivity infrastructure to support data-driven innovation and production in the context of the digital transformation, including fibre-optic broadband and the 5G connections required to convey the massive volumes of data inherent to Industry 4.0 processes.

R4.4 **Promote open innovation platforms and approaches. Producing data is a necessary but insufficient condition for innovation.** To succeed in the digital era, firms must have access to data they do not produce, and be equipped with the skills and technological competencies to process and use them. In addition, while some firms may not have the internal capacity to derive value or insights from the data they do (or could) produce, other firms may be able to unlock such insights. This highlights the importance of supporting an open innovation approach – which the Federal Government has begun pursuing through its 2021 Data Strategy – and creating platforms that involve other innovation actors in producing innovations based on private-sector and industrial data. An important benefit of such open innovation platforms is that they allow more collaboration between firms as well as with PROs and universities.

Additional recommendations related to the Mittelstand

Several recommendations in this review relate to the ability of the business sector to innovate for the digital and green transitions. The following is a short overview of selected recommendations that are particularly relevant to the business sector, along with details of where these can be found in the review.

- Recommendation 1 (Chapter 14): ***Develop a shared vision for Germany 2030 and 2050.*** This recommendation provides guidance on how the Federal Government can provide greater directionality to the science, technology and innovation (STI) system. This is relevant to the business sector because firms – particularly smaller ones – may not automatically direct innovation efforts towards activities that are relevant to future competitiveness and sustainability. A longer-term vision of the STI system, and how it interacts with the private sector, could help ensure a transition that is both sustainable and inclusive.
- Recommendation 2 (Chapter 15): ***Create a public-private laboratory for innovation policy.*** Ensuring the private sector's success in the transitional context may require greater experimentation from policy makers. The policy laboratory would be a platform for testing and scaling new approaches for supporting the innovation activities of SMEs in the transitional context, as well as bringing new SMEs to the STI system.
- Recommendation 3 (Chapter 6): ***Broaden and mainstream the use of agile policy tools to support innovation efforts by SMEs and achieve the transitions.*** Business-sector innovation for the sustainability transition requires firms to move beyond the technology frontier, experimenting with unproven and entirely novel solutions. This means that policy may need to be more agile, ensuring that firms have the regulatory and policy flexibility that gives them confidence to move into new areas.
- Recommendation 6 (Chapter 7): ***Promote financial markets that are conducive to scaling up breakthrough innovations*.** Traditional sources of private-sector finance have limited effectiveness in scaling some of the highest-potential and more breakthrough innovations. These innovations often present higher risk, with start-ups turning to sources such as venture capital to get their ideas off the ground. This recommendation looks at how later-stage venture capital and institutional investors could play a bigger role in helping to scale the most promising German start-ups and innovative firms.
- Recommendation 7 (Chapter 11): ***Strengthen the use of public procurement as a driver of innovation***. A more innovative use of public procurement could help create a demand-side signal to firms that markets are emerging for new technologies that may not yet be commercially viable on paper.

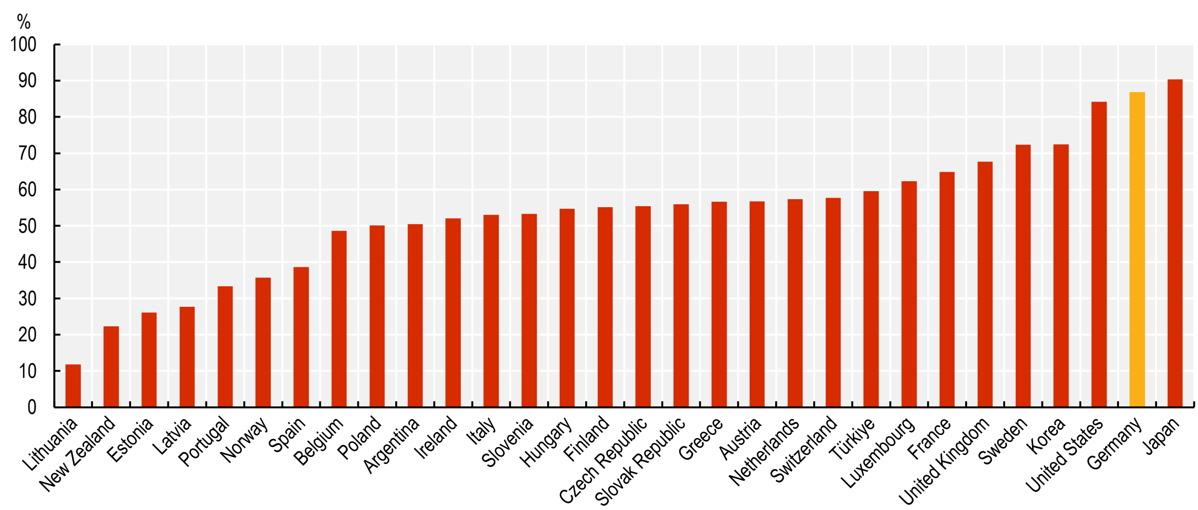
10.1. The role of the *Mittelstand* in business-sector innovation

