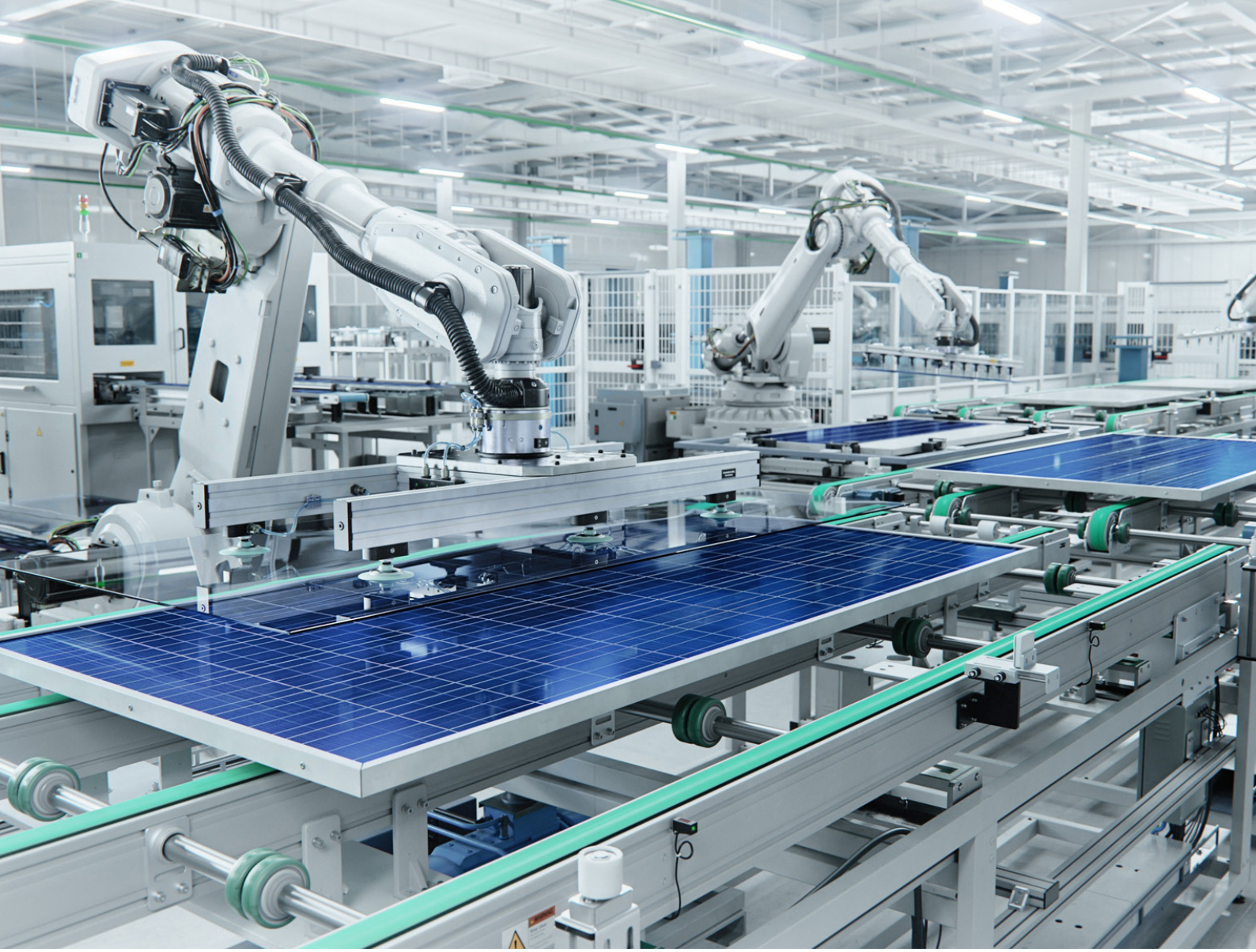

KfW Research

KfW SME Innovation Report 2025

Innovations thriving despite challenging economic conditions

Imprint

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Executive summary

The share of innovators rose by two percentage points to 41% in the 2022–2024 period. It was therefore only marginally lower than in the 2018–2020 period, for which the new definition of innovation was applied in the KfW SME Panel for the first time. Innovation expenditure also increased somewhat on the previous year's survey. It now stood at EUR 35.4 billion (+ EUR 1.8 billion).

The current growth in innovation activity – in defiance of what continues to be an unfavourable economic development – can likely be attributed to the fact that longer-term negative consequences of the COVID-19 pandemic are currently subsiding and that the reluctance of businesses to innovate in recent years has created a backlog of innovation which they have now begun to address.

This argument is supported by the fact that particularly those business segments that scaled back their innovation activities in recent years – where strong innovators are typically found – are now introducing innovations more often again. This applies to, for example, manufacturing enterprises (research and development-intensive manufacturing: +11 percentage points, other manufacturing: +9 percentage points) and internationally active enterprises (+3 percentage points). Product innovations in particular are currently being introduced more often again than in previous years (+4 percentage points).

Thus, the negative trend of the past years did not continue. Rather, the share of innovators has stabilised on the level on which it was when the COVID-19 pandemic broke out. But that does not mean that it has come even close to offsetting the sharp declines since the mid-2000s.

Innovation activity in the SME sector can be additionally incentivised with measures targeting both the cutting-edge segments and the SME sector more broadly. At the cutting-edge level, the main priority is to support businesses' R&D activities. Furthermore, giving businesses direction and coordination through economic policy to tackle the upcoming transformations will be helpful. This could include mission-oriented approaches (e.g. 'low-emission mobility') and technology-specific approaches (e.g. 'AI strategy') that enable societal challenges to be addressed and specific key technologies to be prioritised.

For SMEs more broadly, measures should predominantly address the key hurdles for innovation activity. SMEs are most frequently affected by administrative barriers. Funding challenges and skills-related impediments follow at a considerable distance and with similar frequency.

The administrative hurdles include a plethora of laws, regulations and further administrative provisions. In order to avoid placing a disproportionately high burden on SMEs it would be helpful to review existing and new regulations for their actual protective effects and potential inhibiting effect on innovation.

Barriers in obtaining finance are an obstacle for all SMEs. Low-threshold promotional modules that operate below the level of R&D would be an option for the target group of innovation-oriented small and medium-sized enterprises that do not undertake any R&D, addressing, for example, expenditure on product and service design.

Measures aimed at easing the skilled labour shortage can address the labour force potential, enabling a higher number of young people to engage in vocational training or acquire advanced skills through more formal training and education. Specific approaches that address the skills required by innovative businesses involve enhancing soft skills and digital skills as well as mathematical/statistical abilities.

Last but not least, an enterprise's strategic alignment is crucial to the implementation of innovation activities. In particular, businesses that do not have a pronounced strategic orientation rarely innovate. Measures aimed at raising awareness and strengthening businesses' strategic capabilities can help them initiate innovation activities of their own.

1. Introduction

Innovation is the driver of growth and prosperity

In developed economies, innovation is regarded as the guarantor for safeguarding and increasing prosperity.[1] The ability to introduce an innovation is a decisive competitive factor not just for businesses but for entire economies. From a whole-of-economy perspective, innovation drives productivity growth and economic growth.[2] Germany in particular, a highly developed and export-oriented country with few natural resources to call its own, must therefore secure its technological leadership or take a leadership role in key business areas in order to be internationally competitive. Furthermore, innovation contributes to addressing social challenges such as climate change, health care and the consequences of demographic change.

For a business, innovating is an important lever to apply in order to establish a competitive position in the market. Innovative firms can secure a competitive advantage by better responding to their customers' demands. Even if the success of a specific innovation project is difficult to predict, numerous studies confirm that innovation increases enterprises' headcount, turnover, returns and productivity.[3] Successful innovation activity not only secures the success of businesses but benefits their employees as well. Thus, innovative businesses pay higher wages[4] and offer better working conditions[5] and more stable employment relationships[6] than those that do not innovate.

German innovation ecosystem has strengths and weaknesses

Germany has an effective innovation ecosystem whose strength builds primarily on the R&D of large enterprises and academic institutions. In the past years, however, it has lost ground internationally. After significant growth in R&D expenditure from the second half of the 2000s, the R&D quota has stagnated since 2019.[7] Significant weaknesses exist in the development and marketing of new technologies such as digital and other key technologies.[8] Furthermore, the concentration of innovation activity in increasingly fewer businesses is a sign of weaknesses in the adoption of innovations by small and medium-sized enterprises.[9]

Innovation is more than research and development (R&D)

Innovations, however, are not just novelties based on R&D. Small and medium-sized enterprises, in particular, often develop innovations out of the normal production process or in cooperation with customers and suppliers without any R&D activity. Innovating can also mean adopting innovations from other enterprises and adapting products and services to specific customer requests and usage environments. The further development and adaptation of innovations and the diffusion of new technologies by businesses have an important role to play. Not least, this ensures that the overall economy remains competitive.

Concrete examples of recent innovations include a new type of fuel cell system for long haul transport, a new transport box for the secure transport of welding sheets or a novel system for optimising material flow processes in vibratory systems.[10]

[1] Cf. Ulku (2004), OECD (2007), Bravo-Biosca et al. (2013) or Westmore (2013).

[2] Cf. Solow (1956), Arrow (1962), Griliches (1979), Romer (1990) or Aghion and Howitt (1992).

[3] Cf. Zimmermann (2024a), Zimmermann (2022a), Zimmermann (2021a), Kritikos et al. (2017), Zimmermann (2017a), Zimmermann (2015a), Zimmermann (2015b) or Zimmermann (2014).

[4] Cf. Aghion et al. (2018).

[5] Cf. Chan et al. (2023) and Antonioli et al. (2011).

[6] Cf. Dauth et al. (2017).

[7] Cf. Zimmermann (2022b) and Rammer and Trunschke (2022).

[8] Cf. Cantner (2025), Zimmermann (2025a) and Zimmermann (2023a).

[9] Cf. Zimmermann (2022c) and Rammer et al. (2022).

[10] Cf. https://www.deutscher-zukunftspreis.de/de; https://mwvlw.rlp.de/presse/detail/innovationspreis-rheinland-pfalz-2025-verliehen-schmitt-unsere-preistraeger-sind-vorbilder-fuer-innovationskraft-unternehmergeist-und-zukunftsorientierung; https://module.ksk-gp.de/content/dam/myif/ksk-goeppingen/work/Innovationspreis/Innovationspreis_2025_Preistr%C3%A4ger.pdf?stref=iconbox (in German), last retrieved on 17 December 2025.

