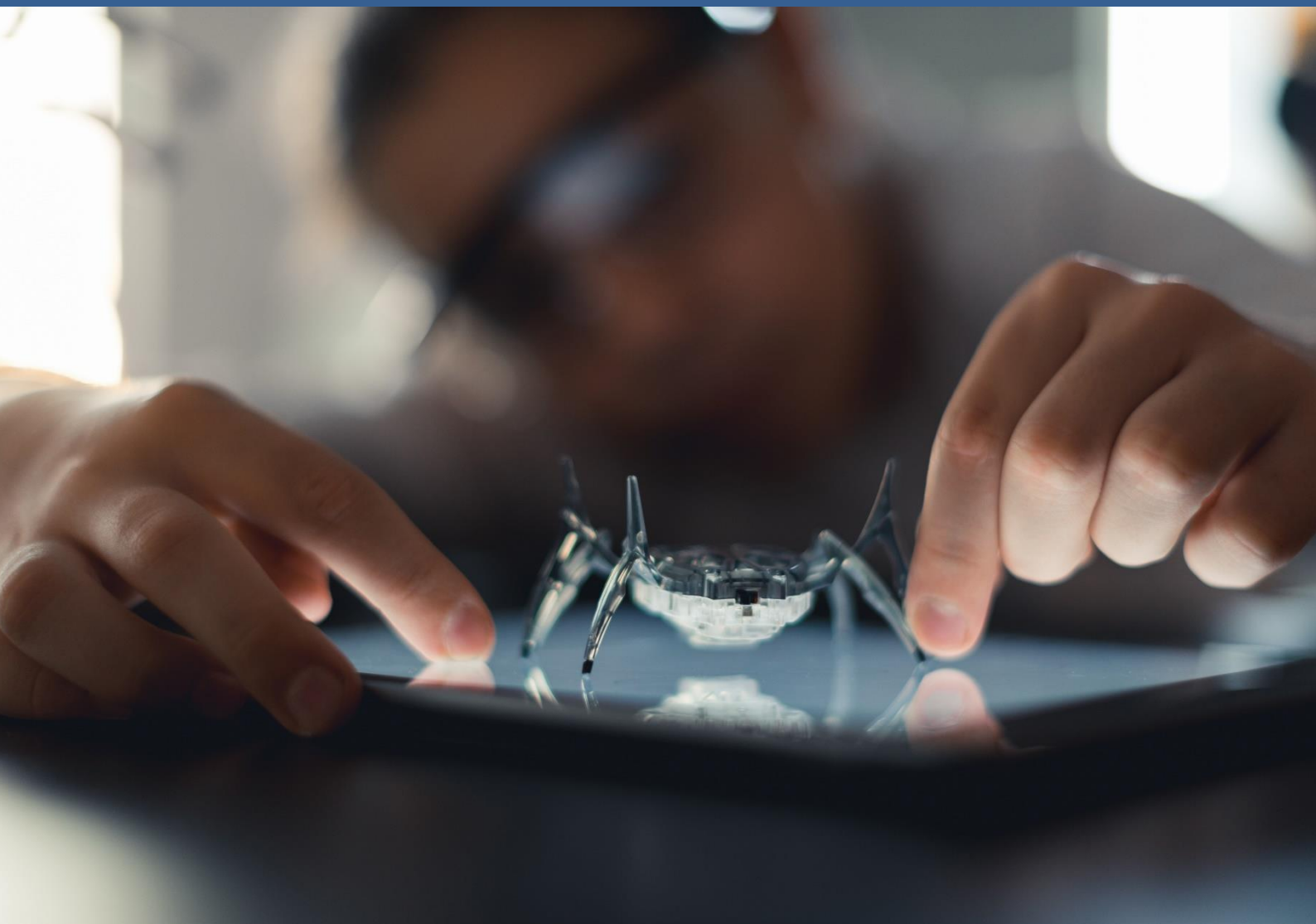


ANNUAL REPORT ON EUROPEAN SMEs 2018/2019

Research & Development and Innovation
by SMEs



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SME Performance Review 2018/2019

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Annual Report on European SMEs 2018/2019

Research & Development and Innovation by
SMEs

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ACRONYMS

BEEHC	Business Economy (except activities of holding companies)
CIS	Community Innovation Survey
EIS	European Innovation Scoreboard
IMD	International Institute for Management Development
NACE	Statistical classification of economic activities in the European Community
NFBS	Non-financial business sector
GDP	Gross Domestic Product
GNI	Gross National Income
PPS	Purchasing Power Standards
R&D	Research and Development
SAFE	EC/ECB Survey on Access to Finance
SBA	Small Business Act for Europe
SME	Small and medium-sized enterprises

Executive Summary

The annual report on European SMEs is part of the SME Performance Review, one of the main tools the European Commission uses to monitor and assess countries' progress in implementing the Small Business Act (SBA) on a yearly basis. It provides a snapshot on the size, structure and importance of SMEs to the European economy and an overview of the past and forecast performance of SMEs from 2008. This year's edition is focused on the R&D and innovation (R&DI) performance of these SMEs.

Overview

In 2018, there were slightly more than 25 million SMEs in the EU-28, of which 93% were micro-SMEs. SMEs accounted for 99.8% of all enterprises in the EU-28 non-financial business sector (NFBS), generating 56.4% of value added and 66.6% of employment in the NFBS.

Based on a Spring 2019 forecast, EU SME value added is predicted to grow by 4.1% in 2019 and 4.2% in 2020, while EU SME employment is expected to grow by 1.6% in 2019 and 1.4% in 2020. However, the economic outlook has weakened since this forecast, so this growth may have to be revised downwards.

Key Findings

SMEs account for the majority of the increase in value added (60%).

Micro SMEs generated 28.5% of this increase, while small and medium-sized SMEs accounted for 16.9% and 14.1%, respectively.

SMEs have made a much stronger contribution to the growth in value added in recent years (i.e. from 2016 to 2018) compared to the longer period of 2013 to 2018. The increase in the SME contribution is almost entirely due to micro SMEs. The contribution of medium-sized SMEs has declined during this period.

Most of the increase in EU-28 SME value added and employment was generated in less knowledge-intensive industries.

Labour productivity has grown, largely due to the growth in the value added. The performance of EU SMEs was significantly stronger than that of their Japanese and US peers in terms of growth in employment and the number of enterprises.

SME value added and employment grew in all Member States in 2018 for the first time in years. Overall, in 2018, EU-28 SME value added grew by 4.1% and EU-28 SME employment by 1.8%. Micro SMEs have driven this recovery - they recorded by far the strongest value added and employment growth of all SME size classes.

Trends in SMEs innovation activities vary substantially between Member States

Almost 50% of EU SMEs undertook some innovation activity¹ over the period 2014-16, the last years for which such data are available. Some of these SMEs developed disruptive innovation or breakthrough innovation, while others have focused on more incremental innovation. The participation of SMEs in innovation activities varies greatly across the EU-28, with the share of innovating SMEs in the total SME

¹ Disclaimer: For the purposes of this report, the term "innovating company" refers to the companies that have introduced a new or significantly improved product or service to the market; a new or significantly improved production process or method; a new way of selling goods or services, or a new organisation of management. The data comes from the companies' self-assessment of relevant activities. Innovating companies come from all sectors and are not limited to the disruptive or digital sectors. Non-innovating companies are not precluded from introducing innovations in the future.

population ranging from 10% in Romania to 66% in Portugal. For the EU-28, the share of innovation was broadly stable from 2004 to 2016.

This EU-wide stability masks considerable differences between Member States. The proportion of innovative SMEs increased in Austria, Belgium, Croatia, Estonia, Greece, France, Hungary, Lithuania, Latvia, Portugal and the United Kingdom, while it fell in Cyprus, Czechia, Germany, Finland, Malta, Romania, Slovakia, Slovenia, Spain and Sweden. The divergences between Member States are partly explained by differing industry trends.

Eight of the top 30 start-up ecosystems in the world are in the EU. Although start-ups are present in all Member States, a number of smaller Member States (Cyprus, Estonia, Lithuania, Latvia and Malta) stand out as having the highest start-up intensities in the EU. The recently released *European Startup Monitor 2019* provides more detailed information on the EU start-up population.

Policies to stimulate innovation by SMEs

The analysis in this report suggests that a two-pronged policy approach – by the EU as part of a new SME Strategy, and by Member States as part of their innovation and SME strategies – would be most conducive to stimulating innovation..

Improvements in the overall innovation environment (such as improving the quality of the domestic research systems) would have important spill-over effects and stimulate innovation by SMEs, especially in those Member States which rank less highly in the EU Innovation Scoreboard.

Such broader policies would need to be complemented by policies directly targeting innovating SMEs and those that currently do not plan innovation activities, such as providing funding (grants, vouchers, tax credits), helping SMEs access the skills required for their innovation activities, and providing mentoring, advice and networking opportunities. Public funding of some of the SMEs' innovation activities would be particularly valuable in Member States where such funding has declined in recent years.

Based on this overall strategic approach, the report highlights a number of specific policy conclusions:

1. There is a need to increase the in-house R&D activities of the SMEs. This could be achieved by increasing grant and non-grant support via the European Regional Development Fund (ERDF) operational programmes under the next long-term EU Budget. In the longer term, to incentivise SMEs to carry out in-house R&D, their cooperation with larger innovative enterprises and research and technology organisations should also be considered.

Adopting an open innovation mindset and business model could also help SMEs to overcome some of the barriers and challenges they face. However, for a culture of open innovation to be successful, it is essential that SMEs engaging in open innovation have the absorptive capacity to do so. Open innovation could also be supported through IT-based platforms such as the platform of the Lombardy region co-funded by the ERDF and which seamlessly integrates with the internationalisation services of the Enterprise Europe Network.

2. There is ample evidence to confirm that skills shortages represent a major barrier to innovation. EU level actions hand in hand with national/regional measures should help increase the innovation management capacity of SMEs. EU-level programmes could particularly support the cross-border access of SMEs to skills to allow them to engage in innovation.
3. As a higher share of university graduates in science, manufacturing, engineering and construction correlates with a higher share of innovative SMEs in the EU-28. Member States should continue to reinforce their support for their education systems so that more graduates from the STEM-disciplines (Science, Technology, Engineering and Mathematics) are available on labour markets.
4. Further barriers include a lack of internal and external funds, especially for innovative SMEs with regard to scaling up their innovations. European level programmes such as the future Horizon Europe plan to address market gaps in scale up financing through the European Innovation Council (EIC) and the future InvestEU programme plans to provide support for the financing of innovative SMEs at all stages of their development.

5. For innovative SMEs it is still important to receive support in finding collaboration partners. The Enterprise Europe Network as an EU-level action of the COSME programme should play an important role in connecting not only SMEs but also different competencies (e.g. Key Enabling Technology centres, digital innovation hubs, testing laboratories, and investors) that are needed to implement innovation projects.
6. The support of incremental innovation should receive as much attention as those of a breakthrough or disruptive nature.
7. At EU-level, with the incoming Commission and the start of a new long-term EU budget, there will be a further improvement in the synergies between the various innovation policy tools.



This report is part of the 2018/19 SME Performance Review.²

It provides information on the recent economic performance of EU-28 SMEs and the evolution of the EU-28 SME demography. As with previous reports, this report also presents the results of an in-depth analysis of a special topic of particular relevance for SMEs in the European Union.³ This year's special topic focuses on the research and development (R&D) and innovation activities of SMEs.

The analysis in this report focuses on SMEs in the non-financial business sector (NFBS). This broad sector includes almost all sectors of the economies of the EU-28 Member States.⁴ In 2018, the NFBS accounted for 54.5% of EU-28 GDP⁵ and 61.4% of EU-28 employment.

SMEs comprise three different categories of enterprises, namely micro-enterprises, small enterprises and medium-sized enterprises (see Table 1). The official EC definition of SMEs takes account of three different factors (level of employment, level of turnover, and size of the balance sheet). However, the data in this report are based only on the employment

² More details on the SME Performance Review are provided in Annex 1.

³ For example, the special topic in the 2018 Annual Report was the participation of SMEs in the global economy and the extent to which they engage in cross-border activities through trade, foreign direct investment, licensing, etc., and the special topic in the 2017 Annual Report was SMEs and self-employment.

⁴ The non-financial business sector includes all sectors of the economy except the following: 'agriculture, forestry, and fishing' (NACE section A), 'financial and insurance activities' (NACE section K), 'public administration and defence; compulsory social security' (NACE section O), 'education' (NACE section P), 'human health and social work activities' (NACE section Q), 'arts, entertainment and recreation' (NACE section R), 'other service activities' (NACE section S), 'activities of households as employers; undifferentiated goods- and services-producing activities of households for own use' (NACE section T) and 'activities of extraterritorial organisations and bodies' (NACE section U). NACE is the Eurostat statistical classification of economic activities in the European Union.

⁵ Measured as value added at factor costs.

definition, since this is the definition used by the Structural Business Statistics (SBS) database maintained by Eurostat, the main data source for the report.

Table 1 Definition of SMEs

Enterprise Category	Employees	Turnover	Balance sheet total
Micro SME	0 to < 10	< €2 million	< €2 million
Small SME	10 to < 50	< €10 million	< €10 million
Medium-sized SME	50 to <250	< €50 million	< €43 million

Source: Commission Recommendation of 6 May 2003 concerning the definition of micro, small, and medium-sized enterprises (2003/361/EC), Official Journal of the European Union, L 124/36, 20 May 2003

1 The SME population in the EU-28 economy in 2018

Key points

There were slightly more than 25 million SMEs in the EU-28 in 2018, of which 93% were micro SMEs. SMEs accounted for 99.8% of all enterprises in the EU-28 non-financial business sector (NFBS), generating 56.4% of NFBS value added and 66.6% of NFBS employment. Overall, the NFBS represented 54.5% of EU-28 GDP and 61.4% of total EU-28 employment.

The importance of SMEs in the economies of Member States showed marked variation. The EU-28 average in 2018 was 58 SMEs per 1,000 inhabitants, but across Member States, the figure ranged from 29 in Romania to 115 in Czechia.

Of the whole SME population in the EU-28 NFBS in 2018, 28.4% were active in the knowledge-intensive services industries and 1.0% in high-tech industries.

Overall, in 2018, SMEs in the EU-28 NFBS accounted for (Table 2):

- almost all EU-28 NFBS sector enterprises (99.8%);
- two-thirds of total EU-28 NFBS employment (66.6%);
- slightly less than three-fifths (56.4%) of the value added generated by the NFBS.

Micro SMEs are by far the most common type of SME, accounting for 93.0% of all enterprises and 93.2%⁶ of all SMEs in the NFBS (Table 2).

However, micro SMEs accounted for only 29.7% of total employment in the NFBS, while small and medium-sized SMEs accounted respectively for 20.1% and 16.8% of total NFBS employment (Table 2). In contrast to the uneven distribution of the number of enterprises and employment across the three SME size classes in the NFBS, the value added contribution of these three size classes is broadly equal, ranging from 17.6% of NFBS value added (small SMEs) to 20.8%(micro SMEs) (Table 2).

Table 2 Number of SMEs and large enterprises in the EU-28 NFBS in 2018 and their value added and employment

	Micro SMEs	Small SMEs	Medium-sized SMEs	All SMEs	Large enterprises	TOTAL - All enterprises
<i>Enterprises</i>						
Number	23,323,938	1,472,402	235,668	25,032,008	47,299	25,079,312
%	93.0%	5.9%	0.9%	99.8%	0.2%	100%
<i>Value added</i>						
Value in € (million)	1,610,134	1,358,496	1,388,416	4,357,046	3,367,321	7,723,625
%	20.8%	17.6%	18.0%	56.4%	43.6%	100.0%
<i>Employment</i>						
Number	43,527,668	29,541,260	24,670,024	97,738,952	49,045,644	146,784,592
%	29.7%	20.1%	16.8%	66.6%	33.4%	100.0%

Note: Large enterprises are enterprises with 250 or more employees.

Source: Eurostat, National Statistical Offices, DIW Econ

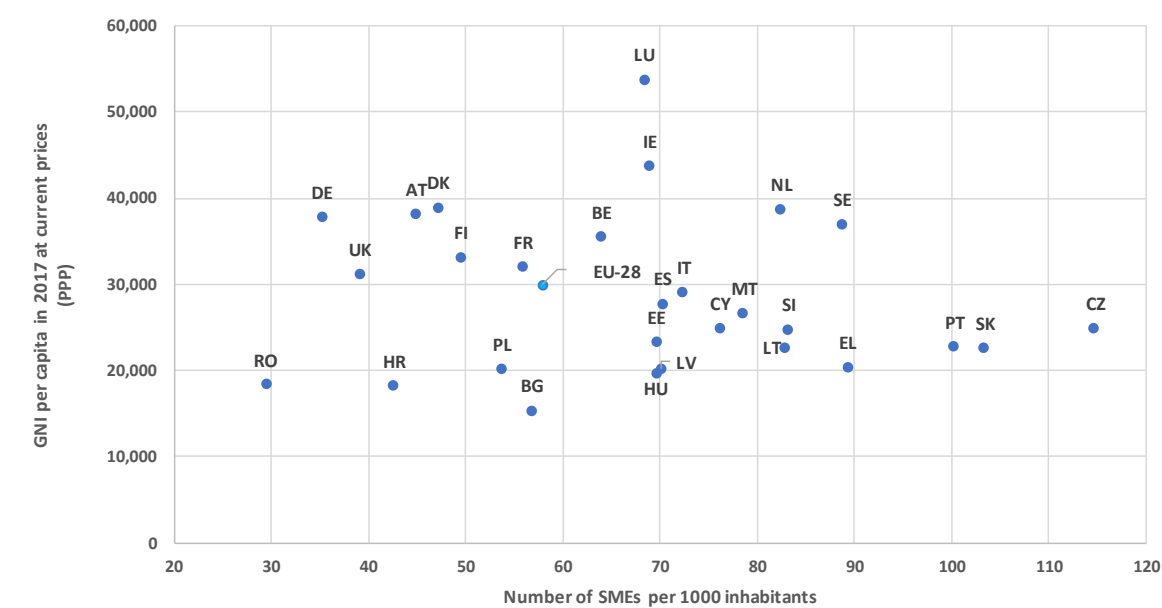
⁶ The figure of 93.23% is derived by dividing the number of micro SMEs shown in Table 2 (23,323,938) by the number of all SMEs shown in the same table (25,032,008).

The number of SMEs in the NFBS varies markedly across Member States even after taking into account the differences in the size of Member States' economies. For example, in 2018, the number of SMEs ranged from 29 per 1,000 inhabitants in RO to 115 in CZ (Figure 1).

Overall, in the EU-28, there were 58 SMEs per 1,000 inhabitants. However, in 7 Member States (AT, DE, DK, FI, HR, RO and UK) there were fewer than 50 SMEs per 1,000 inhabitants and in 8 Member States (CZ, EL, LT, NL, PT, SE, SI and SK) there were more than 80 SMEs per inhabitants (Figure 1).

The variation of the number of SMEs per 1,000 inhabitants reflects a variety of country factors but is not correlated to the level of per capita income.^{7 8} For example, the two EU-28 Member States with the lowest number of SMEs per 1,000 inhabitants, namely DE and RO, have respectively the sixth highest and third lowest income per capita in the EU-28 (Figure 1).

Figure 1 Number of SMEs in EU-28 Member States in 2018



Note: Inhabitants of 15 years or above. GNI = gross national income, PPP = purchasing power parity.
Source: Eurostat, National Statistical Offices, DIW Econ

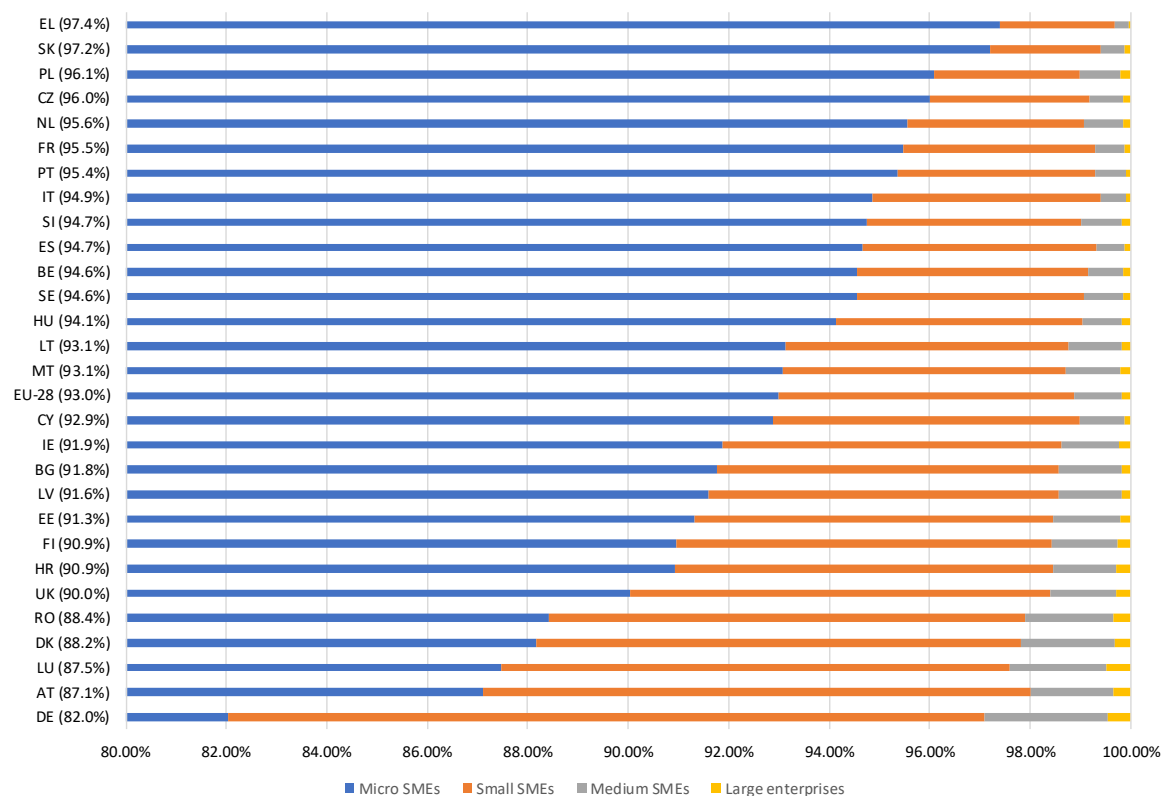
Micro SMEs represent the largest segment of SMEs in all Member States, with a share ranging from 82% in DE to 97.4% in EL in 2018 (Figure 2).

Small SMEs account for more than 10% of all enterprises in the NFBS in only 3 Member States (AT: 10.9% of all enterprises; DE: 15.1%; and LU: 10.1%).⁹

Moreover, medium-sized SMEs account for more than 1.5% of all NFBS enterprises in only 5 Member States (AT: 1.6% of all enterprises; DE: 2.4%; DK and LU: 1.9%; and RO: 1.8%)¹⁰

⁷ The measure of per capita income used in the analysis is Gross National Income (GNI) measured in purchasing power standards (PPS). The use of PPS adjusts the GNI measures for differences in purchasing power and thus make the GNIs of the different Member States comparable.
⁸ The correlation between the number of SMEs per 1,000 inhabitants and GNI per capita is equal to -0.13.
⁹ Annex 2 provides detailed information on the distribution of enterprises across the different enterprise size classes in Member States in 2018.
¹⁰ See Annex 2.

Figure 2 Share of micro, small and medium-sized SMEs in the EU-28 and Member States in 2018



Note: The percentage shown after the country label is the share of micro SMEs in the total SME population. For presentational reasons, the horizontal scale starts at 80%.

Source: Eurostat, National Statistical Offices, DIW Econ

Typically, SMEs account for a proportionately larger share of NFBS employment than of value added (Figure 3). The only exceptions are LU, where the SMEs' value added and employment shares of NFBS value added and employment are almost identical, and MT, where the SMEs' value added share in total NFBS slightly exceeds the SME employment share (Figure 3).

While SMEs accounted for 56.4% of NFBS value added and 66.6% of NFBS employment in the EU-28 in 2018, the economic contribution of SMEs was much more important in a number of Member States. For example, SMEs accounted for (Figure 3)¹¹:

- more than 75% of NFBS employment in CY, BG, EE, EL, IT, MT, LT, LV and PT;
- more than 75% of NFBS value added in CY, EE and MT.

¹¹ See Annex 3 for details.

Figure 3 Share of SME value added and employment in the NFBS of EU-28 Member States in 2018



Source: Eurostat, National Statistical Offices, DIW Econ

Four industries, namely ‘wholesale trade, except of motor vehicles and motorcycles’ (industry G46), ‘retail trade, except of motor vehicles and motorcycles’ (industry G47), ‘specialised construction activities’ (industry F43) and ‘real estate activities’ (industry L68) stand out as accounting for a large share of the value added in the industry and a significant share of total value added generated by SMEs in the EU-28 NFBS.¹²

¹² The precise figures are provided in Annex 4. Similar information for SME employment is provided at Annex 5.

Table 3 Contribution of SMEs in various EU-28 non-financial business industries and importance of these industries for SMEs in 2018

	Share of Value Added by SMEs in industry					
		0% - <20%	20% - <40%	40% - <60%	60% - <80%	80% - 100%
Share of Industry SME Value Added in Total SME Value Added in the NFBS	0% - <2%	B07, C12, C19, C21, C29, C30, H53, J61	B05, B06, C11, C20, C24, C26, C27, D35, E36, H51, J60, M72, N78, N80	B09, C17, C22, C23, C32, E37, E38, F42, H50, J58, J63, N81	B08, C13, C14, C15, C16, C31, C33, I55, J59, M73, N77, N79, N82	C18, E39, M74, M75
	2% - <4%	-	-	C10, C28, H49, H52, J62	C25, F41, G45, I56, M69, M70, M71	-
	4% - <6%	-	-	-	-	L68
	6% - <8%	-	-	G47	-	F43
	8% - <10%	-	-	-	-	-
	10% - <12%	-	-	-	-	-
	12% - <14%	-	-	-	G46	-
	≥14%	-	-	-	-	-

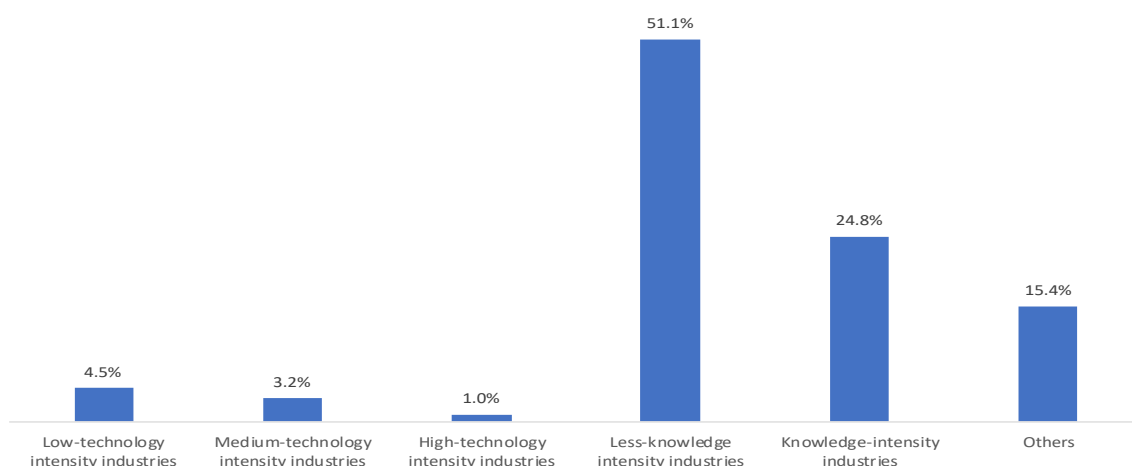
Note: The NACE 2 definition of industries is as follows: B05 'Mining of coal and lignite'; B06 'Extraction of rude petroleum and natural gas'; B07 'Mining of metal ores'; B08 'Other mining and quarrying'; B09 'Mining support service activities'; C10 'Manufacture of food products'; C11 'Manufacture of beverages'; C12 'Manufacture of tobacco products'; C13 'Manufacture of textiles'; C14 'Manufacture of wearing apparel'; C15 'Manufacture of leather and related products'; C16 'Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials'; C17 'Manufacture of paper and paper products'; C18 'Printing and reproduction of recorded media'; C19 'Manufacture of coke and refined petroleum products'; C20 'Manufacture of chemicals and chemical products'; C21 'Manufacture of basic pharmaceutical products and pharmaceutical preparations'; C22 'Manufacture of rubber and plastic products'; C23 'Manufacture of other non-metallic mineral products'; C24 'Manufacture of basic metals'; C25 'Manufacture of fabricated metal products, except machinery and equipment'; C26 'Manufacture of computer, electronic and optical products'; C27 'Manufacture of electrical equipment'; C28 'Manufacture of machinery and equipment n.e.c.'; C29 'Manufacture of motor vehicles, trailers and semi-trailers'; C30 'Manufacture of other transport equipment'; C31 'Manufacture of furniture'; C32 'Other manufacturing'; C33 'Repair and installation of machinery and equipment'; D35 'Electricity, gas, steam and air conditioning supply'; E36 'Water collection, treatment and supply'; E37 'Sewerage'; E38 'Waste collection, treatment and disposal activities; materials recovery'; E39 'Remediation activities and other waste management services'; F41 'Construction of buildings'; F42 'Civil engineering'; F43 'Specialised construction activities'; G45 'Wholesale and retail trade and repair of motor vehicles and motorcycles'; G46 'Wholesale trade, except of motor vehicles and motorcycles'; G47 'Retail trade, except of motor vehicles and motorcycles'; H49 'Land transport and transport via pipelines'; H50 'Water transport'; H51 'Air transport'; H52 'Warehousing and support activities for transportation'; H53 'Postal and courier activities'; I55 'Accommodation'; I56 'Food and beverage service activities'; J58 'Publishing activities'; J59 'Motion picture, video and television programme production, sound recording and music publishing activities'; J60 'Programming and broadcasting activities'; J61 'Telecommunications'; J62 'Computer programming, consultancy and related activities'; J63 'Information service activities'; L68 'Real estate activities'; M69 'Legal and accounting activities'; M70 'Activities of head offices; management consultancy activities'; M71 'Architectural and engineering activities; technical testing and analysis'; M72 'Scientific research and development'; M73 'Advertising and market research'; M74 'Other professional, scientific and technical activities'; M75 'Veterinary activities'; N77 'Rental and leasing activities'; N78 'Employment activities'; N79 'Travel agency, tour operator and other reservation service and related activities'; N80 'Security and investigation activities'; N81 'Services to buildings and landscape activities'; N82 'Office administrative, office support and other business support activities'.

Source: Eurostat, National Statistical Offices, DIW Econ

Most NFBS enterprises operate in the low-knowledge intensity service industries and, to a much lesser extent, in the knowledge-intensive service industries. Relatively few operate in goods-producing industries (Figure 4). These overall observations reflect the distribution of SMEs across the various industry groups.

In contrast to the pattern shown by large enterprises (with a slightly large share of these enterprises operating in the high-tech goods-producing industries than in the other goods-producing industries), the shares and differences in the shares of SMEs operating in the high-, medium- and low-tech goods-producing industries are very small (Figure 5).

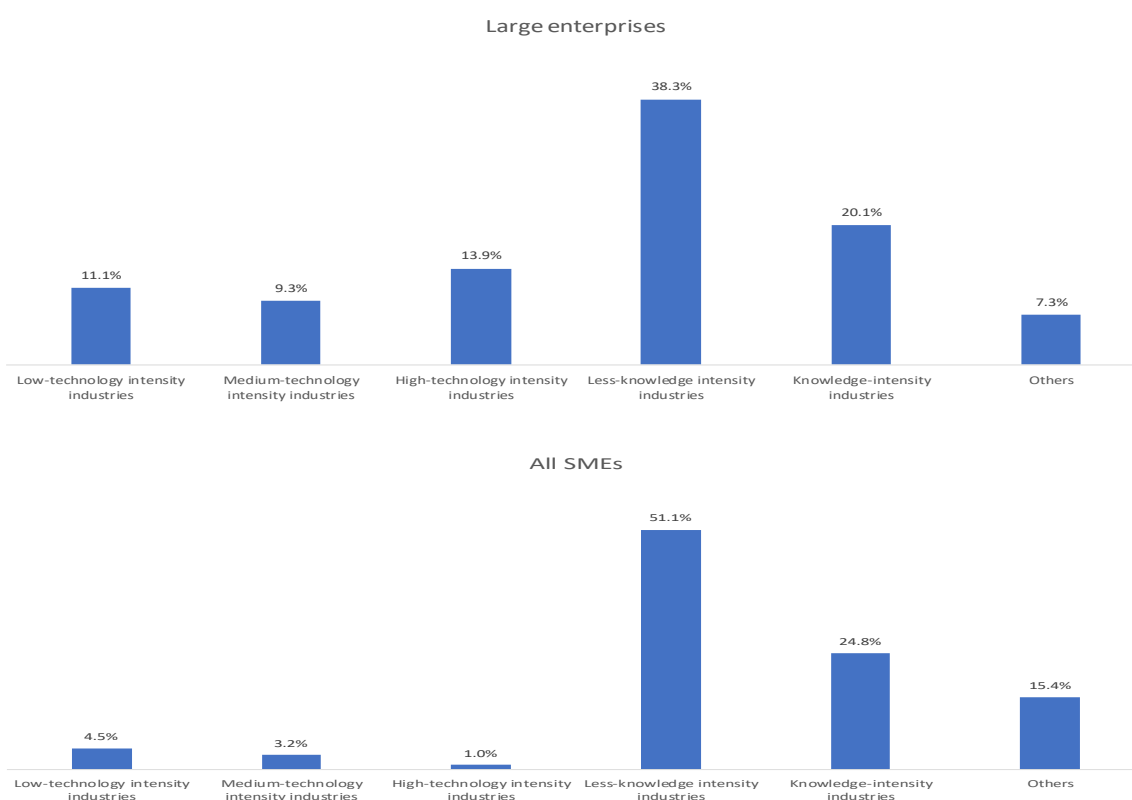
Figure 4 Share of enterprises in industries of different knowledge and technology intensities in total NFBS enterprise population in the EU-28 in 2018

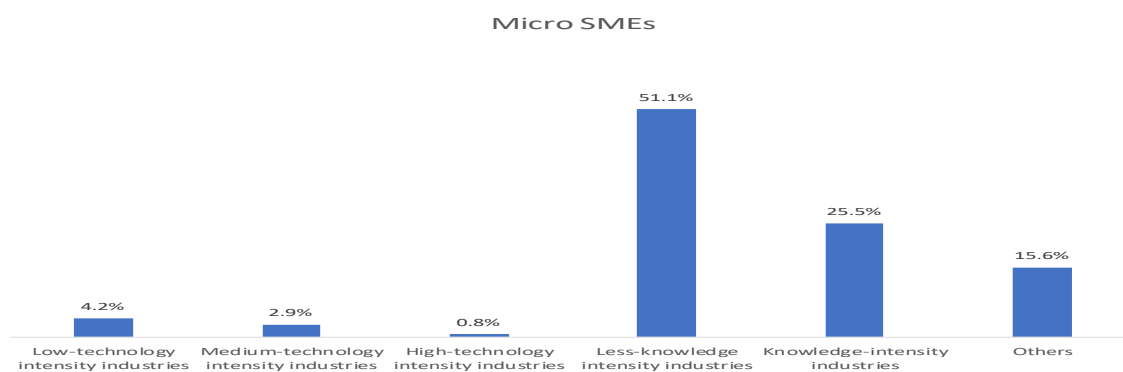
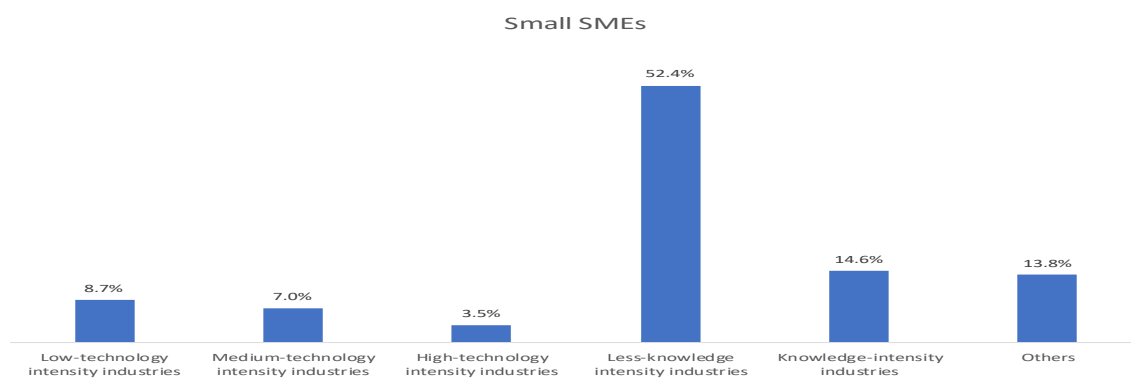
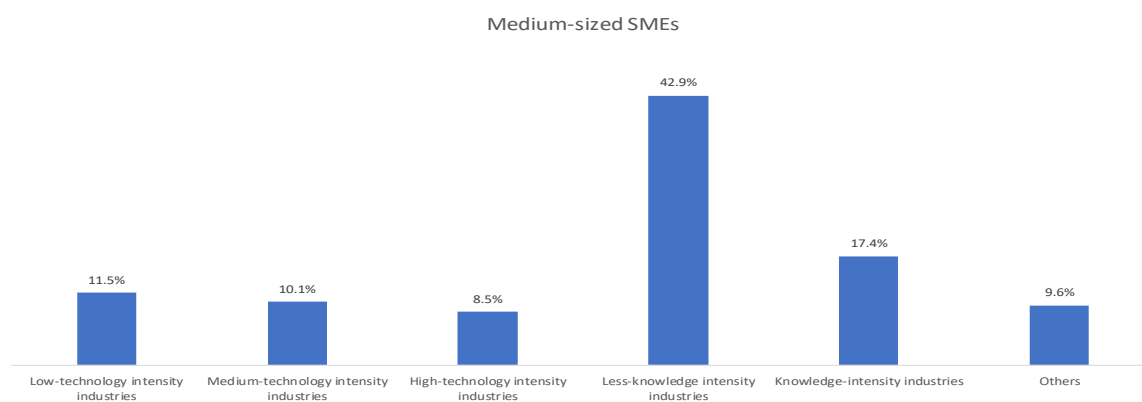


Note: see composition of different industry groupings in Annex 6. The group “others” includes ‘mining and quarrying’, ‘electricity, gas, steam and air conditioning supply’, ‘water supply, sewerage, waste management and remediation activities’ and ‘construction’.