Germany's SMEs are the backbone of its economy. In Germany, 99% of firms have fewer than 500 employees, a threshold under which German policy makers consider them SMEs – or part of the Mittelstand. Following OECD firm-size classifications, 65% of German firms have fewer than 9 employees, accounting for only 4.5% of total employment in the business sector in 2019; firms with 10-19 emplyes accounted for 16% of the business population and 5.7% employment; firms with 20-49 employees accounted for 9% of the business population and 7.8% employment, firms with 50-259 employees accounted for 7.1% of the business population and 19.5% employment; firms with over 250 employees accounted for only 2.1% of the firm population but 62.4% of employment (OECD, 2021[5]). SMEs in Germany are on average around twice as large as those in most European countries, although they are similar in size to other large industrialised economies, such as Japan and the United States (OECD, 2021[6]). Cross-country differences in value added by firm size are also significant, reflecting the concentration of some of the most productive economic activity in Germany's larger firms. For example, while micro SMEs (under ten employees) accounted for 27% of value added in the business sector across the OECD region in 2018, the figure was only 15% for Germany.

Despite their large number, German SMEs accounted for only 8% (EUR 7 billion [euros]) of business expenditure on research and development (BERD) in 2018, the last year for which disaggregated data are available. This was the second-lowest relative contribution in the OECD, behind only Japan (5%). At the same time, the SME share of BERD in Germany has been decreasing since 2009, in line with a similar trend in other major industrialised economies, such as the United States. The decreasing SME contribution to BERD is not ubiquitous across the OECD, however. In France, the second-most industrialised economy in the European Union, the SME share of BERD has actually been growing since 2002, from 14% to 27% (EUR 11 billion) in 2018. Since the global financial crisis of 2008-09, the divergence in research and development (R&D) expenditure between firm sizes has grown, perhaps owing to the asymmetrical long-term impact of supply-side crises on research activities (Figure 10.1). This does not necessarily indicate that the BERD of SMEs has not increased – indeed, it grew by 43% between 2005 and 2018 – but that the 53% increase (over the same period) of large-firm BERD has widened the absolute investment gap between the firm sizes. Other evidence also points to a downward trend in total innovation investment (i.e. BERD and other forms of innovation investment), including in intangibles, as discussed in Chapter 3.

Figure 10.1. Share of BERD performed by large firms (more than 500 employees)

% of total BERD (2019 or latest available data)



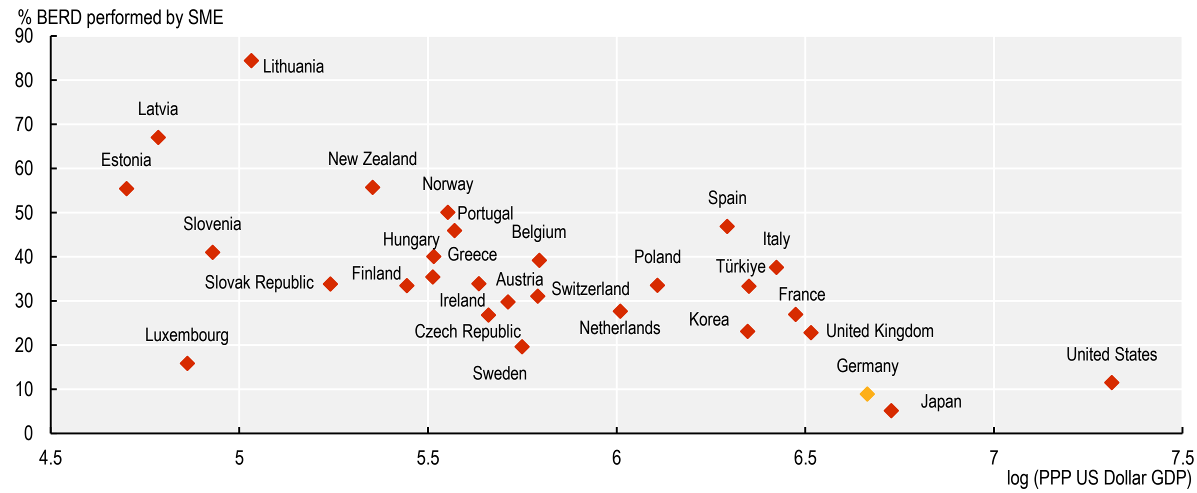
Source: OECD (2022[6]), "Research and Development Statistics: Business enterprise R-D expenditure by size class and by source of funds - ISIC Rev 4", *OECD Science, Technology and R&D Statistics* (database), https://doi.org/10.1787/7ce7448d-en (accessed on 21 May 2022).