2. Development of the share of innovators

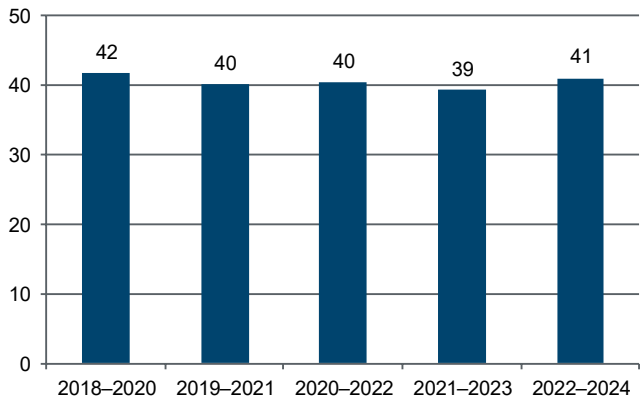
Innovation activity defies current economic challenges

The share of innovators among SMEs rose by two percentage points from the previous year's survey and currently stands at 41% (Figure 1). It measures the share of enterprises that have introduced at least one innovation in the past three years (Box: New OECD innovation definition). Thus, there are currently just under 1.6 million small and medium-sized innovators.

Overall, the share of innovators among SMEs has therefore hardly changed since the definition of innovation was broadened. After the temporary drop and the recent rebound, the current share of innovators of 41% is only marginally below the level at the start of the observation period.

Figure 1: Development of innovators among SMEs

Share in per cent



Note: Figures extrapolated on the basis of the number of enterprises; new OECD definition: Innovators inclusive of marketing and organisational innovations.

Source: KfW SME Panel, own calculations

The current increase in the share of innovators is likely due in part to the easing of special factors driven by the pandemic and to catch-up effects associated with it. In the past years, SMEs had scaled back their innovation activities because of the pandemic and other crises. Why innovation activity in the SME sector nonetheless picked up at the current margin of the observation period despite what continues to be an unfavourable economic situation is explained in more detail in the following.

New OECD innovation definition

The accepted definition of innovation was developed by the OECD in collaboration with Eurostat. It forms the basis for measuring innovation activity in the EU and many other countries, and it is also used in the KfW SME Panel.[11]

According to this definition, innovation is characterised by three key features: A product innovation must be introduced in the market, or a process innovation in the enterprise ('implementation'). Second, the innovation must be new or improved from the viewpoint of the innovating enterprise ('subjective view'). Finally, the innovation must clearly stand out from the company's previous practice or offerings ('noticeable difference').

The definition of innovation was revised in the year 2018. Organisational and marketing innovations now also count as product or process innovations. The vast majority of marketing and organisational innovations are classified as process innovations. What is also new is that significant changes in design count as innovations and are included in product innovations.

Economic situation typically has a strong impact on innovation activity

The development of the business cycle as reflected in, for example, the turnover expectations surveyed by the KfW SME Panel or the development of profit margins, is typically identified as an important determinant of innovation activity throughout the business cycle. As past surveys have demonstrated, businesses typically innovate mainly when they have positive economic expectations.[12] In an optimal case, a business introduces an innovation during an economic upswing.

The reason is that product innovations penetrate the market more easily in such phases and (novel) processes tend to be more profitable because they run at higher capacity during such phases. Besides, innovation activities can be funded more easily in such phases, for example from higher business profits and through better access to bank loans.[13] These considerations indicate that the COVID-19 pandemic and the

[11] Cf. OECD and Eurostat (2018).

[12] Cf. Zimmermann (2018), Zimmermann (2017b), Zimmermann (2017c) and Poschen and Zimmermann (2014).

[13] Cf. Zimmermann (2010).

ensuing crises such as the outbreak of the war in Ukraine, the energy supply crisis and high inflation as well as the protectionist trends that have been on the rise for some time now put a dampener on innovation activity in recent years.

Currently, however, special factors play an important role

In reality, however, for the period from 2020 this pattern has appeared only to a weaker extent. More in-depth studies have found that particularly for businesses that do not conduct R&D, business expectations have not had an impact on the introduction of innovations since the outbreak of the pandemic. In businesses that introduced innovations with R&D, on the other hand, it was found that business expectations did have a certain influence.[14]

One explanation for this is that the pandemic was not a typical economic crisis but, rather, had some effects that increased innovation and others that hampered it. At the outset, the pandemic – despite its negative effects on business performance – triggered an innovation surge that translated into a higher share of enterprises with innovations during that period. This was due to the need for businesses to adapt their activities to the conditions of the pandemic.[15] They expanded typical innovations such as modifications to product range, sales channels and work management (for example by enabling employees to work from home[16]) but also modifications to their business model. Particularly at the beginning of the pandemic, conducting own research and development played a lesser role for innovation activity than usual.

In the years that followed, companies that were in a tight liquidity situation and those expecting a prolonged crisis were then most likely to roll back their innovation activities.[17] The heightened uncertainty about the further progression was also likely to have led many enterprises during the pandemic to defer decisions about the implementation of innovation projects, even when they were not directly affected by the pandemic.[18]

Furthermore, it is likely that the pandemic hampered innovation activities through further channels. For example, the need to work from home restricted activities in research laboratories and in-company exchange in and around innovation projects overall, travel restrictions hampered collaboration in joint research activities and supply chain problems reduced the availability of inputs also needed for innovations. These impact channels caused innovations not just to be suspended on short notice as a result of the pandemic but, particularly in businesses with comprehensive and complex innovation processes, adversely affected the introduction of innovations over a prolonged period of time. In this context, a recent study mentioned that innovation activity was affected by long-COVID symptoms.[19]

Another likely factor for the decline in innovation activity during the pandemic was that businesses pushed ahead with their digitalisation efforts even beyond the initial surge. As the crisis progressed, it was crucial for businesses to respond flexibly to declines in demand and supply shortages, comply with distancing rules and ensure visibility for customers and cooperation partners,[20] responses to which digitalisation measures were able to contribute significantly, particularly under pandemic conditions.[21] Digitalisation activities were intensified by the fact that a large portion of SMEs regarded the trend towards digitalisation not just as a pandemic phenomenon but expected it to prompt lasting demand shifts towards digital offerings and sales channels.[22] Given the tense financial situation during the pandemic, the multi-year surge in digitalisation it triggered likely caused businesses to shift their available financial resources into digitalisation and put innovation projects on the backburner [23]. As a result, a backlog of innovations has likely built up in many enterprises in recent years.

After three years of restraint, innovation has become urgent

The current increase in the share of innovators despite an almost unchanged weak economic situation is thus likely due to two factors. First, the long COVID symptoms mentioned above eased in the second year after the end of the pandemic. Second, the rebound is also likely due to the fact that businesses have become increasingly aware of the innovation gap that was created by the rollback of innovation activities in the past years and the urgency to innovate. These considerations suggest that many businesses currently attribute greater importance to innovation again and are starting to clear the innovation backlog. Another circumstance that supports this argument is that the digitalisation surge triggered by the pandemic has now weakened again for the first time, enabling businesses

[14] Cf. Zimmermann (2025b).

[15] Cf. Zimmermann (2020a), Zimmermann (2020b) and Abel-Koch (2020).

[16] Cf. Abel-Koch (2020).

[17] Cf. Zimmermann (2021b) and Zimmermann (2021c).

[18] Cf. Bloom et al. (2007).

[19] Cf. Trunschke et al. (2024).

[20] Cf. Köhler-Geib and Zimmermann (2022) and Zimmermann (2021b).

[21] Cf. Bertschek (2020).

[22] Cf. Zimmermann (2022d).

[23] Cf. Zimmermann (2022e) and Zimmermann (2023b).

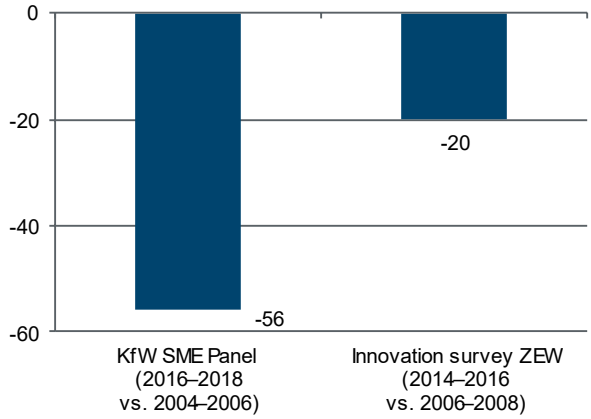
to shift funds from digitalisation to innovation activity.[24]

Share of innovators has fallen sharply over the long term

The cautiously positive development at the current margin, however, does not mean that businesses have come even close to offsetting the loss of innovation activity since the mid-2000s. The KfW SME Panel and the innovation survey conducted by the Mannheim Centre for European Economic Research both arrived at the finding that, based on the innovation definition accepted at the time, the share of innovative businesses dropped sharply between the mid-2000s and the end of the 2020s.

Figure 2: Long-term development of share of innovators according to KfW SME Panel and innovation survey of the Centre for European Economic Research

Variation in per cent



Note: Figures extrapolated on the basis of the number of enterprises, share of innovators according to OECD definition of 2005.

Source: KfW SME Panel, own calculations, Centre for European Economic Research

The innovation survey of the Mannheim Centre for European Economic Research identified a 20% decline in the share of innovators between the 2006–2008 period and the 2014–2016 period (Figure 2).[25] In addition to technical (product and process innovations), the innovation survey also covered marketing and organisational innovations. But it was restricted to businesses with five or more employees and was mainly focused on comparatively innovative economic sectors. According to the innovation survey, the share of the innovative SMEs without R&D fell by around one sixth between 2010 and 2020 while the share of businesses conducting R&D remained stable.[26] The KfW SME Panel even identified a 56% decline in the share of innovators among SMEs of all economic sectors, including businesses with fewer than five employees, between the 2004–2006 period and the 2016–2018 period. During this period, however, the KfW SME Panel captured only technical innovations (without marketing and organisational innovations).[27]

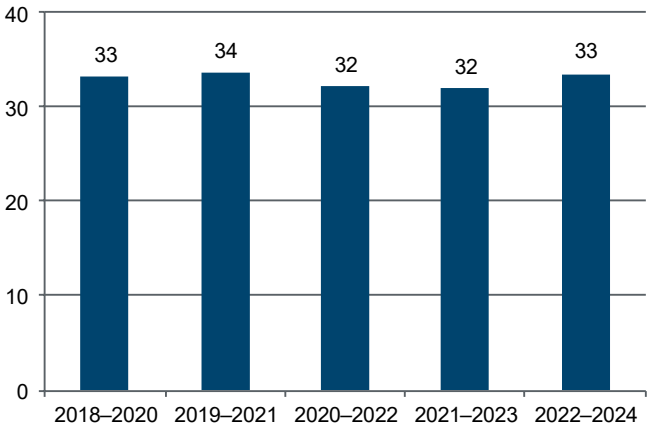
Share of innovative businesses without R&D is up slightly

The majority of SMEs that innovate have no R&D activities of their own. They develop innovations predominantly out of the normal production process or in cooperation with customers and suppliers without conducting any research ('learning by doing, using and interacting'). They do this using external knowledge and informal learning processes based on intensive exchange within the enterprise, for example.[28]

These types of businesses operate mostly in the services sector and at regional and national level. They often pursue competition strategies geared to innovation[29] but usually focus on incremental enhancements or take over innovations from other businesses. Only relatively rarely do these enterprises generate new-to-market innovations. Thus, the share of enterprises with new-to-market products among innovators without own R&D oscillated between only 2 to just under 6% in the past five surveys.