Source: Eurostat, National Statistical Offices, DIW Econ

Figure 5 Distribution of enterprises in an enterprise size class among industries of different technology and knowledge intensities - % of NFBS enterprise size class in the EU-28 in 2018





Note: see composition of different industry groupings in Annex 6. The group "others" includes 'mining and quarrying', 'electricity, gas, steam and air conditioning supply', 'water supply, sewerage, waste management and remediation activities' and 'construction'.
Source: Eurostat, National Statistical Offices, DIW Econ

2 The R&D and innovation potential of the SME population in the EU-28 Member States

Key points

Only 49.5% of small and medium-sized SMEs undertook an innovation activity over the period 2014-2016.

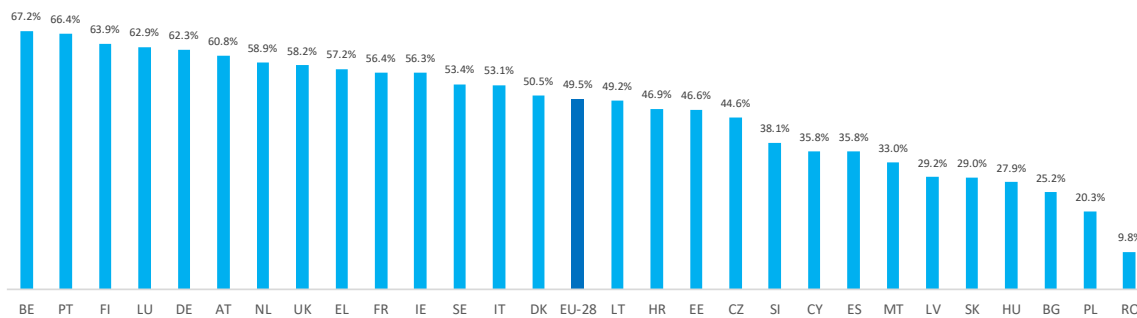
SMEs active in industries characterised by high or very high R&D intensity represented 27.3% of the SME population in the EU-28 NFBS and accounted for 31% of EU-28 NFBS SME value added in 2018.

SMEs active in industries with high or very high innovation intensity represented 14% of the SME population in the EU-28 and generated 27% of EU-28 NFBS SME value added.

As this year's Annual Report focuses on the R&D and innovation performance of EU-28 SMEs, the review of developments in the EU-28 SME sector of the NFBS discusses not only the recent performance of SMEs by enterprise size class, but also, in the first part of the report, presents information on the performance of EU-28 SMEs in industries of different R&D, innovation, knowledge and technology intensities.

According to the 2016 Community Innovation Survey (CIS)¹³, only 49.5% of small and medium-sized SMEs¹⁴ undertook an innovation activity over the period 2014-2016 (Figure 6). These SMEs had either introduced an innovation or had undertaken innovation activities which either were on-going or had been abandoned/suspended in 2014-2016. In half of the EU-28 Member States (BG, CY, CZ, EE, ES, HR, HU, LT, LV, MT, PL, RO, SK and SI), more than 50% of small and medium-sized SMEs were not engaged in any innovation activity (Figure 6).

Figure 6 Share of small and medium-sized EU-28 SMEs which reported having undertaken some innovation activity over the period 2014-2016



Note: The SME population in the CIS includes only small and medium-sized enterprises. An innovating SME is a SME which in 2014-2016 had either introduced an innovation or had any kind of innovation activity (including enterprises with abandoned/suspended or on-going innovation activities).

Source: Eurostat – 2016 CIS

The R&D performance of small and medium-sized SMEs shows a similar picture. Only 47% of EU-27¹⁵ small and medium-sized SMEs undertook in-house R&D over the period 2014-2016 and only 28% of these SMEs outsourced R&D activities (Figure 7).

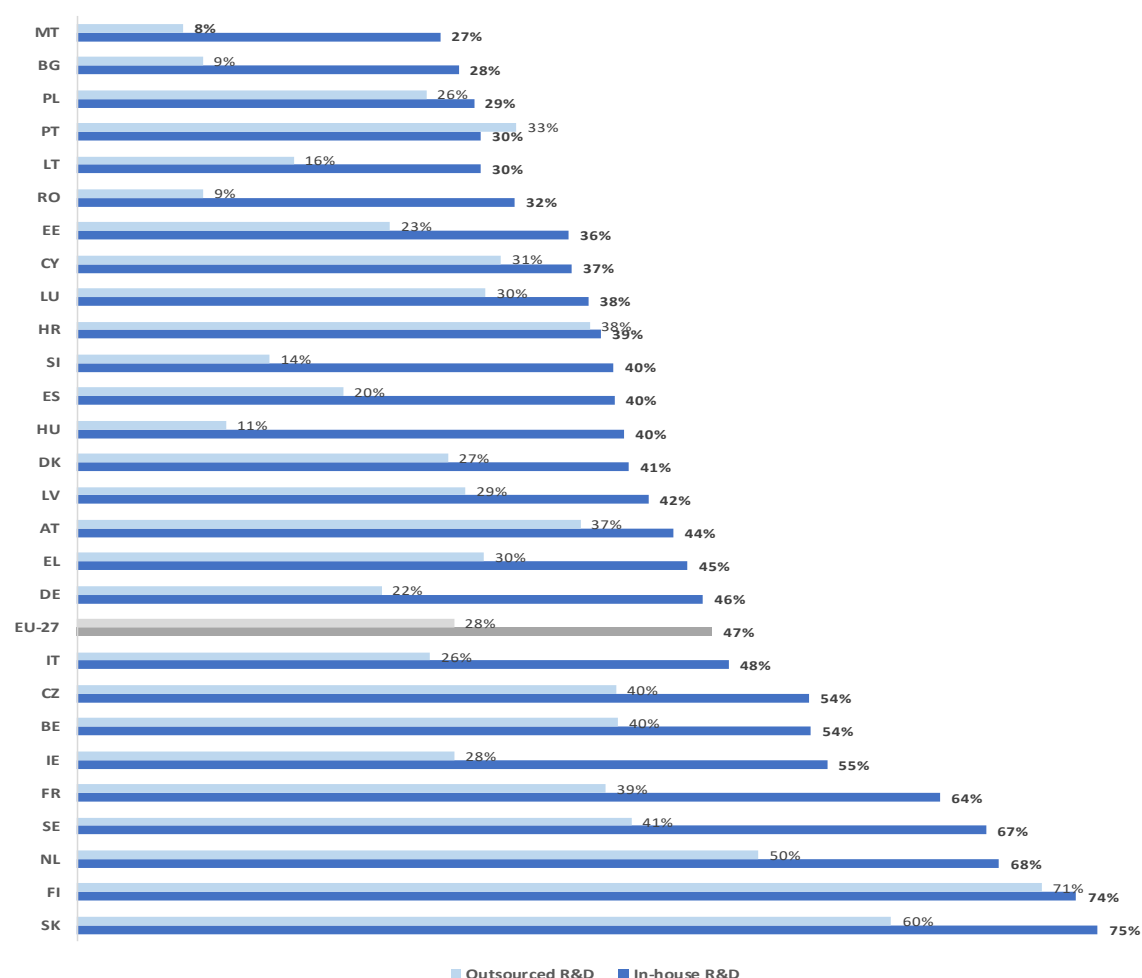
¹³ This is the latest CIS for which data are available.

¹⁴ The CIS does not cover micro SMEs.

¹⁵ Data are not available for the UK.

Across the EU-27, in only eight Member States (BE, CZ, FI, FR, IE, NL, SE and SK) did more than half of small and medium-sized SMEs undertake in-house R&D, and in only three Member States (FI, NL and SK) did more than half of small and medium-sized SMEs outsource R&D activities (Figure 7). More generally, Member States in which a large proportion of the small and medium-sized SMEs undertook in-house R&D were also Member States in which a relatively larger share of small and medium-sized SMEs outsourced R&D activities (Figure 7).¹⁶

Figure 7 Share of small and medium-sized EU-27 SMEs which reported having undertaken in-house R&D or having outsourced R&D activities over the period 2014-2016



Note: The SME population in the CIS includes only small and medium-sized enterprises. No data are available for the UK.

Source: Eurostat – 2016 CIS

The fact that many SMEs do not undertake any innovation or R&D activity does not mean that they could not do so. To shed further light on the potential of the SME sector to engage in R&D and innovation, this section provides an estimate of the R&D and innovation potential of the SMEs in the NFBS of each Member State.

Such an estimation involves an assessment of the extent to which the SME sector in the NFBS of each Member State is comprised of industries in which R&D and/or innovation are more likely to occur.

¹⁶ The correlation between the proportion of small and medium-sized SMEs undertaking in-house R&D and outsourcing R&D activities is 0.82. The detailed analysis of the CIS microdata in the Background Document examines the extent to which an SME simultaneously undertakes in-house R&D and outsources R&D.

The assessment is based on a benchmarking of the industries in which most R&D and innovation activities occur and the results of the benchmarking are summarised in the indices of R&D Potential and Innovation Potential.

2.1 The Index of the R&D Potential

Box 1

Construction of the Index of the R&D Potential of the Member States’ SME population

The R&D index provides an estimate of SME R&D potential in the EU-28 and in individual Member States, and has been constructed as follows.

$$R\&D\ Index_m = \sum_{i=1}^{38} w_{im} * score_i$$

where ‘m’ denotes a Member State and ‘i’ a NACE 2-digit industry. In total, the analysis covers 37 NACE 2 industries at division level and 1 sector at section level in the calculations¹⁷. Each NACE 2 industry was classified as 1 (very low), 2 (low), 3 (average), 4 (high) or 5 (very high) based on average R&D expenditure in that industry in the five Member States with the highest levels of R&D expenditure across all industries in 2015.¹⁸ These classifications were then used as a rating of the industry’s potential in all Member States. ‘w_{im}’ is the weight for NACE 2 industry ‘i’ in Member State ‘m’. This is the share of industry ‘i’ SME value added in total SME value added in the NFBS in Member State ‘m’ in 2015.

Statistics about Member States’ R&D expenditure were sourced from the OECD’s Analytical Business Enterprise Research and Development (ANBERD) database. The most recent year for which data is available for most Member States is 2015, which was therefore chosen to calculate the scores. However, data on NACE 2 industry R&D expenditure was unavailable for many Member States. As a result, using Eurostat statistics from 2015 on industry business expenditure on R&D (as a percentage of value added in the industry), the five Member States (AT, BE, DE, DK, FI) in which industry spent most overall on R&D were used as benchmarks. Using the ANBERD database, a score of 1 to 5 was then assigned to each NACE 2 industry based on the industry expenditure on R&D in those 5 Member States.¹⁹ For example, if an industry’s average R&D expenditure (as a percentage of value added in the industry) was among the highest across all industries in those five Member States, then the industry was assigned a score of 5 in all Member States.

Table 4 below shows the allocation of industries across the various R&D intensity classes.

17 Some NACE divisions were aggregated because some granular information was missing in a NACE section but data were available for the aggregated level. Industries B07, B08 and B09 were aggregated into B (Mining and Quarrying) at section level because it was the narrowest class with data available in the OECD ANBERD database. See table 4 for the list of sectors.

18 AT, BE, DE, DK, FI.

19 SE led EU-28 Member States in terms of total NACE business expenditure on R&D in 2015. However, SE was not chosen as a benchmark country because data were missing for many of the Swedish NACE 2 sectoral R&D expenditures.

Table 4 R&D intensity of different NACE industries

R&D intensity scores	Industry
1 (very low)	<ul style="list-style-type: none"> • Accommodation and food service activities • Administrative and support activities • Construction • Manufacture of leather and related products • Real estate activities • Transportation and storage
2 (low)	<ul style="list-style-type: none"> • Electricity, gas, steam and air conditioning supply & water supply, sewerage, waste management and remediation activities • Manufacture of furniture • Manufacture of paper and paper products • Manufacture of tobacco products • Manufacture of wearing apparel • Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials • Mining and quarrying • Printing and reproduction of recorded media • Wholesale and retail trade, repair of motor vehicles and motorcycles
3 (average)	<ul style="list-style-type: none"> • Manufacture of coke and refined petroleum products • Manufacture of fabricated metal products, except machinery and equipment • Manufacture of textiles • Programming and broadcasting activities • Repair and installation of machinery and equipment • Telecommunications
4 (high)	<ul style="list-style-type: none"> • Manufacture of basic metals • Manufacture of chemicals and chemical products • Manufacture of food products and beverages • Manufacture of other non-metallic mineral products • Information service activities
5 (very high)	<ul style="list-style-type: none"> • Computer programming, consultancy and related activities • Manufacture of basic pharmaceutical products and pharmaceutical preparations • Manufacture of computer, electronic and optical products • Manufacture of electrical equipment • Manufacture of machinery and equipment n.e.c. • Manufacture of motor vehicles, trailers and semi-trailers • Manufacture of other transport equipment • Manufacture of rubber and plastic products • Motion picture, video and television programme production, sound recording and music publishing activities • Other manufacturing • Professional, scientific and technical activities • Publishing activities

Note: Industries were scored by using the average R&D business expenditure on R&D (as a percentage of value added) in all NACE activities in the five Member States (AT, BE, DE, DK, FI) with the highest levels of R&D expenditure across all industries in 2015.

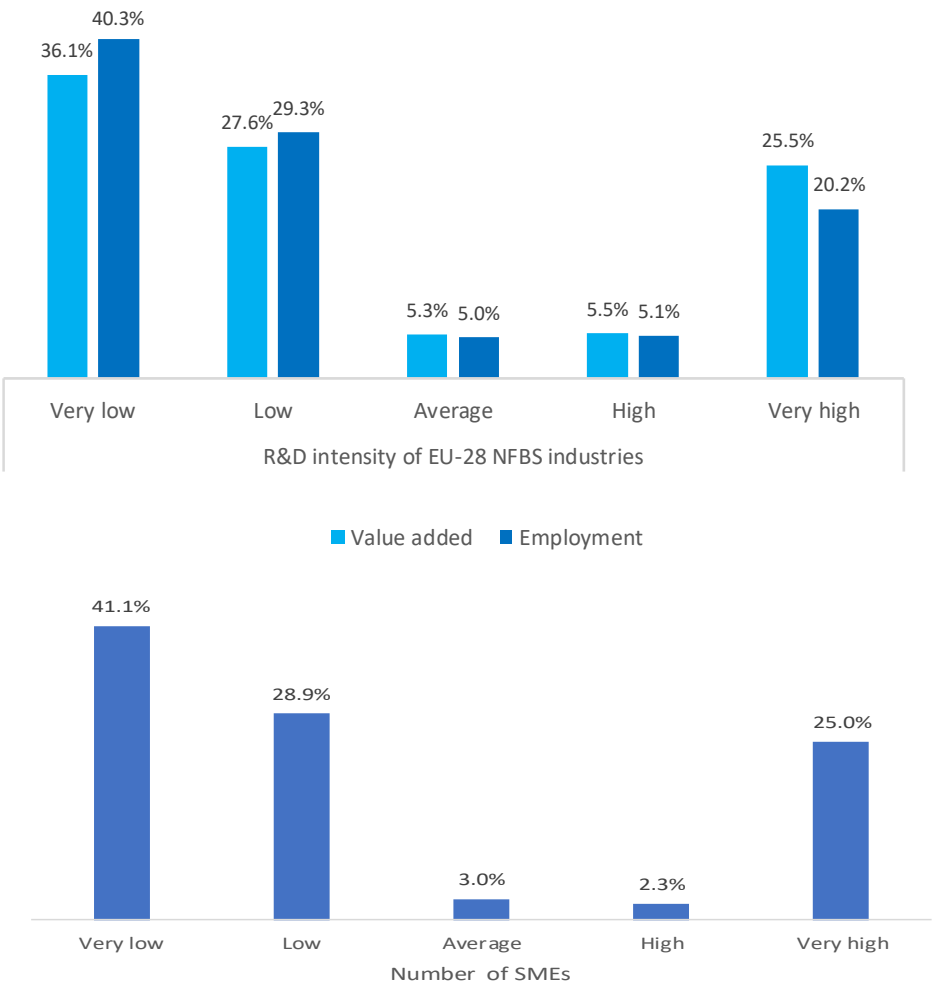
Source: Eurostat, OECD ANBERD and LE Europe

At the EU-28 level, 70.0% of the SMEs in the NFBS are in the industries of very low or low R&D intensity and only 27.3% operate in industries of high or very high R&D intensity.

The share of SME value added in total EU-28 NFBS SME value added generated by SMEs operating in industries characterised by very high R&D intensity was only 25.5% in 2018 (Figure 8). SMEs operating in industries of high R&D intensity accounted for another 5.5% of total SME value added in the NFBS. In contrast, SMEs active in industries of very low or low R&D intensity generated almost ⅔ (63.7%) of total SME value added in the NFBS in 2018.

The distribution of SME employment in the NFBS in 2018 broadly mirrors that of SME value added, with the share of SME employment in industries of very low or low R&D intensity being slightly higher than in the case of value added (69.6% versus 63.7%) and slightly lower in industries of very high R&D intensity (20.2% versus 25.5%).

Figure 8 Share of SME NFBS value added and employment and number of enterprises in industries of different R&D intensity in 2018



Source: Eurostat, OECD ANBERD, DIW Econ and LE Europe

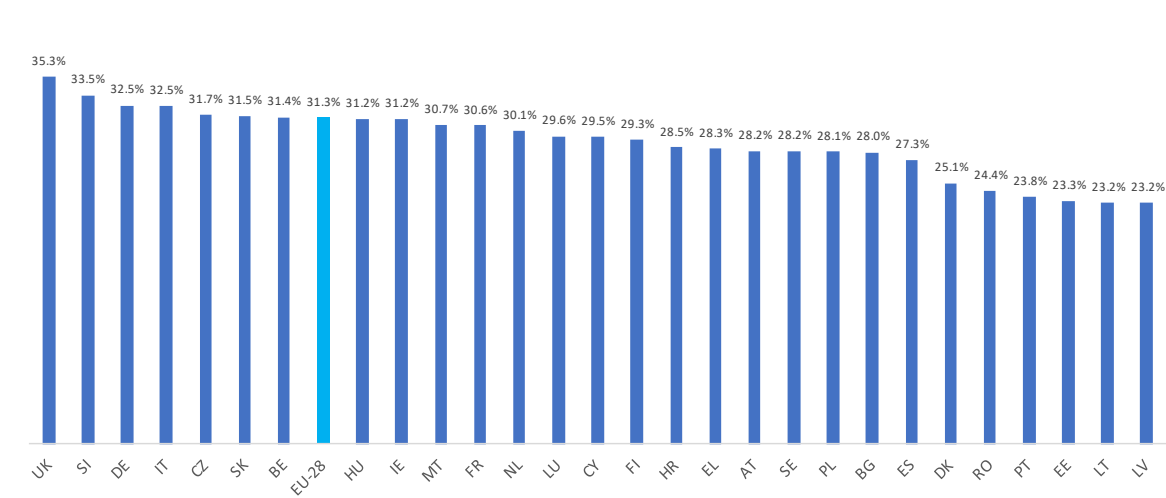
Within the EU-28, in 2018, the share of SME value added generated by SMEs in industries of very high or high R&D intensity ranged from 35.3% in the UK to 23.2% in LT and LV. However, most Member States showed relatively little difference in this R&D metric, with 16 Member States clustering within + / - 3 percentage points of the EU-28 average of 31.3% (Figure 9).²⁰

Reflecting the fact that most SMEs operate in industries characterised by average to low R&D intensity, the index of SME R&D potential varied relatively little across Member States

²⁰ Annex 7 provides detailed Member State information on the share of value added accounted for by SMEs in each of the R&D industry groupings.

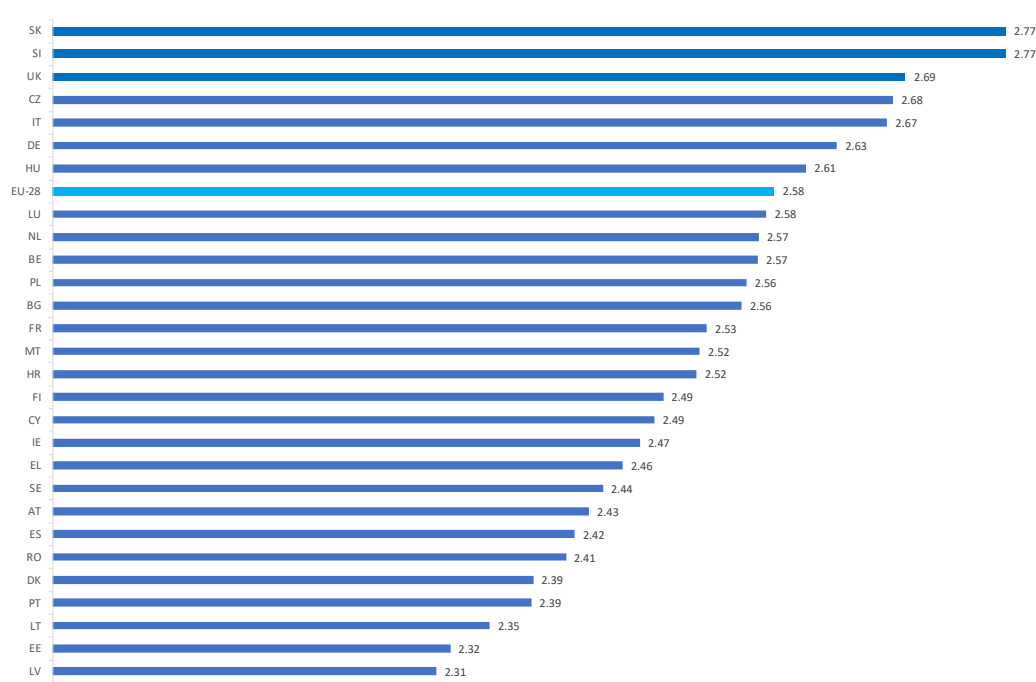
in 2018, ranging from 2.77 (the highest value) in the case of SI and SK to 2.31 in the case of LV (Figure 10). At EU-28 level the index stood at 2.58 and the index for most Member States was below this EU-28 level (Figure 10).

Figure 9 Share of SME NFBS value added generated by SMEs in the industries with the highest R&D intensity in 2018



Source: Eurostat, OECD ANBERD, DIW Econ and LE Europe

Figure 10 Index of SME R&D potential



Source: Eurostat, OECD ANBERD, DIW Econ and LE Europe

2.2 The Index of Innovation Potential

A broadly similar approach was adopted for the computation of the Index of Innovation Potential.

Box 2

Construction of the Index of the Innovation Potential of the Member States' SME population

The formula to construct the Index of Innovation Potential is the same as that used for constructing the Index of R&D Potential. However, the industries covered by this index are analysed at a less granular level than in the Index of R&D Potential, as most of the relevant data are provided by Eurostat only at a higher level of industry aggregation than the R&D data. The benchmark countries for this index are AT, DE, FI, LU and PT, based on their level of innovation spending across all industries for which data are available. Six NFBS industries are covered by the index, namely 'electricity, gas, steam and air conditioning supply', 'information and communication', 'manufacturing', 'mining and quarrying', 'transportation and storage' and 'water supply, sewerage, waste management and remediation activities'. The other six industries in the NFBS were omitted because innovation data were not available for all Member States. Table 5 lists the industries by innovation score.

As in the case of the R&D Index, an estimate of the SME innovation potential of each Member State was derived by taking the weighted average of the scores of the six industries, with the weights being equal to the share of SME value added produced by the industry in the total SME value added of the six industries in 2018.

Table 5 Innovation intensity of different industries

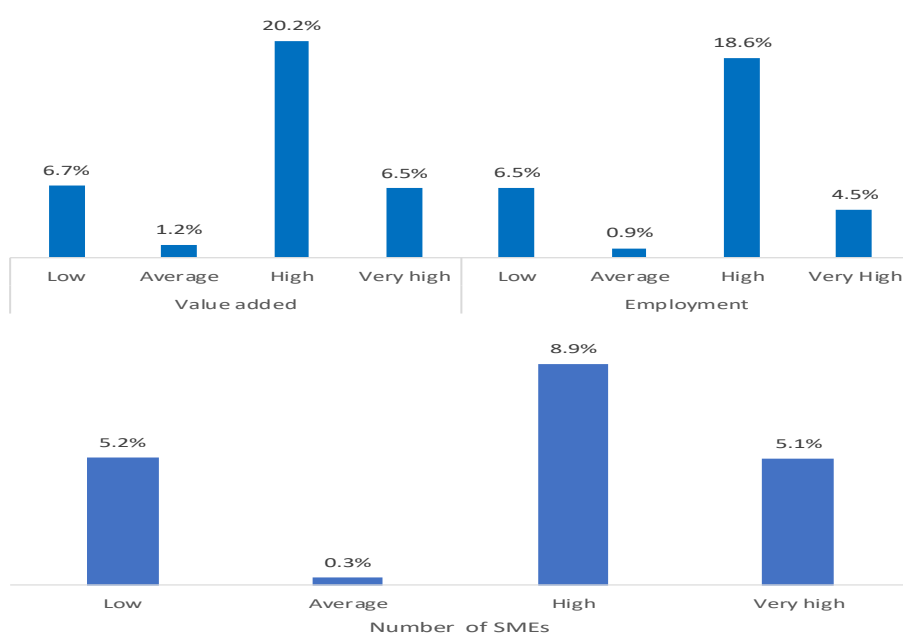
Innovation score	Industry
1 (very low)	–
2 (low)	B (Mining and quarrying) and H (Transportation and storage)
3 (average)	E (Water supply; sewerage, waste management and remediation activities)
4 (high)	C (Manufacturing) and D (Electricity, gas, steam and air conditioning supply)
5 (very high)	J (Information and communication)

Note: see Box 2 for details of scoring methodology

Source: Eurostat and LE Europe

In 2018, the six industries listed in Table 5 accounted for only 35% of total SME value added in the NFBS. However, most of these industries (in terms of number of enterprises, value added and employment) are high or very high innovation intensity industries, and generated a combined share of 26.7% of total SME value added in the NFBS (Figure 11).

Figure 11 Share of SME NFBS value added, employment and number of enterprises in industries of different innovation intensity in 2018



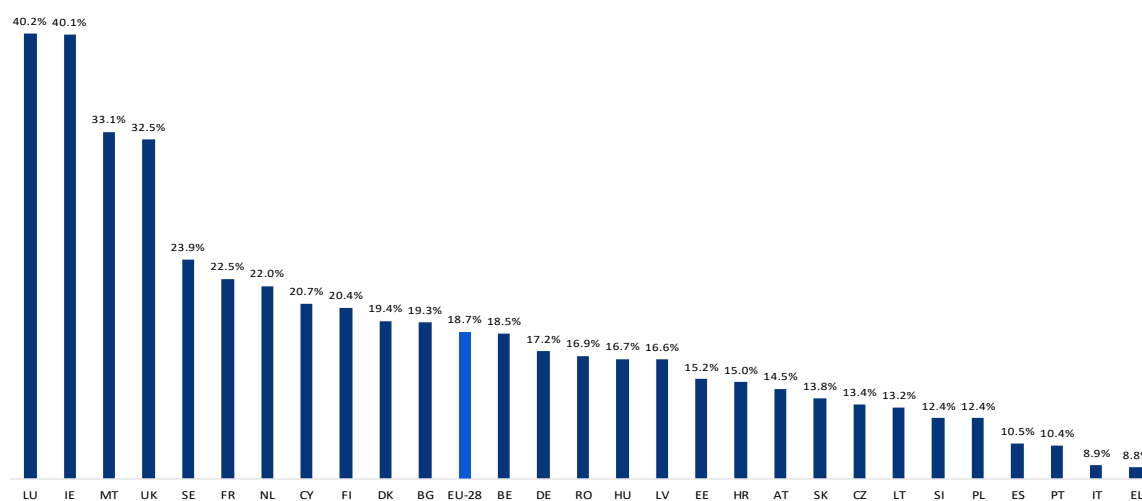
Note: Data on innovation by SMEs are available for all Member States only for the following industries: 'electricity, gas, steam and air conditioning supply', 'information and communication', 'manufacturing', 'mining and quarrying', 'transportation and storage' and 'water supply, sewerage, waste management and remediation activities'. These six industries account for only 35% of total value added generated by EU-28 SMEs in the NFBS in 2018. The industries for which SME innovation data are not available for all Member States include 'administrative and support service activities', 'accommodation and food services activities', 'construction', 'professional, scientific and technical activities', 'real estate activities' and 'wholesale and retail trade; repair of motor vehicles and motorcycles'.

Source: Eurostat, DIW Econ and LE Europe

The SME share of NFBS value added generated in 'information and communication', the only industry among the six industries with a very high innovation intensity (i.e. a rating of 5), varied greatly among Member States in 2018, ranging from 40.2% and 40.1% in LU and IE respectively to 8.8% in EL (Figure 12).

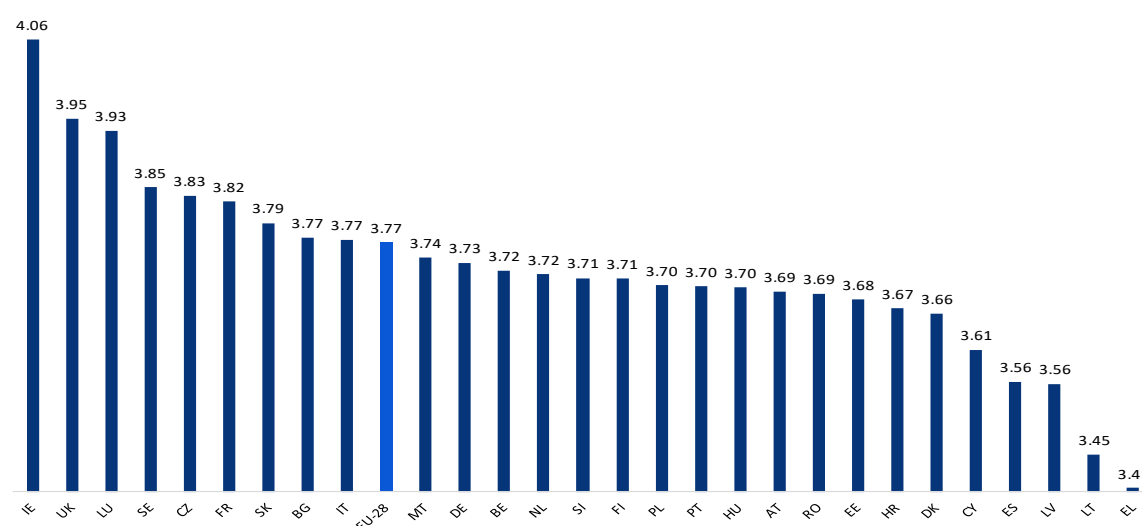
The innovation index also shows a marked variation across Member States in 2018, ranging from 4.06 (the highest value) in IE to 3.41 in EL (the lowest value) (Figure 13). The EU-28 index level stood at 3.77.

Figure 12 Share of value added generated by SMEs in the industries with the highest innovation intensity in total value added generated by SMEs in the different innovation industry groups in 2018



Source: Eurostat, DIW Econ and LE Europe

Figure 13 Index of Innovation Potential



Source: Eurostat, DIW Econ and LE Europe

Both the Index of R&D Potential and the Index of Innovation Potential highlight that, in general, the NFBS SME sector of Member States shows an about average R&D and innovation potential. This reflects the fact that many SMEs operate in industries with low R&D or innovation intensities.

The distribution of EU-28 SME value added and employment across industries of different knowledge or technology intensity yields a broadly similar picture (Table 6). A few key facts are particularly noteworthy:

- SMEs account for only 26% of the value generated by the high-tech industry group whereas, in all other technology or knowledge industry groups, the share of value added created by SMEs ranges from 53% (low-tech industry group) to 65% (less knowledge-intensive group) (Table 6).
- The differences in the share of SME employment in total industry group employment are also very marked, with SMEs accounting for only 37% of total industry group employment in the high-tech industry group. In contrast, in the other industry groupings, SMEs account for 53% (medium-tech industry group) to 70% (low-tech industry group) of industry group employment (Table 6).

- Moreover, 52% of SME value added and 57% of SME employment in the NFBS are accounted for by SMEs in the less knowledge-intensive industry group (Table 6).
- In contrast, only 33% of NFBS value added is generated by SMEs in the high-tech and knowledge-intensive industry groups and these SMEs account for only 26% of total SME employment in the NFBS (Table 6).

Table 6 Contribution of EU-28 SMEs in different industry groupings to a) industry group value added and employment and b) total SME value added and employment in the EU-28 NFBS* in 2018

		Industry grouping				
		Low-tech	Medium-tech	High-tech	Less knowledge-intensive	Knowledge intensive
Share of SMEs in industry group	Value added	53.0%	55.9%	25.8%	64.7%	57.0%
	Employment	69.5%	52.8%	36.5%	69.2%	62.5%
Share of industry SME in total SMEs in NFBS	Value added	7.5%	7.8%	6.7%	51.7%	26.3%
	Employment	9.2%	7.3%	4.6%	57.4%	21.4%

Notes: See Annex 6 for details of allocation of different industries to industry groupings. NFBS* = NFBS excluding the following industries: 'construction', 'electricity, gas, steam and air conditioning supply', 'mining and quarrying' and 'water supply, sewerage, waste management and remediation'. The share of SMEs in industry group is the share of total value added of an industry group which is generated by SMEs in that particular industry group such as, for example, in the knowledge industry group. The share of industry SME in total SMEs in NFBS is the share of total NFBS value added generated by SMEs in a particular industry group.

Source: Eurostat, National Statistical Offices and DIW Econ

As already noted, SMEs in the high-tech industry account for a low share of total value added in the NFBS – IT is the Member State in which SMEs in the high-tech industry contribute most (11%) to value added in the NFBS. Other Member States with a notable contribution made by high-tech SMEs to NFBS value added include CZ (9%), FI (8%) and SI (8%) (Table 7).

The contribution of SMEs in the knowledge-intensive industries to NFBS value added is more substantial and is equal to 25% or more of total value added generated by the NFBS in the following Member States: BE (29%), CY (26%), DE (25%), FI (28%), FR (29%), IE (31%), LU (30%), MT (35%), NL (28%), SE (27%) and UK (40%) (Table 7).

The contribution of SMEs in the high-tech and knowledge industries to NFBS employment shows a similar pattern (Table 7).