SME-level innovation in Germany differs from other countries in the particular role played by "hidden champions", firms that are often world leaders in the manufacturing of highly specialised products. Germany has a disproportionately high number of such firms: around 1 300 are estimated to be active, mainly located in just the two states of Bavaria and Baden-Württemberg (BMWK, 2020[7]). The challenge in assessing the performance of these firms relative to other SMEs is a lack of data. Neither the German statistical agency nor private-sector organisations have a publicly available register of these firms, impeding the ability of policy makers and researchers to study their economic (including investment) activities in relation to other firms. A detailed firm survey on these hidden champions may help German policy makers exploit these domestic successes for the benefit of the broader private sector.

While in Germany BERD is highly concentrated in larger firms, this is a common feature of countries of larger size. Figure 10.2 shows a correlation between the country size, expressed by GDP, and the relative contribution of SMEs to total business R&D, the larger the GDP of an economy, the lower the relative contribution of its SMEs to R&D expenditure.

Figure 10.2. SME share in BERD relative to GDP

2019 or latest data available



Note: Data for the United States from 2018, for France for 2017; correlation coefficient is -0.63.

Source: OECD (2022[8]), "Main Science and Technology Indicators", OECD Science, Technology and R&D Statistics (database), https://doi.org/10.1787/data-00182-en (accessed on 25 May 2022) and OECD (2022[9]), "Research and Development Statistics: Business enterprise R-D expenditure by size class and by source of funds - ISIC Rev 3", *OECD Science, Technology and R&D Statistics* (database), https://doi.org/10.1787/data-00182-en (accessed on 25 May 2022)

The concentration in business R&D also depends on industry structure. For example, economies with a larger share of manufacturing generally have larger firms than those with a higher share of services in their sectoral breakdown. This is partly why Germany, Japan and the United States have such a marked concentration of larger firms.

10.2. Digitalisation in the business sector: Equipping the *Mittelstand*

The ability of the private sector – particularly the *Mittelstand* – to contribute innovation for both sustainability and competitiveness will depend on firms' competencies in a range of technology domains, as well as their abilities to use data and digital technologies. For example, the ability of manufacturing firms to innovate in their production processes largely depends on their ability to derive knowledge from the data produced by industrial robots involved in those processes. Similarly, using industry data to produce new breakthroughs means that firms must have the available skills – either internally or through new forms of knowledge transfer – to derive new knowledge and insights from such data, as well as the internal human capacities to recognise the value in doing so. This subsection focuses on the digital capabilities of the *Mittelstand*. Chapter 6 discusses many of the issues relating to the digital framework conditions.

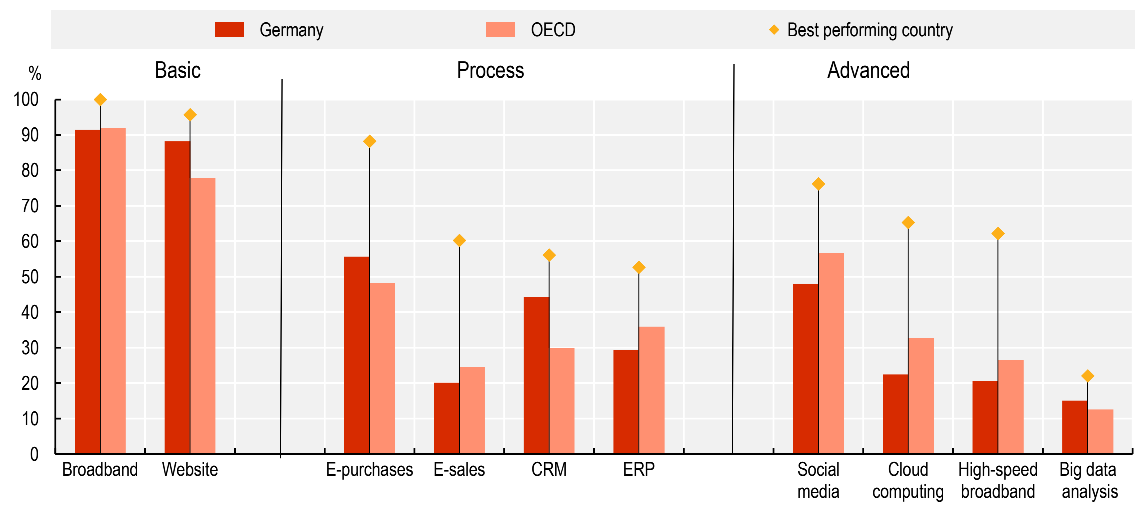
The Federal Government recognises the importance of the digital transformation for innovation in Germany, and has developed several policy programmes to support the digitalisation of SMEs in particular. Policy support has taken a number of forms, from direct finance to networking bodies. Recent examples of such initiatives include the Federal Ministry for Economic Affairs and Climate Action (BMWK)'s "Go-Digital" 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.