Figure 3: Development of innovators without R&D

Share in per cent



Note: Figures extrapolated on the basis of the number of enterprises; new OECD definition: Innovators inclusive of marketing and organisational innovations.

Source: KfW SME Panel, own calculations

[24] KfW Research will publish its findings on the development of digitalisation activities in small and medium-sized enterprises in Zimmermann (2026): KfW Digitalisation Report 2025, which is scheduled for publication in spring 2026.

[25] Cf. https://www.zew.de/publikationen/zew-gutachten-und-forschungsberichte/forschungsberichte/innovationen/innovationserhebung/kernindikatoren (in German), last retrieved on 18 February 2026.

[26] Cf. Zimmermann (2022c) and Rammer et al. (2022).

[27] Cf. Zimmermann (2020c) and Rammer and Schubert (2018).

[28] Cf. Zimmermann and Thomä (2019a) as well as Jensen et al. (2007).

[29] Cf. Zimmermann (2025b).

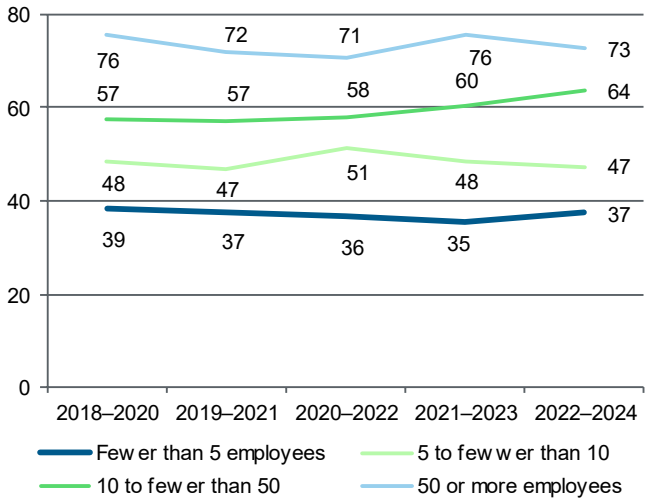
The share of innovators without R&D in the SME sector has currently risen moderately to 33% and has therefore returned to the level at the start of the observation period (Figure 3). The recovery identified for the SME sector as a whole can thus be observed particularly in this group of businesses. This is attributable to the high share of innovators without R&D in all innovators, which means that the development in this group strongly affects the share of innovators across the SME sector more broadly.

Large enterprises innovate more often than small businesses

With respect to the level of innovation activity, it has been found that the share of innovators grows with increasing enterprise size (Figure 4). The share of innovators in the group of companies with 50 or more employees is today nearly twice as high as in the group of small businesses with fewer than five employees (73 vs. 37%).[30]

Figure 4: Innovators by company size

Share in per cent



Note: Figures extrapolated on the basis of the number of enterprises; new OECD definition: Innovators inclusive of marketing and organisational innovations.

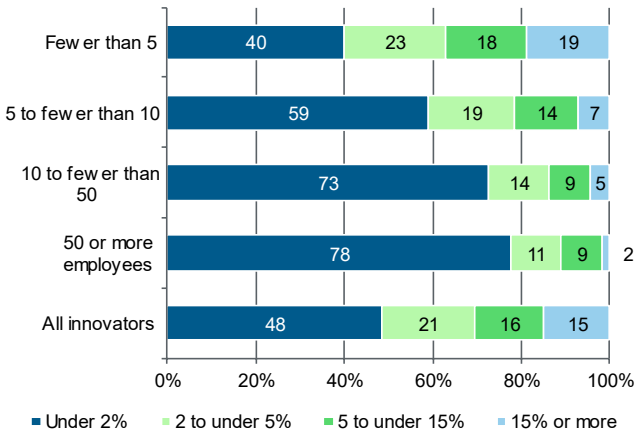
Source: KfW SME Panel, own calculations

This is because small businesses have fewer resources and cover smaller markets.[31] That makes it harder for them to innovate and reduces profits which they could generate from innovating. These disadvantages are exacerbated by the fact that innovation projects often cannot be split up at will.[32] Minimum project sizes and high fixed costs mean that innovating places a higher financial strain on small enterprises than on larger ones.

For example, just under three quarters of large SME innovators (with 50 and more employees) spend less than 2% of their annual turnover on innovation (Figure 5). However, that percentage of turnover is spent by only 40% of SMEs with fewer than five employees. In return, just under one fifth of small businesses spend 15% and more of their turnover and another 15% spend 5 to less than 15% of their turnover on innovation, while those shares are a mere 2 and 9% among large SMEs. The often higher relative burden means that small SMEs either have to shoulder a high (relative) financial burden or must forego innovation altogether. If they actively innovate, small businesses can usually carry out fewer innovation projects at the same time. That means they have fewer options to spread their innovation risks across a broader innovation portfolio than large enterprises, which also hampers their innovation activity.

Figure 5: Innovation expenditure as a percentage of annual turnover by enterprise size

Share in per cent



Note: Figures extrapolated on the basis of the number of enterprises; new OECD definition: Innovators inclusive of marketing and organisational innovations.

Source: KfW SME Panel, own calculations

Development of innovator rate varies by company size

The growth in the share of innovative businesses by 4 percentage points to 64% illustrates a continuation of the trend that could already be observed among medium-sized SMEs with 10 to fewer than 50 employees last year (Figure 4). Among large SMEs, the share of innovators failed to match the high level of the previous year, at 73%, but stabilised on a higher level than in the 2019–2022 period, which was significantly shaped by

[30] The number of employees is calculated including the active owners but excluding trainees and apprentices. Two part-time employees are counted as one full-time employee.

[31] Cf. Crepon et al. (1998) or Baptista (2000).

[32] Cf. Galbraith (1952), Cohen et al. (1987) as well as Cohen and Klepper (1996).

the COVID-19 pandemic. Among smaller SMEs, the variations on the previous year's level were comparatively small, with businesses with fewer than five employees recording a rise (+2%) while those with five to fewer than 10 employees experienced a minor drop (-1%).

The temporary decline in innovation activity among small businesses is consistent with the observation that they in particular were affected more severely and, overall, more frequently by turnover losses at the beginning of the pandemic.[33] At the current margin, these businesses have not yet fully recovered from this decline in the share of innovators.

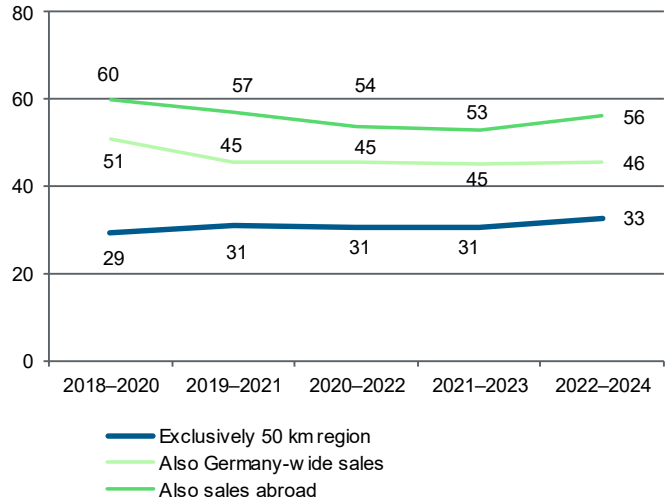
The temporary drop in large SMEs, on the other hand, can likely be attributed more closely to the long-COVID symptoms mentioned above. During the pandemic, these enterprises suffered comparatively lower losses in turnover and, being more actively engaged in R&D and international business, often carry out complex innovation projects with longer project terms. The difficult situation in both industry and exports is likely hampering innovation activity for these enterprises. At the same time, larger enterprises in particular are likely under high pressure to innovate in spite of the unfavourable economic situation, for example because their presence on international markets requires them to be highly competitive.

Share of innovators by sales region: moderate rise at least among businesses operating in all sales regions

A breakdown by sales region shows that the rate of innovators has grown at least moderately among businesses operating in all three different sales regions. SMEs that sell their products abroad posted the sharpest rise of +3 percentage points (Figure 6). The share of innovators among these firms had seen the sharpest drop after 2018–2020. It was precisely these businesses that were affected by turnover losses particularly often as well as somewhat more severely than others.[34] It can also be expected that a particularly large share of enterprises is susceptible to 'long COVID' symptoms in this group as they are typically characterised by ambitious and R&D-based innovation activity.[35] Another factor that has probably played a role in the decline over the past years is that export expectations have clouded over.[36] At the same time, however, these businesses experience high competitive intensity and, hence, a great need to innovate as a result of their international activities, which may have contributed to kick-starting innovation activity at the current margin.

Figure 6: Innovators by sales region

Share in per cent



Note: Figures extrapolated on the basis of the number of enterprises; new OECD definition: Innovators inclusive of marketing and organisational innovations.

Source: KfW SME Panel, own calculations

Among businesses that sell products across Germany and suffered a drop in the share of innovators after the 2018–2020 period as well, the share of innovators is currently increasing by a notable +1 percentage point after remaining steady in the past years. Among businesses that operate solely in regional markets, however, the share of innovators has grown from 29 to 33% throughout the whole observation period.

Across the period of observation, the pattern is that the larger the geographic extension of the sales region, the higher the share of innovators. That link was already established in various studies.[37] One of the likely drivers of this is the more intensive competition in supra-regional sales markets. International markets are deemed to be particularly fiercely contested, so that great innovation efforts are necessary to remain competitive in such markets.[38]

In addition, doing business abroad also provides access to new, outside knowledge from which the

[33] Cf. Zimmermann and Köhler-Geib (2023).