Table 7 Contribution of SMEs in different industry groupings to total SME value added and employment in the NFBS* of Member States in 2018

	Share of SME in each technology or knowledge groupings in all technology and knowledge groupings, 2018									
	VA					Employment				
	low-tech	medium-tech	high-tech	less-knowledge intensive	knowledge intensive	low-tech	medium-tech	high-tech	less-knowledge intensive	knowledge intensive
AT	7.6%	6.8%	7.0%	56.5%	22.1%	8.7%	6.3%	4.4%	58.7%	21.9%
BE	7.0%	6.4%	5.6%	52.4%	28.6%	8.0%	6.1%	3.6%	58.2%	24.1%
BG	10.7%	6.9%	6.1%	55.8%	20.5%	17.1%	6.9%	3.6%	57.4%	15.0%
CY	8.0%	5.7%	1.7%	58.3%	26.4%	9.0%	4.8%	1.2%	65.7%	19.2%
CZ	9.1%	13.1%	9.1%	47.9%	20.8%	12.1%	13.3%	8.4%	46.2%	19.9%
DE	6.2%	8.4%	7.9%	52.5%	25.0%	7.3%	7.7%	5.8%	57.8%	21.5%
DK	5.7%	6.4%	7.5%	57.7%	22.7%	5.8%	6.1%	5.7%	60.0%	22.4%
EE	13.5%	8.3%	5.1%	53.7%	19.5%	15.2%	8.0%	4.3%	52.6%	19.9%
EL	12.7%	5.9%	4.9%	56.9%	19.5%	8.3%	3.4%	1.6%	69.7%	17.0%
ES	8.9%	7.6%	6.0%	59.1%	18.4%	8.2%	5.7%	3.4%	66.5%	16.3%
EU28	7.5%	7.8%	6.7%	51.7%	26.3%	9.2%	7.3%	4.6%	57.4%	21.4%
FI	6.8%	8.2%	8.1%	49.4%	27.5%	7.6%	8.8%	6.4%	50.5%	26.7%
FR	7.1%	6.4%	4.6%	52.6%	29.3%	8.7%	6.2%	3.5%	55.6%	25.9%
HR	10.1%	9.2%	5.1%	54.1%	21.5%	14.2%	9.4%	4.5%	52.2%	19.6%
HU	7.9%	9.8%	6.2%	53.9%	22.2%	10.0%	8.7%	4.6%	53.5%	23.1%
IE	5.2%	3.6%	4.9%	55.7%	30.5%	5.7%	4.0%	2.6%	64.3%	23.4%
IT	12.1%	11.7%	11.1%	47.6%	17.5%	12.0%	9.4%	6.4%	56.1%	16.1%
LT	10.8%	6.0%	4.8%	60.8%	17.6%	15.7%	5.9%	2.6%	59.2%	16.6%
LU	2.1%	3.5%	2.0%	62.9%	29.5%	3.7%	4.1%	2.2%	58.4%	31.5%
LV	11.7%	5.4%	5.0%	57.2%	20.6%	14.0%	5.1%	2.7%	58.1%	20.0%
MT	4.9%	3.6%	2.9%	53.8%	34.7%	6.8%	3.8%	2.8%	64.0%	22.7%
NL	5.8%	6.1%	6.0%	54.0%	28.0%	5.6%	4.9%	3.9%	55.1%	30.5%
PL	11.1%	12.5%	6.1%	50.9%	19.4%	12.9%	10.5%	4.2%	54.7%	17.7%
PT	14.4%	8.8%	4.5%	55.7%	16.6%	15.3%	6.9%	2.7%	60.4%	14.6%
RO	10.2%	6.8%	6.0%	57.4%	19.5%	17.4%	7.2%	3.7%	56.0%	15.6%
SE	5.7%	7.2%	6.7%	53.0%	27.3%	6.0%	6.8%	5.0%	54.7%	27.5%
SI	8.9%	15.3%	8.4%	44.5%	22.8%	10.7%	14.1%	6.8%	45.0%	23.4%
SK	6.6%	14.1%	7.5%	50.4%	21.4%	10.6%	12.3%	5.7%	51.5%	20.0%
UK	5.3%	5.7%	4.7%	44.4%	39.9%	5.7%	5.6%	3.8%	56.5%	28.4%

Notes: See Annex 6 for details of allocation of different industries to industry groupings. NFBS* = NFBS excluding the following industries: 'construction', 'electricity, gas, steam and air conditioning supply', 'mining and quarrying' and 'water supply, sewerage, waste management and remediation'.

Source: Eurostat, National Statistical Offices and DIW Econ



Image by Gerd Altman from Pixabay

Part 1: The economic performance of EU SMEs and the evolution of the EU SME demography

Introduction to Part 1

The first section of Part 1 of the SME Annual Report reviews the economic performance of SMEs in recent years in the EU-28 as a whole and in Member States at the economy-wide level and in various industries.

The key economic performance indicators used in this analysis are the number of SMEs, SME value added and SME employment. The recent evolution of SME profitability and apparent SME labour productivity is also reviewed in this part of the report.

Finally, this first section concludes with a comparison of the performance of EU-28, US and Japanese SMEs.

The second section reviews recent developments in the implementation of the SBA.

The third section analyses the contribution of SMEs to economic growth in 2017 and 2018, and compares the most recent contribution of SMEs with the contribution they have made since 2013.

The fourth section presents the outlook for SMEs in the EU in 2019 and 2020.

The fifth and final section highlights recent developments in the SME population overall and, more specifically, among startups and scaleups.

Recent developments in the EU-28 SME sector

3 The economic environment faced by EU SMEs weakened in 2018

Key points

Overall economic growth in the EU-28 weakened in 2018.

EU-28 GDP increased by 2.1% in 2018 after growing by 2.5% in 2017.

As noted in the European Commission's Spring 2019 forecast, economic growth in the EU-28 slowed in 2018, reflecting a range of factors, such as weaker global economic growth and international trade, tightened global financing conditions, continued trade tensions and, more generally, high uncertainty.²¹

Overall, growth in GDP (at constant prices) slowed from 2.5% in 2017 to 2.1% in 2018 (Figure 14).

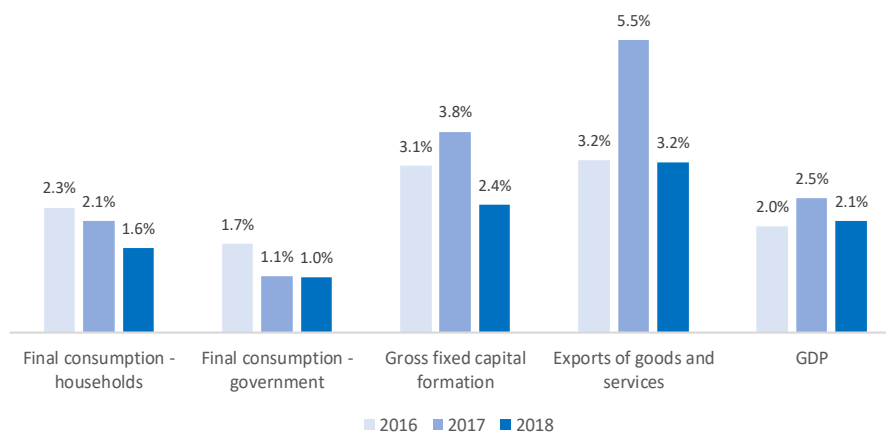
The slowdown in growth was particularly marked in the case of:

- final consumption of households (in constant prices): the annual growth rate of this major aggregate demand component fell from 2.1% in 2017 to 1.6% in 2018 (Figure 14)
- gross fixed capital formation (in constant prices): annual growth slowed to 2.4% in 2018 from 3.8% in 2017 (Figure 14)
- exports of goods and services (in constant prices): the annual growth rate of this previously major source of economic stimulus declined from 5.5% to 3.2% (Figure 14)

In contrast, final consumption of government (at constant prices) continued to expand in 2018 at roughly the same moderate rate as in 2017 (1.0% in 2018 versus 1.1% in 2017) (Figure 14).

²¹ European Commission (2019), Spring 2019 Economic Forecast – Overview, 7 May.

Figure 14 Evolution of key macroeconomic aggregate demand variables in the EU-28, 2016 to 2018



Note: all the economic variables in the figure above are expressed in constant prices.

Source: Eurostat

Not all SMEs are exposed to the same demand factors. Some are more sensitive to the evolution of the final consumption of households while others depend more on the strength of exports of goods and services, or gross fixed capital formation or the final consumption of government. Moreover, the level of SME activity in various industries may depend on more than one aggregate demand factor.

A simple correlation analysis shows that, among the 12 industries²² in the EU-28 NFBS, developments in most industries were highly correlated²³ with overall EU-28 GDP growth from 2008 to 2018. However, the impact of fluctuations in the growth of the different aggregate demand components varied greatly (Table 8):

- 'manufacturing' value added moved strongly in line with exports of goods and services and, to a slightly lesser extent, with gross fixed capital formation;
- growth in 'construction' value added was highly correlated with growth in gross fixed capital formation and to a lesser extent with exports of goods and services;
- growth in value added in 'wholesale and retail trade and repair of motor vehicles and motorcycles' was driven by the evolution of both gross fixed capital formation and the final consumption of households²⁴;
- growth of value added in 'transportation and storage' was driven mainly by growth in exports of goods and services and gross fixed capital formation;
- value added growth in 'accommodation and food services' reflected mainly growth in gross fixed capital formation and final consumption of households;
- value added growth in 'information and communication', 'professional, scientific and technical activities' and 'administrative and support service activities' depended on growth in export of goods and services and gross fixed capital formation; and,
- finally, changes in value added in 'mining and quarrying', 'electricity, gas, steam and air conditioning supply' and 'water supply, sewerage, waste management and remediation activities' were not strongly affected by any of the aggregate demand components and were also not even strongly related to changes in GDP.

²² These 12 industries are the NACE Rev 2 1-digit industries, the highest level of industry aggregation in the NACE classification. They are 'accommodation and food service activities', 'administrative and support service activities' 'construction', 'electricity, gas, steam and air conditioning supply', 'information and communication', 'manufacturing', 'mining and quarrying', 'professional, scientific and technical activities', 'real estate', 'transportation and storage', 'water supply, sewerage, waste management and remediation activities', 'wholesale and retail trade, repair of motor vehicles and motorcycles'.

²³ The correlation coefficient is 0.75 or greater over the period 2008 to 2018.

²⁴ The fact that the correlation of the growth rate of value added in 'wholesale and retail trade and repair of motor vehicles and motorcycles' with the growth rate of gross fixed capital formation is somewhat higher than the correlation with the growth rate of the final consumption of households reflects simply the fact that, at the margin, value added in 'wholesale and retail trade and repair of motor vehicles and motorcycles' is more sensitive to fluctuations in the growth rate of gross fixed capital formation. However, the trend growth in the final consumption of households is a more important driver of trend growth in 'wholesale and retail trade and repair of motor vehicles and motorcycles' than trend growth gross fixed capital formation.

Table 8 Value of correlation coefficient between annual growth of various aggregate components and annual growth of SME value in various industries – 2008 to 2018

	GDP	Final consumption of households	Final consumption of government	Gross fixed capital formation	Exports of goods and services
Accommodation and food service activities	0.82	0.76	-0.07	0.88	0.72
Administrative and support service activities	0.83	0.48	-0.56	0.77	0.91
Construction	0.91	0.78	-0.31	0.93	0.75
Electricity, gas, steam and air conditioning supply	0.42	0.09	-0.76	0.45	0.51
Information and communication	0.72	0.40	-0.54	0.75	0.79
Manufacturing	0.93	0.64	-0.44	0.84	0.98
Mining and quarrying	0.48	0.12	-0.63	0.38	0.65
Professional, scientific and technical activities	0.91	0.62	-0.51	0.87	0.96
Real estate	0.50	0.12	-0.61	0.43	0.54
Transportation and storage	0.92	0.67	-0.45	0.88	0.94
Water supply, sewerage, waste management and remediation activities	0.55	0.28	-0.25	0.41	0.70
Wholesale and retail trade, repair of motor vehicles and motorcycles	0.82	0.78	0.04	0.83	0.64

Note: all the economic variables are expressed in constant prices in the calculation of the correlation coefficient.

Source: Eurostat

4 The performance of SMEs in 2018

Key points

In 2018 in the EU-28 NFBS, the number of SMEs increased by 2.0%, SME value added by 4.1% and SME employment by 1.8%.

SME value added and employment grew in all Member States.

Across the various R&D industry groupings, the strongest growth in value added was 5.6%, generated by EU-28 SMEs in industries characterised by very low R&D intensity. Robust value added growth of 3.6% was also achieved by EU-28 SMEs in low R&D intensity industries.

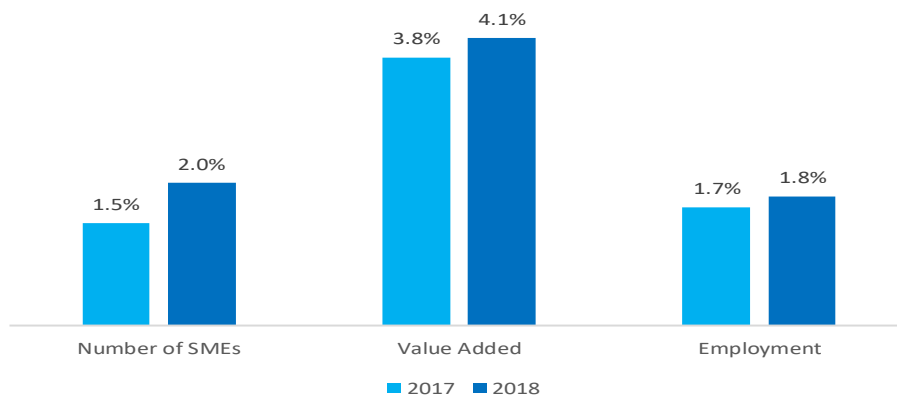
In contrast, in industries of greater R&D intensities, only SMEs which were active in industries of very high R&D intensity managed to accomplish similar robust value added growth of 3.8%.

4.1 The performance of the SME population in the NFBS in 2018

The EU-28 SME sector grew marginally faster in 2018 than in 2017 (Figure 15).

- Value added (in current prices) generated by SMEs in the NFBS increased by 4.1% in 2018, slightly more than the increase in GDP (in current prices) and economy-wide aggregate demand²⁵ and slightly more than the increase of 3.8% posted by EU-28 SMEs in 2017.
- SME employment growth increased marginally from 1.7% in 2017 to 1.8% in 2018.
- The number of SMEs increased by 2.0% in 2018 after growing by 1.5% in 2017.

Figure 15 Developments in key EU-28 SME performance indicators 2017 and 2018



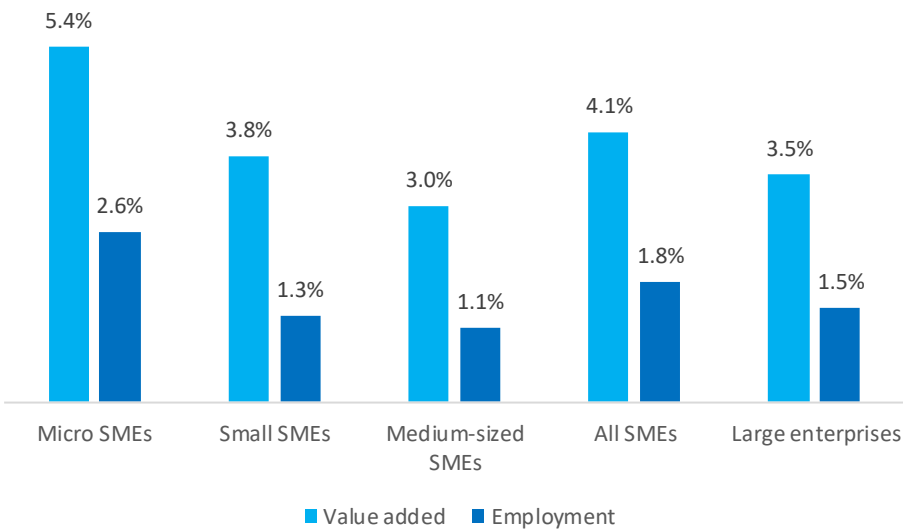
Source: Eurostat, National Statistical Offices and DIW Econ

EU-28 micro SMEs recorded by far the strongest growth of all enterprise size classes in both value added and employment in 2018 (Figure 16). In fact, the value added and employment performance of EU-28 small and medium-sized SMEs, and larger enterprises varied relatively little across these three size classes in 2018. Medium-sized EU-28 SMEs posted the weakest performance and small SMEs the strongest in terms of value added

²⁵ Nominal EU-28 GDP grew by 2.9% in 2017 and 3.2% in 2018, and EU-28 aggregate demand increased by 4.2% in 2017 and 3.8% in 2018.

growth. Micro SMEs were also by far the strongest performers in terms of employment (Figure 16).

Figure 16 Value added and employment growth in 2018 among various NFBS enterprise size classes in 2018



Source: Eurostat, National Statistical Offices and DIW Econ

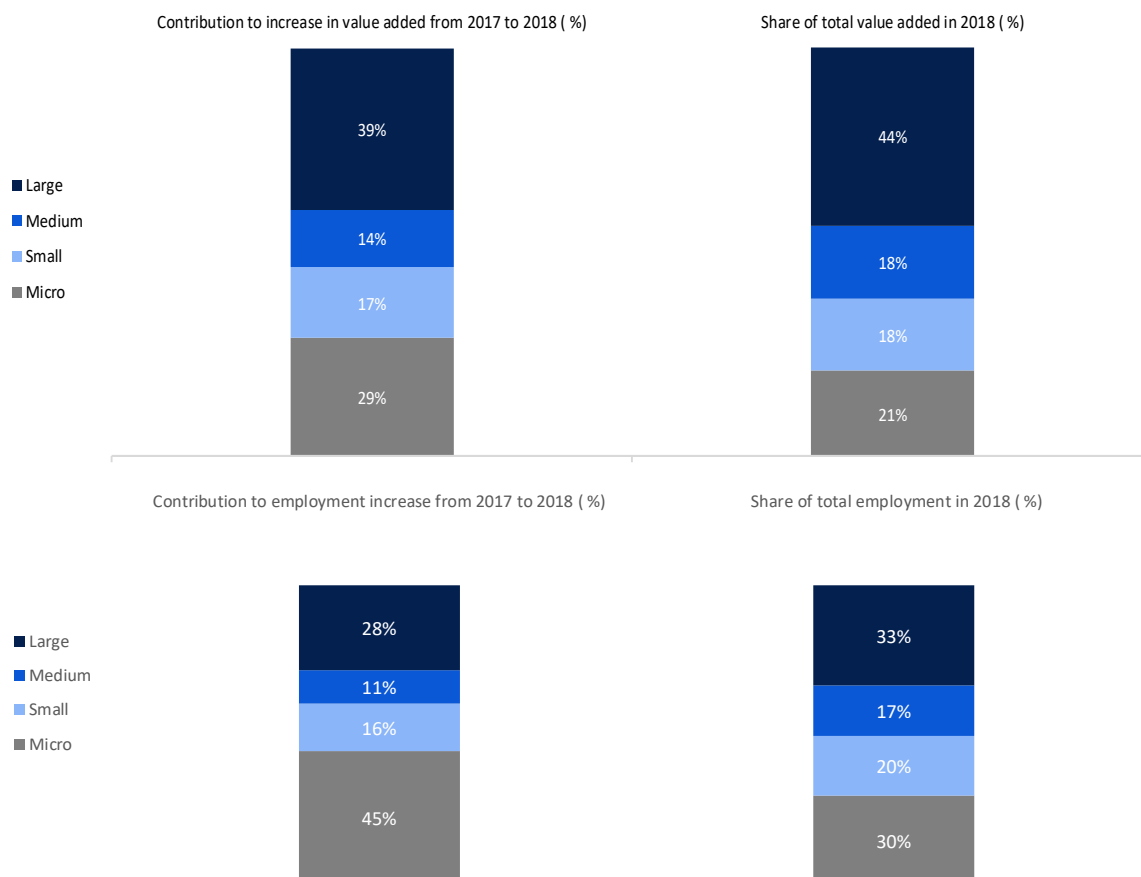
In 2018, EU-28 SMEs contributed slightly more than proportionately to NFBS value added growth compared to their actual share of NFBS value added, accounting for 60% of NFBS value added growth, although their share of NFBS value added was only 57% (Figure 17).

Micro SMEs accounted for a large part of this proportionately higher SME contribution to NFBS value added growth, as their contribution to value added growth in 2018 was 29%, while their share of value added in 2018 was only 21%.

A similar pattern can be observed with regard to employment. SMEs accounted for proportionately more of NFBS employment growth in 2018 than their overall NFBS employment share. Once again, micro SMEs were the main source of this development. The increase in micro SME employment reflected almost entirely the increase in the population of micro SMEs as the average number of persons employed by micro SMEs remained practically unchanged from 2017 to 2018.²⁶

²⁶ In 2017, micro SMEs employed on average 1.86 persons and, in 2018, this figure was 1.87.

Figure 17 Contribution of various enterprise size classes to growth in value added and employment in the EU-28 NFBS in 2018



Source: Eurostat, National Statistical Offices, DIW Econ

4.2 The performance of NFBS SMEs in Member States in 2018

SME value added in the NFBS grew in all Member States in 2018.

However, the rate of growth of SME value added varied greatly among Member States (Figure 18):

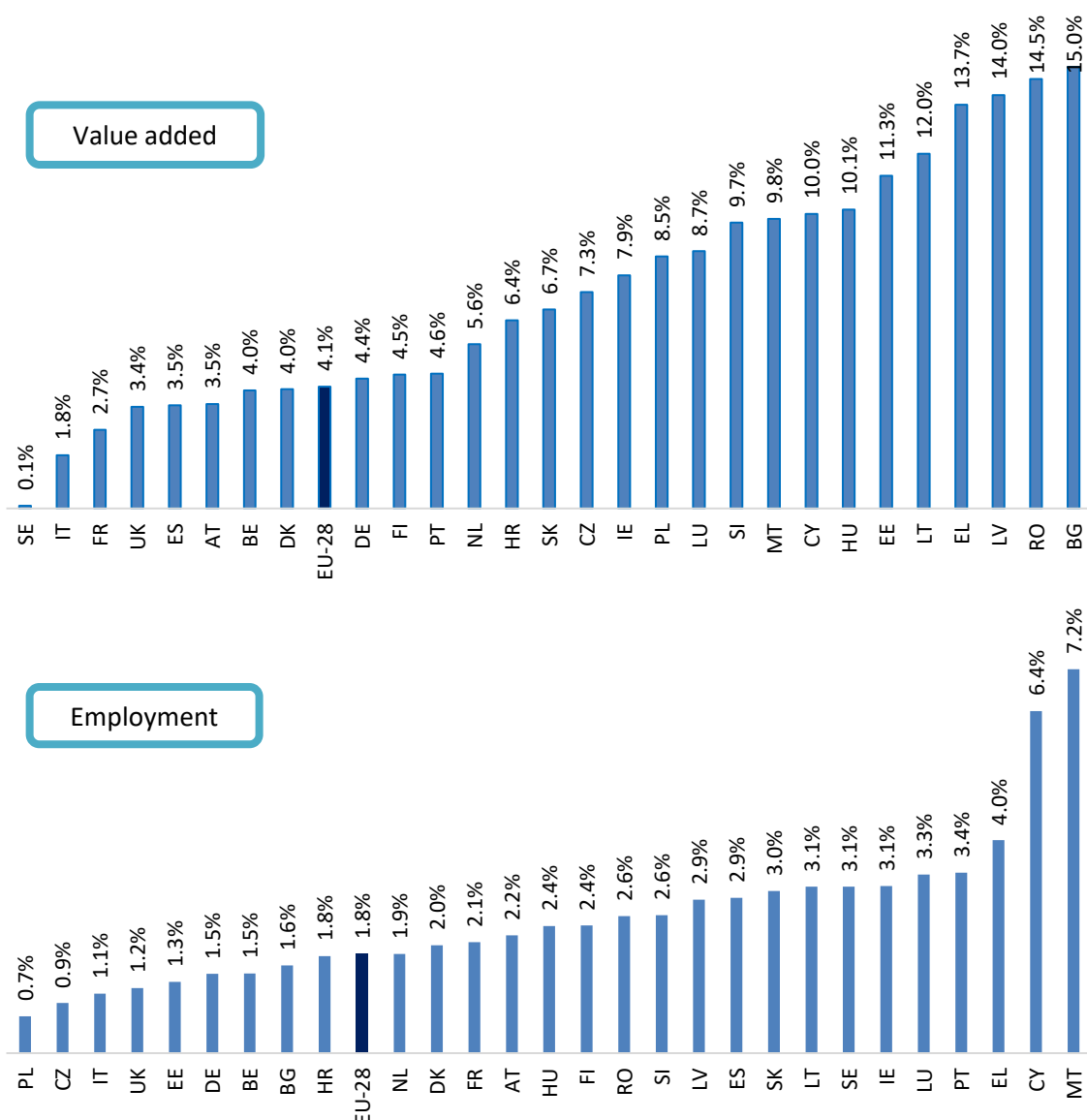
- The NFBS SME sector in eight Member States (BG, CY, EE, EL, HU, LT, LV, and RO) generated growth of 10% or more in 2018.
- In contrast, SME value added in the NFBS grew by less than 5% in ten Member States (AT, BE, DE, DK, ES, FI, FR, IT, PT, UK), and stagnated in SE.

SME employment in the NFBS also grew in all Member States in 2018.

However, the variation in SME employment growth across Member States was not as wide as that of SME value added. Instead it ranged from 0.7% (PL) to 7.2% (MT) (Figure 18).

The difference between the annual growth in value added and in employment is large in a number of Member States (for example, BG and RO). Typically, the substantial difference reflects a combination of higher inflation (and hence higher growth in value added at current prices) and higher productivity growth (and hence lower employment growth) in these Member States.

Figure 18 Annual change (in %) in SME value added and employment in the NFBS of EU Member States in 2018



Source: Eurostat, DIW Econ

Although, at EU-28 level, micro SMEs posted the strongest growth of all enterprise size classes in terms of value added and employment in the NFBS in 2018 (Figure 16), this was not the case in all Member States in 2018 (Table 9):

- micro SMEs in the NFBS generated the strongest growth in value added in only 13 Member States (CZ, DE, EE, ES, FI, HR, IT, LT, LU, PT, SE, SK and UK) and also in only 13 Member States in terms of employment (BE, CY, EE, EL, ES, FI, HR, LU, LV, MT, PT, RO and UK) (Table 9);
- small SMEs in the NFBS posted the strongest growth in value added in 8 Member States (AT, BE, BG, IE, EL, MT, NL and RO) and in employment in 3 Member States (BG, NL and SE) (Table 9);
- medium-sized SMEs in the NFBS showed the strongest value added growth in 3 Member States (DK, PL and SI) and in terms of employment growth, also in 3 Member States (DE, DK and SI) (Table 9); and,
- finally, large enterprises in the NFBS reported the strongest growth in value added in 4 Member States (AT, FR, HU and LV) and in employment in 9 Member States (AT, CZ, FR, HU, IE, IT, LT, PL and SK) (Table 9).

Table 9 Change (in %) in number of enterprises, value added and employment in the EU-28 and Member States by enterprise size class in 2018

	Micro SMEs			Small SMEs			Medium-sized SMEs			all SMEs			Large enterprises		
	Number of enterprises	Value added	Employment	Number of enterprises	Value added	Employment	Number of enterprises	Value added	Employment	Number of enterprises	Value added	Employment	Number of enterprises	Value added	Employment
AT	2.7%	3.3%	2.5%	1.9%	4.0%	1.8%	2.5%	3.3%	2.3%	2.6%	3.5%	2.2%	3.9%	5.0%	3.3%
BE	1.8%	3.7%	2.0%	0.6%	7.3%	1.1%	0.2%	0.5%	0.9%	1.8%	4.0%	1.5%	1.0%	1.0%	1.9%
BG	1.2%	17.9%	1.8%	0.9%	22.0%	1.9%	-0.2%	5.3%	1.1%	1.2%	15.0%	1.6%	-1.7%	8.1%	-0.3%
CY	6.5%	11.4%	7.5%	5.6%	12.3%	6.3%	3.6%	5.1%	4.4%	6.4%	10.0%	6.4%	4.2%	6.2%	5.1%
CZ	1.5%	11.5%	1.7%	0.6%	7.3%	0.6%	-0.1%	3.3%	0.1%	1.5%	7.3%	0.9%	2.4%	4.9%	2.7%
DE	1.3%	5.9%	1.5%	1.1%	4.4%	1.4%	1.2%	3.2%	1.6%	1.3%	4.4%	1.5%	0.6%	2.8%	1.0%
DK	2.2%	3.1%	-0.6%	4.7%	2.3%	1.9%	7.4%	6.4%	4.5%	2.5%	4.0%	2.0%	5.8%	4.7%	2.9%
EE	2.5%	15.8%	3.6%	-0.1%	10.6%	0.7%	-1.7%	6.8%	-1.1%	2.3%	11.3%	1.3%	-1.8%	7.8%	-0.3%
EL	3.0%	4.3%	9.4%	-12.4%	25.5%	-6.5%	-14.0%	10.8%	-7.9%	2.5%	13.7%	4.0%	-12.2%	1.9%	-7.6%
ES	3.9%	5.6%	3.5%	2.9%	1.6%	2.5%	2.2%	2.6%	1.8%	3.8%	3.5%	2.9%	3.5%	2.6%	3.2%
EU-28	2.1%	5.4%	2.6%	0.9%	3.8%	1.3%	0.6%	3.0%	1.1%	2.0%	4.1%	1.8%	0.8%	3.5%	1.5%
FI	3.4%	2.3%	1.2%	5.1%	4.6%	2.3%	6.9%	6.5%	4.1%	3.6%	4.5%	2.4%	9.1%	7.8%	6.6%
FR	1.6%	4.6%	4.0%	-1.9%	2.6%	0.6%	-2.8%	-0.4%	-0.1%	1.5%	2.7%	2.1%	-2.7%	2.1%	0.4%
HR	1.4%	6.5%	2.1%	0.9%	4.8%	1.7%	0.9%	7.9%	1.6%	1.4%	6.4%	1.8%	2.2%	11.1%	2.4%
HU	3.8%	10.3%	2.4%	3.4%	11.4%	2.3%	3.6%	8.8%	2.3%	3.8%	10.1%	2.4%	6.1%	8.4%	4.5%
IE	5.0%	15.1%	3.5%	4.5%	2.6%	3.1%	3.9%	-0.9%	2.7%	4.9%	7.9%	3.1%	6.1%	5.5%	5.1%
IT	1.3%	3.3%	1.5%	0.6%	0.0%	1.0%	-0.7%	1.5%	-0.2%	1.2%	1.8%	1.1%	1.8%	2.4%	2.1%
LT	2.7%	19.9%	5.1%	-0.9%	10.7%	2.2%	-2.2%	7.6%	1.5%	2.4%	12.0%	3.1%	-2.7%	6.1%	1.4%
LU	4.4%	9.0%	4.3%	2.0%	8.6%	2.2%	3.5%	8.6%	3.8%	4.1%	8.7%	3.3%	3.2%	11.5%	3.5%
LV	3.0%	14.3%	4.0%	0.9%	17.2%	2.0%	0.8%	11.1%	2.2%	2.8%	14.0%	2.9%	0.5%	7.7%	1.5%
MT	9.2%	11.1%	8.1%	8.7%	12.8%	9.5%	2.7%	3.1%	3.4%	9.1%	9.8%	7.2%	1.5%	2.8%	5.2%
NL	2.8%	3.9%	1.8%	2.1%	5.8%	1.2%	3.5%	6.8%	2.6%	2.8%	5.6%	1.9%	5.9%	5.9%	4.7%
PL	0.8%	14.7%	1.6%	-1.3%	6.0%	0.1%	-2.7%	4.7%	-0.9%	0.7%	8.5%	0.7%	-2.7%	4.6%	-0.6%
PT	3.1%	4.6%	4.6%	0.6%	5.3%	1.9%	1.0%	3.9%	2.4%	3.0%	4.6%	3.4%	-0.9%	3.3%	0.7%
RO	2.9%	22.0%	2.7%	2.8%	13.9%	3.0%	1.3%	8.5%	2.0%	2.9%	14.5%	2.6%	-0.1%	15.4%	1.2%
SE	3.7%	0.1%	2.9%	3.8%	-0.1%	3.0%	4.3%	0.3%	3.5%	3.7%	0.1%	3.1%	3.0%	-2.2%	2.6%
SI	3.5%	10.9%	3.5%	1.7%	9.9%	1.6%	2.1%	8.3%	2.0%	3.4%	9.7%	2.6%	6.0%	8.3%	5.8%
SK	2.7%	14.1%	4.7%	0.0%	1.5%	2.7%	-4.5%	1.1%	-1.1%	2.6%	6.7%	3.0%	-4.1%	6.5%	0.4%
UK	1.3%	4.3%	1.6%	0.5%	3.0%	0.9%	0.4%	2.7%	1.1%	1.2%	3.4%	1.2%	0.1%	4.0%	0.8%

Source: Eurostat, National Statistical Offices and DIW Econ

4.3 The performance of EU-28 SMEs in the various technology and knowledge industry groupings

At EU-28 level, in 2018, SMEs recorded much stronger growth in value added in the knowledge and less knowledge-intensive industries than in the industries of different technology intensities (Figure 19). This was the case for micro, small and medium-sized SMEs.

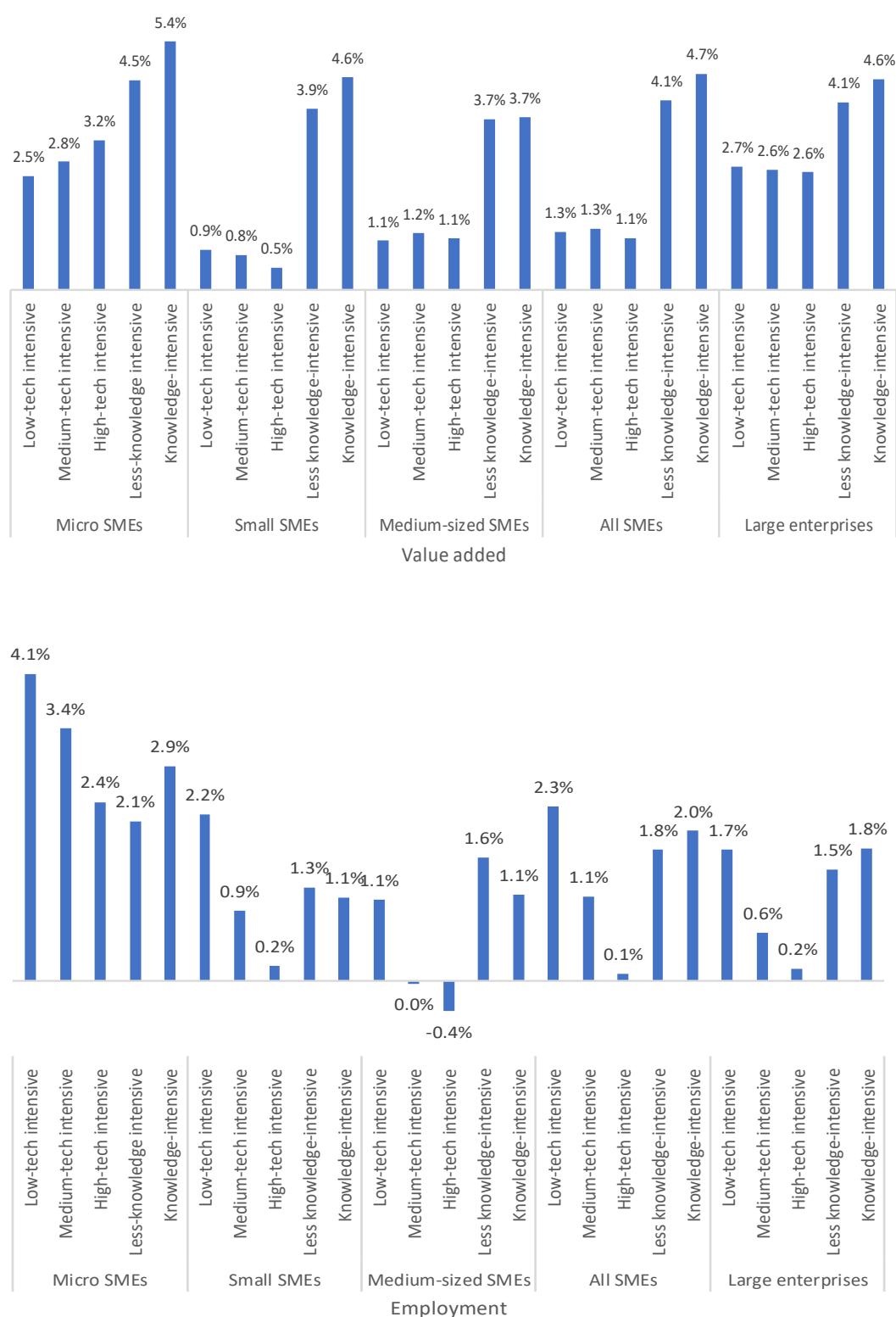
However, the differences in growth performance of SMEs in the various industry groupings were less pronounced in the case of micro SMEs than in the case of small and medium-sized SMEs. Moreover, while SMEs in high-tech industries posted the weakest growth of all industry groupings, this was not case for micro SMEs.

SMEs in the knowledge and less knowledge-intensive industries also posted stronger employment growth than SMEs in the industries of different technology intensities. In particular, it should be noted that, in 2018, SMEs in the knowledge-intensive industries increased their employment by 2.0% while SME employment in high-tech industries stagnated, increasing by only 0.1% (Figure 19).

More generally, micro SMEs recorded the strongest growth in value and employment among the three SME size classes in all industry groups and exceeded the growth recorded by large enterprises in all industries, except in the case of value added in the low-tech industries (Figure 19).²⁷

²⁷ Information on value added and employment growth in 2018 in Member States in the different technology and knowledge industries is provided at Annex 9.