Historically, digitalisation was not a necessary condition for innovation success in Germany, but this is gradually changing in an economic context where value added and innovation are increasingly data-driven in both the traditional manufacturing sectors of Germany's economy and the less strong service areas. Similarly, ICT tools are increasingly embedded in innovations to support climate management and sustainable energy, illustrating the links between the twin digital and green transitions.

For a more comprehensive digital transformation of the German economy, firms will need to adopt newer and more advanced ICT tools and activities – particularly those that will enable them to collect, store, exchange and process large amounts of data. There is also an important disparity in ICT adoption depending on firm size. With cloud computing, for example, medium-sized firms significantly lag the OECD average in the corresponding size band (-14 percentage points) (Figure 10.3), which is surprising, given that smaller and younger firms are often the key beneficiaries of these services, which offer the cost efficiency and flexibility of scaling up or down digital operations (OECD, 2022[9]).

Figure 10.3. German firms lag in the adoption of advanced ICT tools and activities

% of all firms (2019 or latest available year)



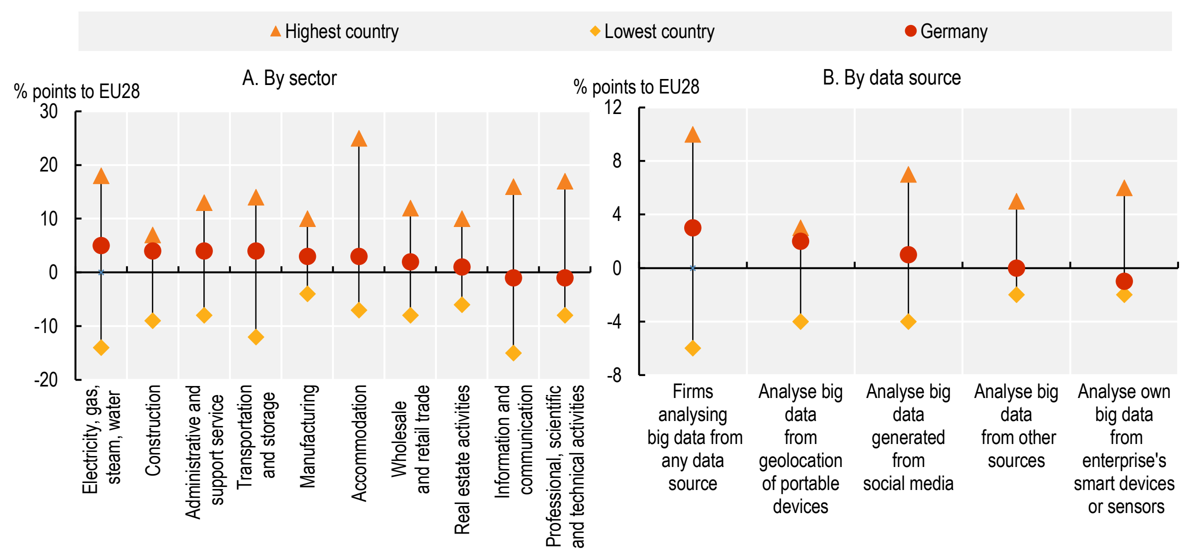
Note: Firms with 10 or more employees, excluding financial sector. ERP stands for enterprise resource planning, CRM for customer relationship management; high-speed broadband are subscriptions with 100+ Mbps.
Source: OECD (2020[11]), OECD Economic Surveys: Germany 2020, OECD Publishing, Paris, https://doi.org/10.1787/91973c69-en based on OECD ICT Access and Usage by Businesses database.