[34] Cf. Zimmermann and Köhler-Geib (2023).

[35] Cf. Zimmermann (2025b).

[36] Cf. Abel-Koch (2024).

[37] Cf. Zimmermann (2025b) and Zimmermann (2018).

[38] Cf. Schlegelmilch (1988), Lachenmaier and Wößmann (2006), Greenaway, and Kneller (2007), Wagner (2007), Fryges and Wagner (2010) as well as Carboni and Medda (2024).

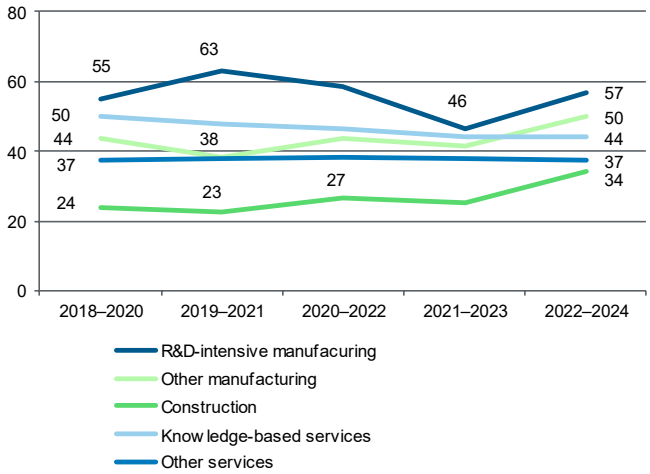
businesses operating there can learn.[39] For small and medium-sized enterprises in particular, given their limited own resources, external sources are an important input.[40] To what extent a business succeeds in integrating external knowledge successfully into its own operations depends on its absorptive capacity.[41] In order for a business to be able to draw additional benefit from external knowledge, it must not only complement existing knowledge but be able to latch onto the knowledge already existing in the business.[42] That knowledge thus plays an important role for its ability to absorb new knowledge.

Share of innovators in manufacturing and construction has risen

There was recently a sharp increase in the share of innovators particularly in R&D intensive manufacturing (+11 percentage points, Figure 7).[43] The competitiveness of businesses in these sectors, in particular, likely rests heavily on the introduction of innovations, which means businesses here cannot afford longer periods of weakness. The current development marks a recovery following significant downturns that occurred during the period under review.

Figure 7: Innovators by industry

Share in per cent



Note: Figures extrapolated on the basis of the number of enterprises; new OECD definition: Innovators inclusive of marketing and organisational innovations.

Source: KfW SME Panel, own calculations

With +9 percentage points each, other manufacturing (comprising, for example, the food and animal fodder production and metal products industries) and construction most recently recorded a strong increase in innovators. The positive trend since the 2019–2021 period – which was definitely marked by interruptions – thus continues in both groups of economic sectors. After significant temporary declines during the period of observation, that means a recovery particularly for manufacturing segments.

By contrast, the share of innovators in the services sectors did not experience any significant fluctuations. In businesses that operate in other (non-knowledge-based) services (such as hospitality, transport and storage) the share of innovators remained steady at 37% across the entire period of observation. In knowledge-based sectors (such as IT and information service providers, law firms, tax consultancies and management consulting firms) the share of innovators has decreased continuously from a high level to now 44%. No temporary drops in innovation activity in the services sector could thus be observed, nor any opposing movements at the current margin.

Increases at the current margin in both product and process innovations

In the breakdown by product and process innovators, the corresponding shares are currently 32 and 33%, respectively (Figure 8). Thus, a good 1.2 million SMEs currently brought new or improved products (including services) to market. Just under 1.3 million modernised their processes or introduced organisational innovations or new marketing methods.

In the course of the pandemic[44], SMEs scaled back the introduction of product innovations in particular. The proportion of businesses that introduced product innovations temporarily dropped by up to 4 percentage points since the beginning of the period of observation. That share in particular is currently returning to the level at the start of the observation period. By contrast, the share of SMEs with process innovations dropped by merely 2 percentage points at a maximum in the course of the COVID-19 pandemic. At present, an increase – albeit a moderate one – can at least be observed again for process innovations.

[39] Cf. Anderson and Lööf (2009), Harris and Li (2009), Vendrell-Herrero. et al. (2025) and Krieger and Trottner (2024).

[40] Cf. Ugur et al. (2020), Jirjahn and Kraft (2011), Czarnitzki and Kraft (2012), as well as Cappelli et al. (2014).

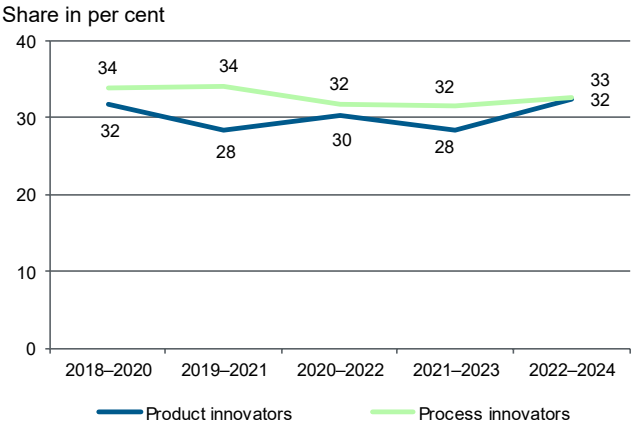
[41] Cf. Cohen and Levinthal (1990).

[42] Cf. Jirjahn and Kraft (2011) as well as Cohen and Levinthal (1989).

[43] These include mechanical engineering, electrical engineering, chemicals and the car industry.

[44] Cf. Zimmermann (2020a), Zimmermann (2021b) and Zimmermann (2021c).

Figure 8: Development of SME product and process innovators



Note: Figures extrapolated on the basis of the number of enterprises; new OECD definition: Innovators inclusive of marketing and organisational innovations.

Source: KfW SME Panel, own calculations

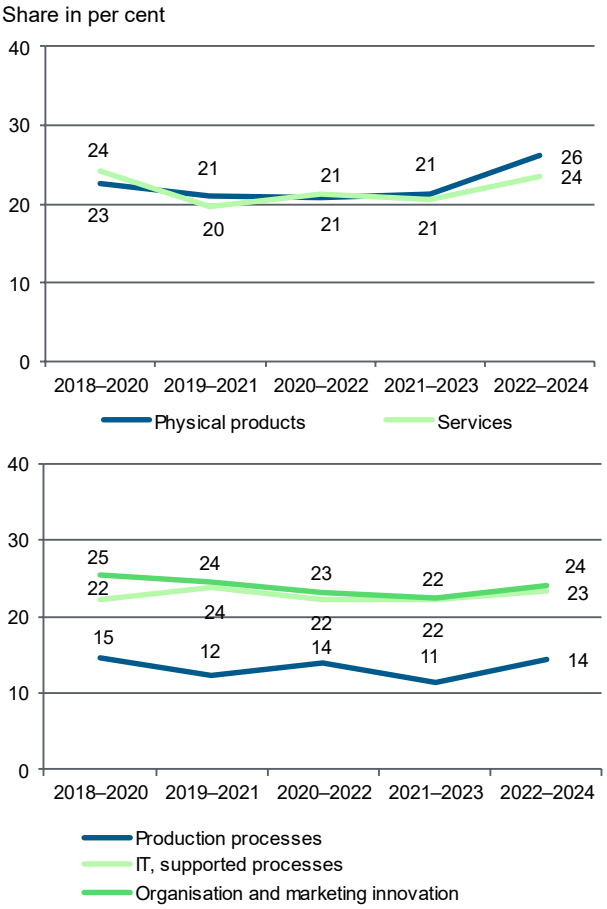
Generating product innovations typically depends more heavily on the state of the economy than the introduction of process innovations.[45] This is because the market success of product innovations is heavily dependent on rapid dissemination driven by strong demand, something that businesses take into account when deciding when to introduce them to the market.

To be sure, businesses also have greater difficulty generating process innovations in times of economic weakness – for example because of reduced access to finance. But process innovations can be partly deployed as 'rationalisation measures' in response to unfavourable economic developments. This slows the decline in process innovations compared with product innovations in times of economic weakness. These considerations very clearly explain the different intensity in the decline of innovation activities during and following the COVID-19 pandemic. The different levels of increase seen at the current margin are closely aligned with the consideration previously discussed, namely that the current increase in innovation activity can be strongly attributed to catch-up effects.

Innovation activity has increased in all types of innovation

Since the survey was adapted to take into account the new innovation definition, the types of innovations generated can be examined in more detail with the aid of the KfW SME Panel. Figure 9 illustrates that the shares of innovators sit at similar levels – currently between 23 and 26% – with regard to physical products (i.e., goods including digital products), service innovations (including digital services), data processing methods including supporting administrative procedures as well as non-technical innovations such as organisational and marketing innovations. Only the rate of innovations in manufacturing processes was significantly lower at 14%.

Figure 9: Development of the individual types of innovation among SMEs



Note: Figures extrapolated on the basis of the number of enterprises; new OECD definition: Innovators inclusive of marketing and organisational innovations.

Source: KfW SME Panel, own calculations

With regard to the development over time, the share of innovators has trended downwards for all types of innovation in recent years. Only at the current margin, however, have the relevant shares begun to increase again for all types of innovation. The strongest increases were recorded for physical products (+4 percentage points), followed by services and manufacturing processes (+3 percentage points each). In organisational and marketing innovations as well as EDP including supporting processes in administration, the increases were +2 and +1 percentage points. Thus, a minor increase in innovation activity was at least identified for all types of innovation.

[45] Cf. Zimmermann (2017b) as well as Poschen and Zimmermann (2014).