Figure 19 Annual change (in %) in value added and employment in the EU-28 NFBS by enterprise size class in 2018



Source: Eurostat, National Statistical Offices, DIW Econ

4.4 The performance of EU-28 SMEs in the various R&D and innovation industry groupings

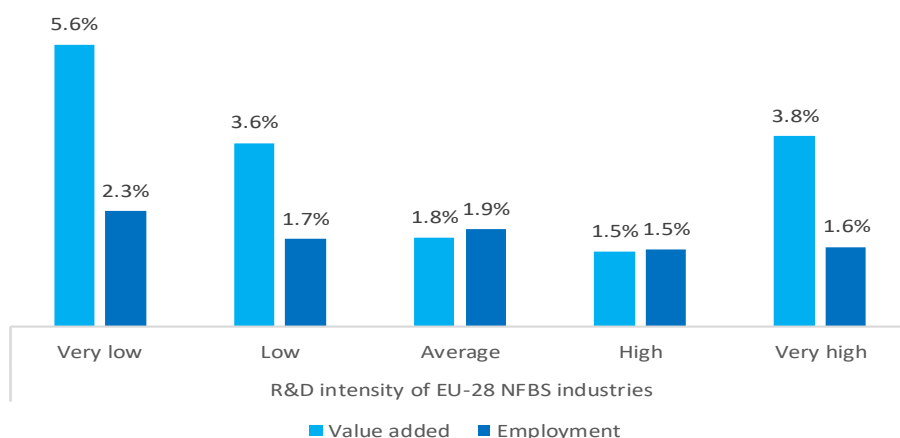
As this year's special topic in the SME Annual Report is R&D and innovation by SMEs, the present section presents detailed information on the performance of SMEs in industries of different R&D and innovation intensities. The discussion below complements the information provided in the previous section by examining the performance of EU-28 SMEs from a slightly different angle.

The growth of EU-28 SME value added across the range of industries of different R&D and innovation intensities showed a bipolar pattern in 2018 (Figure 20).²⁸

- At one end of the range, the strongest growth in value added (5.6%) was recorded by EU-28 SMEs in industries characterised by very low R&D intensity. EU-28 SMEs in low R&D intensity industries also posted robust growth in value added (3.6%).
- At the other end of the range, only EU-28 SMEs in industries of very high R&D intensity posted solid value added growth (3.8%).
- The value added growth performance of SMEs in industries of average and high R&D intensity was significantly lower (1.8% and 1.5% respectively).

In sharp contrast, the employment growth performance of EU-28 SMEs varied much less across the different R&D industry groupings. EU-28 SMEs in very low and low R&D intensity industries posted only slightly higher employment growth than EU-28 SMEs in high and very high R&D intensities (Figure 20).

Figure 20 Annual change (in %) of SME value added and employment in industries of different R&D intensities in the EU-28 NFBS in 2018



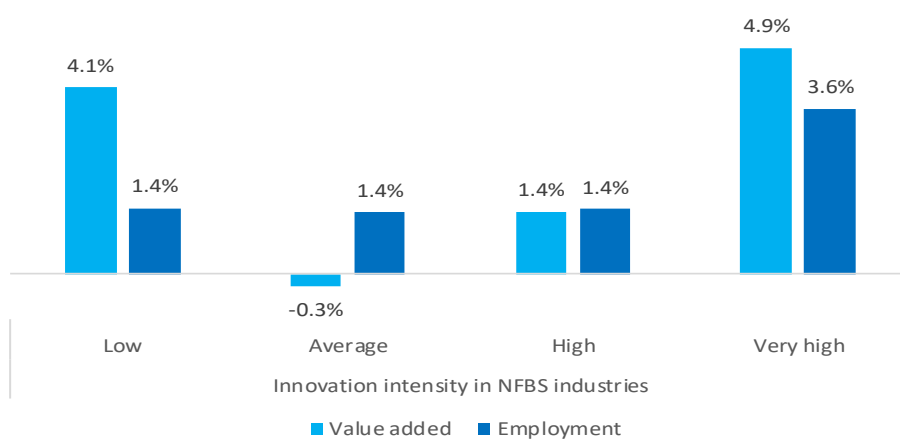
Source: Eurostat, DIW Econ, LE Europe

The value added growth pattern of EU-28 SMEs in industry groups of different innovation intensity shows a very similar picture. Much stronger growth in value added by EU-28 SMEs was recorded in industries of either very high or low innovation intensity than in industries of average or low innovation intensity (4.9% and 4.1% respectively versus -0.3% and 1.4% respectively) (Figure 21).

However, a different picture emerges from a comparison of the employment performance of EU-28 SMEs in the different innovation intensity groups. While EU-28 SMEs active in the very-high-innovation intensity industries recorded strong growth of 3.6% in employment, EU-28 SMEs active in the other industry groups only increased their employment by 1.4% (Figure 21).

²⁸ See Annexes 7 and 8 for detailed information at Member State level.

Figure 21 Annual change (in %) of SME value added and employment in industries of different innovation intensities in the EU-28 NFBS in 2018



Source: Eurostat, DIW Econ, LE Europe

5 The recent profitability of SMEs

Key points

SME profit rates and profit trends varied across industries, with the most notable development being a sharp decline from 2013 to 2016 (the most recent year for which profitability data are available) in the profitability of SMEs in the 'mining and quarrying' sector.

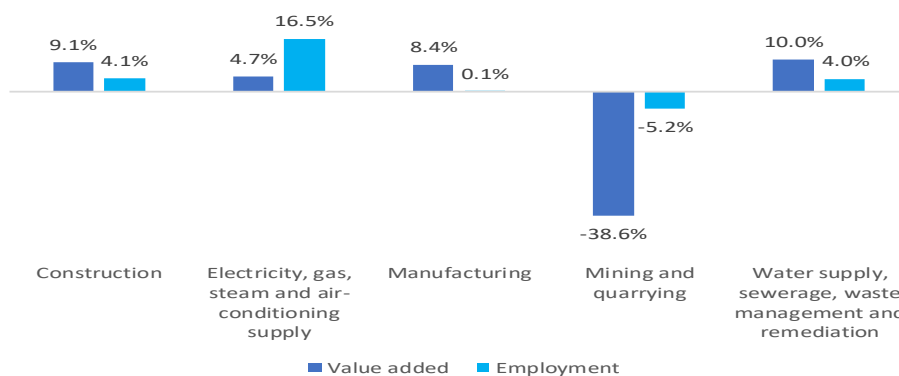
However, this sector's 18.9% profit rate (i.e. gross operating surplus / turnover), together with the profit rate of 18.0% posted by 'water supply, sewerage, waste management and remediation', was still at the upper end of the profit rates of the various industries. The lowest profit rates of 10.4% and 10.6% were posted respectively by 'electricity, gas, steam, and air conditioning supply' and 'manufacturing'.

Within all industries, the profit rate declined as the SME size class increased.

Data on profitability by enterprise size class are only available to 2016 in the Eurostat Structural Business Statistics database. Moreover, such data are only reported for the five industries: 'construction', 'electricity, gas, steam and air conditioning supply', 'manufacturing', 'mining and quarrying' and 'water supply, sewerage, waste management and remediation'.

Of these five industries, 'mining and quarrying' showed a sharp decline in EU-28 SME value added (-38.6%) from 2013 to 2016. In contrast, 'construction', 'manufacturing' and 'water supply, sewerage, waste management and remediation' showed cumulative value added growth of between 8.4% and 10%, although value added growth in 'electricity, gas, steam and air conditioning supply' was lower, at only 4.7% (Figure 22).

Figure 22 Cumulative change (in %) in EU-28 SME value added and employment from 2013 to 2016 in EU-28 'construction', 'electricity, gas, steam and air conditioning supply', 'manufacturing', 'mining and quarrying' and 'water supply, sewerage, waste management and remediation'



Source: Eurostat, DIW Econ, LE Europe

SMEs in the 'mining and quarrying' industry reported the highest profit rate of 18.9% (defined as the ratio of gross operating surplus to turnover) in 2016, followed closely by SMEs in the 'water supply, sewerage, waste management and remediation' industry (18.0%) (Figure 23).

At 12.8%, 10.6% and 10.4% respectively, the 2016 profit rates of SMEs in the 'construction', 'manufacturing' and 'electricity, gas, steam and air-conditioning supply' industries were significantly lower in 2016 than in the 'mining and quarrying' and 'water supply, sewerage, waste management and remediation' industries (Figure 23).

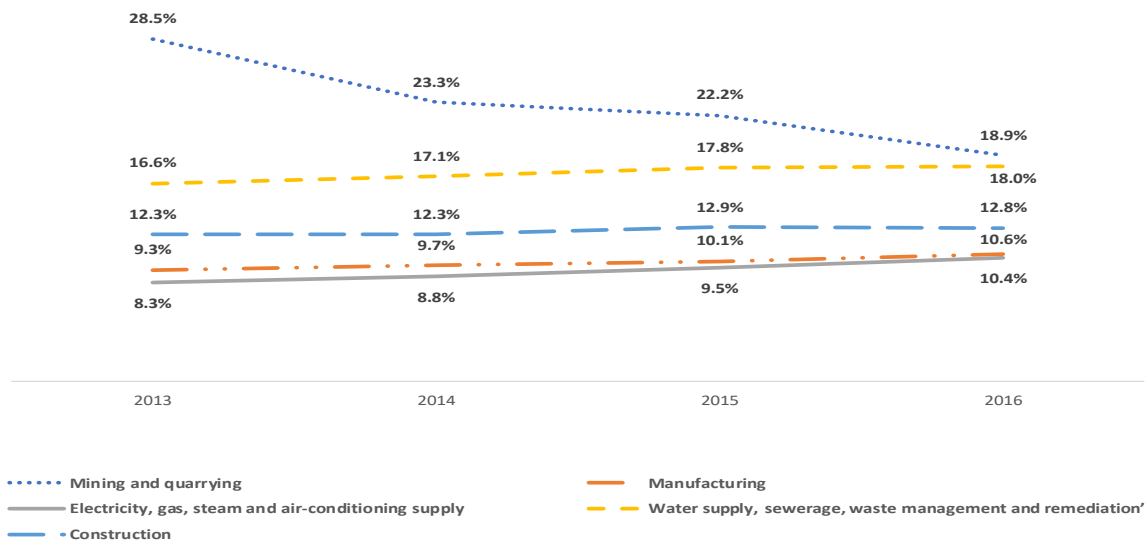
Not only did the levels of profit rates differ in 2016 across industries but the trends in profit rates from 2013 to 2016 also differed.²⁹

- the profit rate declined sharply from 2013 to 2016 in the 'mining and quarrying' industry, in part reflecting the evolution of commodity prices and value added during this period (Figure 23)
- in contrast, the profit rate increased moderately in 'electricity, gas, steam and air-conditioning supply' 'manufacturing', and 'water supply, sewerage, waste management and remediation' (Figure 23)
- finally, the profit rate increased only marginally in 'construction' (Figure 23).

SME profit rates also varied markedly across SME size class in each of the five industries.

- In general, the profit rate decreased with the increase in SME size. In 2016, in four of the five industries, micro SMEs posted the highest profit rate at EU-28 level and medium-sized SMEs the lowest profit rate (Table 10).³⁰
- The direction of the change in the profit rate from 2013 to 2016 was generally the same across the three SME size classes in each industry. However, within each industry, the magnitude of the change in the profit rate varied markedly depending on SME size class (Table 10).

Figure 23 Profitability of EU-28 SMEs in selected industries, 2013 to 2018



Note: Data on SME profitability are missing for various years in various Member States. The following industries are not included in the EU-28 total shown in the figure: industries B and D in 2013; industry B in CY in 2014; industries B, C, D and E in MT in 2014; industries B and D in LU in 2014; industry B in CY in 2015; industries B and D in MT in 2015; industries B and D in LU in 2015; industry B in CY in 2016; industry B in EE in 2016; industries B, D and E in MT in 2016; and industries B and D in LU in 2016. Industry B is 'mining and quarrying', industry C is 'manufacturing', industry D is 'electricity, gas, steam and air conditioning supply', industry E is 'water supply, sewerage, waste management and remediation' and industry F is 'construction'.

Source: Eurostat

²⁹ See Annex 10 for information at Member State level.

³⁰ Detailed information on the profitability of the three SME size classes in each of the six industries is provided in Annex 11.

Table 10 SME profit rate (in %) in 2016 and change in EU-28 SME profit rate (in percentage points) from 2013 to 2016 by SME size class in various industries

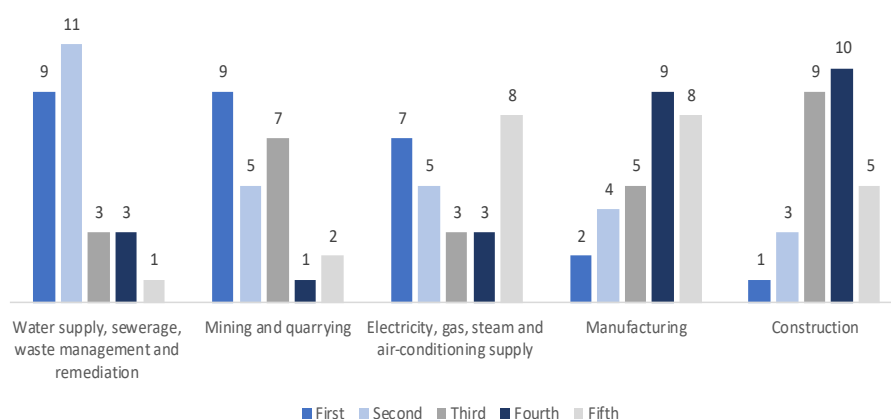
Industry	Profit rate in 2016			Change in profit rate from 2013 to 2016 (in percentage points)		
	Micro SMEs	Small SMEs	Medium-sized SMEs	Micro SMEs	Small SMEs	Medium-sized SMEs
Mining and quarrying	22.9%	25.3%	14.1%	-10.5	-21.2	-5.8
Manufacturing	14.9%	10.8%	9.5%	0.1	1.6	1.4
Electricity, gas, steam and air conditioning supply	25.1%	7.0%	5.4%	7.7	-0.6	0.9
Water supply, sewerage, waste management and remediation	17.2%	16.9%	19.2%	-0.2	1.2	2.4
Construction	16.3%	10.0%	9.1%	-1.1	1.8	1.1

Source: Eurostat

SME profitability also varied across Member States.

- 'Water supply, sewerage, waste management and remediation' was the industry in which the SME profit rate in Member States was the highest or the second highest among the five industries in 2016. This was the case in 20 Member States out of the 27 Member States for which data are available (Figure 24).
- 'Mining and quarrying' was the industry which showed the second highest occurrence of highest or second highest profitability among the five industries across Member States (Figure 24).
- In contrast, 'construction' and 'manufacturing' were the industries which most frequently showed the lowest or second lowest profitability among the five industries across Member States (Figure 24).

Figure 24 Number of times that an industry showed the highest, second highest, third highest, fourth highest and fifth highest SME profitability rate in EU Member States in 2016



Note: The total number for each industry varies as information is not available for all industries in all Member States.

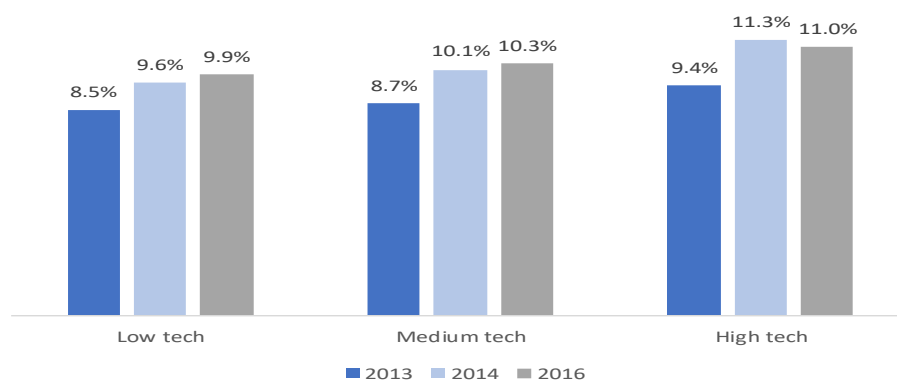
Source: Eurostat, LE Europe

The profit rate of EU-28 SMEs increased slightly with technology intensity. Among the three technology industry groupings, EU-28 SMEs in the high-tech industry showed a slightly higher profitability over the period 2013 to 2016 (Figure 25).³¹

³¹ As the Eurostat Structural Business Statistics database has no data on profitability in the service industries, it is not possible to undertake a similar analysis for knowledge- and less-knowledge-intensive industries.

However, while EU-28 SME profitability increased steadily from 2013 to 2016 in the low- and medium-tech industries, EU-28 SMEs in the high-tech industry experienced a marginal decline in profitability in 2016 after posting a marked increase from 2013 to 2014 (Figure 25).

Figure 25 Profitability of EU-28 SMEs in industries of different technology intensities



Notes: See Annex 6 for industry composition of different technology intensity industries. No data are available for 2015.

Source: Eurostat, LE Europe

6 The recent labour productivity performance of SMEs

Key points

The apparent labour productivity of EU-28 SMEs grew marginally faster in 2018 than in 2017 (2.2% versus 2.1%). SMEs in all Member States except Sweden recorded an increase. It is important to note that this increase was due to stronger growth in value added than in employment, rather than simply a decline in employment.

Among EU-28 SMEs, micro SMEs posted the highest growth (2.7%) in 2018, followed by small SMEs (2.4%) and medium-sized SMEs (1.8%).

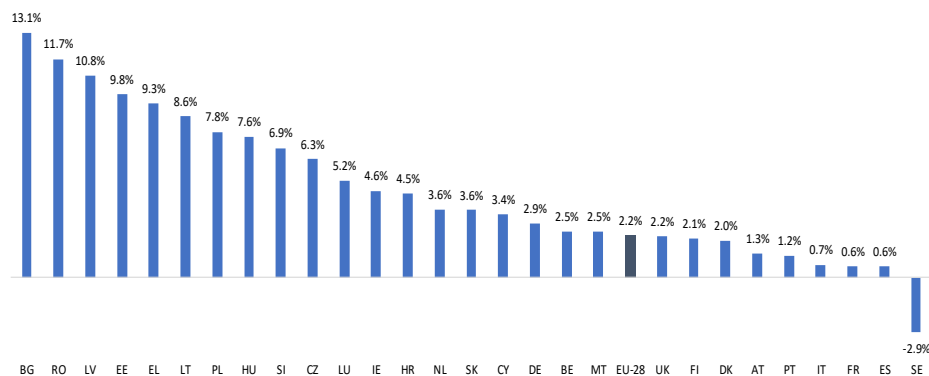
EU-28 SMEs in industries characterised by very low R&D intensity posted the strongest growth (3.2%) in apparent labour productivity in 2018, out of all the industry groupings of different R&D intensities. In contrast, EU-28 SMEs in industries of very high R&D intensity recorded growth in apparent labour productivity of only 2.1%.

The rate of SME value added growth in 2018 exceeded SME employment growth in all but one Member State (SE) (Figure 26). This implies that apparent labour productivity, defined as value added (in current prices) divided by employment, increased in all but one Member State.

The strongest apparent labour productivity growth in 2018 was recorded in BG (13.1%), RO (11.7%) and LV (10.8%). Moreover, SMEs increased their apparent labour productivity by more than 5% in a further 8 Member States (CZ, EE, EL, HU, LT, LU, PL and SI). In contrast, SME apparent labour productivity increased by less than 2% in five Member States (AT, ES, FR, IT and PT) and fell in one Member State (SE) (Figure 26).

The decline in SME productivity in SE reflects the fact that SME value added increased by only 0.1% in SE while employment growth did not adjust to this slowdown. Employment and labour productivity growth often react with a lag to a slowdown in economic growth. Such a delay arises when businesses are surprised by a slowdown in economic growth and/or are not implementing any mitigating measures before they are certain that the slowdown is not a short-lived one with no impact on their medium-term growth path.

Figure 26 Annual SME apparent labour productivity growth (in %) in EU-28 Member States in 2018

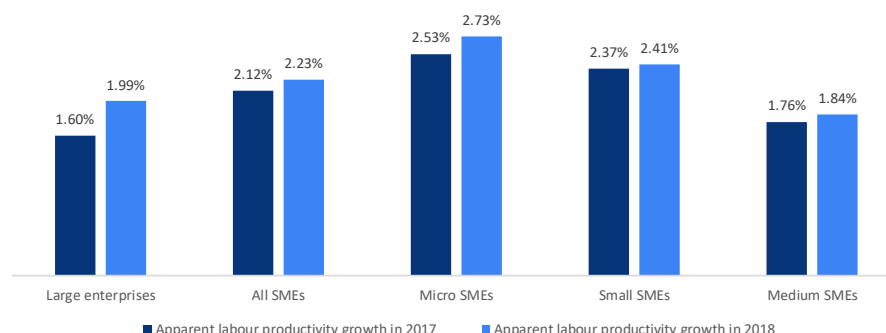


Source: Eurostat, National Statistical Offices and DIW Econ

Apparent labour productivity of all enterprise size classes grew marginally faster in 2018 than in 2017 (Figure 27).

Among EU-28 SMEs, micro SMEs posted the highest increase (2.7%) in labour productivity growth in 2018, followed by small SMEs (2.4%) and medium-sized SMEs (1.8%) (Figure 27).

Figure 27 Annual apparent labour productivity growth (in %) in large enterprises and SMEs in the EU-28 in 2017 and 2018



Source: Eurostat, DIW Econ

SME apparent labour productivity performance also differed markedly across SME classes in 2018:

- micro SMEs in BG, EE, IE, LT, PL and RO recorded apparent labour productivity growth of more than 10% in 2018, while in AT, BE, ES, FI, FR and IT, SME apparent labour productivity increased by 2% or less, stagnated in PT and fell in SE (Annex 12);
- small SMEs also saw their apparent labour productivity grow by more than 10% in 2018 in BG, EL, LV and RO. In contrast, this SME size class recorded a decline in apparent labour productivity in ES, IE, IT, SE and SK³² (Annex 12); and,
- finally, the apparent labour productivity of medium-sized SMEs increased by more than 10% only in EL in 2018, while it declined in BE, FR, IE, MT and SE, and grew by less than 2% in AT, CY, DE, DK, ES, IT, PT and UK (Annex 12). The decline in apparent labour productivity in BE, FR, IE, MT and SE typically reflected a slowdown in value added growth which was not fully matched immediately by a similar adjustment in employment growth. Such a lagged response in employment growth to output growth is often observed in larger enterprises.

Moreover, the direction and magnitude of the changes in the level of EU-28 SME apparent labour productivity varied greatly across industries in 2018.

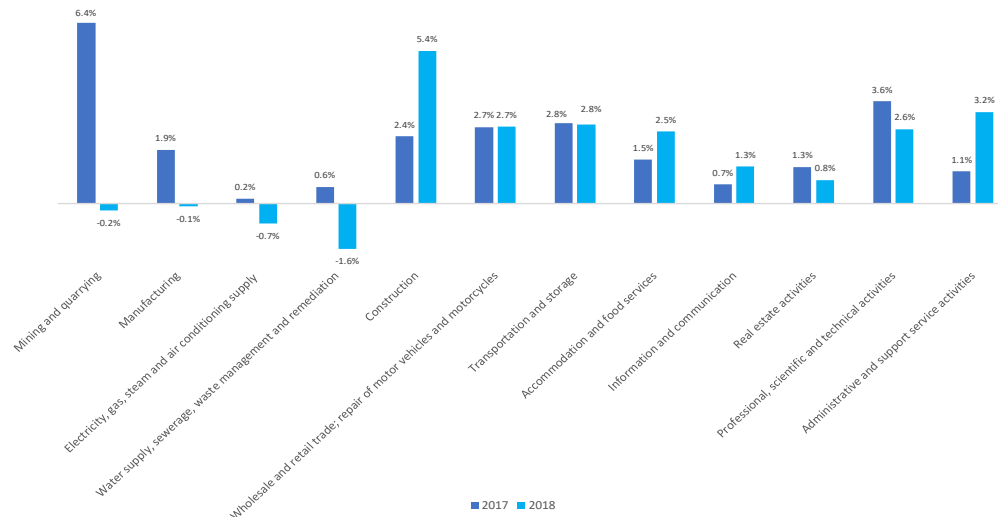
Apparent labour productivity:

- declined in 'electricity, gas, steam and air conditioning supply' (-0.7%), 'manufacturing' (-0.1%), 'mining and quarrying'³³ (-0.2%), and 'water supply, sewerage, waste management and remediation' (-1.6%) (Figure 28);
- increased marginally in 'information and communication' (1.3%) and 'real estate activities' (0.8%) (Figure 28);
- increased moderately in 'accommodation and food services' (2.5%), 'administrative and support service activities' (3.2%), 'professional, scientific and technical activities' (2.6%), 'transportation and storage' (2.8%) and 'wholesale and retail trade; repair of motor vehicles and motorcycles' (2.7%) (Figure 28); and,
- increased most strongly in 'construction' (5.4%) (Figure 28).

³² No Member State showed an increase of apparent labour productivity of less than 2% in the small SME size class in 2008 (Annex 12).

³³ The decline in apparent labour productivity in 'mining and quarrying' reflects the weakening of commodity prices which impacted on value added at current prices.

Figure 28 Annual SME apparent labour productivity growth (in %) in various EU-28 industries

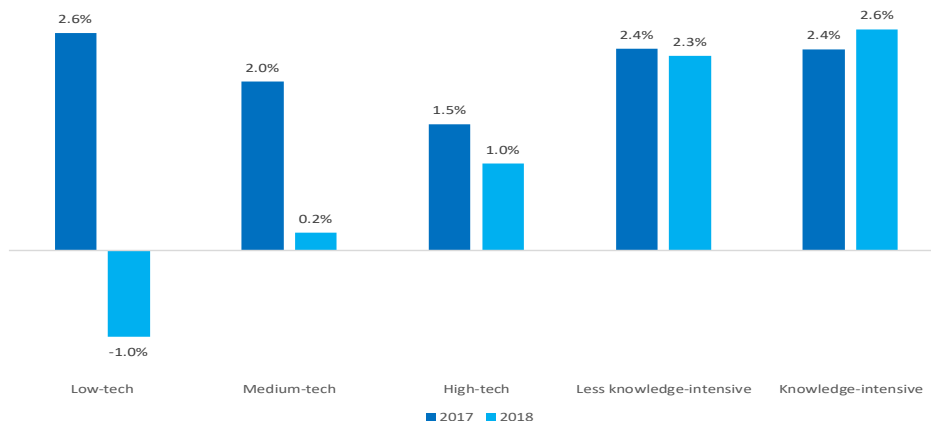


Source: Eurostat, National Statistical Offices, DIW Econ

Among the industry groupings of various technology and knowledge intensity, in 2018, EU-28 SMEs in the knowledge-intensive industries recorded the strongest growth in apparent labour productivity (2.6%) followed closely by SMEs in less knowledge-intensive industries (2.3%) and to a lesser extent by SMEs in the high-tech industries (1.0%) (Figure 29).³⁴

In contrast, EU-28 SMEs in the medium-tech and low-tech industries experienced respectively marginal growth (0.2%) or a decline (-1.0%) in apparent labour productivity in 2018 (Figure 29).

Figure 29 Annual growth (in %) in EU-28 SME apparent labour productivity in industries of different technology / knowledge intensity – 2017 and 2018

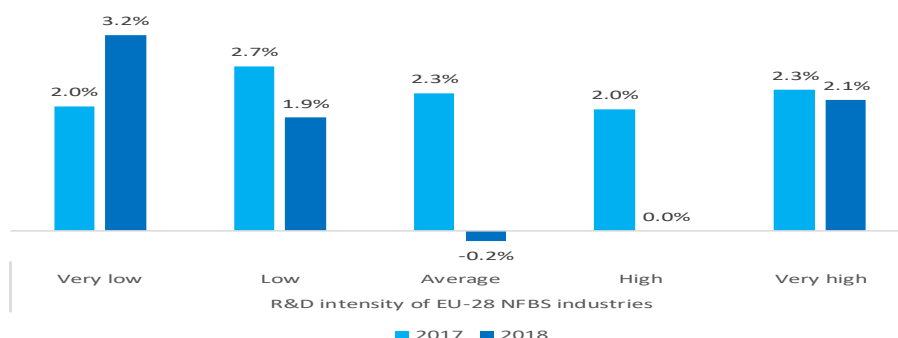


Source: Eurostat, National Statistical Offices, DIW Econ

Among the industry groupings of different R&D intensities, EU-28 SMEs showed the strongest growth in apparent labour productivity in industries of very low R&D intensity (3.2%) (Figure 30). In contrast, EU-28 SMEs in industries of very high and low R&D intensity posted apparent labour productivity growth of only 2.1% and 1.9% respectively. Moreover, in 2018, the apparent labour productivity of EU-28 SMEs in high R&D intensity industries stagnated, and in average R&D intensity industries it fell by -0.2% (Figure 30).

³⁴ Detailed information at Member State level on SME apparent labour productivity performance in the various industry groupings is provided in Annex 13.

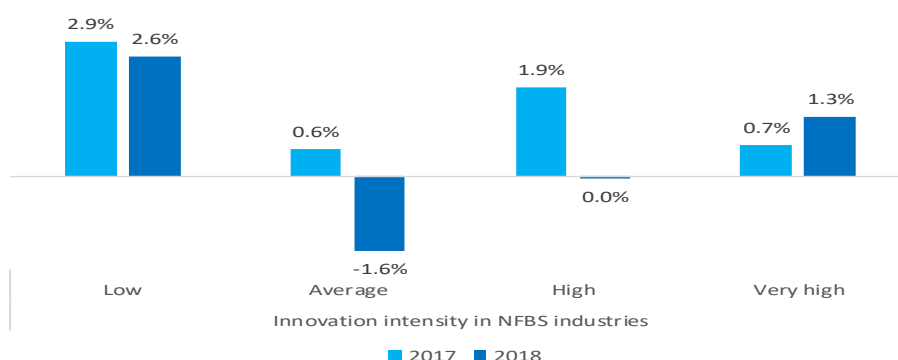
Figure 30 Annual growth (in %) in EU-28 SME apparent labour productivity in industries of different R&D intensity – 2017 and 2018



Source: Eurostat, National Statistical Offices, DIW Econ

EU-28 SMEs in industries of very high innovation intensity recorded only weak apparent labour productivity growth of 1.3% in 2018 (Figure 31), whereas EU-28 SMEs in industries of very high R&D intensity increased their apparent labour productivity by 2.1% in 2018 (Figure 30). These different outcomes are largely a reflection of the differences in employment creation by EU-28 SMEs in these R&D and innovation groupings of similar intensity³⁵. In contrast, EU-28 SMEs in industries of high innovation intensity posted an increase of 1.9% in apparent labour productivity while apparent labour productivity of EU-28 SMEs in industries of high R&D did not increase at all in 2018 (Figure 30 and Figure 31).

Figure 31 Annual growth (in %) in EU-28 SME apparent labour productivity in industries of different innovation intensity – 2017 and 2018



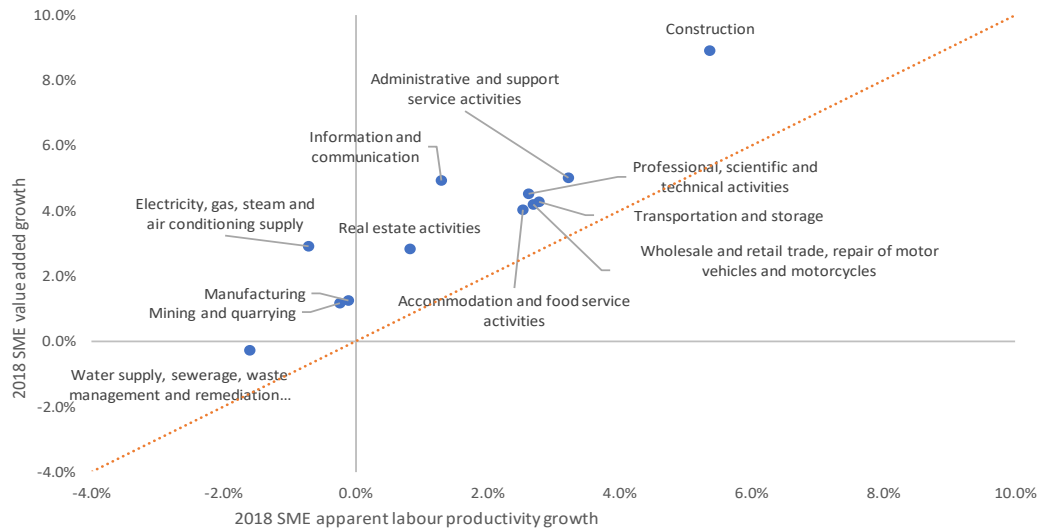
Source: Eurostat, National Statistical Offices, DIW Econ

In the case of all industries represented in Figure 28 and Figure 29, the increase (in %) in EU-28 SME value added was higher than the rate of growth in labour productivity in 2018 (Figure 32 and Figure 33). This implies that the increase in productivity was in all cases driven by increases in value added and not by decreases in employment.³⁶

³⁵ See Figure 20 and Figure 21 for details.

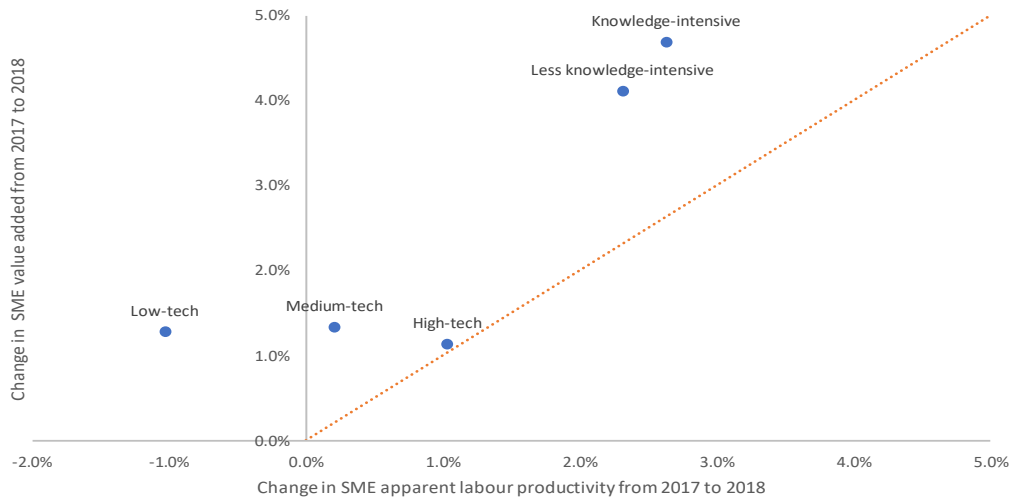
³⁶ See Annex 14 for detailed information on each industry or industry grouping.

Figure 32 Annual growth (in %) in EU-28 SME value added and apparent labour productivity in main industries in 2018



Eurostat, National Statistical Offices, DIW Econ

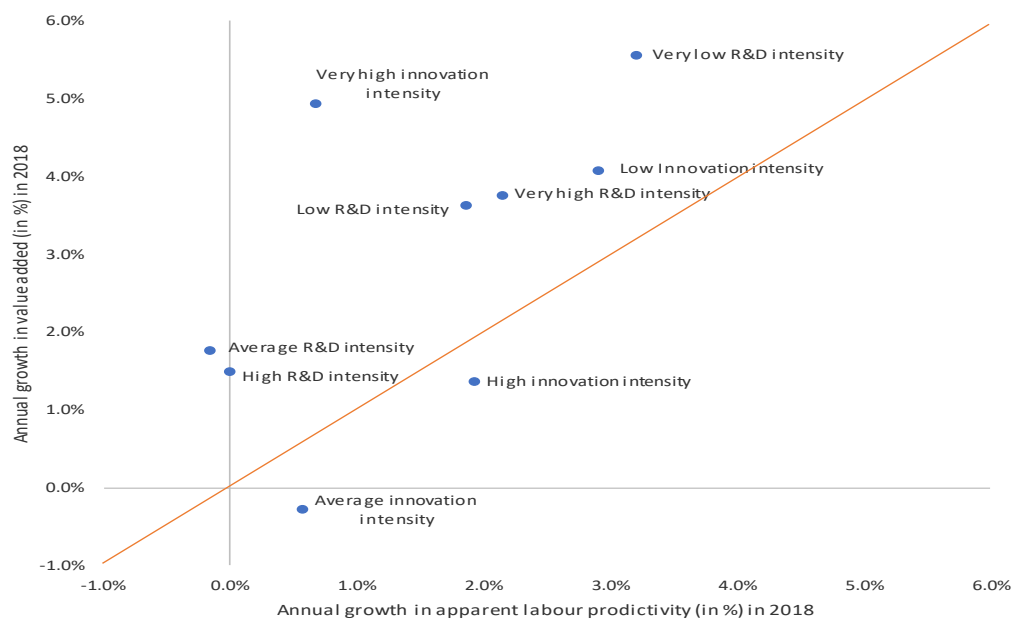
Figure 33 Annual growth (in %) in EU-28 SME value added and apparent labour productivity in industries of different technology and knowledge intensity in 2018



Eurostat, National Statistical Offices, DIW Econ

In all but two cases, the growth in apparent SME labour productivity in 2018 in industries of different R&D and innovation intensities also reflected increases in value added rather than decreases in employment (Figure 34). The only exceptions were SMEs active in industries of average and high innovation intensity.