Creating value added from data, and using data for innovation, will likely be key to the German economy in the coming years. Doing so requires collecting and processing vast quantities of data, often from the services and manufacturing sectors, in the context of Industry 4.0. Notably, only 3% of German firms use data from their own sensors or devices to perform big-data analysis (Figure 10.4). This is below the EU average (4%) and significantly below the levels in leading countries such as the Netherlands (10%), Finland (8%) and Belgium (7%) (OECD, 2020[10]). The most recent evidence suggests that data from the geolocation of portable devices and social media – as opposed, for example, to data from production-line robots – are the most likely sources for firms' big-data analysis in Germany, suggesting a significant missed opportunity to create additional value from in-house data (Nolan, 2021[11]). In many ways, the limited data use – whether owing to skill shortages or technical capacities – illustrates the importance of a dynamic technology start-up ecosystem, as smaller firms are often better able to derive new insights and value from larger firms' data than their own workers (Nolan, 2021[11]).

The COVID-19 pandemic has accelerated the digital transformation of firms in Germany, as in other developed economies. According to a recent survey study of 1 000 German firms, three-quarters of large companies have increased their commitment to investing in digital technologies because of the pandemic (Bitkom, 2021[12]). The pandemic is also promoting a surge in ICT adoption – particularly in e-commerce and cloud services – among small firms. According to the German Federal Statistical Office, around one in three German companies with at least ten employees used fee-based information technology services on cloud computing platforms in 2021, an increase of 11 percentage points over 2018 levels of 22%.

Figure 10.4. Data from firms' sensors and devices remains underused for big data analysis

% firms performing big data analysis, differences in percentage points to EU28 average (2018 or 2016)



Note: EU28: European Union (before 2020 withdrawal of the United Kingdom). Firms with ten or more employees, excluding financial sector.
Source: OECD (2020[11]). *OECD Economic Surveys: Germany 2020*, https://doi.org/10.1787/91973c69-en based on Eurostat, ITC usage in enterprises dataset.

The more data firms collect, the more important artificial intelligence (AI) and machine learning will become as tools for creating value from the data collected. The diffusion and adoption of these technologies in Germany remains relatively low, and while the role of German start-ups and firms in AI markets is growing, they nevertheless lag the United States and China, the two most dominant players. In 2020, AI start-ups in the United States and China absorbed more than 80% of venture capital (VC) investments. The share of the EU was just 4%, followed by the UK and Israel with 3% (OECD, 2021[13]). Between 2012 and 2020, Germany and France accounted for over two-thirds of VC investments in the EU. Nevertheless, Germany has set out an ambitious AI strategy. The challenge in the near future will be to ensure that technology diffusion and adoption by firms is more comprehensive and commensurate with policy ambitions. Chapter 3 provides further details on the German Federal Government's AI strategy.

In contrast to the relatively slow diffusion of ICT and data use, Germany is at the forefront of global automation efforts. With 371 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 (932), Singapore (605) and Japan (390) (International Federation of Robotics, 2021[14]). In 2020, Germany accounted for 33% of total European robot sales and 38% of Europe's operational robot stock, with 221 500 owned robot units compared to 74 400 in Italy, 42 000 in France and 21 700 in the United Kingdom (International Federation of Robotics, 2021[14]). The International Federation of Robotics expects demand for robots in Germany to grow owing to demand for low-cost robots outside the manufacturing industries.

While digitalisation offers great opportunities for SMEs to raise productivity, it also risks widening the gaps between enterprises due to difficulties in financing digital investments and intangibles more broadly. The Federal Government has taken policy action in recent years to address this gap, such as providing support for technology transfer through a national network of support centres and specialists (i.e. "Mittelstand-Digital"). Within this strategy, "Mittelstand 4.0 Centres of Excellence" is a major policy instrument addressing the technology-adoption needs of SMEs. This newly created technology transfer network provides a broad range of support services nationwide, including coaching and assistance by 1 000 digitalisation experts.