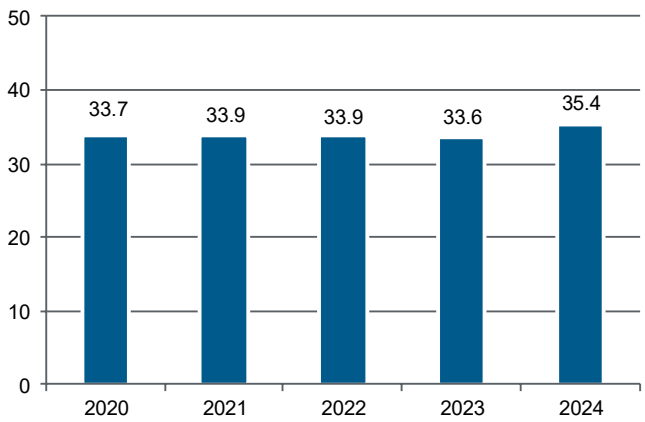
3. Development of innovation expenditure

Innovation expenditure has risen at the current margin

SMEs' spending on innovation rose in 2024 after remaining steady in previous years. Aggregate innovation expenditure of SMEs currently sits at a good EUR 35 billion (Figure 10). This includes all spending on innovation including personnel costs and capital expenditure related to developing innovations and bringing them into the market.[46] Innovation expenditure rose by EUR 1.8 billion in nominal terms on the previous year. If we take price increases into account, innovation expenditure grew by EUR 1 billion to EUR 34.6 billion.[47] Thus, SMEs' spending on innovation rose slightly, as did the share of innovators.

Figure 10: Aggregate innovation expenditure in the SME sector

In EUR bn



Note: Nominal values, extrapolated on the basis of the number of employees, new OECD definition: Innovation expenditure inclusive of marketing and organisational innovations.

Source: KfW SME Panel, own calculations

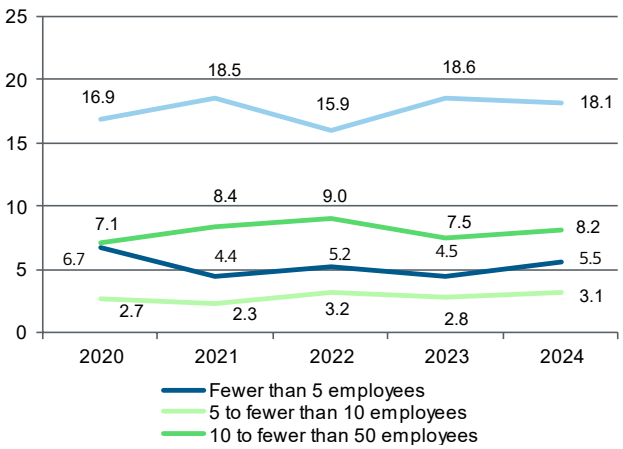
Thus, SMEs' innovation expenditure has recently developed slightly more positively than their investment in physical assets. The latter increased only slightly in nominal terms in 2024 but fell in real terms.[48] That means SMEs spent significantly more than seven times more in physical assets than on innovation projects, which was almost unchanged from the previous year.

Variation in innovation expenditure was not aligned with enterprise size

The change in innovation expenditure did not correlate with business size, as was the case with the share of innovators (Figure 11). Just as the share of innovators in businesses with 50 or more employees fell moderately, so, too, did their innovation expenditure. However, it increased in all other enterprise size classes. In all enterprise size classes, however, the variations in innovation expenditure on the previous year were rather moderate.

Figure 11: Aggregate innovation expenditure by enterprise size

In EUR bn



Note: Nominal values; extrapolated on the basis of the number of employees, not counting enterprises of the remaining economic sectors, new OECD definition: Innovation expenditure inclusive of marketing and organisational innovations.

Source: KfW SME Panel, own calculations

SMEs' innovation expenditure continued to be heavily concentrated in the group of large SMEs (Figure 12). Thus, large companies with 50 and more employees account for more than half of innovation expenditure in the SME sector even though this group represents only 4% of innovative small and medium-sized enterprises. A further 23% of innovation expenditure is attributable to the group of SME innovators with 10 to fewer than 50 employees, which makes up 12% of small and medium-sized innovators. At the opposite end of the distribution, 73% of innovators with fewer than five

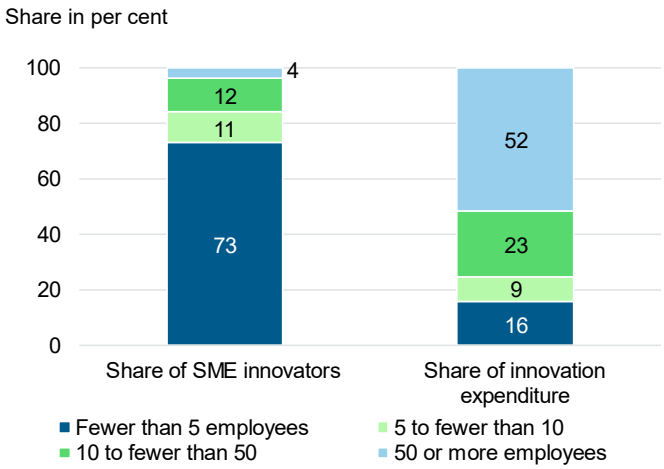
[46] Specifically, this includes expenditure on internal and external research and development (R&D), innovation-related expenditure on machinery, equipment, software and external knowledge (e.g. patents and licenses). It also includes expenditure on product design, construction, service design and preparation for the manufacture and sale of innovations. Expenditure on training conducted in the context of innovations and their introduction into the market is included as well.

[47] The deflation of innovation expenditure is done with a composite deflator made up 25% of the variation in the prices for fixed capital formation in machinery and equipment and 75% of the variation in the prices of other machinery and equipment as reported by the Federal Statistical Office (2025) (ed.) Fachserie 18 Reihe 1.4, Blatt 2.3.11. This deflator can be considered an approximation to the inflation rate of innovation expenditure, because according to calculations made on the basis of the innovation survey conducted by the Centre for European Economic Research in Mannheim, innovation expenditure is composed 25% of physical investments and other machinery and equipment comprises, among other things, expenditure on intellectual property such as research and development.

[48] Cf. Schwartz and Gerstenberger (2025).

employees account for a mere 16% of SMEs' innovation expenditure.

Figure 12: Concentration of innovation expenditure in the SME sector



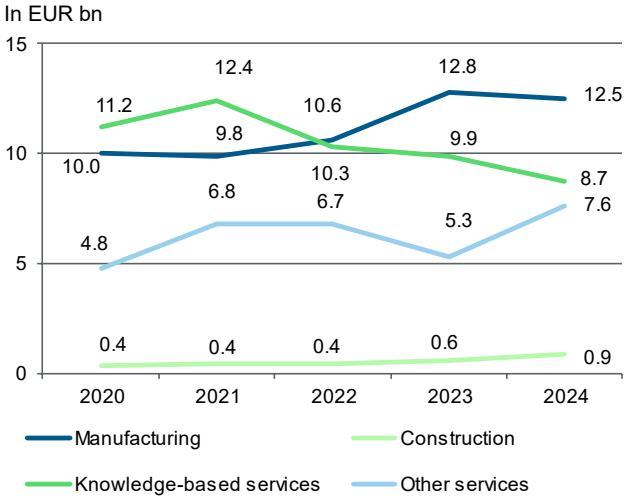
Note: Values extrapolated from the number of employees, not counting enterprises of the remaining economic sectors, new OECD definition: Innovation expenditure inclusive of marketing and organisational innovations.

Source: KfW SME Panel, own calculations

Manufacturers and knowledge-based service providers spent the most on innovation

By sector, manufacturers spent the highest amounts on innovation, almost EUR 13 billion, followed by knowledge-based service providers with EUR 9 billion (Figure 13). The strong contribution of knowledge-based services to SMEs' innovation expenditure corresponds with the high share of SME innovators operating in these industries (48%). Manufacturers, on the other hand, make up only 8% of SME innovators. Thus, in relation to the number of enterprises, manufacturers in particular inject high financial resources into the businesses' innovation activities. Ranked third are other services, with just under EUR 8 billion. Innovation expenditure was lowest in the construction sector, at EUR 0.9 billion.

Figure 13: Aggregate innovation expenditure by sector



Note: Nominal values extrapolated on the basis of the number of employees; not counting businesses with fewer than five employees, new OECD definition: Innovation expenditure inclusive of marketing and organisational innovations.

Source: KfW SME Panel, own calculations

Manufacturing enterprises spent significantly more on innovation across the entire period of observation, even if their innovation expenditure is now merely stable despite a growing share of innovators. Businesses operating in other services have also increased their innovation expenditure overall. Among businesses that offer knowledge-based services, on the other hand, innovation expenditure has fallen overall – as has the share of innovators in this segment. Finally, innovation expenditure in the construction industry has increased slightly in the past two years.

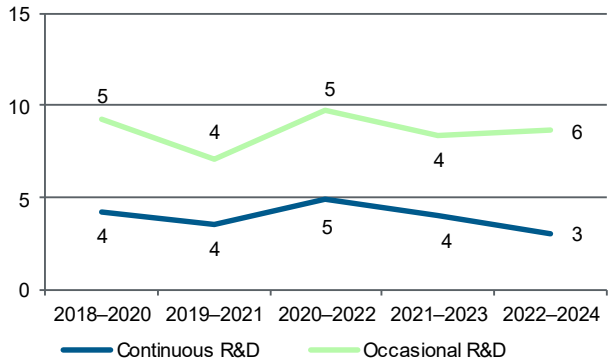
4. Development of R&D activity

R&D is uncommon in the SME sector

The economic literature distinguishes between two different modes of generating innovations. The bulk of SMEs develop innovations out of the normal production process or in cooperation with customers and suppliers ('learning by doing, using and interacting' mode).[49] The other mode ('science, technology and innovation', or STI mode) is based on R&D. R&D is defined as 'systematic creative work aimed at expanding existing knowledge [...] and using it with the objective of finding new potential applications'.[50] Behind it is a targeted, formalised activity that is typically carried out by specialised workers in dedicated departments.

Figure 14: Enterprises with research and development activities of their own

Shares in per cent – stacked lines



Note: Figures extrapolated on the basis of the number of enterprises.

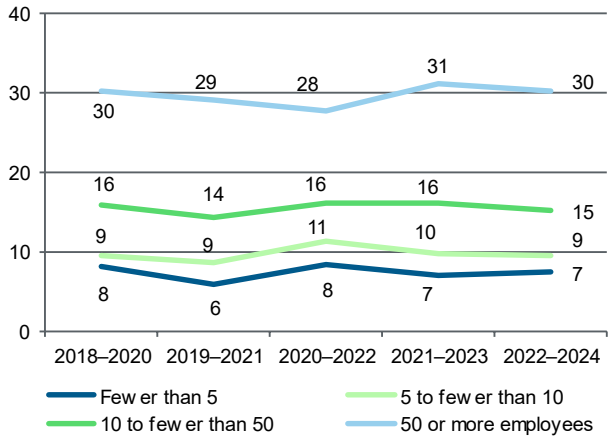
Source: KfW SME Panel, own calculations

In the 2022–2024 period, a mere 3% of SMEs conducted R&D continuously and a further 6% occasionally (Figure 14). In absolute figures, that means around 350,000 SMEs in total conducted R&D of their own. It is not possible to identify a clear trend in the share of SMEs conducting R&D throughout the period of observation. Rather, that share oscillates between values of 8% and 10%. The share of businesses with continuous R&D activities fell by one percentage point on the previous survey, and that of businesses that conduct R&D on a case-by-case basis grew by two percentage points. In total, however, the increase in the share of SME innovators is based on a broad range of business segments in which innovation activity has increased at least moderately.