Figure 34 Annual growth (in %) in EU-28 SME value added and apparent labour productivity in industries of different R&D and innovation intensity in 2018



Source: Eurostat, LE Europe

7 How does the recent performance of EU-28 SMEs compare to that of SMEs in the USA and Japan?

Key points

Overall, in 2016 and 2017 (the most recent year for which data are available for the EU, Japan and the USA), the performance of EU SMEs was significantly stronger than that of their Japanese and US peers in terms of growth in employment and the number of enterprises.

The picture is more varied in the case of value added growth.

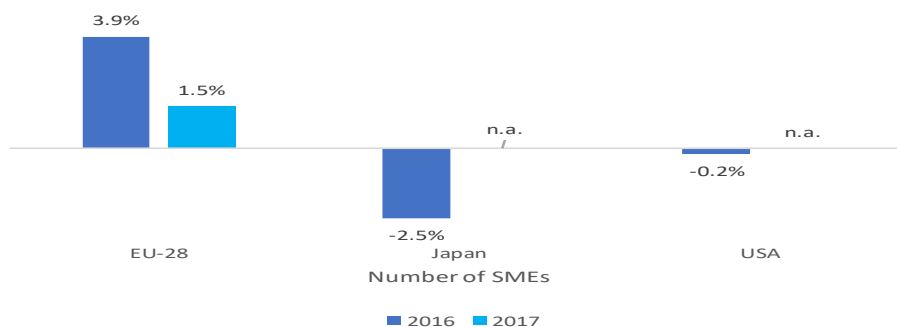
As data for 2018 are not yet available for Japan and the USA, the following comparative analysis focuses on the performance of EU-28, US and Japanese SMEs in 2016 and 2017.³⁷

Overall, the performance of EU SMEs was clearly better than that of Japanese and US SMEs in terms of growth in the number of enterprises and employment. The picture is somewhat more mixed in the case of value added growth.

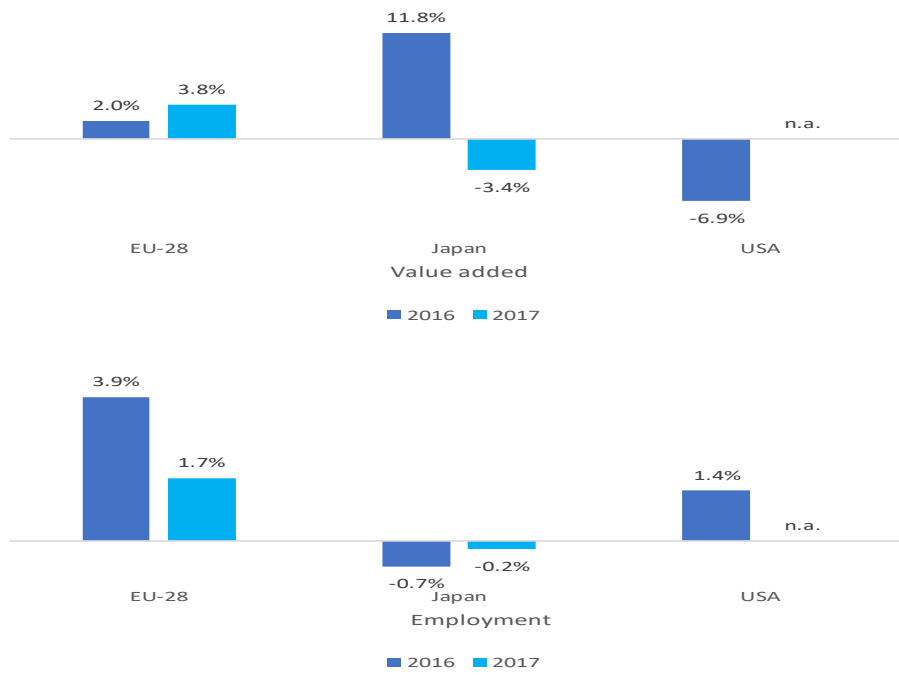
The key points to note are:

1. The number of EU-28 SMEs grew by 3.9% in 2016, while SME numbers declined by 2.5% in Japan and reduced marginally by 0.2% in the USA. Data on the number of SMEs in Japan and the USA in 2017 are not yet available (Figure 35).
2. Despite the stronger performance of EU-28 SMEs in 2016 in terms of the number of enterprises, the value added generated by EU-28 SMEs increased by only 2.0% in 2016, compared to an increase of 11.8% in the case of Japanese SMEs. In contrast, US SMEs experienced a decline of 6.9% in value added. However, in 2017, the opposite occurred. EU-28 SMEs posted a 3.8% increase in value added, while Japanese SMEs recorded a 3.4% decline. US data for 2017 are not yet available (Figure 35).
3. The employment performance of EU-28 SMEs in 2016 was significantly better than that of US and Japanese SMEs. Employment grew by 3.9%, compared to an increase of only 1.4% in the USA and a fall of 0.7% in Japan. Although EU-28 SME employment growth slowed to 1.7% in 2017, EU-28 SMEs continued to outperform Japanese SMEs, which recorded a drop of 0.2% in employment. US SME employment data for 2017 are not yet available (Figure 36).

Figure 35 Annual change in 2016 and 2017 in the number of SMEs, SME value added and employment in the EU-28, Japan, and USA



³⁷ Information on the performance of SMEs in a number of other countries (Albania, Bosnia and Herzegovina, Brazil, Iceland, Moldova, North Macedonia, Serbia, Turkey and Ukraine) is provided in Annex 15.



Source: Eurostat, National Statistical Offices, DIW Econ

8 The contribution of SMEs to the continued expansion of the EU-28 economy in 2017 and 2018

Key points

SMEs in the EU-28 accounted for almost 60% of the increase in EU-28 NFBS value added from 2016 to 2018. Micro SMEs generated 28.5% of this increase, while small and medium-sized SMEs accounted for 16.9% and 14.1%, respectively, of the increase.

In terms of NFBS employment growth, EU-28 SMEs accounted for almost 68% of the increase from 2016 to 2018. EU-28 micro SMEs contributed 43.0% of the total increase during the same period, followed by small SMEs (14.1%) and medium-sized SMEs (10.7%).

EU-28 SMEs have made a much stronger contribution to the growth in EU-28 NFBS value added in recent years (i.e. from 2016 to 2018) than over the longer period of 2013 to 2018. The increase in the SME contribution is almost entirely due to micro SMEs. In fact, the contribution of medium-sized SMEs has declined in recent years.

The contribution of EU-28 SMEs to the increase in EU-28 NFBS employment has also increased in recent years, but only marginally.

Among the various technology and knowledge industry groupings, SMEs active in less knowledge-intensive industries made the largest contribution to value added and employment growth in the EU-28 NFBS. They accounted for approximately $\frac{1}{4}$ of the increase in value added and $\frac{1}{3}$ of the increase in employment in the EU-28 in both 2013 to 2018 and 2016 to 2018.

Most of the increase in EU-28 SME value added and employment in the EU-28 NFBS from 2013 to 2018 and 2016 to 2018 was generated in industries of very low or low R&D intensity.

In particular, NFBS SMEs in very low R&D intensity industries contributed more than 50% of the increase in employment in both 2013 to 2018 and 2016 to 2018, as well as 40% or more of the growth in value added in the EU-28 NFBS in the same two periods.

In contrast, EU-28 SMEs in industries of very high R&D intensity only accounted for roughly $\frac{1}{4}$ of the increase in EU-28 NFBS value added in both periods, and also in EU-28 NFBS employment from 2013 to 2018.

8.1 Economy-wide SME contribution to EU-28 NFBS value added and employment

SMEs in the EU-28 accounted for almost 60% of the increase in EU-28 NFBS value added from 2016 to 2018. Micro SMEs generated 28.5% of this increase while small and medium-sized SMEs accounted for 16.9% and 14.1%, respectively, of the increase (Figure 36).

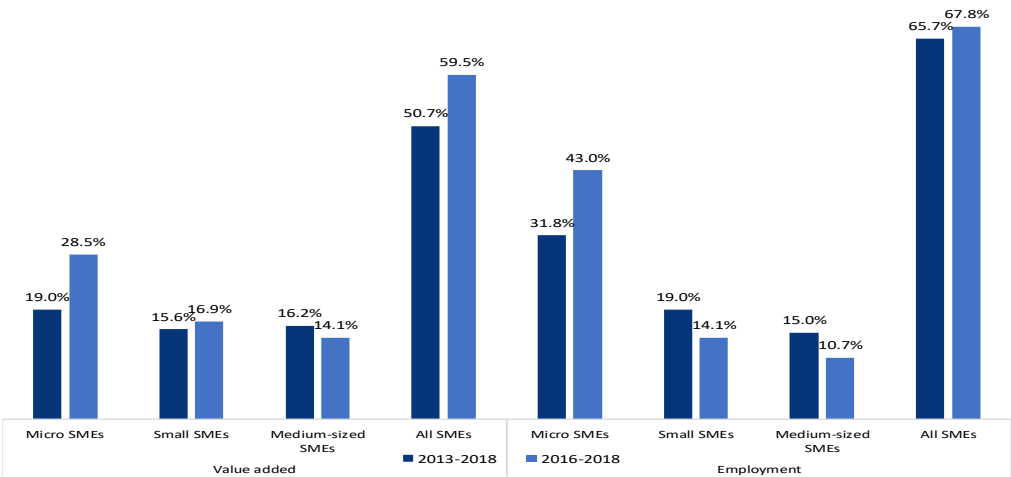
Furthermore, EU-28 SMEs accounted for almost 68% of the increase in NFBS employment from 2016 to 2018. EU-28 micro SMEs contributed 43.0% of the total increase in NFBS employment over this period, followed by small SMEs (14.1%) and medium-sized SMEs (10.7%) (Figure 36).

EU-28 SMEs have made a much stronger contribution to the growth in EU-28 NFBS value added in recent years (i.e. from 2016 to 2018) than over the longer period of 2013 to 2018. The difference in the EU-28 SME contribution between these two periods is almost 9 percentage points (Figure 36). The increase in the SME contribution is almost entirely due

to micro SMEs. In fact the contribution of medium-sized SMEs has declined in recent years (Figure 36).

The contribution of EU-28 SMEs to the increase in EU-28 NFBS employment has also increased in recent years, but only marginally. The contribution of EU-28 micro SMEs increased markedly in the period 2016 to 2018, but this was offset by a decrease in the contribution of both small and medium-sized EU-28 SMEs (Figure 36).

Figure 36 EU-28 SME contribution to change in EU-28 NFBS value added and employment by enterprise class size, 2013-2018 and 2016-2018



Source: Eurostat, National Statistical Offices, DIW Econ

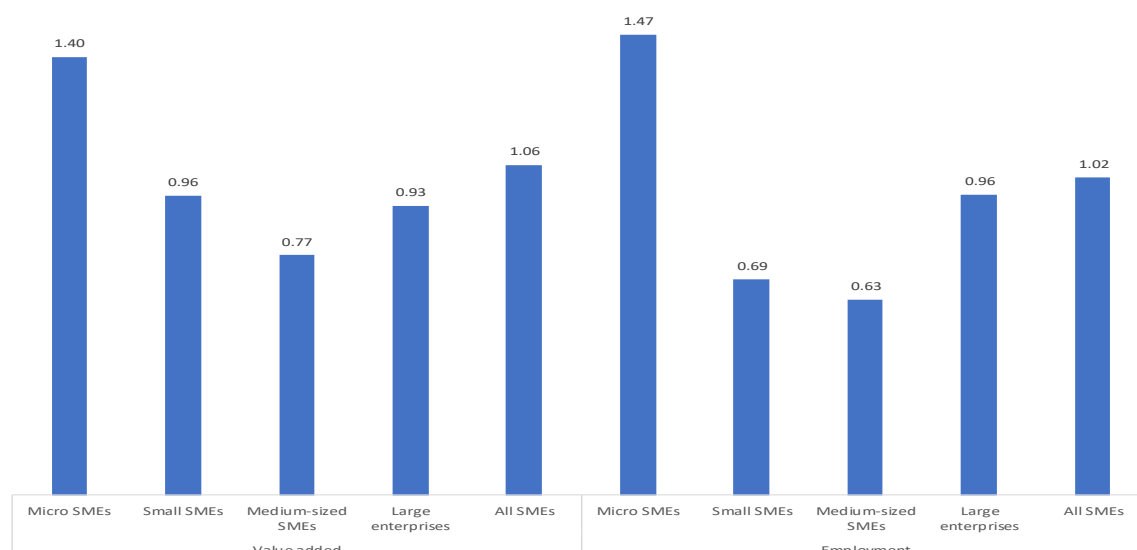
While the contribution of EU-28 SMEs to the growth in NFBS value added and employment was substantial over the period 2016 to 2018, this may simply be due to the fact that SMEs accounted for a large share of NFBS value added and employment. To assess whether the contribution of SMEs was consistent with their importance in the NFBS, the relative contribution of SMEs was derived.

This relative contribution is simply the ratio of the SME contribution over the period 2016 to 2018 to the SME share in the NFBS in 2016. A ratio greater than 1 means that the contribution was larger than would have been expected on the basis of the SME NFBS share, and vice versa when the ratio is less than 1.

Overall, the contribution of EU-28 SMEs to the increase in EU-28 NFBS value added from 2016 to 2018 was somewhat greater than would have been expected, as shown by the ratio value of 1.06 (Figure 37). However, this greater than expected contribution was entirely due to micro SMEs. Both small and medium-sized SMEs contributed less than would be expected to value added growth in the NFBS (Figure 37).

The same observation holds true for employment in the EU-28 NFBS over the period 2016 to 2018 (Figure 37).

Figure 37 Relative contribution of EU-28 SMEs to change in value added in the EU-28 NFBS from 2016 to 2018 by size class

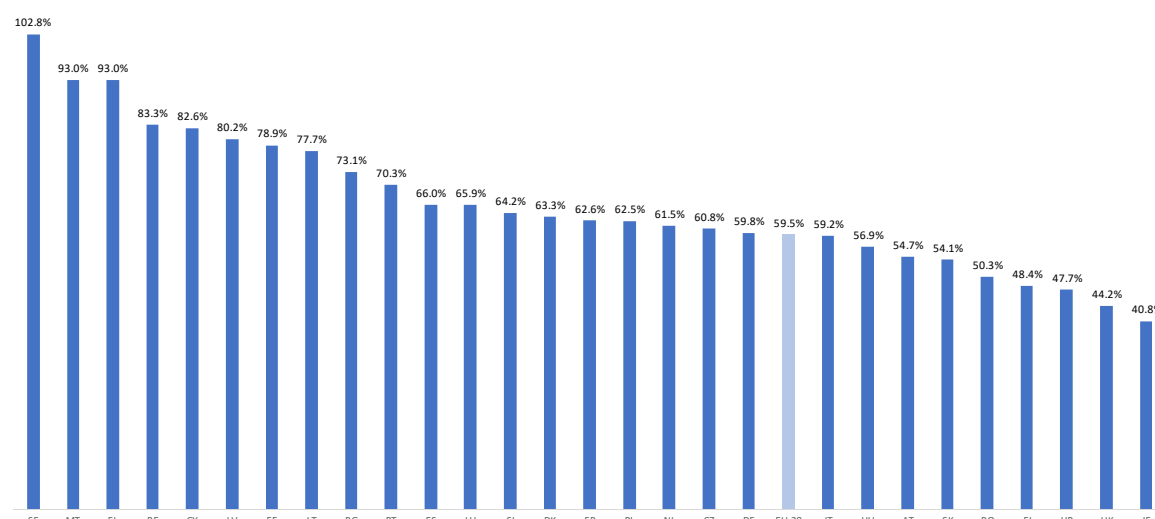


Note: The relative contribution of an enterprise class to the change in value added (employment) from 2016 to 2018 is calculated as the contribution of the enterprise class to the change in NFBS value added (employment) from 2016 to 2018 divided by the enterprise size class's share of value added (employment) in the NFBS in 2016.

Source: Eurostat, National Statistical Offices, DIW Econ

Over the 2016-2018 period, SMEs contributed at least 40% of the increase in NFBS value added in every Member State. In six Member States (BE, CY, EL, LV, MT, SE), the contribution of SMEs exceeded 80%. In fact, in SE, SMEs accounted for more than 100% of the total increase in NFBS value added from 2016 to 2018, offsetting the negative value added contribution of large enterprises (Figure 38).

Figure 38 SME contribution to change in NFBS value added from 2016 to 2018 in Member States

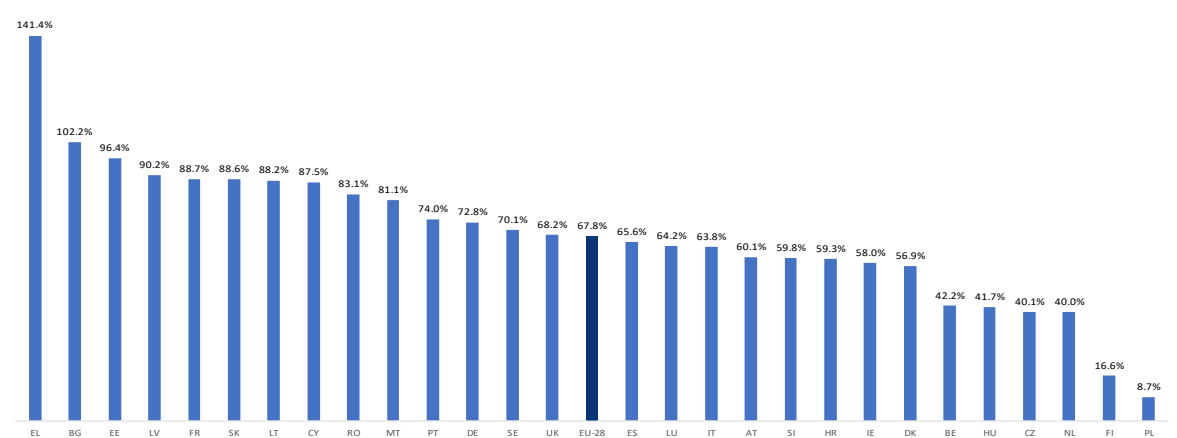


Source: Eurostat, National Statistical Offices and DIW Econ

In all but two Member States, SMEs accounted for 40% or more of the total increase in NFBS employment from 2016 to 2018. The two exceptions were FI and PL where SMEs accounted respectively for only 16.6% and 8.7% of the increase in NFBS employment over this period. In contrast, SMEs in ten Member States (BG, CY, EE, EL, FR, LT, LV, MT, SK, and RO) accounted for more than 80% of the total increase in NFBS employment. Moreover, in

BG and EL, SMEs accounted for more than 100% of the increase in NFBS employment from 2016 to 2018 (Figure 39).

Figure 39 SME contribution to change in NFBS employment from 2016 to 2018 in Member States

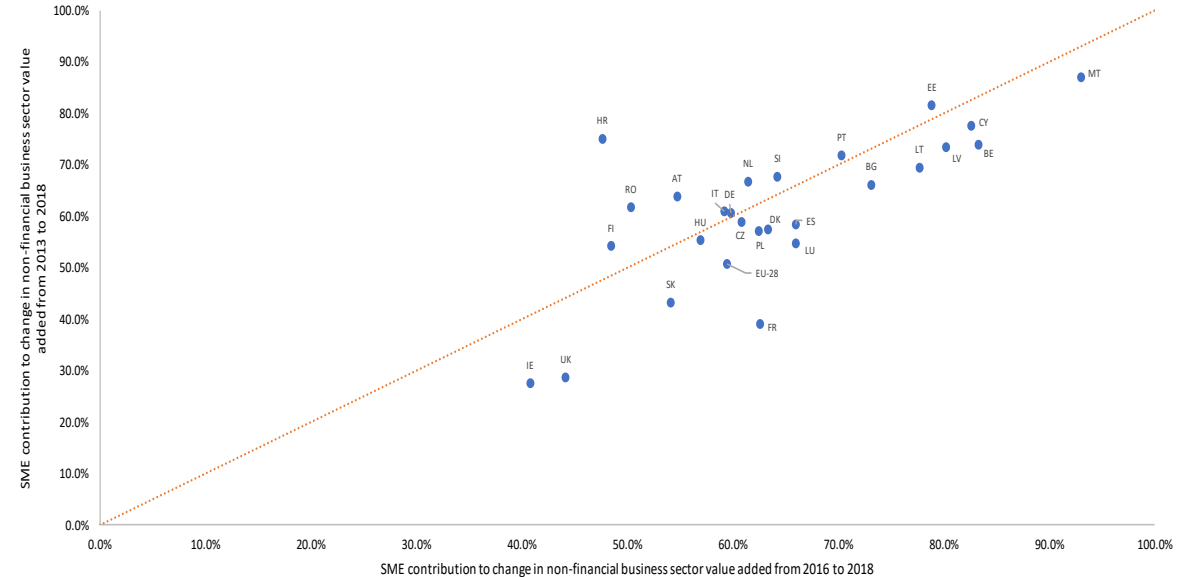


Source: Eurostat, National Statistical Offices, DIW Econ

The SME contribution to the growth of Member State NFBS value added and employment varied greatly among Member States:

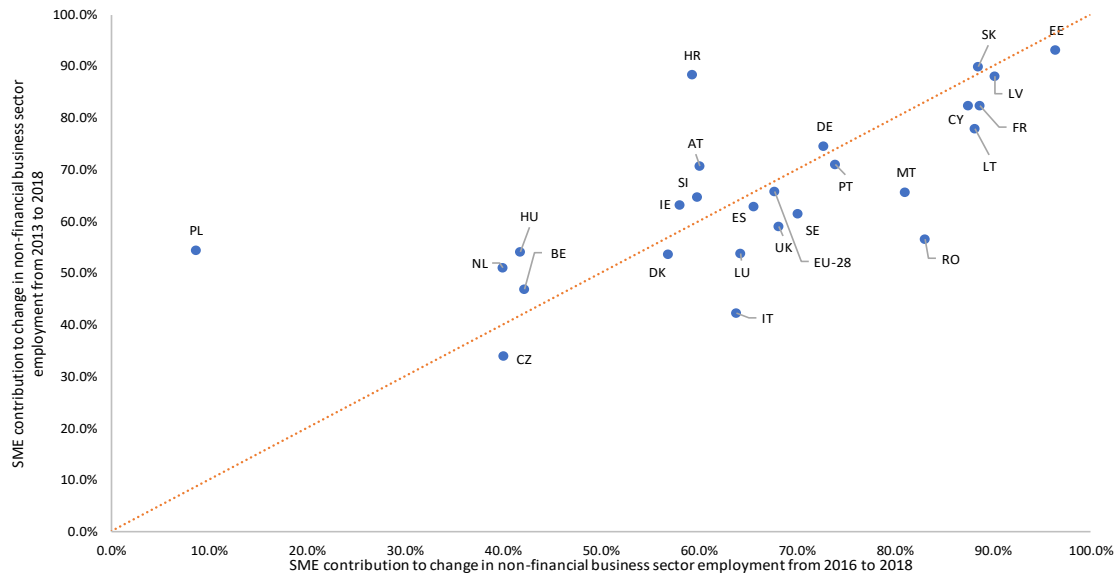
- However, the SME contribution to growth in NFBS value added was higher in the period 2016 to 2018 than in the period 2013 to 2018 in all but 10 Member States (AT, DE, EE, FI, HR, IT, NL, PT, RO, SI) (Figure 40).
- Moreover, the employment contribution of SMEs to employment growth in the NFBS sector was higher in the period 2016 to 2018 than in the period 2013 to 2018 in all but 11 Member States (AT, BE, DE, FI, HR, HU, IE, NL, PL, SI, SK) (Figure 41).

Figure 40 Comparison of SME contribution to growth in NFBS value added from 2013 to 2018 and from 2016 to 2018



Source: Eurostat, National Statistical Offices and DIW Econ

Figure 41 Comparison of SME contribution to growth in NFBS employment from 2013 to 2018 and from 2016 to 2018



Source: Eurostat, National Statistical Offices and DIW Econ

8.2 Contribution of EU-28 SMEs in different industries to EU-28 NFBS value added and employment from 2016 to 2018

In terms of the contribution of EU-28 SMEs in different industries to the increase in EU-28 NFBS value added and employment from 2016 to 2018, the following facts are worth noting:

- SMEs in three industries ('construction', 'professional, scientific and technical activities' and 'wholesale and retail trade, repair of motor vehicles and motorcycles') accounted for 34% of the total increase in EU-28 NFBS value added and 57% of the total SME contribution to the increase in EU-28 NFBS value added (Figure 42).³⁸
- SMEs in four industries ('accommodation and food service activities', 'administrative and support service activities', 'construction', 'wholesale and retail trade, repair of motor vehicles and motorcycles') accounted for 44% of the total increase in NFBS employment from 2016 to 2018, and for 65% of the total SME contribution to the growth of NFBS employment in this period (Figure 42).³⁹
- In contrast, EU-28 SMEs in four industries ('electricity, gas, steam and air conditioning supply', 'mining and quarrying' 'real estate', 'water supply, sewerage, waste management and remediation activities') contributed very little to the growth of EU-28 NFBS value added and employment from 2016 to 2018 (Figure 42).

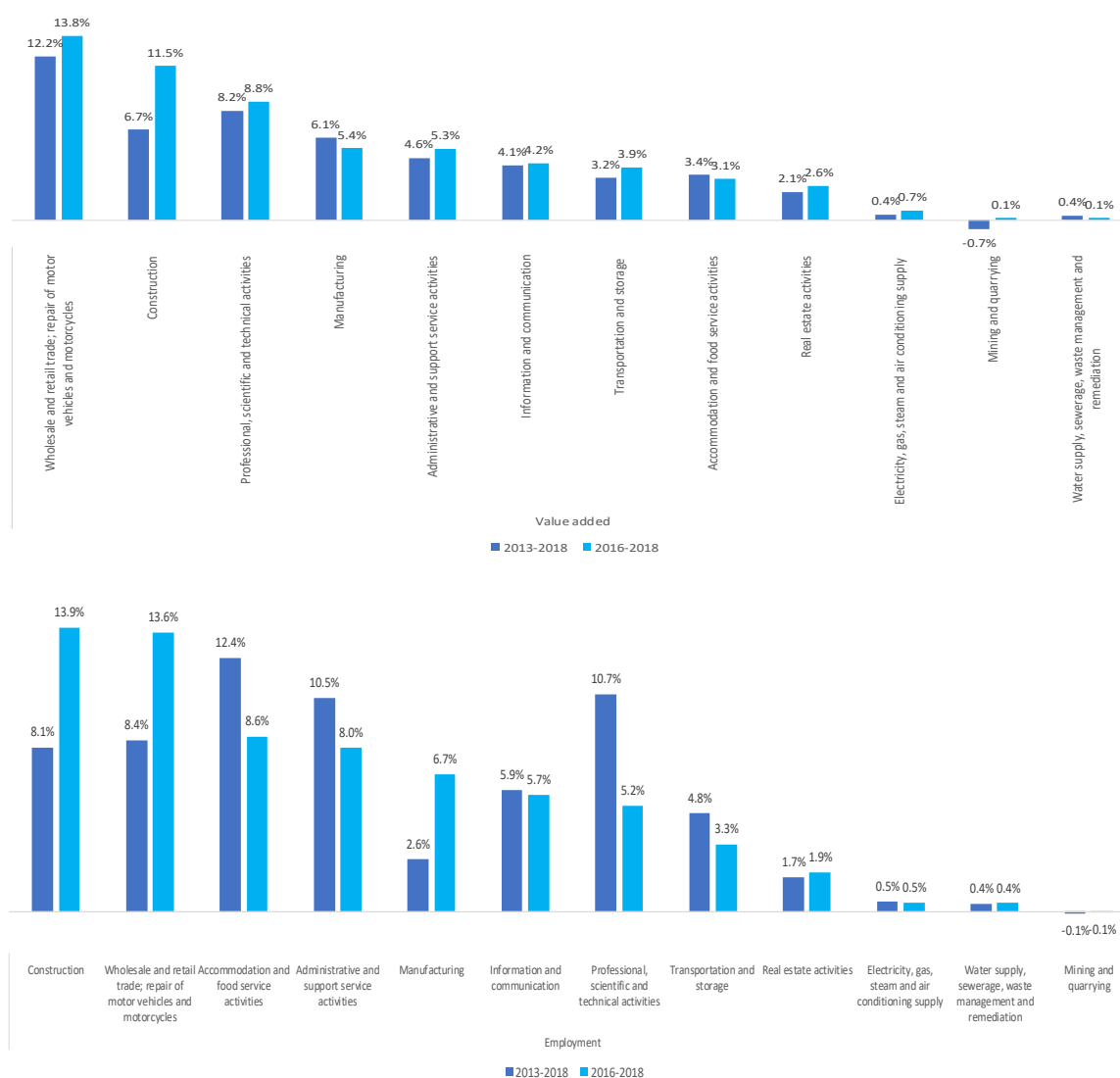
Over the longer period of 2013 to 2018, 'construction' contributed significantly less to the growth of value added in the EU-28 NFBS than in the period 2016 to 2018. The contribution of 'construction' to the growth in employment in the EU-28 NFBS was also markedly lower from 2013 to 2018 than from 2016 to 2018. This was also the case for 'wholesale and retail trade, repair of motor vehicles and motorcycles'. In contrast, the contributions of 'professional, scientific and technical activities' and, to a somewhat lesser extent, 'accommodation and food service activities' and 'administrative and support service activities' were much more important from 2013 to 2018 than from 2016 to 2018 (Figure 42).

³⁸ The figure of 57% is obtained by dividing the percentage contribution of SMEs in the three sectors to the total increase in NFBS (34.1%) by the percentage contribution of all SMEs to the total increase in NFBS (59.5%).

³⁹ The figure of 65% is obtained by dividing the percentage contribution of SMEs in the three sectors to the total increase in NFBS employment (44.1%) by the percentage contribution of all SMEs to the total increase in NFBS employment (67.8%).

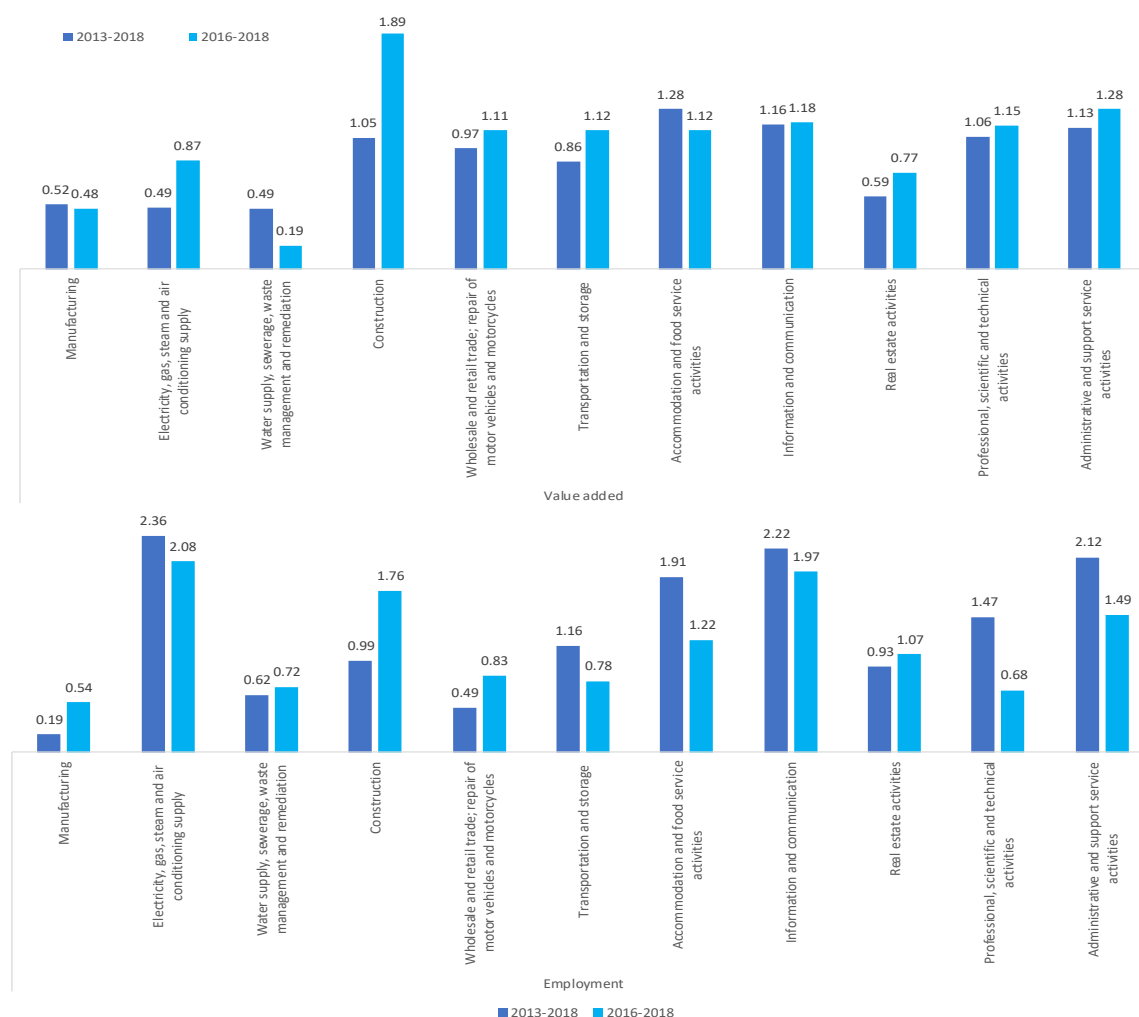
It is noteworthy that, from 2013 to 2018 and 2016 to 2018, 'manufacturing', 'water supply, sewerage, waste management and remediation activities' and 'real estate activities' made a much smaller contribution to the increase in value added and employment in the EU-28 NFBS than would have been expected on the basis of their share of EU-28 NFBS value added / employment, while the opposite is the case for 'construction', especially from 2016 to 2018. In the case of 'electricity, gas, steam and air conditioning supply' only the relative contribution to value added growth was less than would have been expected (Figure 43).

Figure 42 Contribution of EU-28 SMEs in different industries to change in NFBS value added and employment from 2016 to 2018



Source: Eurostat, National Statistical Offices, DIW Econ

Figure 43 Relative contribution of EU-28 SMEs in different industries to change in NFBS value added and employment from 2016 to 2018 and 2013 to 2018



Note: The relative contribution of 'mining and quarrying' is not shown because the absolute contribution was negative

Source: Eurostat, National Statistical Offices, DIW Econ

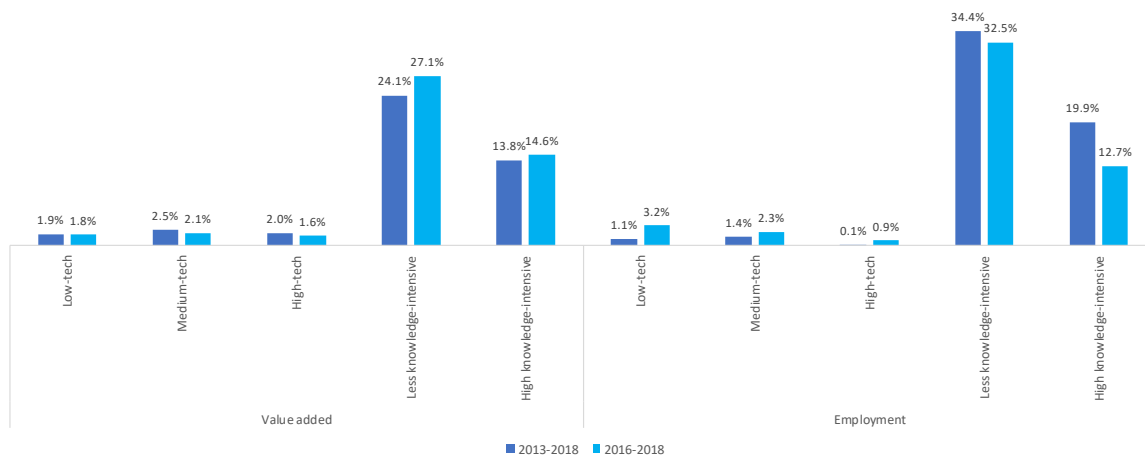
In sharp contrast to the contribution of EU-28 SMEs in industries of different knowledge intensities, EU-28 SMEs in the high-, medium- and low-tech goods producing industries contributed very little to the increase in EU-28 NFBS value added and employment in the periods from 2013 to 2018 and from 2016 to 2018 (Figure 44).

The contribution of EU-28 SMEs in industries of different technology intensity scarcely differed in these two periods. However, in the different knowledge-intensity industries the contribution of SMEs to value added growth in the EU-28 NFBS was higher in the period from 2016 to 2018 than in the period from 2013 to 2018. The opposite occurred in the case of employment growth in the EU-28 NFBS (Figure 44).