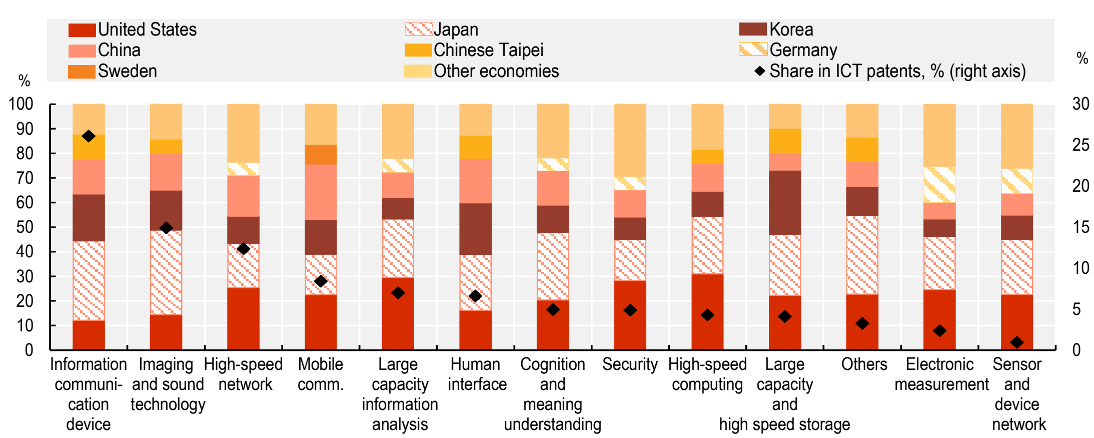
10.2.1. Business-sector performance and innovation for digital transformation

Despite the importance of digital and communications technologies throughout the German economy, few German firms feature among the leading producers of ICT-related trademarks and patents. In the 2021 European Innovation Scoreboard, only 11 German companies in digital sectors (*software and computer services, technology hardware and equipment, mobile* telecommunications) featured in the world's 2500 most innovative firms (European Commission, 2021[17]). Of these, only one – SAP – featured in the top 100. By contrast, of the 2500 top global innovative firms, 126 were Chinese companies in the same categories and 267 were from the United States.

The relative lack of German firms among the top global ICT innovators is substantiated by a more detailed breakdown of Germany's contribution to ICT-related patenting compared to the four other top economies in these fields (Figure 10.5). Information technologies and digitalisation are highly heterogeneous categories, ranging from communications and connectivity technology to machine learning and AI. Globally, Germany features among the top five countries in fewer than half of the ICT-related patent categories shown in Figure 10.5. As discussed in Chapter 3, Germany's relative under-performance in ICT innovation may partly reflect the limited diffusion of ICT in German firms and the research focus of existing industries.

Figure 10.5. Germany lags behind top economies in ICT-related patenting

Share of the top five economies' shares of patents in ICT-related technologies (2014-17)



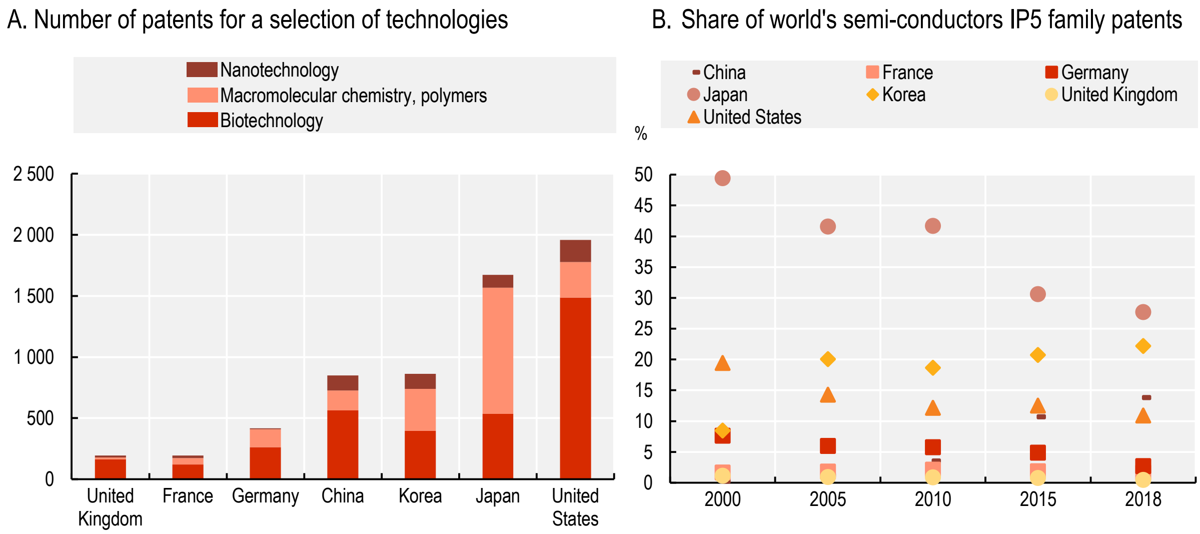
Note: Data refer to five IP offices (IP5 families), by filing date, according to the applicants' residence using fractional counts. Patents in ICT are identified using the list of International Patent Classification codes in Inaba and Squicciarini (2017[18]).
Source: As quoted in OECD (2020[12]), *OECD Economic Surveys: Germany 2020*, https://doi.org/10.1787/91973c69-en, based on STI Micro-data Lab and Intellectual Property Database (September 2020), http://oe.cd/ipstats.