For innovation activity in the SME sector, that means 20% of all SMEs that innovate undertake R&D. However, 80% of innovators generate new or improved products and processes without drawing on own R&D activities (Figure 20 in the Annex).

Figure 15: Enterprises with own (occasional or continuous) R&D by size

In per cent



Note: Figures extrapolated on the basis of the number of enterprises.

Source: KfW SME Panel, own calculations

Share of enterprises conducting R&D remains steady in all size classes

Large SMEs are much more likely to carry out R&D themselves than other enterprises. In the period under review, 30% of SMEs with 50 or more employees conducted their own R&D, compared with 7% of businesses with fewer than five employees (Figure 15). In other words, large SMEs are almost 4.5 times more likely to conduct R&D than small businesses. This is an indication that larger enterprises undertake innovation activities more systematically and that their innovation processes are more permanent.[51] Even the breakdown by enterprise size classes does not show any trend in the share of businesses conducting R&D over time.

R&D-intensive manufacturing SMEs are most likely to conduct own R&D

R&D-intensive manufacturers are by far the most active in conducting own R&D, leading all other sectors by a wide margin (Figure 16). At present, 30% of SMEs in this sector continuously or occasionally conduct R&D of their own. This is a higher level than in other economic sectors and forms the basis for the high share of innovators here compared with other sectors. The two percentage-point rise on the previous year's survey has stopped the downward trend of the past years for now but without reaching the high level seen at the start of the period of observation.

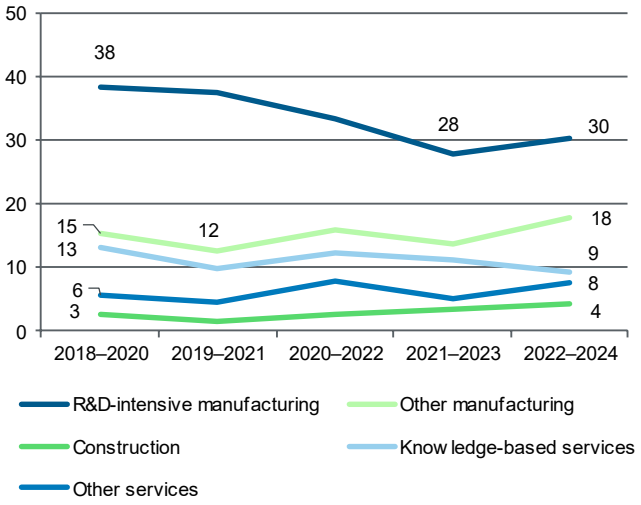
[49] Cf. Zimmermann and Thomä (2019a) Jensen et al. (2007) and Thomä and Zimmermann (2020).

[50] Cf. OECD (2015).

[51] Cf. Zimmermann (2017d).

Figure 16: Enterprises with own (occasional or continuous) R&D by sector

In per cent



Note: Figures extrapolated on the basis of the number of enterprises.

Source: KfW SME Panel, own calculations

Other manufacturing (18%), knowledge-based service providers (9%) and other service providers (8%) follow at a much shorter distance. Construction firms are even less likely to conduct own R&D (4%).

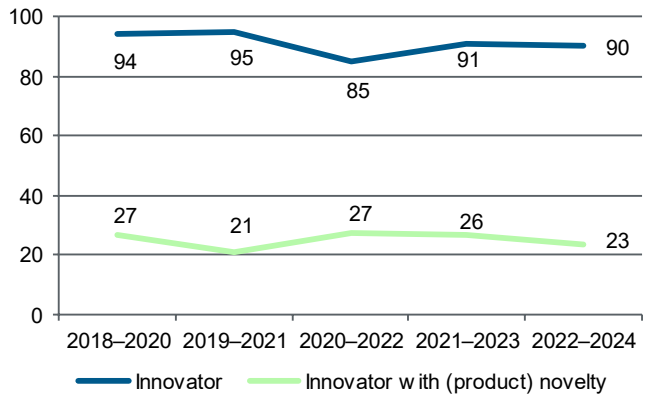
The share of businesses conducting R&D in manufacturing and knowledge-based services decreased throughout the entire period of observation. By contrast, other manufacturing, other services and the construction sector saw moderate increases in the shares of businesses conducting R&D.

SMEs conducting R&D have a high innovation output

Even if the group of SMEs with R&D activities is comparatively small, it does play an important role in the innovation ecosystem. This is because enterprises with R&D activities are, to a certain extent, at the spearhead of innovation in the SME sector. Thus, SMEs that undertake R&D almost continuously generate innovations. In the past years, the share of innovators among these enterprises fluctuated between 85 and 95% (Figure 17). At 90%, the share of innovators in this group is currently more than twice as high as in the SME sector overall (Figure 1).

Figure 17: Innovators with own (occasional or continuous) R&D

In per cent



Note: Figures extrapolated on the basis of the number of enterprises.

Source: KfW SME Panel, own calculations

Many of their innovations also feature a higher degree of novelty. The share of enterprises conducting R&D with new-to-market products hovered between 21 and 27% throughout the period under review (Figure 17). That share is thus five to ten times higher than in SMEs that conduct no R&D, where that share sits between 2 and just under 6%. SMEs that undertake R&D thus do not just generate innovations at a higher rate but often with a high degree of novelty as well. Consequently, they often play a pioneer role in the innovation ecosystem.

5. Conclusion

Key findings on the development of innovation activity in the SME sector

The share of innovators rose by two percentage points to 41% in the period under review. The negative trend of the past years thus did not continue. Instead, the share of innovators was only marginally lower than in the 2018–2020 period, for which the new definition of innovation was applied in the KfW SME Panel for the first time. Innovation expenditure also increased somewhat on the previous year's survey and now sits at EUR 35.4 billion. In the face of what continues to be an unfavourable economic environment, this positive development is remarkable.

This finding can likely be attributed to the fact that longer-term negative consequences of the COVID-19 pandemic ('long-COVID effects') are currently subsiding and that the reluctance of businesses to innovate in recent years has created a backlog of innovation which they have now begun to tackle. This argument is supported by the fact that business segments that scaled back their innovation activities in recent years in particular are now introducing innovations more often again. These include manufacturing enterprises and internationally active enterprises. Product innovations, above all, are currently being introduced more often again than in the past years.

But the current moderate increase in the share of SME innovators does not mean that it has come even close to offsetting the sharp declines since the mid-2000s. Between the mid-2000s and the end of the 2010s, small businesses, businesses from economic sectors in which innovation does not constitute a key competition parameter as well as companies that pursue innovation activities with a low financial input and often on a low innovation level in particular have stopped innovating.[52] Thus, businesses without own R&D, in particular, are less likely to innovate[53].

To be sure, the retreat of these businesses diminishes the output of innovations with a high degree of novelty to a limited extent only. But the innovations introduced by these companies make a significant contribution to diffusing novelty across the economy. It can therefore be anticipated that Germany's productivity growth and transformative capacity will be weakened overall in the long term if an increasingly larger proportion of enterprises fails to periodically renew their production processes and product offerings.[54] It must be noted in this context that innovation efforts by SMEs are already concentrated in relatively small groups of companies.

SMEs face many barriers to innovation

The unfavourable economic development since the outbreak of the COVID-19 pandemic was not the only thing that hampered innovation activity in the past approx. two decades. Rather, the impact of impediments to innovation has grown in almost all segments of the SME sector during this period. This applies to the group of innovators without R&D to a particular degree.[55]

Innovation barriers can be grouped into three main types of impediments. The most common barrier for SMEs takes the form of administrative barriers. Funding challenges and skills-related impediments follow at a considerable distance and with similar frequency.[56]

Administrative hurdles include a large number of laws, regulations and further administrative provisions ranging from tax and labour law through consumer, environmental and climate protection through occupational health and safety and data protection to administrative procedures, standards and norms.[57] Whether a bureaucratic provision is perceived as an impediment also depends on the business owner's personality. Their opinion about how compliance cost compares with perceived benefit and the emotional reaction towards the issue of bureaucracy play an important role in how the business owner feels about the bureaucratic burden. What also plays a role is the perceived relationship between the trust government institutions place in it vs. the control they exert over it.[58]

With a view to funding-related barriers, high costs, uncertainty about business success and long payback periods weigh on businesses' innovation appetite and hamper access to external finance. This affects businesses with a low credit rating as well as young and small businesses in particular. Financing barriers exist not only for research-intensive but also for technologically less ambitious innovations. Financing difficulties in particular are closely linked to project

[52] Cf. Rammer and Schubert (2018); Hottenrott et al. (2024) and Zimmermann (2021c).

[53] Cf. Zimmermann (2022c) and Rammer et al. (2022).

[54] Cf. Hottenrott et al. (2024); Andrews et al (2015) as well as Akcigit and Ates (2021).

[55] Cf. Zimmermann (2022c) and Rammer et al. (2022).

[56] Cf. Zimmermann (2025c).

[57] Cf. Zimmermann (2024b).

[58] Cf. Holz et al. (2019) and Chittenden et al. (2002).

cancellations.

Skills-related impediments are reflected, for example, in a shortage of skilled workers or a lack of technological or organisational expertise. They are relatively seldom the main reason to cancel a project, which may be attributable to the fact that businesses often identify the skills required for a project in advance and, if doubts remain, tend to refrain from starting projects for which available skills may be insufficient. Businesses that conduct own R&D, in particular – and therefore have specialist staff – are less likely to experience skills-related impediments.

Innovation support landscape in Germany is differentiated but focused on R&D

Germany has a differentiated offering of support measures that address all phases and all actors in the innovation process.[59] Major gaps in the promotional landscape are hardly identifiable. Nonetheless, not all segments of the innovation ecosystem are covered by promotional measures to the same extent and with the same intensity. Overall, a clear emphasis on the promotion of R&D activities is evident. This emphasis is guided by the fact that R&D-based innovation projects are likely to have the greatest spill-over effects and face the most profound funding difficulties (resulting from an information imbalance between the innovator and a potential provider of capital).[60] Thus, the market failure in the development of innovations is most pronounced among these enterprises.