Over the periods 2013 to 2018 and 2016 to 2018, SMEs in industries of various technology intensity contributed significantly less to the increase in EU-28 NFBS value added and employment than would have been expected on the basis of their value added and employment shares in the EU-28 NFBS (Figure 45)

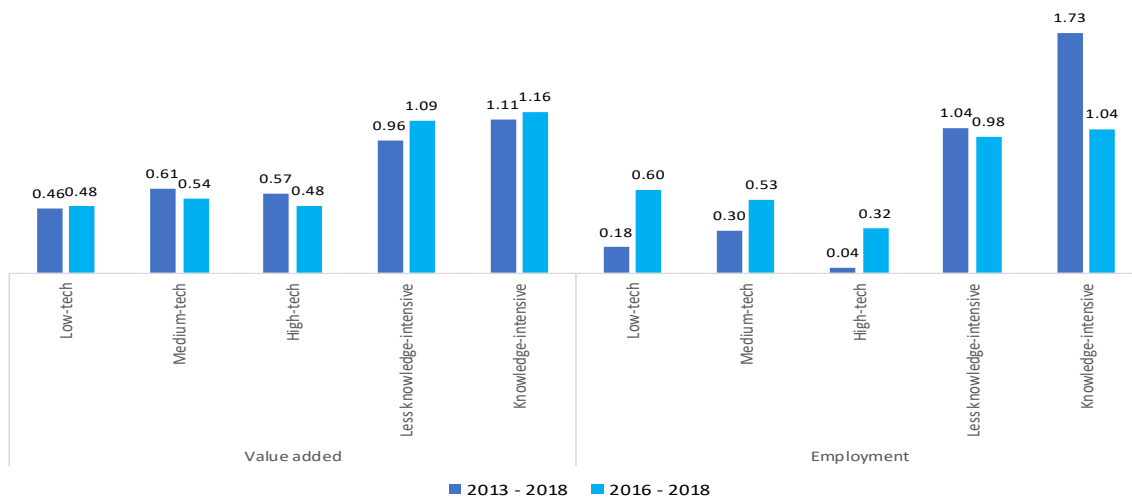
In contrast, SMEs active in the knowledge intensive industries contributed much more to employment growth in the EU-28 NFBS from 2013 to 2018 and somewhat more to the increase in value added from 2016 to 2018 (Figure 45).

Figure 44 Contribution of EU-28 SMEs to the increase in value added and employment in the NFBS by technology and knowledge intensity from 2013 to 2018 and from 2016 to 2018



Source: Eurostat, National Statistical Offices, DIW Econ, LE Europe

Figure 45 Relative contribution of EU-28 SMEs to the increase in value added and employment in the NFBS by technology and knowledge intensity from 2013 to 2018 and from 2016 to 2018



Source: Eurostat, National Statistical Offices, DIW Econ, LE Europe

Most of the increase in EU-28 SME value added and employment in the EU-28 NFBS from 2013 to 2018 and 2016 to 2018 was generated in industries of very low or low R&D intensity.

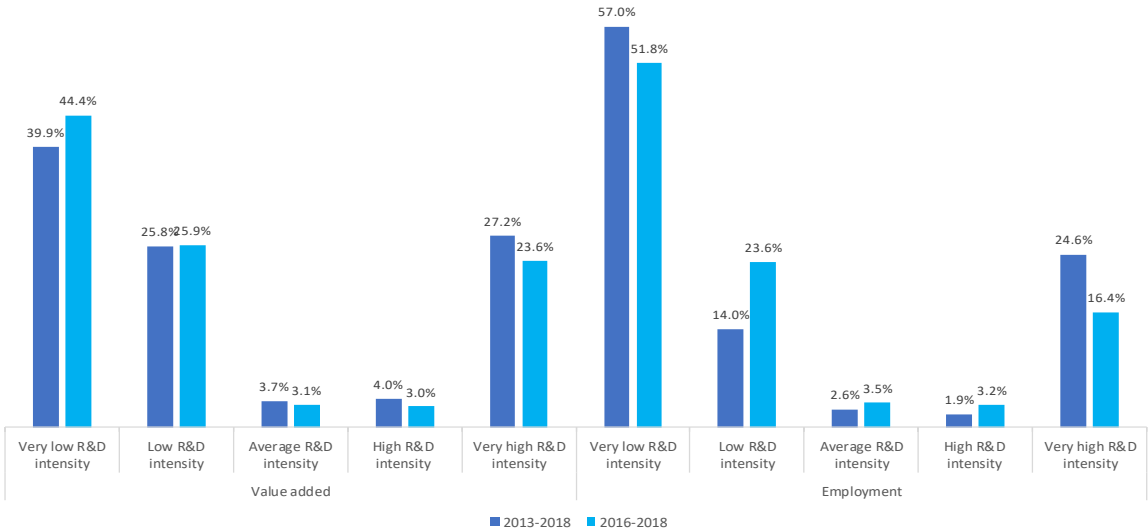
In particular, NFBS SMEs in very low R&D intensity industries contributed more than 50% of the increase in employment from both 2013 to 2018 and 2016 to 2018 and 40% or more of the growth in valued added in the EU-28 NFBS (Figure 46).

In contrast, reflecting the relatively small number of EU-28 SMEs active in the very high R&D intensity industry, these SMEs accounted for about ¼ of the increase in EU-28 NFBS value added in both periods and in EU-28 NFBS employment from 2013 to 2018 (Figure 46).

Moreover, in the periods 2013 to 2018 and 2016 to 2018, SMEs in industries of very low R&D intensity accounted for markedly more of the increase in EU NFBS value added and employment than would have been expected on the basis of their share of EU-28 NFBS

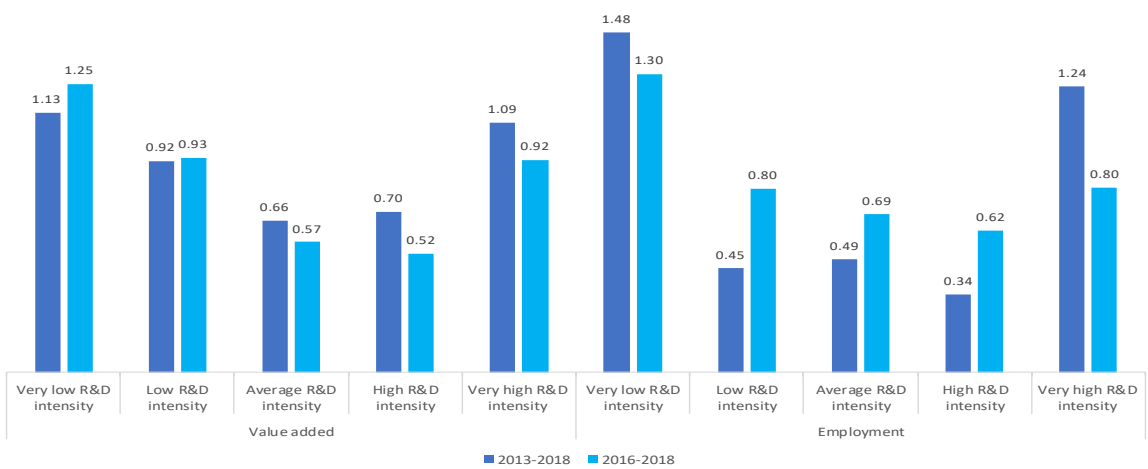
value added and employment. This was also the case for SMEs active in industries of very high R&D intensity, but only over the period 2013 to 2018 (Figure 47).

Figure 46 Contribution of EU-28 SMEs to the increase in value added and employment in the NFBS by R&D intensity from 2013 to 2018 and from 2016 to 2018



Source: Eurostat, National Statistical Offices, DIW Econ, LE Europe

Figure 47 Relative contribution of EU-28 SMEs to the increase in value added and employment in the NFBS by R&D intensity from 2013 to 2018 and from 2016 to 2018



Source: Eurostat, National Statistical Offices, DIW Econ, LE Europe

9 Recent developments in the SME business demography

Key points

From 2013 to 2016 (the most recent year for which data are available), the number of businesses in the EU-28 business economy grew by 4.1%. The strongest growth (10.1%) was in the population of SMEs with 10 or more employees, while within the population of micro SMEs, those with 0 employees grew by only 2.7%. The rate of population growth increased with SME size, with the number of SMEs rising by 4.8% for SMEs with 1 to 4 employees and by 7.9% for SMEs with 5 to 9 employees.

Smaller enterprise size classes typically show higher enterprise birth and death rates than larger enterprise size classes.

The average enterprise birth and death rates in the EU-28 NFBS were 9.9% and 8.3%, respectively, over the period 2013 to 2016, reflecting the high birth and death rates of small micro SMEs (i.e. SMEs with 0 employees or only 1 to 4 employees).

Although micro SMEs accounted for the largest share of the increase in SME value added, 56% of this contribution reflected the increase in the micro SME population and only 39% of the contribution was actually due to an increase in value added per micro SME.

In contrast, in the case of small SMEs and, even more significantly, in the case of medium-sized SMEs, the increase in value added per SME was the most important factor in the contribution of the SME size class to the overall increase in value added generated by SMEs from 2013 to 2016.

9.1 Evolution of the EU-28 enterprise population

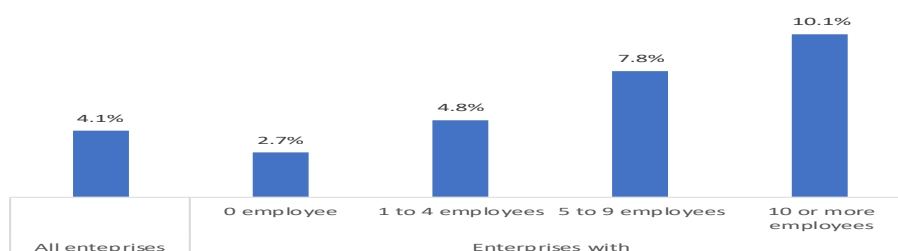
The data on the enterprise demography in the EU-28 NFBS, which are published by Eurostat, distinguish various enterprise size classes using employment thresholds which differ from those used to distinguish between micro, small and medium-sized SMEs and large enterprises.

These business demography data provide information on enterprises with 0 employees, 1 to 4 employees, 5 to 9 employees and 10 or more employees. As practically all enterprises in the EU-28 NFBS are SMEs, the business demography data are useful in terms of analysis of enterprise births and deaths within different sub-groups of micro SMEs and the combined group of small and medium-sized SMEs.⁴⁰ At the present time, such data are available to 2016 only.

Over the period 2013 to 2016, the greatest growth (10.1%) was in the population of SMEs with 10 or more employees, while within micro SMEs, the population with 0 employees grew by only 2.7%. The rate of population growth increased with SME size, rising by 4.8% for SMEs with 1 to 4 employees and by 7.9% for SMEs with 5 to 9 employees (Figure 50).

⁴⁰ As large enterprises account for such a minuscule share of the total number of enterprises (Table 2), it is highly unlikely that the change in the overall number of enterprises with 10 or more employees would be significantly impacted by changes in the number of large enterprises.

Figure 48 Change (in %) in the number of enterprises in the EU-28 NFBS from 2013 to 2016

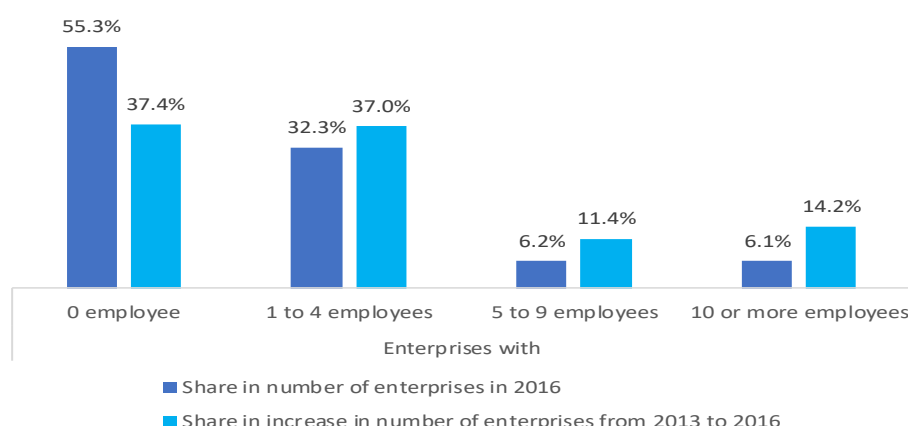


Source: Eurostat, LE Europe

Although the number of EU-28 SMEs with 0 employees increased by only 2.7% from 2013 to 2016 (Figure 48), these SMEs accounted for 37.4% of the total increase in the number of SMEs over that period (Figure 49). In contrast, EU-28 SMEs with 10 or more employees accounted for only 14.2% of the increase in SME population from 2013 to 2016 (Figure 49) even though the number of such SMEs increased by 10.1% (Figure 48).

Overall, while the contribution of EU-28 micro SMEs with zero employees to the increase in the SME population from 2013 to 2016 was proportionately much lower than their share of the SME population (37.4% vs. 55.3%), the opposite was true for all other SME size classes, especially SMEs with 5 to 9 employees and 10 or more employees (Figure 51). Their contribution to the increase in the EU-28 SME population was roughly double their share in the EU-28 SME population.

Figure 49 Share of different enterprise size classes in number of EU-28 NFBS enterprises in 2016 and in the increase in the number of EU-28 NFBS enterprises from 2013 to 2016



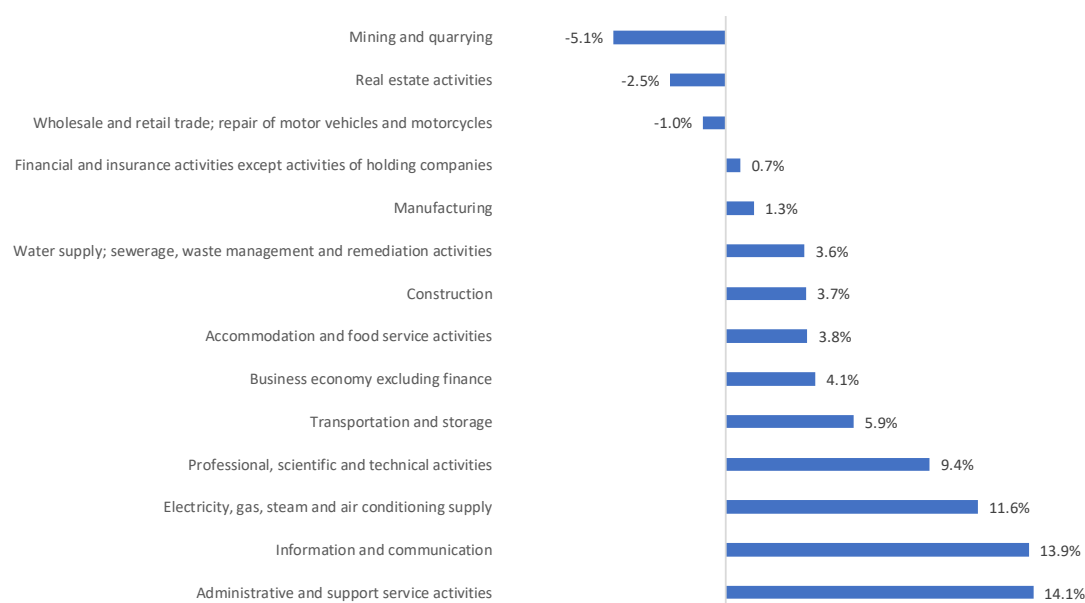
Source: Eurostat, LE Europe

The evolution of the EU-28 SME population from 2013 to 2016 varied greatly across industries.

The EU-28 NFBS recorded strong growth in the number of enterprises in 'administrative and support service activities' (14.1%), 'electricity, gas, steam and air conditioning supply' (11.6%), 'information and communication' (13.9%) and 'professional, scientific and technical activities' (9.4%) (Figure 50).

In contrast, the number of enterprises fell in 'mining and quarrying' (-5.1%), 'real estate activities' (-2.5%) and 'wholesale and retail trade; repair of motor vehicles and motorcycles' (-1.0%) (Figure 50).

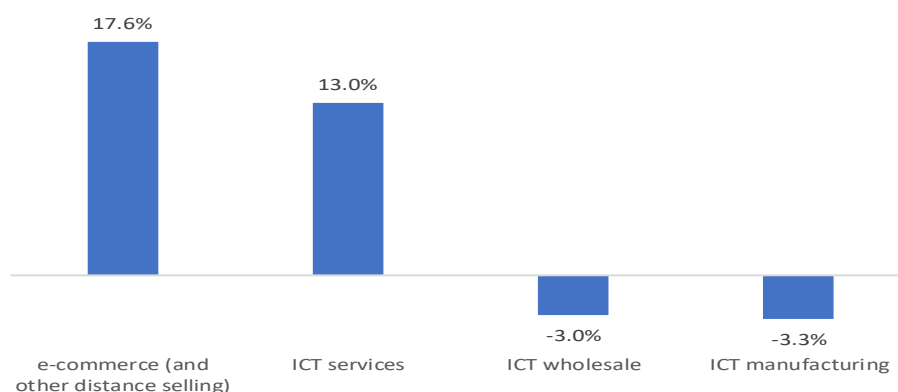
Figure 50 Growth (in %) from 2013 to 2016 in the number of enterprises in different industries of the EU-28 NFBS



Source: Eurostat, LE Europe

Within the digital economy, strong growth in the number of enterprises was recorded over the period 2013 to 2016 in 'e-commerce (and other distance selling)' (17.6%) and 'ICT services' (13.0%). In contrast, the number of enterprises declined in 'ICT manufacturing' (-3.3%) and 'ICT wholesale' (-3.0%) (Figure 51).

Figure 51 Growth (in %) from 2013 to 2016 in the number of enterprises in different EU-28 digital and ICT industries



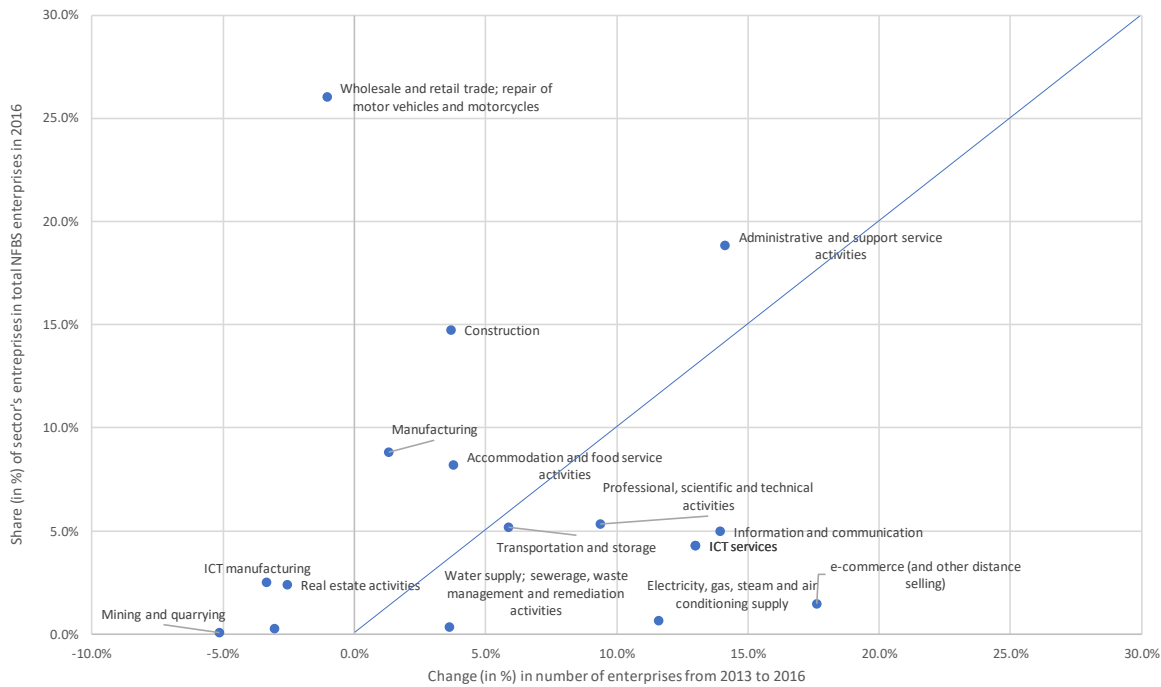
Source: Eurostat, LE Europe

With the exception of the 'administrative and support service activities' industry, the number of enterprises in the industries which accounted for a large proportion of the total EU-28 NFBS enterprise population (i.e., 'accommodation and food service activities', 'construction' and 'manufacturing') increased only marginally from 2013 to 2016 (Figure 53).

In contrast, three of four industries showing the strongest growth in the number of enterprises from 2013 to 2016 (i.e., 'administrative and support service activities', 'electricity, gas, steam and air conditioning supply', 'information and communication', and 'professional, scientific and technical activities') accounted in 2016 for only a very small share of the total NFBS enterprise population (Figure 52).

The exception is the industry ‘administrative and support service activities’ which both posted strong growth in the number of enterprises and accounted for a substantial proportion of the NFBS enterprise population (Figure 52).

Figure 52 Growth (in %) from 2013 to 2016 in the number of enterprises in different industries of the EU-28 NFBS and sectoral share (in %) of EU-28 NFBS enterprises in 2016



Source: Eurostat, LE Europe

9.2 Enterprise births and deaths from 2013 to 2016

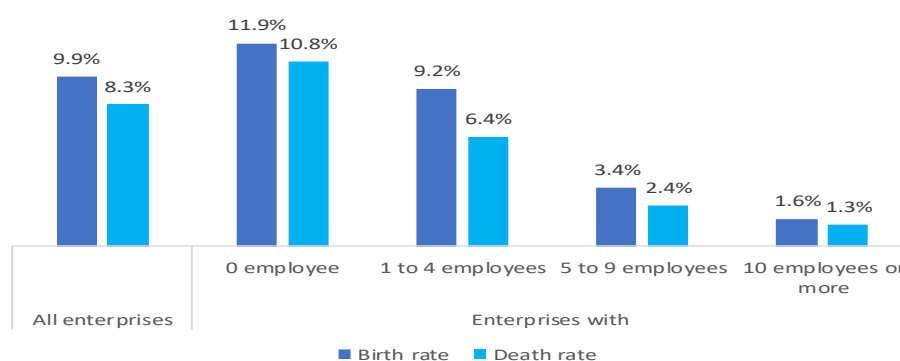
Smaller enterprise size classes typically show higher enterprise birth and death rates⁴¹ than larger enterprise size classes.

For example, SMEs with 0 employees posted an average birth rate of 11.9% over the period 2013 to 2016 and an average death rate of 10.8% over the same period, while the corresponding figures for enterprises with 10 employees or more were 1.6% and 1.3% respectively (Figure 53).

The average enterprise birth and death rates in the EU-28 NFBS were 9.9% and 8.3% respectively over the period 2013 to 2016, reflecting the high birth and death rates of small micro SMEs (i.e. SMEs with 0 employees or only 1 to 4 employees) (Figure 53).

⁴¹ The enterprise birth rate is equal to the number of new enterprises divided by the number of enterprises in year t-1. Similarly, the enterprise death rate is equal to the number of enterprises which have disappeared in year t, divided by the number of enterprises in year t-1. It is important to note that the economic activity of some of these enterprises may not have stopped if such enterprises are operating under a new legal name because they were sold or restructured.

Figure 53 Average enterprise birth and death rates in the EU-28 NFBS from 2013 to 2016 – all enterprises and different enterprise size classes



Note: The enterprise birth and death rates are computed as the ratio of enterprise births / deaths in year t to the enterprise population in year $t-1$.

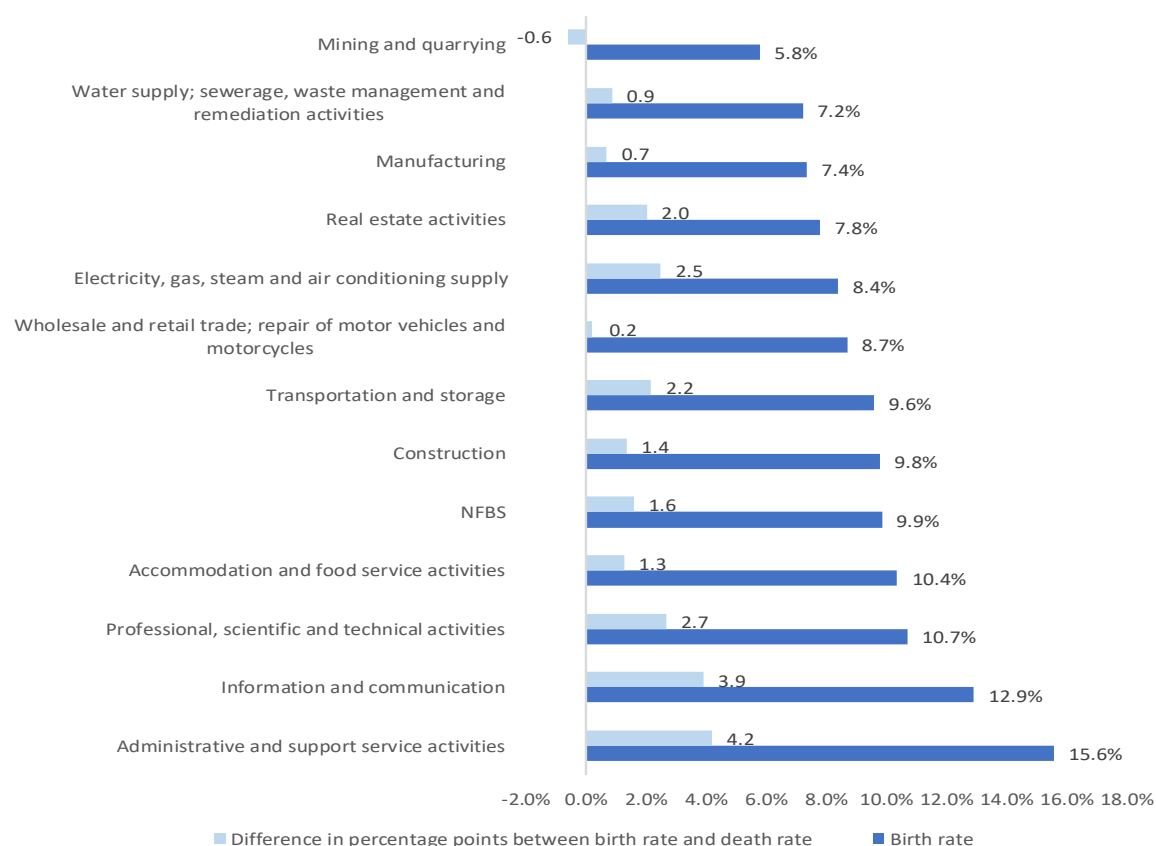
Source: Eurostat, LE Europe

Strong growth in the number of enterprises may result from a high birth rate and/or a low death rate relative to the birth rate. Interestingly, the three industries with the highest average enterprise birth rate from 2013 to 2016 in the EU-28, namely ‘administrative and support service activities’, ‘information and communication’ and ‘professional, scientific and technical activities’, were also those industries in which the enterprise birth rate most exceeded the enterprise death rate. For example, ‘administrative and support service activities’ posted the highest average enterprise birth rate (15.6%) from 2013 to 2016 and also the greatest difference (4.2 percentage points) between the average birth and death rates over this period (Figure 54).

In contrast, ‘manufacturing’, ‘mining and quarrying’ and ‘water supply; sewerage, waste management and remediation activities’, the three industries with the lowest average enterprise birth rates in the EU-28 over the period 2013 to 2016, were also the industries in which the differences between the average birth and death rates were among the smallest of all NFBS industries, with the average death rate actually exceeding the average birth rate in ‘mining and quarrying’ over the period 2013 to 2016. Moreover, only ‘wholesale and retail trade; repair of motor vehicles and motorcycles’ showed only a very small positive difference between average birth and death rates over the period 2013 to 2016 (Figure 54).

The digital / ICT industries showed a similar dichotomy. ‘E-commerce (and other distance selling)’, the industry with the highest average enterprise birth rate (18.6%) during the period 2013 to 2016, was also the industry with the greatest difference (5.1 percentage points) between average birth and death rates in this period. In contrast, the two industries with the lowest average birth rates (‘ICT manufacturing’ and ‘ICT wholesale’) were also the industries with the smallest difference between average birth and death rates, with death rates only marginally exceeding birth rates (Figure 55).

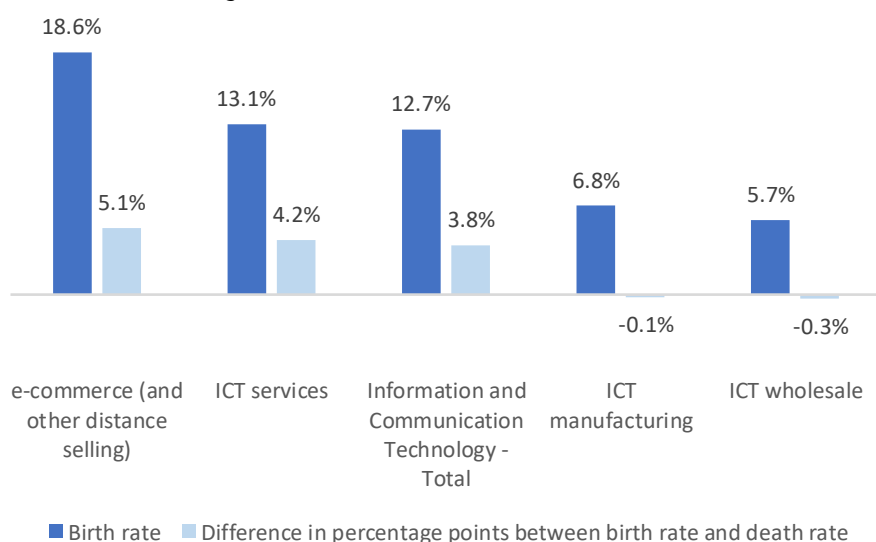
Figure 54 Average enterprise birth rates from 2013 to 2016 in different industries of the EU-28 NFBS and the NFBS overall



Note: The enterprise birth and death rates are computed as the ratio of enterprise births / deaths in year t to the enterprise population in year t-1.

Source: Eurostat, LE Europe

Figure 55 Average enterprise birth rates in different EU-28 digital and ICT industries from 2013 to 2016



Note: The enterprise birth and death rates are computed as the ratio of enterprise births / deaths in year t to the enterprise population at t-1.

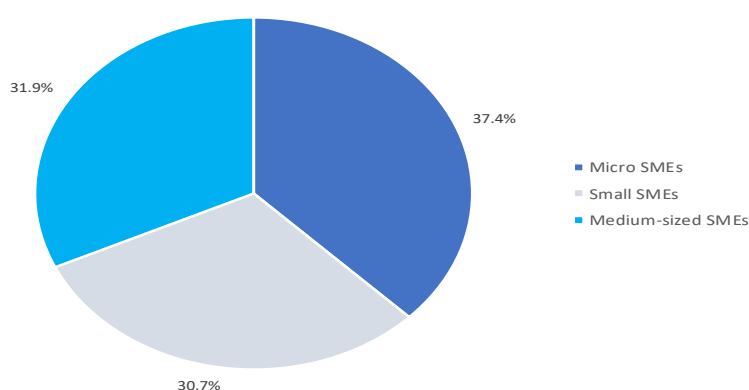
Source: Eurostat, LE Europe

9.3 Contribution of changes in the SME population to overall growth in value added in the EU-28 NFBS

As shown earlier, the increase in value added generated EU-28 SMEs in the NFBS accounted for 50.7% of the total increase in NFBS value added from 2013 to 2018 (Figure 36). Micro SMEs accounted for 37.4% of this increase in SME value added while small SMEs accounted for 30.7% and medium-sized SMEs for 31.9% (Figure 56).

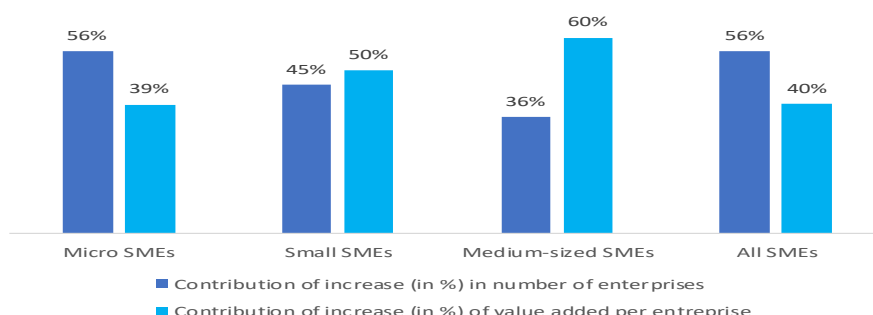
While micro SMEs accounted for the largest share of the increase in SME value added, 56% of this contribution reflected the increase in the micro SME population and only 39% of the contribution was accounted for by an increase in value added per micro SME (Figure 57). In contrast, in the case of small SMEs and, even more markedly, in the case of medium-sized SMEs, the increase in value added per SME was the most important factor in the contribution of the SME size class to the overall increase in value added generated by SMEs from 2013 to 2016 (Figure 57).

Figure 56 Contribution (in %) by micro, small and medium-sized SMEs, to the increase in SME value added in the NFBS from 2013 to 2018.



Source: Eurostat, LE Europe

Figure 57 Contribution of the increase in the number of enterprises and value added per enterprise to the increase from 2013 to 2018 in the EU-28 NFBS value added generated by micro, small and medium-sized SMEs



Note: The difference between 100% and sum of the contributions of the increase in the number of enterprises and the value added per enterprise reflects the increase in value added per enterprise of the additional enterprises formed.

Source: Eurostat, LE Europe

10 High-growth enterprises, startups and scaleups

Key points

Overall, in the EU-28 business economy in 2017, there were 187,677 high-growth enterprises i.e. enterprises with more than 10 employees and average growth of 10% or more in employment over the previous three-year period.

In 2016, the most recent year for which data on the total enterprise population in the EU-28 business economy are available, high-growth enterprises had, on average, 86 employees.

They accounted for 10.7% of all EU-28 enterprises with 10 or more employees and 15.2% of the employment of these enterprises. The number of such high-growth enterprises has grown slightly faster than the overall population of enterprises with 10 or more employees.

Eight of the top 30 startup ecosystems in the world are in the EU. As of August 2019, there were 18,258 startups in the EU.

While startups are present in all Member States, CY, EE, LT, LV and MT have the highest startup intensities in the EU with at least 3 startups per EUR billion of GDP. Estonia in particular stands out with 12.3 start-ups per EUR 1 billion of GDP.

Although dynamic startups and scaleups are expected by EU and Member State policymakers to play a key role in achieving the EU's objective of fostering smart, sustainable and inclusive growth in order to improve Europe's competitiveness and productivity and underpin a sustainable social market economy, no central database or register exists which provides comprehensive information on the EU startup and scaleup populations.

Business registers and Eurostat do provide information on enterprise births but not every enterprise birth is a startup due to differences in set-up and visions. While there is no precise definition of a startup, this term is generally understood to refer to enterprises which are:

- young (younger than 10 years / 5 years depending on the sector)
- innovative (in terms of business models and/or product/service)
- aiming to rapidly scale up (i.e. to grow their number of employees and/or the markets in which they operate)⁴².

As already noted in the 2017/2018 SME Annual Report, all startups are SMEs, but not all SMEs are startups. EU Recommendation 2003/361 defines an SME on the basis of employment and either turnover or the balance sheet total. In the case of startups, these criteria may be difficult to apply, since a company may have a large number of employees but may not yet have a significant turnover. Moreover, the initial capital required to grow the business is commonly much higher (sometimes in the order of millions) for a startup than for SMEs in general.

This section uses data from different sources to shed some light on the European startup and scaleup population, namely:

- Eurostat data on high-growth enterprises and gazelles in the business economy. The latter includes the NFBS and financial and insurance activities (excluding holding companies)⁴³.
 - High-growth enterprises are defined as enterprises with at least 10 employees at the beginning of their high growth period and which post

⁴² See EU Start-up Monitor - 2018 Report p. 7 for example.

⁴³ High-growth enterprise data are not available at the NFBS level.

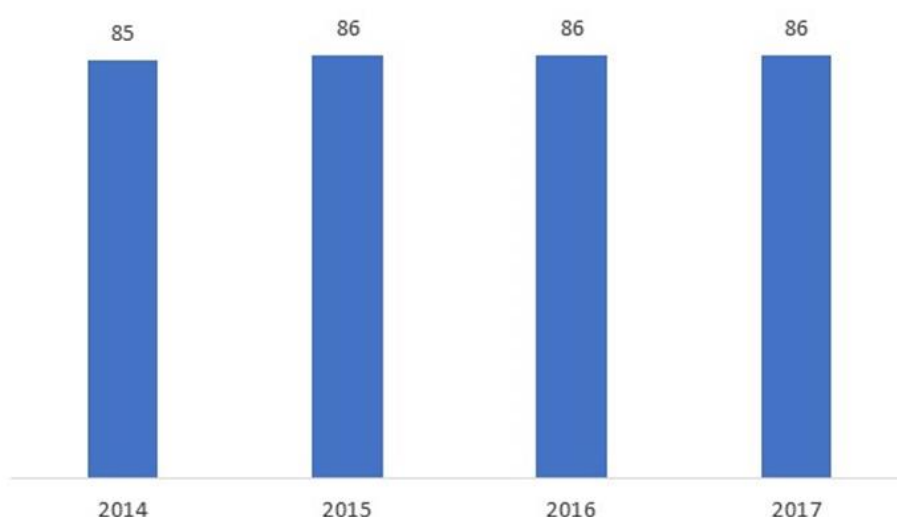
- average annualised growth in the number of employees (or turnover) greater than 10% per annum over a three year period.
- Gazelles are defined as high-growth enterprises that are up to five years old with average annualised growth (turnover or employment) greater than 10% per annum, over a three year period. This section uses the employment-based definition of high growth as this is the only one for which data are generally available.
- Crunchbase⁴⁴ data on the number of startups in different Member States.
- Startup Genome⁴⁵ data on startup ecosystems in the EU-28 economy.
- European Startup Monitor 2019.