Germany's limited contribution to global ICT innovation is true of both general ICT and more advanced technologies, including important general-purpose technologies such as AI. In 2017, Germany accounted for 146 AI-related IP5 patent applications, compared to 1 065 from the United States and 1 115 from Japan. Measured by publication output (which is often a more suitable metric for software and ICT innovation), only 2 of the top 50 corporations performing R&D in AI were German in 2014-16 (OECD, 2019[17]). While patenting has limitations in assessing AI innovation, the difference is nevertheless stark.

Germany also faces challenges in increasing innovative output in key enabling technologies, such as semiconductors and nanotechnologies. As the digital component of products becomes increasingly advanced, the hardware necessary to power applications concomitantly increases, and the ability to design and create these technologies will become an increasingly important component of value added. At the same time, a lack of domestic innovative and productive capacities in these technologies renders German industry vulnerable to supply-chain shocks, as demonstrated during the COVID-19 pandemic. The examples of semiconductors and nanotechnology are illustrative: nanotechnologies are a key input for the development of semiconductors, and strengths in the former are likely to underpin strengths in the latter. In 2017, however, Germany accounted for just 17 IP5 patent applications in nanotechnology, far behind the United States (140) and Japan (112), with a similarly low contribution to semiconductor patenting. Over 2000-18, only China managed to significantly increase its global share in these technology fields (Figure 10.6).

Figure 10.6. Research and patenting in selected advanced technologies

IP5 Patent families, Inventor(s)'s country(ies) of residence, priority date



Source: OECD (2022[20]), "Patents by main technology and by International Patent Classification (IPC)", OECD Patent Statistics (database), https://doi.org/10.1787/data-00508-en (accessed on 25 May 2022).

In practical terms, this means that contrary to the past, when German inventions wielded significant influence over manufacturing and industrial processes around the world, German firms will increasingly rely upon innovations – and the standards determining their use – that originated beyond its borders.

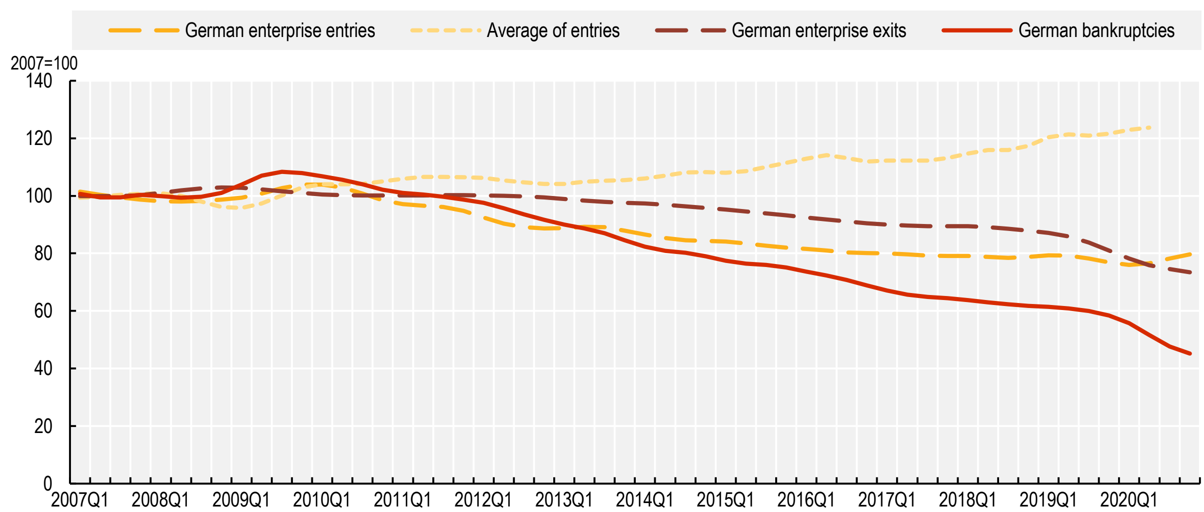
10.3. Business dynamics, entrepreneurship and implications for innovation