The consequence of emphasising such promotion, however, is that the relevant programmes reach only a small proportion of innovative enterprises[61] and that various potentials for further refining the promotional schemes on offer can be identified. Economic policy measures can target segments that have so far been given less attention and the key hurdles for innovation activity as the most important potential starting points.

Possible starting points for boosting innovation activity in the SME sector

Support peak segments and the broader business community

Targeted economic policy measures can stimulate innovative activity in peak segments and within the broader business community in Germany. It is important to support the R&D activities of businesses at the cutting edge of innovation. Beyond that, it would be expedient for economic policy to provide direction and coordination in order to advance the major transformations such as the transition to sustainability or digitalisation, as is currently being done under the mission-oriented components of innovation policy. Since entering into new technologies is not a strength of the German innovation ecosystem and Germany is lagging behind in key technologies of the future, one option is to adopt mission-oriented and technology-specific approaches that enable societal challenges and key technologies to be addressed.[62] Such approaches are also more relevant today than before because innovation cycles are becoming shorter, leaving less time to adopt new technologies and technological change, for example towards digital technologies, is far-reaching and in part requires other skills than those required for further developing Germany's technological strengths.

Identifying missions and key technologies as well as designing specific, targeted measures places high demands on economic policymakers. In order to avoid making misguided decisions, it is necessary to have a good source of information and well-founded advice without becoming exposed to lobbyism.

With a view to the innovation activities of small and medium-sized enterprises, it would be a good idea to also place a greater focus on the needs of businesses that undertake no R&D of their own. This is supported by the observable long-term decline in innovation activity on the part of these businesses and by the finding that these enterprises, too, are successful innovators[63] and contribute significantly with their innovations to the diffusion of novelties in the economy. They, too, therefore make an important contribution to the functioning of the innovation ecosystem as a whole.

A recent analysis demonstrated that small and medium-sized enterprises without own R&D generate 34% of the turnover achieved with product innovations in the SME sector and account for 42% of the cost reductions brought about by process innovations. Their innovation activities are characterised by high efficiency because, at 20% of innovation expenditure in the SME sector, they account for a significantly lower share of innovation expenditure.[64] At the same time, their share as recipients of innovation promotion has dropped at a disproportionately high rate, so that they are now clearly underrepresented compared with their

[59] Cf. Kulicke et al. (2023) and Zimmermann (2023a).

[60] Cf. Zimmermann (2022f).

[61] Cf. Hottenrott et al. (2024).

[62] Cf. Cantner (2025); Zimmermann (2025d), Zimmermann (2025a), Zimmermann (2024c) and Zimmermann (2024d).

[63] Cf. Thomä and Zimmermann (2020) or Zimmermann and Thomä (2019a); Zimmermann and Thomä (2019b) or Rammer et al. (2009).

[64] Cf. Zimmermann (2022c) and Rammer et al. (2022).

contribution to the SME innovation ecosystem.[65]

A wide range of measures are conceivable as possible starting points for economic policy measures aimed at increasing innovation activity of small and medium-sized enterprises:

Reduce administrative barriers

Bureaucracy allows activities to comply with general and predictable rules and creates a counterweight to arbitrariness and dependence on personal relationships.[66] It is deemed to be particularly important for the functioning of highly complex economic and social systems.[67] Additionally, in assessing bureaucratic barriers to innovation it must be taken into account that many legal norms and administrative procedures are not aimed at regulating innovation but at protecting other legal assets or averting threats in general.

In order to avoid placing a disproportionately high burden on SMEs nonetheless, it would be helpful to review existing and new regulations for their actual protective effects and potentially inhibiting effect on innovation. The aim should be for regulations to effectively achieve necessary protection goals while placing as few restrictions as possible on the scope for entrepreneurial initiative and innovation.

Eliminating bureaucracy is a tedious process in which a vast number of bureaucratic areas need to be worked through and many regulations must be assessed in detail. That requires expert knowledge, patience and stamina. Individual measures with a high impact on the administrative burden are not to be expected. As this process is complex and requires a lot of work, many parties need to interact in a coordinated manner and with the involvement of businesses.[68]

One low-threshold possibility for businesses to participate can be to set up a reporting office for administrative obstacles, which is under consideration. Another approach is to systematically check new regulations for their impact on innovation and their comprehensible and coherent formulation. In addition, digitalising administration presents great potential for noticeably reducing red tape for businesses and making procedures more efficient. Not only does this free up resources, it also enhances the digital skills of businesses.

Improve funding opportunities

Financing-related barriers present a hurdle for the innovation activity of all SMEs.[69] Difficulties in financing innovation projects are a reflection of the particular characteristics of such projects, which hamper the provision of financial resources. Thus, external effects in the form of a spillover of knowledge contribute to a situation in which the results of innovation projects benefit not just the innovating business but can also be used by competitors at no cost or at low cost. As a result, the cost-benefit ratio of possible innovation projects drops so that businesses are less willing to invest capital in the development of innovations.

Uncertainty about the success of an innovation project is a particular barrier to obtaining external finance. Potential external financiers in particular find it difficult to assess the prospects of success of innovation projects. The uneven distribution of information ('information asymmetry') between the enterprise and the potential provider of capital makes external lenders less willing to finance such projects. The external financing of innovations with debt capital, which is otherwise widespread in the SME sector, is often prevented by insufficient debt collateral and the limited capacity of bank loans to account for the risks.

Financing difficulties can be addressed by expanding the level of R&D and innovation promotion in the context of tried and tested promotional measures.[70] The special role of businesses that undertake continuous research activities suggests that comprehensive incentives should be provided wherever possible to ensure that businesses preserve their existing R&D capabilities. Broadly applied measures such as the research grant that was introduced in 2020 – and is being increasingly used by small and medium-sized enterprises – can be effective instruments.[71] International studies confirm the positive effect of tax incentives to promote R&D on the R&D expenditure of businesses.[72]

Low-threshold promotional modules would be an option for the target group of innovation-oriented small and medium-sized enterprises that do not undertake any R&D. As set out above, the vast portion of the innovation activity of these enterprises is based on experiential skills that are acquired through informal processes of learning and understanding and arise from day-to-

[65] Cf. Hottenrott et al. (2024); Zimmermann (2022c) and Rammer et al. (2022).

[66] Cf. Weber (1922).

[67] Cf. De Jong and Van Witteloostuijn (2015); Kitching et al. (2015); Weber (1922) and Kitching (2006).

[68] Cf. Holz et al. (2025).

[69] Cf. Zimmermann (2025c) and Zimmermann (2022f).

[70] Cf. Rammer et al. (2022) and Rammer and Schubert (2018)

[71] Cf. Rammer (2025); Rammer (2023) and Rammer (2021).

[72] Cf. Angelino et al. (2024), Dechezleprêtre et al. (2023) and Guceri and Liu (2019).

day working and interacting with the business environment ('learning by doing, using and interacting').[73] For measures consisting in financial support for innovation, this means that the level of ambition required to be eligible for such support must not be set too high. Measures for these businesses must be provided below the R&D threshold, for example for expenditure on product design and service design.[74]

Ease skilled labour shortages

Easing skilled labour shortages is of great importance for the expertise available for innovation activities in a business. The share of innovative SMEs with hiring problems increased by around two thirds to 52% between 2012 and 2022. Besides insufficient qualifications on the part of applicants, businesses attribute hiring problems to, among other things, a general lack of applicants and excessive wage demands.[75]

A wide range of measures can contribute to improving the supply of skilled workers in the German labour market. A key starting point which enterprises can influence themselves would be to upskill workers through continuing education and training. Innovative SMEs in particular are already focusing more strongly than other enterprises on enhancing the skills of their workforce.[76] But given the severity of the skilled worker shortage, it must be feared that measures taken by businesses alone cannot solve the problem. Rather, it has become obvious that economic and educational policymakers must also intervene to ease the shortage of skilled labour.

A key lever to reducing the shortage of skilled labour is to train skilled workers under the dual system of vocational training. Among other things, young people with a migration background must be better integrated into training programmes.[77] For small businesses in particular, barriers to offering training places must be lowered and they must be made more attractive as businesses that provide training.[78]

In the area of school education, for example, approaches include reducing dropout rates, improving basic competencies by supporting students with learning difficulties and improving basic literacy and numeracy skills. Measures aimed at reducing the strong dependence of educational attainment on parents' educational level should also be considered.[79]

The skilled worker shortage will continue to worsen in future as the baby boomer generation retires from the workforce.[80]More people must therefore be encouraged to join the labour market. To achieve this, it is important to make better use of the domestic labour supply, for example by increasing labour force participation of women and older people, and migration must be understood as a potential source of skilled labour.[81]

Build innovation-relevant skills

Starting points for economic policy responses include not just increasing the overall availability of skilled labour but developing the specific skills required to carry out innovation projects.[82]

It is important to realise the guiding principle of 'lifelong learning' so that the skills of working-age people keep pace with changing requirements. Increasing further training activities will require setting effective training incentives in the form of financial support. The cost of further training and employees' absence from work as well as loss of income sustained during extended qualification measures constitute major hurdles for further training activities.[83] Other useful starting points are measures aimed at enabling the certification of qualifications and improving the navigation and quality assurance in the confusing market for continuing education and training.[84]

Soft skills and digital skills as well as mathematical/statistical skills, in particular – which are often inadequate – are what innovative enterprises require most often. Specific further training measures that address the needs of innovative firms must target these shortcomings. With regard to digital expertise, one angle of attack is to mitigate the shortage of IT specialists on the one hand and to improve digital skills across the breadth of the workforce. Such content needs to be more closely integrated into school, vocational and academic courses as well. After all, Germany lags behind other countries in the teaching of digital skills in schools[85] and only around half of tertiary students

[73] Cf. Jensen et al. (2007).

[74] Cf. Zimmermann (2022f).

[75] Cf. Zimmermann (2024e).

[76] Cf. Zimmermann (2023c).

[77] Cf. Grewenig and Schmidt (2025).

[78] Cf. Zimmermann (2024e).

[79] Cf. Müller (2023).

[80] Cf. Kuhn et al. (2025).

[81] The aspects mentioned in this section 'Ease skilled labour shortages' are discussed in greater detail in separate studies by KfW Research on securing the supply of skilled labour. Cf. Zimmermann (2024e); Zimmermann (2023c); Zimmermann (2023d) and Müller (2023).