10.1 High-growth enterprises

In the EU-28, high-growth enterprises employed, on average, 86 employees in 2017 (the most recent year for which such data are available) (Figure 58). This average has changed very little since 2014, and is at the lower range of the size of an EU-28 medium-sized SME.

Overall, in the EU-28 business economy in 2017, there were 187,677 high-growth enterprises (Figure 59). In 2016, the last year for which data on the total enterprise population in the EU-28 business economy are presently available, these high-growth enterprises accounted for 10.7% of all EU-28 enterprises with 10 or more employees and 15.2% of the employment of these enterprises (Figure 60). The number of such high-growth enterprises has grown rapidly in recent years (9.2% on average in the period 2015 to 2017) (Figure 59) and slightly faster than the overall population of enterprises with 10 or more employees (as reflected by the small trend increase in the share of high-growth enterprises in the number of enterprises with 10 or more employees and their total employment) (Figure 60).

Figure 58 Average size (in terms of number of employees) of high-growth enterprises in the EU-28 business economy



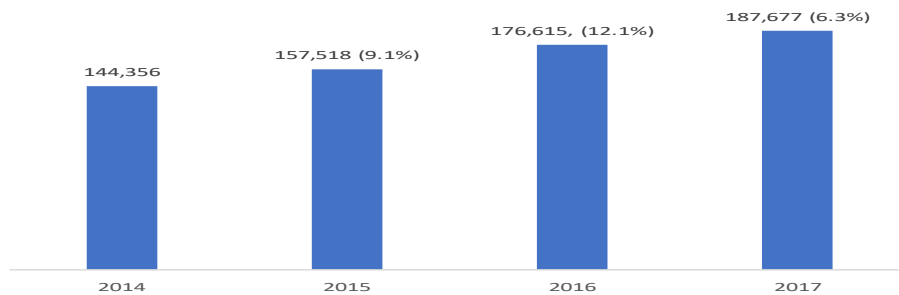
Note: High-growth enterprises are enterprises with at least 10 employees at the beginning of their growth period and which post average annualised growth in the number of employees greater than 10% per annum over a three year period. The business economy includes the NFBS and financial and insurance activities (excluding holding companies).

Source: Eurostat

⁴⁴ Data are available at <https://www.crunchbase.com/>

⁴⁵ Data are available at <https://startupgenome.com/>

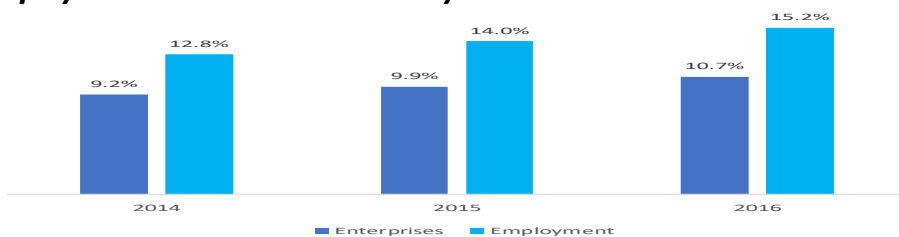
Figure 59 Number and annual growth in the number of high-growth enterprises in the EU-28 business economy



Note: Annual growth rate is shown in (.). No annual growth rate is shown for 2014 as data on high-growth enterprises are not available prior to 2014. High-growth enterprises are enterprises with at least 10 employees in the beginning of their growth and which post average annualised growth in the number of employees greater than 10% per annum over a three year period. The business economy includes the NFBS and financial and insurance activities (excluding holding companies).

Source: Eurostat

Figure 60 High-growth enterprises' share of number of enterprises and employment in EU-28 population of enterprises with 10 or more employees in the business economy



Note: No data are shown for 2017 because data on the total population of enterprises with 10 or more employees are not yet available. High-growth enterprises are enterprises with at least 10 employees in the beginning of their growth and which post average annualised growth in the number of employees greater than 10% per annum over a three year period. The business economy includes the NFBS and financial and insurance activities (excluding holding companies).

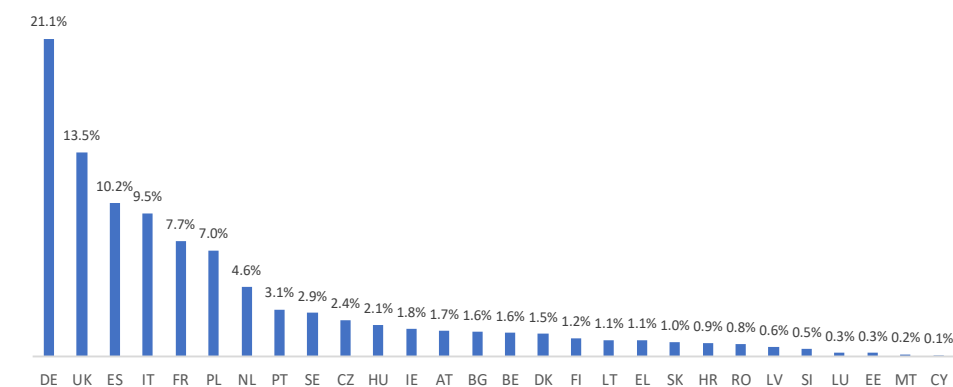
Source: Eurostat

Although the largest six EU economies (DE, ES, FR, IT, PL and UK) accounted in 2017 for 69% of all EU-28 high-growth enterprises in the business economy (Figure 61), in the case of BE, FR, IT and UK, their share of high-growth enterprises was notably lower than would have been expected on the basis of their share of EU-28 GDP (at constant prices) (Figure 62).

In contrast, in the case of ES, PL, and PT, their share of high-growth enterprises was markedly higher in 2017 than would be expected from their share of EU-28 GDP. This was also the case, albeit to a somewhat lesser extent, for BG, CZ and HU.

Also of note is the fact that DE's share of high-growth enterprises, while by far the largest in the EU-28, was only marginally higher than its share of EU-28 GDP.

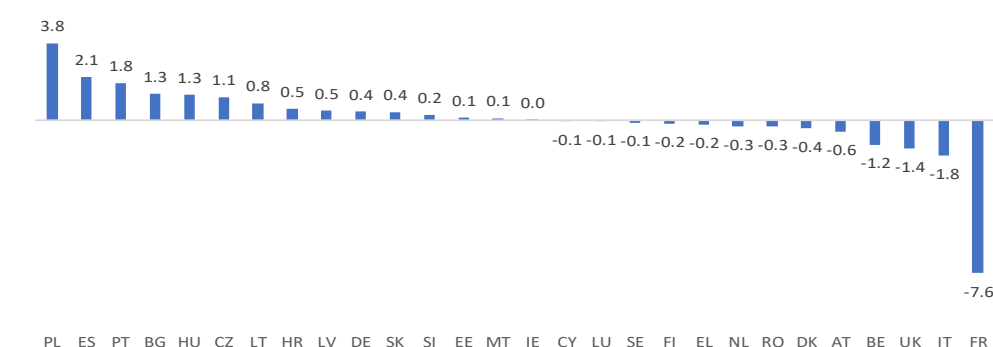
Figure 61 Member States' share (in %) of EU-28 high-growth enterprises in the business economy in 2017



Note: High-growth enterprises are enterprises with at least 10 employees in the beginning of their growth and which post average annualised growth in the number of employees greater than 10% per annum over a three year period. The business economy includes the NFBS and financial and insurance activities (excluding holding companies).

Source: Eurostat

Figure 62 Difference (in percentage points) between Member States' shares of EU-28 high-growth enterprises in the business economy and EU-28 GDP in 2017



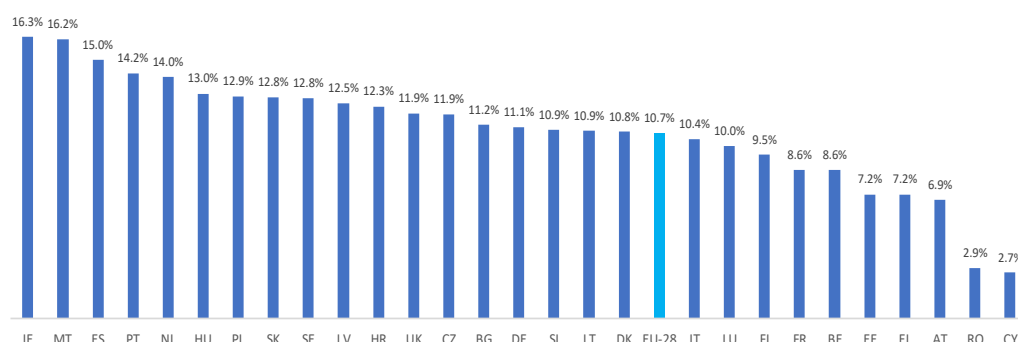
Note: High-growth enterprises are enterprises with at least 10 employees in the beginning of their growth and which post average annualised growth in the number of employees greater than 10% per annum over a three year period. The business economy includes the NFBS and financial and insurance activities (excluding holding companies).

Source: Eurostat

Member States also showed marked differences in terms of the importance of high-growth enterprises in the business economy. For example, in 2016⁴⁶, high-growth enterprises accounted for at least 13% of enterprises with 10 or more employees in the business economy in 6 Member States (ES, HU, IE, MT, NL and PT), whereas they accounted for less than 8% in 5 Member States (AT, CY, EE, EL and RO) (Figure 63). Four of the six Member States with the highest share of high-growth enterprises in 2016 and 2017 (ES, IE, NL and PT) were also the Member States in which this share has grown most since 2014 (Figure 64). In contrast, in 5 Member States (EE, FI, LT, LV and UK) the relative importance of high-growth enterprises fell slightly during the same period.

⁴⁶ 2017 in the case of CZ, EE, ES, HR, IT, NL, PL, PT.

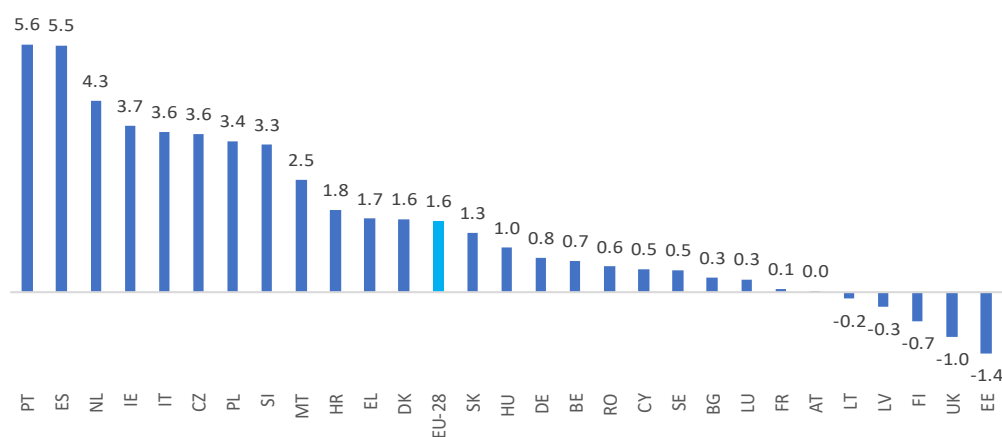
Figure 63 High-growth enterprises' share of number of enterprises in population of enterprises with 10 or more employees in the business economy of EU-28 Member States in 2016 / 2017



Note: 2017 data are shown for CZ, EE, ES, HR, IT, NL, PL, PT. High-growth enterprises are enterprises with at least 10 employees in the beginning of their growth and which post average annualised growth in the number of employees greater than 10% per annum over a three year period. The business economy includes the NFBs and financial and insurance activities (excluding holding companies).

Source: Eurostat

Figure 64 Change in high-growth enterprises' share of number of enterprises in population of enterprises with 10 or more employees in EU-28 Member States from 2014 to 2016 (2017)



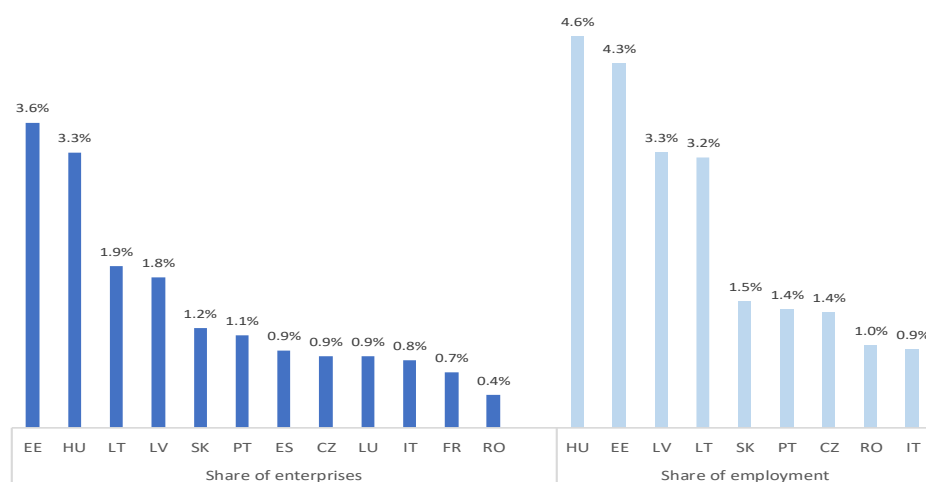
Note: 2017 data are shown for CZ, EE, ES, HR, IT, NL, PL, PT. High-growth enterprises are enterprises with at least 10 employees in the beginning of their growth and which post average annualised growth in the number of employees greater than 10% per annum over a three year period.

Source: Eurostat

10.2 Gazelles

Data on gazelles, i.e. young high-growth enterprises, are only available for a limited number of Member States. The 2016 data (the most recent year for which data are available) show that the importance of gazelles in the business economy varied markedly across Member States. The largest contribution of gazelles to the economies of Member States was in Central Europe. In particular, EE and HU, followed by LT and LV, stand out, with a relatively high contribution of gazelles compared to the number of enterprises and employment in the business economy (Figure 65).

Figure 65 Gazelles' share of number of enterprises and employment in the EU-28 population of enterprises with 10 or more employees in 2016



Note: 2015 data are shown for EE. No employment data are available for ES, FR and LU. Gazelles are high-growth enterprises that are up to five years old, with average annualised growth (turnover or employment) greater than 10% per annum, over a three year period. The business economy includes the NFBS and financial and insurance activities (excluding holding companies).

Source: Eurostat

10.3 Startup ecosystems and the EU startup population

Information on the startup ecosystems is drawn from the Global Startup Ecosystem Report produced by Startup Genome. This report ranks the top startup ecosystems annually according to a number of indicators or “success factors”.⁴⁷

Eight of the top 30 startup ecosystems identified by Startup Genome are located in EU-28 Member States. London (United Kingdom) is ranked 3rd overall, Paris (France) is ranked 9th, Berlin (Germany) is ranked 10th, Stockholm (Sweden) is ranked 11th, the Amsterdam-StartupDelta (the Netherlands) is ranked 15th, and Barcelona (Spain), Dublin (Ireland) and Munich (Germany) are ranked 26-30. All of these are in Member States with over 500 SME startups.

EU-28 startup ecosystems perform relatively strongly in terms of funding, connectedness and knowledge success factors and relatively weakly in terms of talent, experience and market reach. This assessment of the EU-28 startup ecosystems is based on the ranking by Startup Genome of each ecosystem dimension⁴⁸ of these ecosystems among the top 30 startup ecosystems in the world, namely: Silicon Valley, New York City, London, Beijing, Boston, Tel Aviv, Los Angeles, Shanghai, Paris, Berlin, Stockholm, Seattle, Toronto-Waterloo, Singapore, Amsterdam-Startup Delta, Austin, Chicago, Bangalore, Washington D.C., San Diego, Denver-Boulder, Lausanne-Bern-Geneva, Sydney, Vancouver, Hong Kong, Atlanta, Barcelona, Dublin, Miami, Munich.⁴⁹

Comparable data on the EU startup population is not currently produced by national and international statistical organisations. Therefore, the information which follows was extracted from the Crunchbase company database, which provides information on startups throughout the world and which has been recently used by OECD staff⁵⁰ to develop a clear overview of the startup population in OECD countries.⁵¹

⁴⁷ See The Global Startup Ecosystem Report 2019 for detailed information on the success factors.

⁴⁸ The ecosystem dimensions include performance, funding, market reach, connectedness, talent, experience and knowledge (see Startup Genome, 2019).

⁴⁹ The first 25 ecosystems are listed in the order of their overall ranking by Startup Genome and the last 5 are listed in alphabetical order (See Startup Genome, 2019).

⁵⁰ See Breschi et al. (2018).

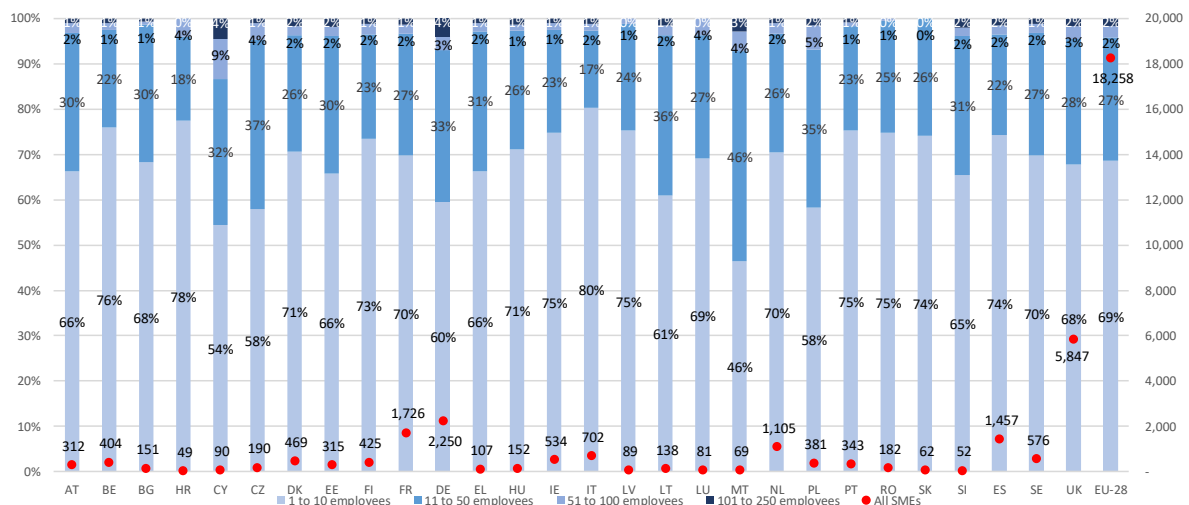
⁵¹ The data reflect the information available in the Crunchbase on 20 August 2019.

For the purposes of this report, after reviewing the entire set of companies included in the Crunchbase, every young, active, for-profit SME⁵² headquartered within an EU-28 Member State was identified as an EU startup.

Based on these criteria, the number of startups hosted by the EU-28 in August 2019 was 18,258 (Figure 66). Five Member States have startup populations of over 1,000 (DE, ES, FR, NL and UK) and an additional three Member States have over 500 startups (IE, IT and SE).

Almost 70% of all startups in the EU-28 are micro SMEs. Small and medium-sized SMEs account for 27% and 4% respectively of the EU startup population. The SME size distribution of startups varies across Member States. For example, micro SMEs make up at least 75% of startups in BE, HR, IE, IT, LV, PT and RO while micro SME startups account for 60% or less of all startups in CY, CZ, DE, MT and PL.

Figure 66 SME Startup population in EU-28 Member States - August 2019



Source: LE Europe analysis of the Crunchbase company database.

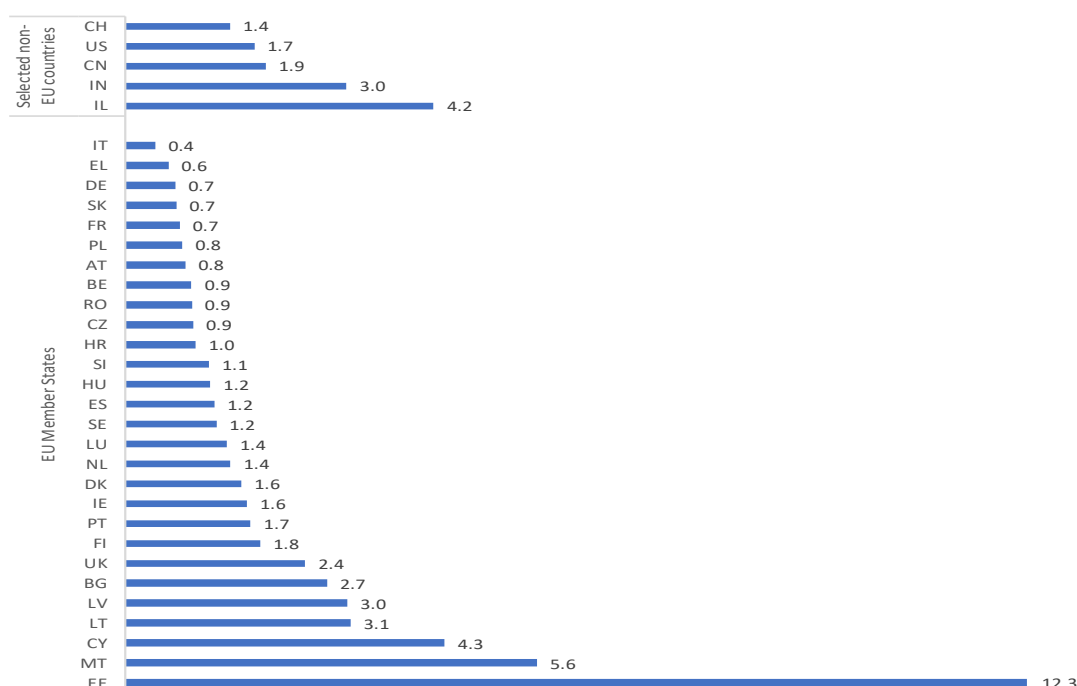
Differences in startup populations reflect numerous factors, for example, startup ecosystems, tax systems, the overall size of the national economy, etc. To adjust for the overall size of the national economy, Figure 67 shows the number of startups per EUR 1 billion of GDP as of August 2019. The scaling of the overall number of startups in a Member State by its GDP (at current prices) shows that some smaller Member States have a relatively large startup population.

For example:

- CY, EE, LT, LV and MT have the highest startup intensities in the EU, with at least 3 startups per EUR billion of GDP (Figure 67). EE, in particular, stands out with 12.3 startups per EUR 1 billion of GDP, by far the highest total out of all EU Member States.
- In contrast, AT, BE, CZ, DE, EL, FR, IT, PL, SK and RO have less than one startup per EUR 1 billion of GDP.

⁵² Companies with less than 500 employees which were founded after 1 January 2014.

Figure 67 Number of SME startups per EUR 1 billion of GDP – August 2019



Source: LE Europe analysis of the Crunchbase company database.

10.4 Some key characteristics of the EU startup population

This section presents some key figures on startups in Europe. The following data were collected for the European Startup Monitor 2019,⁵³ via an online survey aimed at startup founders, which was disseminated by a variety of startup support professionals, startup associations and startup ecosystem stakeholders. The survey remained open from mid-July 2019 until the beginning of September 2019 and collected 848 responses⁵⁴ from 31 countries.⁵⁵

As previously noted, the term 'startup' has no commonly agreed official definition. The following startup criteria are used in the European Startup Monitor:

- age of the enterprise (younger than ten years);
- focus by the enterprise on innovation (of product and/or service and/or business model); and,
- the enterprise's aim is to scale up (i.e. the enterprise intends to grow the number of employees and/or turnover and/or markets in which it operates).

In the analysis which follows and in the European Startup Monitor, the survey responses are frequently analysed by startup development stage, using the following development categories:

- Pre-seed or seed stage (concept development/no revenues yet);

⁵³ www.europeanstartupmonitor2019.eu

⁵⁴ Some limitations to the study must be taken into account when drawing conclusions from the findings. Firstly, the European Startup Monitor does not provide full coverage of all the startups in Europe, which significantly exceed the survey response sample. Instead, the researchers focus on analysing the data by development stage of the startups. However, there is a sufficiently large number of startups in each development stage to be able to draw meaningful conclusions and to compare results across development stages, with the exception of the steady stage category, which is too small a sample size, accounting for only 2.5% of the survey response sample. Secondly, the data for Austria were collected through a dedicated survey, using an approach that was mostly, but not completely, aligned with the main survey. The general similarity between the two surveys permits joint analysis of the data, but some differences made it impossible to use the Austrian data for a few specific analyses.

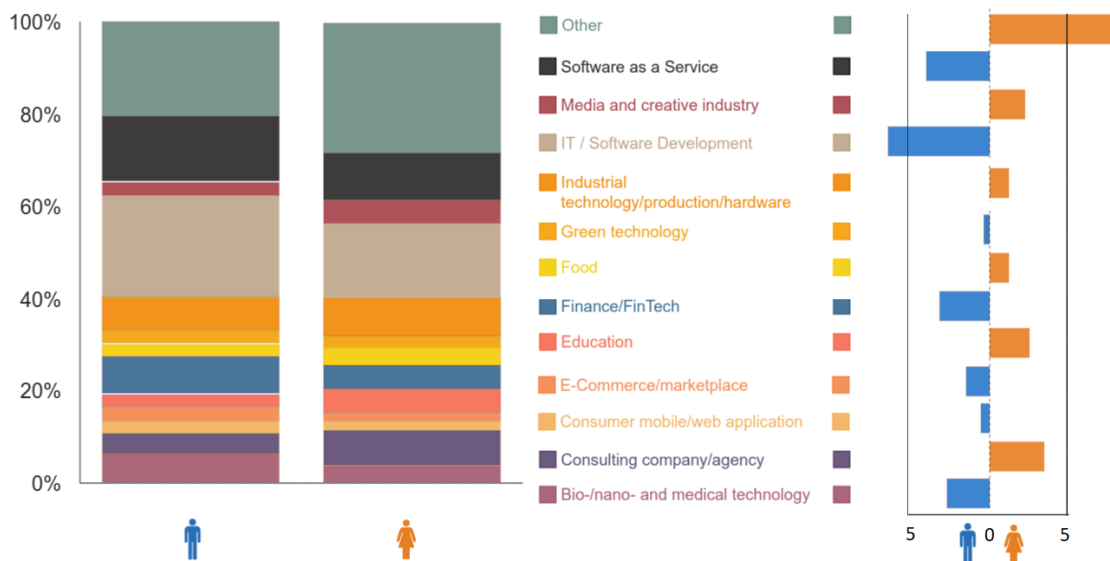
⁵⁵ Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom.

- Startup stage (completion of a marketable product);
- Steady stage (the startup's business does not currently show any substantial growth); and,
- Growth stage (strong sales growth and/or user growth).

10.4.1 Profile of the startup founders

The vast majority of startup founders are male and the average age of both male and female founders is 38. There is a general similarity in the gender distribution of founders among the different sectors, with some notable exceptions: “Software as a service”, “IT/Software Development” and “Consulting company/agency” in which male founders predominate. (Figure 68).

Figure 68 Distribution of male and female founders among sectors (left) & differences in distribution (right)*



Notes: Differences in distribution are given in percentage points. For instance, the share of male founders active in “IT/Software Development” is 22% of the total of male founders, while the share of female founders active in the same sector is 16% of the total of female founders: a difference of 6 percentage points.

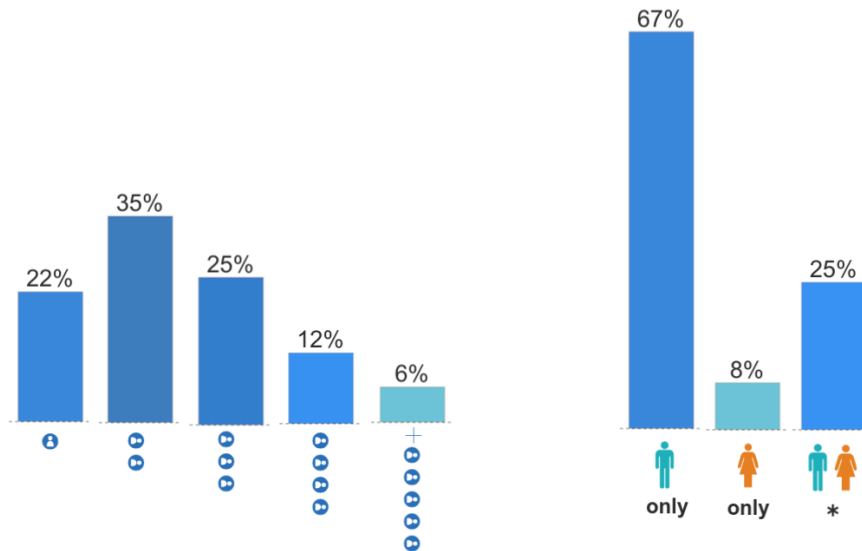
Source: European Startup Monitor 2019

10.4.2 Founding team

Contrary to the stereotype of the successful entrepreneur who independently comes up with a groundbreaking new idea for a business venture, founding a startup is often a cooperative endeavour (Figure 69).

Indeed, about three quarters of the startups were founded by a team, while only 22% have a single founder. The overwhelming majority of startups were founded by all-male teams, and just 8% of them were founded by all-female teams. The remaining 25% were founded by a team including at least one male and one female.

Figure 69 Size (left) and gender balance (right) of founding teams



Note: The number of bubbles under the bars in the left part of the figure represent the number of startup founders. *= at least one male and one female founded the startup.

Source: European Startup Monitor 2019

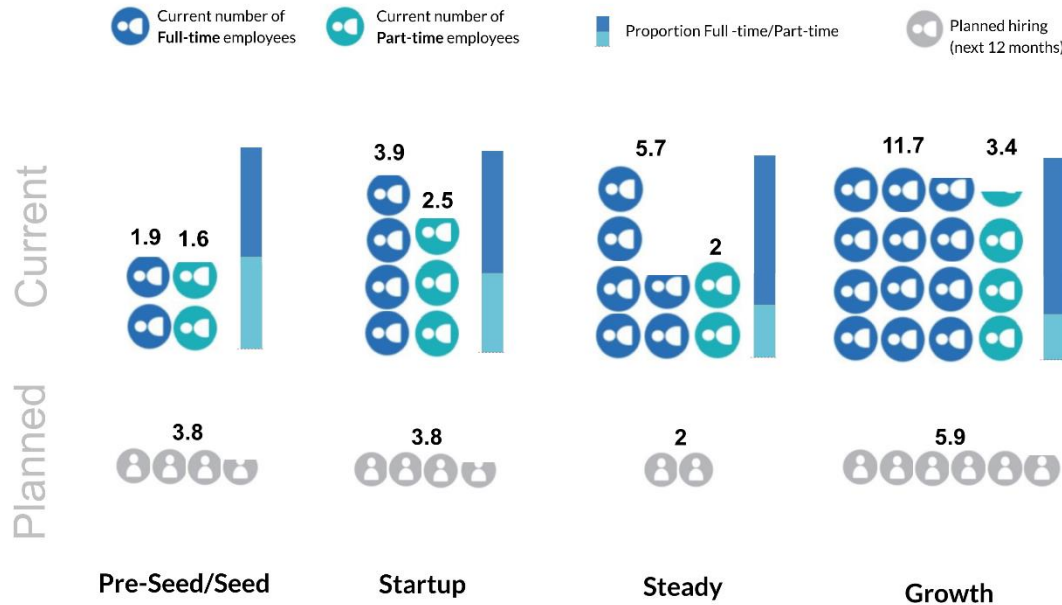
10.4.3 Employment creation by startups

Startups have great job creation potential. The average number of current employees varies according to the development stage of the startup (Figure 70). In the pre-seed/seed stage, the average number of full-time and part-time employees is 3.5. This number tends to increase in later stages, as the startup becomes more economically sound, reaching an average of 15.1 in the growth stage. The total decreases slightly in the steady stage, but it is not possible to draw definitive conclusions from this finding, as the number of startups in the steady stage is smaller than the number in the other categories (Figure 70).

Looking ahead, the number of people that startups plan to hire in the next 12 months ranges, on average, from 2 in the case of startups in the steady stage to almost 6 for startups in the growth stage. Startups in the pre-seed/seed and startup stage plan to increase their headcount by almost 4 over the coming 12 months (Figure 70).

It is worth noting that the proportion of part-time employment in total startup employment remains substantial across all stages of startup development, with a decrease from the pre-seed/seed stage to later stages. This fact should be taken into account when assessing the future job creation potential of startups.

Figure 70 Average number of current employees and planned hiring (next 12 months)

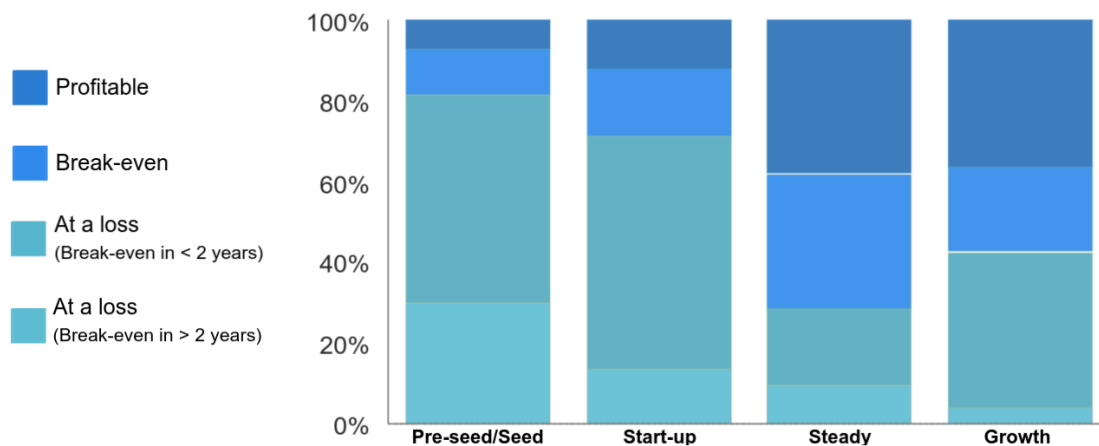


Source: European Startup Monitor 2019

10.4.4 Profitability

As expected, most of the surveyed companies in the pre-seed/seed and startup stage are not yet profitable (Figure 71). However, most of those startups that are currently operating at a loss expect to reach break-even point in less than 2 years. The proportion of those enterprises that anticipate reaching break-even point in more than 2 years declines at later stages of maturity of the startup. However, this could be due to the fact that companies with a worse market outlook in early stages probably do not even reach the later development stages.

Figure 71 Profitability of startups

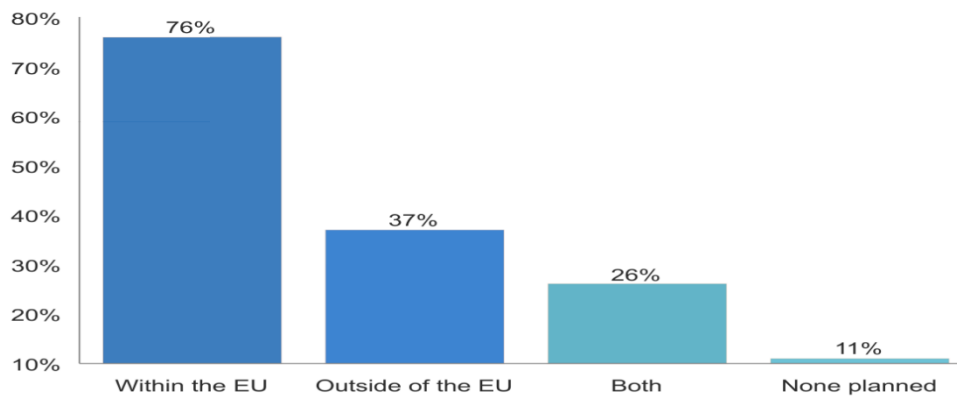


Source: European Startup Monitor 2019

10.4.5 Internationalisation

Most of the respondents planned to expand internationally within the next 12 months (Figure 72). Among the startups which responded to the survey, 76% planned to expand within the EU and 37% outside of the EU (with 26% planning to expand both within as well as outside of the EU). Only 11% of surveyed startups did not plan to expand internationally in the next 12 months. There was no significant difference in the intention to expand internationally with regard to the different development stages of the startups.