In Germany, innovation – particularly incremental innovation – has generally been internalised within established firms, with a relatively minimal role (and establishment) of start-ups. This reflects in part the sectoral composition and strong focus of the German economy on manufacturing and industry. The challenge for Germany's traditionally innovative sectors is that Germany's traditionally innovative firms will likely be less capable of internalising the development of many key technological inputs for future innovation and competitiveness. In the context of the sustainable and digital transitions, young firms – whether the academic spin-off of an early-stage technology or a disruptive service-based firm that challenges market assumptions – can act as agents of change and make important contributions to competitiveness and sustainability goals. This section considers business dynamism in Germany, linking to some of the issues discussed in Chapter 6 on framework conditions for innovation in Germany.

Germany exhibits a very low rate of firm exit and entry relative to other countries (OECD, 2020[10]). For example, its share of start-ups in the business sector (taken here as firms that have been active for two years or less) is the fourth-lowest in the OECD. The lower share of younger firms in the business population has several implications for both innovation and the commercialisation of innovation. One of the most striking consequences lies in the missed opportunities for scaling high-potential ideas: an OECD report found that young firms (under six years old) are two to three times more likely to scale up than an older firm of a comparable size (OECD, 2021[6]). This has clear implications for the German private sector's likely success in the digital and sustainability transitions, where there is renewed urgency for new ideas and technologies to reach the market.

As in a number of OECD countries, firm-entry rates in Germany have been declining for several years (Figure 10.7). There is growing concern that the “secular decline” in business dynamism – the entry and exit of firms, associated with job destruction and reallocation – is not specific to Germany alone and is affecting other advanced economies. In an OECD paper on business dynamism, the authors found that dynamism was declining (to varying degrees of severity) in each of the 18 countries analysed. They noted that this decline was occurring at a disaggregated sectoral level, rather than through a changing composition of economies (e.g. from manufacturing to services) or the “servitisation” of manufacturing (Calvino, Criscuolo and Verlhac, 2020[19]).[1] They also found that these declines are separate from business cycles, especially in terms of firm entry (3% average decline over 2000-15) and job reallocation rates (5% decline).

Figure 10.7. Business dynamism was slowing before the crisis



Note: Index constructed with business demography data (see http://www.oecd.org/sdd/46413155.pdf for more information on the methodology). "Average entries" includes data for Belgium, Denmark, Finland, France, Germany, Iceland, Italy, Japan, the Netherlands, Norway, Sweden and the United States.
Source: OECD (2020[11]) OECD Economic Surveys: Germany 2020, OECD Publishing, Paris, https://doi.org/10.1787/91973c69-en based on OECD (2020[22]), *Timely indicators of entrepreneurship (ISIC 4)*, https://doi.org/10.1787/888934201211.

It bears noting that high-growth firms (particularly start-ups) tend to be overwhelmingly concentrated in the service sectors, an area that has not traditionally been the focus of German STI policy makers. Trends in business dynamism result from a wide variety of factors, including key sectors’ market structure; integration in global value chains; demographics, with a shrinking share of the age group (30-50 years) most likely to start a business; relatively high wages; and a tight labour market (OECD, 2020[10]). Business framework conditions, such as regulatory burdens, bureaucracy, bankruptcy efficiency, access to finance, the strength of the innovation system and skills, also affect business dynamism.

Behind these macro-level firm-entry data are important nuances. For example, not all start-ups are necessarily innovative, and some are significantly more innovative than others. For example, these data do not show the share of academic start-ups and the ways in which they have (or have not) been affected by long-term trends or recent crises. Such data are generally lacking. An OECD analysis of high-growth start-ups using Crunchbase data found that the share of German start-up founders who launched their company within 4 years of completing an undergraduate degree was around the average of the 13 countries analysed (Breschi, Lassébie and Menon, 2018[21]). The picture is somewhat different for founders with a PhD, with Germany ranking third among the countries analysed. While interesting, these figures say little about the overall trends and drivers of academic or highly innovative start-ups in Germany, nor do they indicate how the structural transformation of the German economy will affect these trends.

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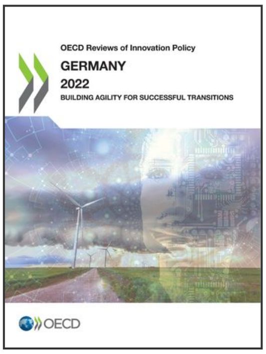
Endnote

[1] The study looked at 18 countries: Austria, Belgium, Brazil, Canada, Costa Rica, Denmark, Finland, France, Hungary, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden and Turkey.



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