[82] Cf. Zimmermann and Thomä (2016).

[83] Cf. Suessenbach et al. (2023).

[84] Cf. Leifels (2021).

[85] Cf. Leifels (2021).

possess the required digital skills at the end of their degree course.[86]

Mathematical/statistical abilities are key skills that need to be acquired primarily at school. The results of the PISA studies are therefore alarming. After the mathematical literacy of students in Germany improved between 2003 and 2012, it has dropped again since. Also noteworthy is the wide gulf between students from privileged socio-economic backgrounds and those from socio-economically disadvantaged groups[87].

The reason for the high importance of soft skills is that innovative businesses apply more modern work management methods because of their role as trailblazers in the structural transformation and place higher demands on the social skills of their employees because of the requirements of their innovation processes. Apart from early childhood education, school education is deemed to be of crucial importance for developing social skills.[88] But since different occupational profiles require different social skills, the design of vocational training and academic education is another starting point for imparting appropriate social skills.[89]

Increase innovative capacity

Measures aimed at building expertise can also aim to empower businesses to initiate own R&D activities. To achieve this, it will be necessary to address the specific prerequisites which they must fulfil to carry out innovation projects and initiate R&D. This means acquiring technical expertise and market information as well as developing strategic capabilities and the ability for businesses to cooperate with academia and other businesses. Broadly speaking, appropriate measures must aim to build scientific and technological competencies.[90] Possible measures can include advisory services and specific offers of funding for initiating R&D.

For businesses that generate innovations through 'learning by doing, using and interacting', the use of external knowledge and informal learning processes based on, for example, intensive exchange within the enterprise and a corresponding business organisation constitute important sources of innovative strength.[91]

With respect to improving access to external knowledge, integration into regional innovation ecosystems plays an important role because the businesses referred to here in particular often operate locally and these innovation ecosystems differ from one region to another.[92] Supporting regional integration – especially in rural areas – by expanding cluster promotion, moving away from excellence clusters towards broader regional approaches – which already exist for some regions[93] – could be a starting point for economic policy to both improve businesses' strategic alignment and increase their innovation activities.

In-company processes of learning and understanding can be improved by modifying the work and business organisation[94] and by introducing appropriate management practices.[95] They can be aimed at facilitating knowledge flows within the enterprise, giving workers scope for decision-making and introducing ideas and providing incentives for generating innovations. Not least, they also include a living risk culture that promotes new ideas and accepts failure.[96] One option for supporting these aspects could consist in combining advisory services with financial solutions for their implementation.

Another approach would be to support small and medium-sized enterprises in developing capacities for organising innovation activities. This should also benefit enterprises without own R&D in particular. The primary aim here is to increase the availability of staff who are able to design and drive innovation projects. Important aspects here include promoting continuing education schemes around innovation management and more closely integrating innovation aspects into vocational education and training.[97]

Develop strategic capabilities

Last but not least, a company's innovative activities can be increased by strengthening its strategic skills. Thus, an enterprise's strategic orientation crucially determines its innovation activities. Strong innovation efforts are undertaken particularly by enterprises that pursue the competition strategy of 'growth through innovation' but also by those that focus on customer-specific solutions and high quality as well as those that concentrate on a small number of core products and services.

[86] Cf. Senkbeil et al. (2019).

[87] Cf. Lewalter et al. (2023); OECD (2019) and Stanat et al (2025)

[88] Cf. Bachmann et al. (2021).

[89] Cf. Tschöpe et al. (2016) and Bachmann et al. (2021).

[90] Cf. Zimmermann (2022c) and Rammer et al. (2022).

[91] Cf. Thomä and Zimmermann (2020), and Zimmermann and Thomä (2019a).

[92] Cf. Thomä and Bizer (2021).

[93] These include the programme lines WIR!, RUBIN, T!Raum and REGION.innovativ. Vgl. https://www.bmftr.bund.de/DE/Forschung/TransferInDiePraxis/InnovationUndStrukturwandel/innovationundstrukturwandel_node.html, zuletzt aufgerufen am 19.12.2025.

[94] Cf. Totterdill (2015).

[95] Cf. Kritikos et al. (2025).

[96] Cf. Thomä and Zimmermann (2020), and Zimmermann and Thomä (2019a).

[97] Cf. Zimmermann (2022c) and Rammer et al. (2022).

Companies that do not have a pronounced competition strategy, on the other hand, have very little innovation activity.[98]

Small businesses with well-established but not very innovative business models, in particular, pay little attention to the aspect of strategic business development. These businesses often do not employ university graduates and operate only within their own region. Limited resources and the prioritisation of day-to-day business often prevent them from seeing the need to focus on innovation and address the further development of their business as a whole.[99] The main target group here is therefore composed of enterprises that are not orientated towards innovation, which usually can hardly be reached with direct measures to promote innovation.

Approaches aimed at improving the strategic capabilities of these businesses include, among other things, awareness-raising campaigns that highlight specific role models and best-practice examples, providing more permanent low-threshold information services for SMEs on innovation strategies and innovation management and continuous monitoring and further development of the quality of advisory services in existing advisory programmes and infrastructures. Another measure would be to raise awareness about the significance of strategic considerations by incorporating such aspects more systematically in technical and vocational education and training, i.e. in the training of specialists and master tradespeople. Not least, explicitly incorporating strategic aspects in the context of innovation promotion, such as an innovation audit that can be used in modular form and accounted for as a reimbursable cost, could be another helpful approach.[100]

[98] Cf. Zimmermann (2024a) and Zimmermann (2024f).

[99] Cf. Zimmermann (2024g) and Astor et al. (2016).

[100] Cf. Zimmermann (2022c) and Rammer et al. (2022).

Annex

The structure of innovative SMEs

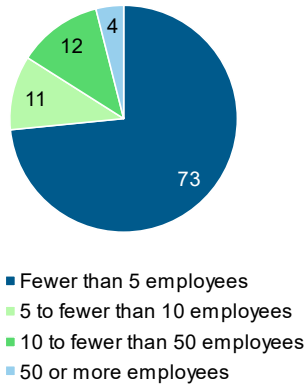
The SME sector, according to KfW's definition, covers all enterprises in Germany whose annual turnover does not exceed EUR 500 million. By this definition, around 3.87 million SMEs exist today. The SME sector thus accounts for 99.95% of all enterprises in Germany. Nearly 1.6 million of these enterprises are innovators.

The majority of innovative SMEs are small enterprises. The majority of innovative SMEs (just under 1.2 million enterprises, or 73%) have fewer than five employees. This high proportion of small innovators is due to the overall structure of small and medium-sized enterprises. Eighty-one per cent of SMEs have fewer than five employees. The manufacturing industry accounts for 8% of innovators while the service sector represents 83%.

Eighty per cent of innovative SMEs do not conduct any R&D of their own. Only one fifth have undertaken R&D in the past three years.

Figure 18: Innovative SMEs by company size

In per cent

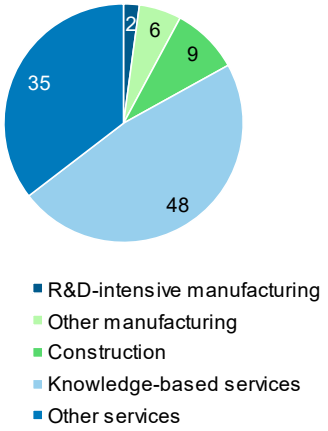


Note: Figures extrapolated on the basis of the number of enterprises.

Source: KfW SME Panel, own calculations

Figure 19: Innovative SMEs by industry

In per cent

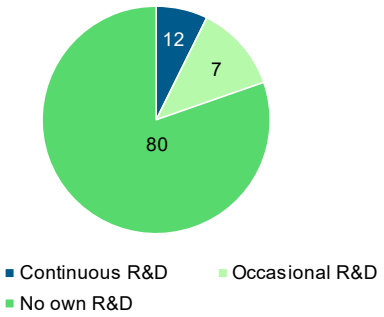


Note: Figures extrapolated on the basis of the number of enterprises.

Source: KfW SME Panel, own calculations

Figure 20: Innovative SMEs by own R&D activity

In per cent



Note: Figures extrapolated on the basis of the number of enterprises.

Source: KfW SME Panel, own calculations

KfW SME Panel

The KfW SME Panel (KfW-Mittelstandspanel) has been conducted since 2003 as a recurring postal survey of small and medium-sized enterprises in Germany with annual turnover of up to EUR 500 million.
With data based on up to 15,000 companies a year, the KfW SME Panel is the only representative survey of the German SME sector, making it the most important source of data on issues relevant to the SME sector. Due to the fact that it is representative of all SMEs of all sizes and across all branches in Germany, the KfW SME Panel offers projections for even the smallest companies with fewer than five employees. A total of 13,079 SMEs took part in the current wave.

The KfW SME Panel is used as the basis for analyses of long-term structural developments in the SME sector. It gives a representative picture of the current situation and the needs and plans of SMEs in Germany. It focuses on annually recurring information on companies' performance, investment activity, innovation and digitalisation activities and financing structure. This tool provides a unique way of determining quantitative key figures for SMEs such as investment spending, loan demand and equity ratios.

The basic population used for the KfW SME Panel comprises all SMEs in Germany. These include private-sector companies from all sectors of the economy with annual turnover of not more than EUR 500 million. The population does not include the public sector, banks or non-profit organisations. Currently there are no official statistics providing adequate information on the number of SMEs or the number of people they employ. The survey used the German Company Register (Unternehmensregister) and the official employment statistics (Erwerbstätigenrechnung) to determine the current population of SMEs as a starting point.
The KfW SME Panel sample is designed in such a way that it can generate representative, reliable data that are as precise as possible. The sample is split into four groups: type of promotion, branches, firm size as measured by the number of employees, and region. In order to draw conclusions on the basic population based on the sample, the results of the survey are weighted/extrapolated. The four main stratification criteria are used to determine the extrapolation factors. These factors look at the distribution in the net sample (in line with the four group characteristics) in relation to their distribution in the population as a whole. Overall, two extrapolation factors are determined: an unlinked factor for extrapolating qualitative parameters to the number of SMEs in Germany, and a linked factor for extrapolating quantitative parameters to the number of employees in SMEs in Germany.

The survey is conducted by GfK GmbH on behalf of KfW Group. The project received expert advice from the Leibnitz Centre for European Economic Research (ZEW) in Mannheim. The main survey of the 23rd wave of the KfW SME Panel was conducted in the period from 10 February to 20 June 2025.

Further information can be obtained at www.kfw-mittelstandspanel.de.

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