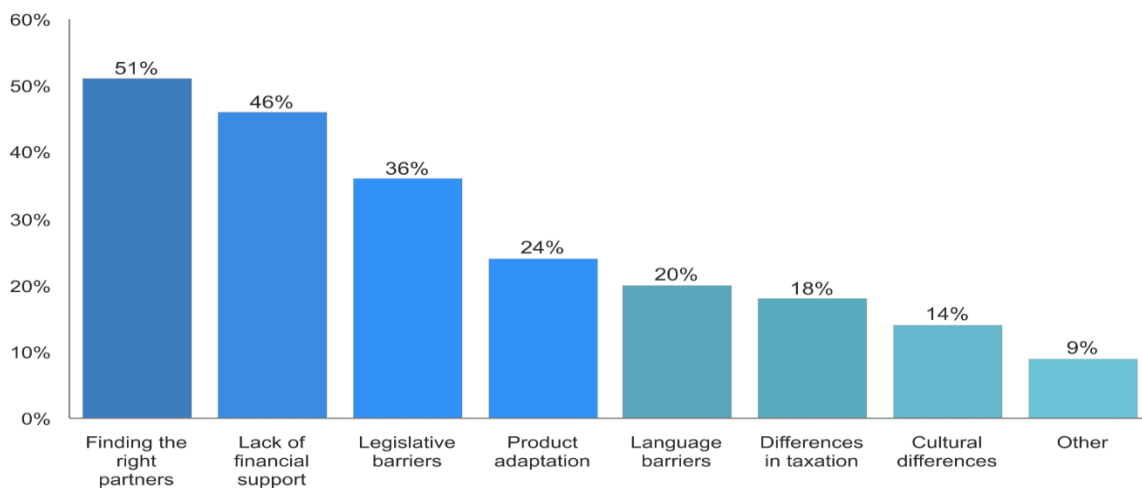
Figure 72 Planned internationalisation (next 12 months)



Source: European Startup Monitor 2019

Although internationalisation is a goal for many startups, there are many obstacles which must be overcome to make internationalisation possible (Figure 73). “Finding the right partners”, “lack of financial support” and “legislative/regulatory barriers” were the obstacles most frequently reported.

Figure 73 Obstacles to internationalisation



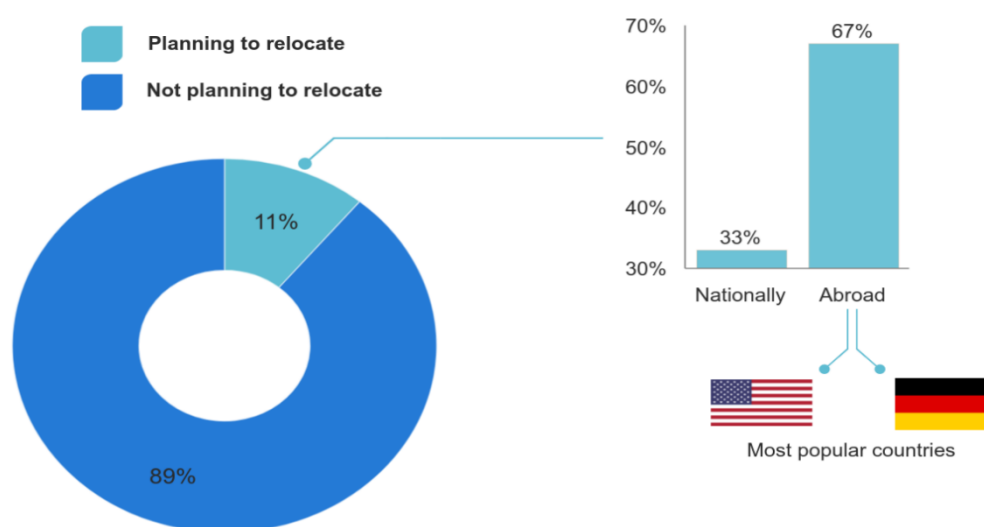
Source: European Startup Monitor 2019

10.4.6 Relocation

Around 11% of respondents reported plans to relocate their startup in the next 12 months (Figure 74). Of these, the vast majority aimed to relocate abroad, with the most popular destinations being the USA (24% of respondents) and DE (18% of respondents). Other relatively popular destinations were NL (11% of respondents), and ES and UK (8% in each case)⁵⁶.

⁵⁶ The fact that the proportion of survey respondents from AT is very high does not affect the overall picture of the preferred relocation destinations. When the survey responses from AT startups are excluded from the analysis, the proportion of survey respondents planning to relocate to various destinations is as follows: US 25%, DE 15%, NL 12%, ES 8% and UK 8%.

Figure 74 : Intentions to relocate (next 12 months) and most popular destinations



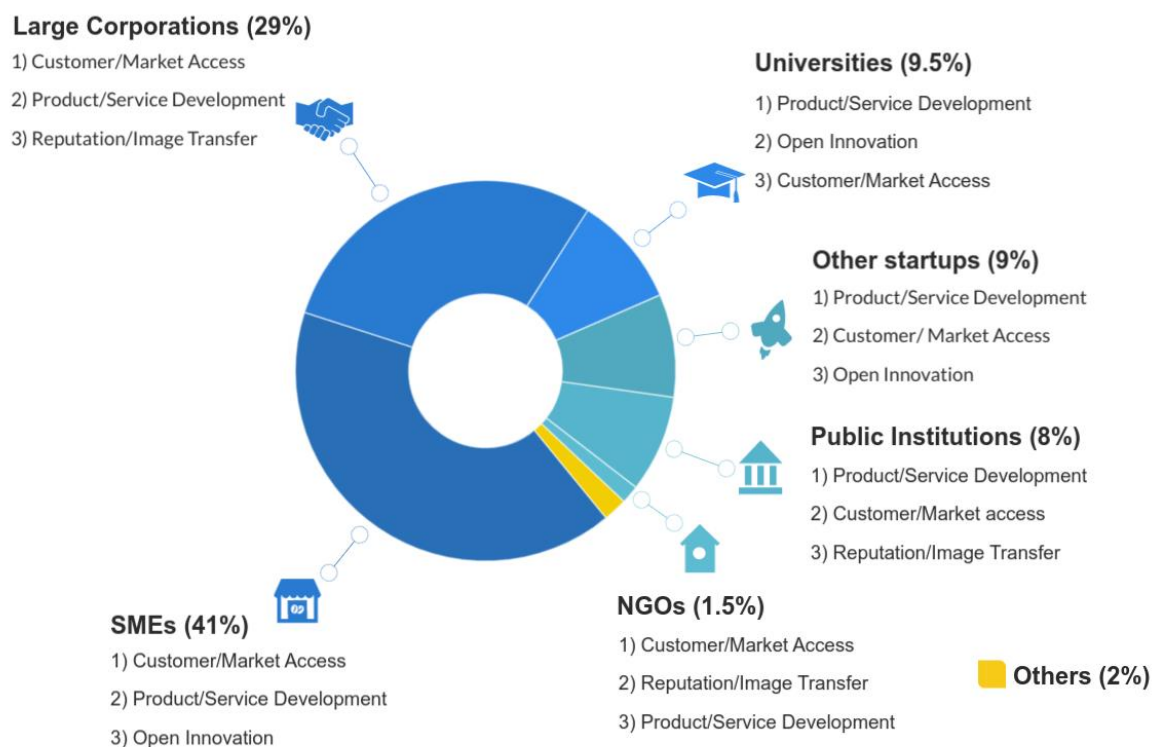
Source: European Startup Monitor 2019

10.4.7 Cooperation

The vast majority of startups cooperate with various types of partners, such as large corporations, NGOs, other startups, public institutions, SMEs and universities. It is worth noting that SMEs are the most frequently chosen partner for cooperation at any stage of development (Figure 75). 41% of startup respondents reported that SMEs are the most important type of partner with whom they cooperate, followed by large corporations. These two types of partners significantly outrank the other cooperation partners in terms of importance.

Some of the reasons for cooperating with different partners apply to all or almost all partners (for example, to gain customer or market access) and some are specific to particular partner(s) (e.g. reputation/image transfer).

**Figure 75 : Most important partner and reasons to cooperate⁵⁷
(ranking)⁵⁸**



Source: European Startup Monitor 2019

The proportion of startups that reported no cooperation at all is below 15% at every stage of startup development and tended to be lowest in the later stages (Figure 76).

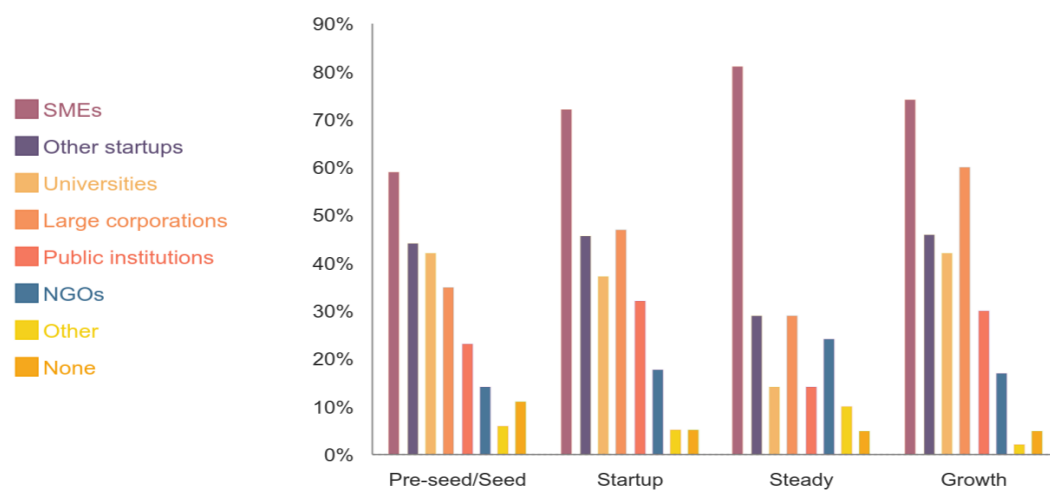
It is possible that startups which do not cooperate at all in their pre-seed/seed stage do not yet recognise the positive impact of collaborations and/or do not yet have the time and resources to invest in building collaborations.

⁵⁷ The list of reasons for cooperating include:

- Product/Service Development: the partners jointly develop (part of) a product/service
- Open Innovation: innovation process whereby knowledge flows across the organisational boundaries of the partners
- Reputation/Image Transfer: cooperating with established organisations helps the startup to be perceived as a credible player by third parties
- Customer/Market Access: the startup gains from cooperating with a partner that is already well positioned in a specific market by getting (possibly partial) access to its customers/markets
- Gaining Technology Expertise: the startup acquires expertise from its partner about specific technologies that it cannot develop in-house
- Fundraising: the partner either directly invests into the startup or helps the startup to raise funds from its ecosystem partners.

⁵⁸ Excluding Austria.

Figure 76 : Choice of cooperation partners ⁵⁹



Source: European Startup Monitor 2019

⁵⁹ Startups may cooperate with more than one partner simultaneously.

11 Recent SBA developments

Key points

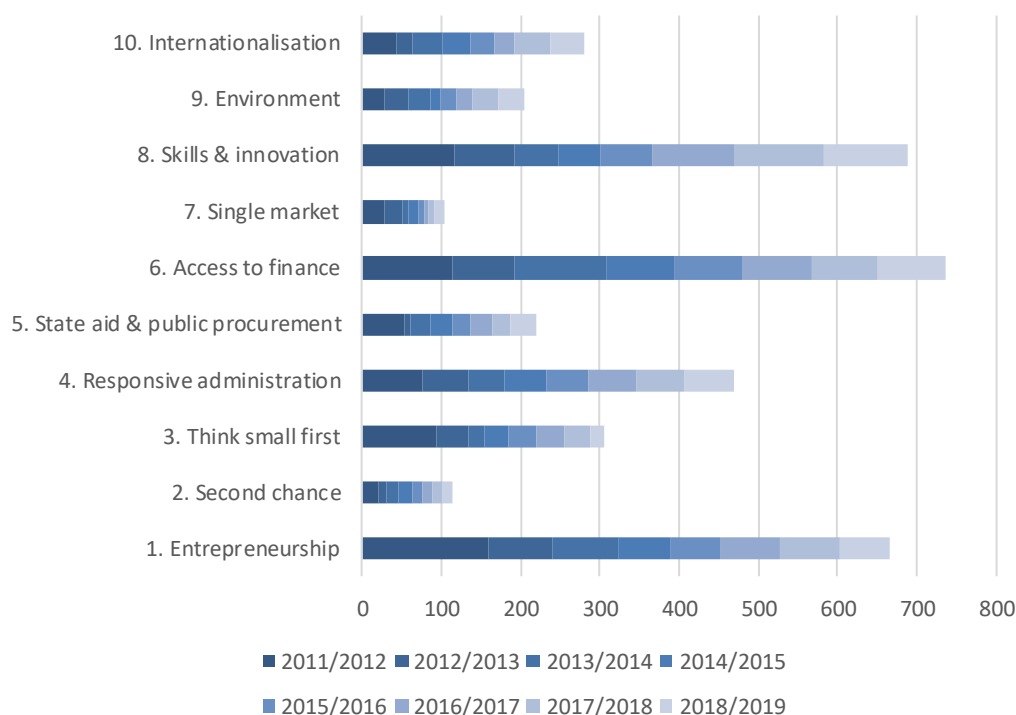
More than 3,750 policy measures have been adopted/implemented since 2011 in the EU, an average of more than 450 a year.

In the EU-28 as a whole, the greatest policy progress can be observed in 'access to finance', 'skills & innovation', and 'entrepreneurship', and to a lesser extent in 'responsive administration', 'think small first' and 'internationalisation'.

In contrast, 'second chance' and 'single market' are the principles showing the least policy activity, followed by 'environment' and 'state aid & public procurement'.

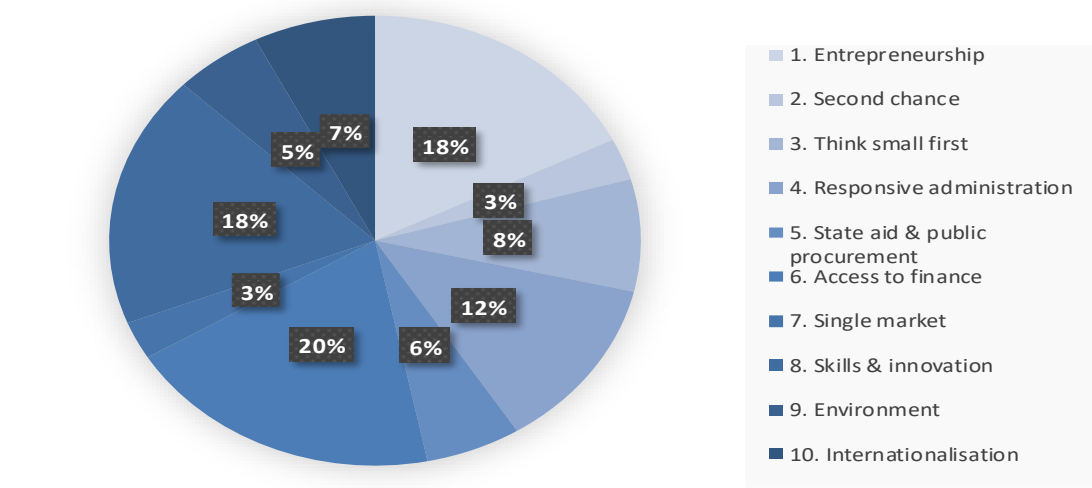
More than 3,750 policy measures have been adopted/implemented since 2011 in the EU, an average of more than 450 a year. Figure 77 shows the collective policy progress at EU-aggregate level in terms of the number of policy measures adopted/implemented over the period 2011 to 2019 per (primary) SBA principle. The greatest policy progress can be observed in 'access to finance', 'skills & innovation', and 'entrepreneurship', and to a lesser extent in 'responsive administration', 'think small first' and 'internationalisation'. In contrast, 'second chance' and 'single market' are the principles with the least policy activity registered, followed by 'environment' and 'state aid & public procurement'.

Figure 77 Number of SBA policy measures adopted/implemented in the EU-28 from 2011 to 2019



Source: CARSA

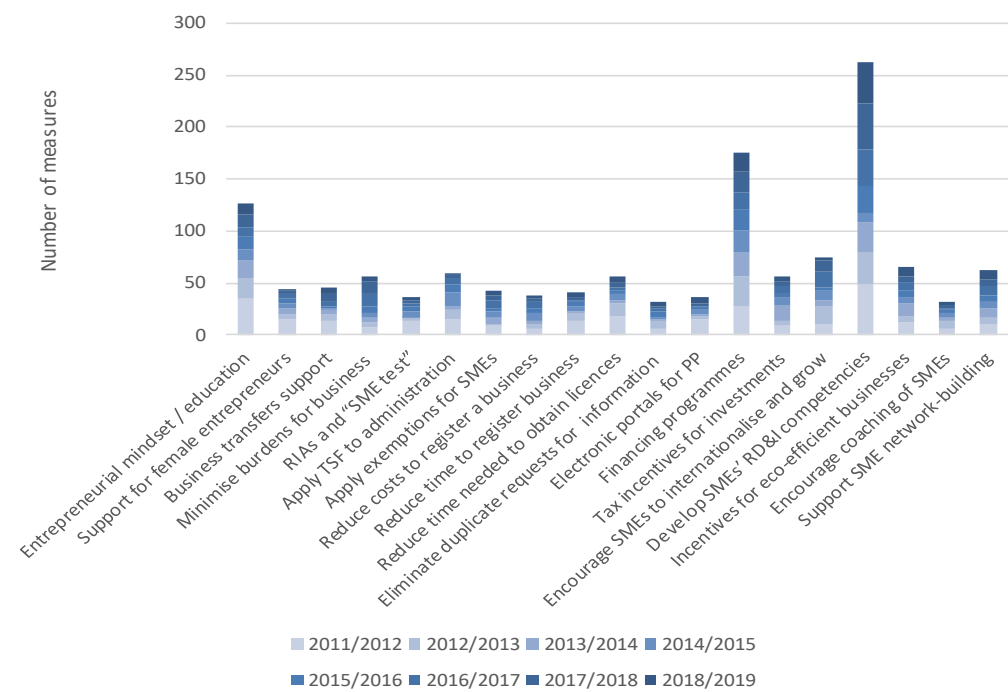
Figure 78 Distribution of policy measures adopted/implemented per SBA principle – EU-28 (2011-2019)



Source: CARSA

Overall, the three most commonly adopted/implemented measures across the EU since 2011 include measures for establishing public financing programmes, for developing the RD&I competencies of SMEs, and for promoting an entrepreneurial mindset. These three measures alone cover an estimated 565 of 3 750 measures.

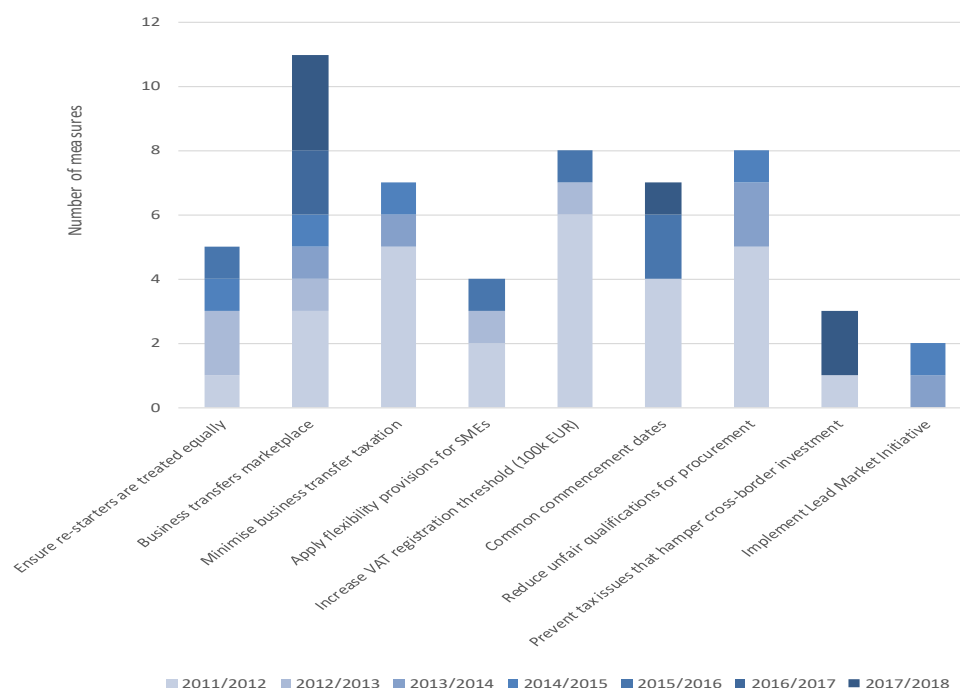
Figure 79 Most commonly implemented measures in EU-28 (2011-2019)



Source: CARSA

On the other hand, the policy measures ‘lead market initiative’, ‘ensure re-starters are treated equally’, ‘common commencement dates’, ‘increase VAT registration threshold’ and ‘reduce unfair qualifications for procurement’ are among the least commonly adopted/implemented measures since 2011 in the EU. Few measures have also been put in place to ease business transfers, e.g. ‘business transfers marketplace’ and ‘minimise business transfer taxation’.

Figure 80 Least commonly implemented measures in EU-28 (2011-2019)



Source: CARSA

Figure 81 SBA inventory checklist at EU-28 level as of Spring 2019

(The colours in the figure below reflect the number of measures adopted. Green: 22-28 measures adopted; yellow: 15 to 21 measures adopted; orange: 8 to 14 measures adopted; and red: less than 8 measures adopted)

Entrepreneurship <i>No. of EU28 Member States with the answer 'Yes'</i>	Are there specific measures to increase the number of entrepreneurs/new company formations? <i>Specific measures notably include business plan competitions, rewarding role model entrepreneurs, entrepreneurship grants, support to start up a company, measures on social security, tax incentives, strategic support from clusters etc.</i>	28
	Are there programmes incorporated into the education curriculum to teach, improve and measure entrepreneurial skills from an early age?	23
	Are there trainings in place to allow teachers to teach entrepreneurship issues?	22
	Are there sufficient measures in place to provide entrepreneurship support specific to WOMEN, YOUNG, UNEMPLOYED, IMMIGRANTS, and REFUGEES? Entrepreneurship support includes advice, training, financing, mentoring etc.	18
	Is there a marketplace and/or specific support and matching schemes to ensure successful business transfers?	15
Entrepreneurship SME Action Programme	Are new developments in the area of the sharing economy closely monitored?	17
'Second chance' <i>No. of EU28 Member States with the answer 'Yes'</i>	Are re-starters treated on an equal footing with new startups?	19
	Are there early warning and help desk mechanisms in place to prevent entrepreneurs from going into bankruptcy? Prevention measures notably include information campaigns, training, information sessions on procedures to reduce the stigma of failure.	15
	Is there the possibility of automatic discharge for honest entrepreneurs after liquidation (or fast track and specific procedures in place for SMEs)?	14
	Are legal bankruptcy procedures completed within a year and is discharge from bankruptcy within a maximum of three years?	10
'Think Small First' <i>No. of EU28 Member States with the answer 'Yes'</i>	Are SME stakeholders consulted on new legislative proposals?	28
	Is the regulatory impact assessment (RIA) process in place?	27
	Is the 'Think Small First' principle applied both to legislation and administrative procedures affecting SMEs?	25
	If so, are consultation results taken into consideration and made publicly available?	24
	Have specific targets for the reduction of administrative burden been set and achieved?	22

	If so, are the results of the impact assessment effectively used to change (or cancel) the proposed legislation?	20
	Is the 'SME test' systematically applied as an integral part of the regulatory impact assessments?	20
	Is there a 'common commencement date' for all new legislation and amendments to the existing legislation relevant to SMEs?	7

Responsive administration <i>No. of EU28 Member States with the answer 'Yes'</i>	Is there a one stop shop where SMEs can perform all administrative requirements and where guidance is provided?	20
	Is there an SME friendly and effective e-Government infrastructure allowing SMEs to quickly handle all procedures (online)?	19
	If so, is the existing single point of contact responsible for ensuring the effectiveness of startup procedures?	14
	Are the various databases of different public administrations sufficiently connected so that companies can provide information only once (except for updates)?	11
Better regulation SME Action Programme <i>No. of EU28 Member States with the answer 'Yes'</i>	Is the SME Envoy highly visible among SME stakeholders and is he/she playing a proactive role between SME stakeholders, the Regulatory Scrutiny Board and policymakers at national level?	19
	Is the cross-border implementation of the 'Once Only' principle supported?	10

State aid & public procurement <i>No. of EU28 Member States with the answer 'Yes'</i>	Does the State Aid policy address SMEs' needs?	27
	Is there an effective e-Procurement portal where all public procurements can be screened and applied?	25
	Is there 'public procurement of innovation' in-place?	19
	Are there protective measures in-place for SMEs in the case of late payments?	18
	Is it a common practice to split big tenders into smaller lots so that small SMEs can also apply and to provide opportunities for collective bidding for SMEs (e.g. via clusters)?	13

Access to finance <i>No. of EU28 Member States with the answer 'Yes'</i>	Are there bank loans and corresponding guarantee schemes to provide access to loans?	28
	Is there funding dedicated to starting up a business as well as for innovation, proof of concept and for the commercialisation of innovation?	28
	Are there Business Angels Funds and Venture Capital Funds established?	27
	Are EU-based funds for SMEs relatively easily accessible?	27
	Are there national grants and risk capital to support SMEs and startups?	27
	Are legal, tax and/or regulatory frameworks not restricting access to these sources of funding?	26
	Is there a one stop shop to support SMEs in accessing the required funds?	17
Access to finance SME Action Programme <i>No. of EU28 Member States with the answer 'Yes'</i>	Are Fund of Funds for alternative equity and debt financing established?	24
	Is the knowledge on the impact of microfinance activities increased? Is the need for target group-specific microfinancing analysed?	21
	Is there an expert group on alternative finance, to offer inspiration and guidance?	15

Single market <i>No. of EU28 Member States with the answer 'Yes'</i>	Does the national government take steps to correctly transpose EU laws on time?	27
	Is there an effective 'Internal Market Information System' and SOLVIT centre to solve the Single Market related problems of SMEs?	26
	Is there a single point of contact to support SMEs within the Single Market?	24
	Are there measures to enable the participation of SMEs in the development of standards and to help them better access European standards?	24
	Are there measures to help SMEs overcome the difficulties in accessing patents and trademarks within the Single Market?	22

Skills & innovation <i>No. of EU28 Member States with the answer 'Yes'</i>	Are there public measures to ensure that SMEs can provide/get access to training for employees and business advisory/support services?	28
	Are there specific measures in place to develop the RD&I competencies of SMEs and to support high-growth innovative companies?	28

	Is there a well-developed network of training providers accessible across the country and sectors?	24
	Is there a mechanism in place to assess labour market needs and to adopt education and vocational trainings accordingly to meet labour market demand?	24
	Is there a mechanism to support SMEs to take part in innovation partnerships at national/EU level as well as to help with the commercialisation of RTD results (i.e. IPR management)?	23
Skills & innovation SME Action Programme <i>No. of EU28 Member States with the answer 'Yes'</i>	Is there financial support for SMEs which engage in vocational education and training (VET)?	22
	Is the European Social Fund to finance digital skills training for SMEs used?	22
	Is a common methodology for a long-term outlook for jobs and skills established in each industry to forecast the training and labour needs of SMEs?	13
	Is an adequate and easily accessible funding for cross-border training ensured?	13

Digitalisation <i>No. of EU28 Member States with the answer 'Yes'</i>	Is the establishment of broadband infrastructure supported?	27
	Is there any help offered to SMEs on digital regulation?	17
	Are good practice sharing opportunities provided for project managers? e.g. for developers of digital learning tools?	14
	Is there a beginner's guide to SME digitisation?	12

Environment <i>No. of EU28 Member States with the answer 'Yes'</i>	Are there support measures to ensure energy efficiency/use of renewables by SMEs?	26
	Are there support measures to put green public procurement in place?	18
	Are there support measures, such as an organisation specifically responsible for providing strategic support to SMEs, to ensure environmental & energy regulatory compliance?	15
	Are there support measures to incentivise SMEs to get EMAS certified?	10

Internationalisation <i>No. of EU28 Member States with the answer 'Yes'</i>	Are there missions/partnership agreements/trips/networking events organised by the responsible authorities to boost new market entry of SMEs inside and outside of the EU?	28
	Is there financial support (loans, guarantees, equity, export credit insurance facilities) available specifically for SME's internationalisation?	27
	Are there clusters, accelerators and trade organisations in the country to boost SME internationalisation?	27
	Is there an umbrella organisation providing all sorts of support (strategic, operational, legal, financial, linguistic etc.) to SMEs for internationalisation and to stimulate trade & export?	24
Access to market SME Action Programme <i>No. of EU28 Member States with the answer 'Yes'</i>	Are there single access points for information on applicable rules and regulations in foreign markets?	24

Source: CARSA and PwC

Over 665 policy measures have been adopted/implemented under the 'entrepreneurship' principle since 2011, with 60 policy measures adopted/implemented in 2018/19, i.e. during the current reference period. As in previous years, most of the measures aim to promote an entrepreneurial mindset. All EU Member States have specific measures in place to increase the number of entrepreneurs and new company formations, with the majority also having a strong focus on entrepreneurial education for both teachers and students. In more than half of EU Member States, there are measures in place which target female and immigrant employment, the shared economy, and the provision of a marketplace and/or specific support and matching schemes to ensure successful business transfers.

Regarding the 'second chance' principle, over 110 policy measures have been adopted/implemented since 2011, including approximately 10 policy measures adopted/implemented during 2018 and the first quarter of 2019. However, it is still not possible to complete legal bankruptcy proceedings within a year in most EU Member States, nor to be discharged from bankruptcy within three years. Similarly, there is no

possibility of automatic discharge for honest entrepreneurs after liquidation or fast-track procedures in half of EU Member States. Re-starters are generally treated the same as startups in the majority of EU Member States. However, a little over half of EU Member States have early warning and help desk mechanisms in place to prevent entrepreneurs from going bankrupt.

Over 300 policy measures have been adopted/implemented under the 'think small first' principle since 2011, and more than 15 have been adopted/implemented during the current reference period. As in previous years, most of the measures aim to minimise administrative burdens for businesses. Regulatory impact assessments (RIAs) are in place in almost every EU Member State. In addition, SME stakeholders are generally consulted on new legislative proposals in all EU Member States, with most EU Member States also publishing the results of the consultations. However, eight EU Member States are still struggling to use the results of RIAs effectively, and to systematically apply the 'SME Test'. Furthermore, most EU Member States still do not have common commencement dates for new or amended legislation.

The 60 policy measures adopted/implemented during 2018 and the first quarter of 2019 under the 'responsive administration' principle raise the total number of policy measures adopted/implemented since 2011 to over 465. Although most EU Member States have a one stop shop for SMEs, as well as an effective e-Government infrastructure allowing SMEs to handle various administrative procedures online, the 'once only' principle, which requires interconnected public administration databases, remains underapplied. More than half of EU Member States have a highly active SME envoy.

Around 220 policy measures have been adopted/implemented under the 'state aid & public procurement' principle since 2011, with over 30 policy measures adopted/implemented during the current reference period. There is an effective e-Procurement portal in the majority of EU Member States. Similarly, 'public procurement of innovation' is in place in most EU Member States, as well as protective measures for SMEs in the case of late payments. However, in fewer than half of EU Member States, it is common practice to split big tenders into smaller lots, making it harder for smaller SMEs to compete or bid for these tenders.

More than 735 policy measures have been adopted/implemented related to 'access to finance' since 2011 and over 85 policy measures were adopted/implemented during the current reference period. As in previous years, most of the measures consist of public financing programmes for SMEs. All EU Member States have funding dedicated to starting up a business, as well as for supporting innovation, proof of concept and commercialisation. EU-based funds for SMEs are relatively easily accessible in most EU Member States. In addition, business angel funds and venture capital funds are established in most EU Member States, as well as fund of funds for alternative equity and debt financing. More than half of EU Member States have a one stop shop supporting SMEs in accessing funds or an expert group offering inspiration and guidance on alternative finance.

Since 2011, more than 100 policy measures related to the 'single market' principle have been adopted/implemented, with over 10 policy measures adopted/implemented during 2018 and the first quarter of 2019. Most EU Member States have established a comprehensive single point of contact and an effective SOLVIT⁶⁰ centre to help SMEs. However, not all EU Member States have put in place measures to help SMEs overcome difficulties in accessing patents and trademarks.

During the current reference period, over 100 policy measures were adopted/implemented under the 'skills & innovation' principle, taking the total number of policy measures adopted/implemented since 2011 across the EU to 680. Most of the measures, as in previous years, aim to develop the RD&I competencies or capacities of SMEs. All EU Member States have established measures to help SMEs offer training to employees and

⁶⁰ SOLVIT is a service provided by the national administration in each EU country and in Iceland, Liechtenstein and Norway. SOLVIT is free of charge. It is mainly an online service. SOLVIT can help when a person's EU rights as a citizen or as a business are breached by public authorities in another EU country and the person has not (yet) taken the case to court

to provide access to business advisory/support services. In addition, all EU Member States have specific measures in place to support the development of SMEs' RD&I competencies. The majority of EU Member States have mechanisms in place to support the commercialisation of RTD results.

Concerning the 'environment' principle, over 200 policy measures have been adopted/implemented at EU-level since 2011 and over 30 policy measures have been adopted/implemented during the current reference period. Most measures aim to provide incentives to businesses to be eco-efficient and to fund sustainable energy use. Indeed, support measures and incentives are widely in place across the EU to encourage energy efficiency and the use of renewables by SMEs. However, green public procurement is not yet commonplace, and most EU Member States have not adopted measures to help or incentivise SMEs to get EMAS certified.

Last but not least, since 2011, around 280 policy measures have been adopted/implemented in the EU to support the internationalisation of SMEs, with over 40 policy measures adopted/implemented during 2018 and the first quarter of 2019. Most EU Member States have set up an umbrella organisation to provide different types of support services to help SMEs to internationalise. In addition, different types of financial support measures dedicated to internationalisation are widely in place across the EU.

12 The outlook for SMEs in the EU in 2019 and 2020

Key points

The UK is included in the 2019 forecasts for the number of EU-28 SMEs and for EU-28 SME value added and employment. However, the 2020 projections do not include the UK.

In 2018, SMEs in the UK accounted for 8.5% of the EU-28 SMEs in the NFBS, 14.8% of NFBS value added generated by EU-28 SMEs and 11.1% of NFBS employment by EU-28 SMEs.

SME value added in the EU NFBS is predicted to grow by 4.1% in 2019 and by 4.2% in 2020 (Figure 82).

In contrast, SME employment growth in the EU NFBS is expected to slow marginally from 1.8% in 2018 to 1.6% in 2019 and to drop further, to 1.4%, in 2020

12.1 The outlook

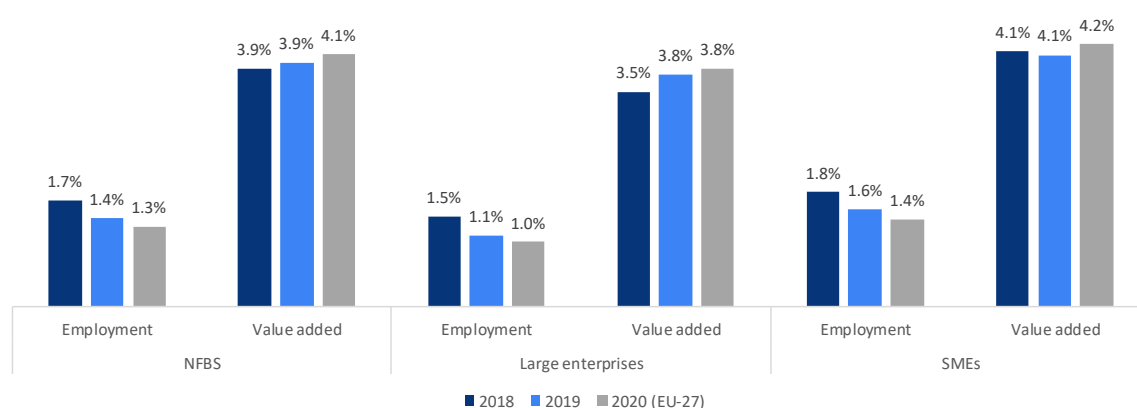
The forecasts of the number of EU SMEs and EU SME value added and employment include the UK SMEs in 2019 but not in 2020.

In 2018, SMEs in the UK accounted for 8.5% of the EU-28 SMEs in the NFBS, 14.8% of NFBS value added generated by EU-28 SMEs and 11.1% of NFBS employment by EU-28 SMEs.

SME value added in the EU NFBS is predicted to grow by 4.1% in 2019 and 4.2% in 2020 (Figure 82).⁶¹

In contrast, SME employment growth in the EU NFBS is expected to slow marginally from 1.8% in 2018 to 1.6% in 2019 and to drop further, to 1.4%, in 2020 (Figure 82).

Figure 82 The outlook for EU SMEs in 2019 and 2020



Source: Eurostat, DIW Econ

The outlook for SME value added in Member States

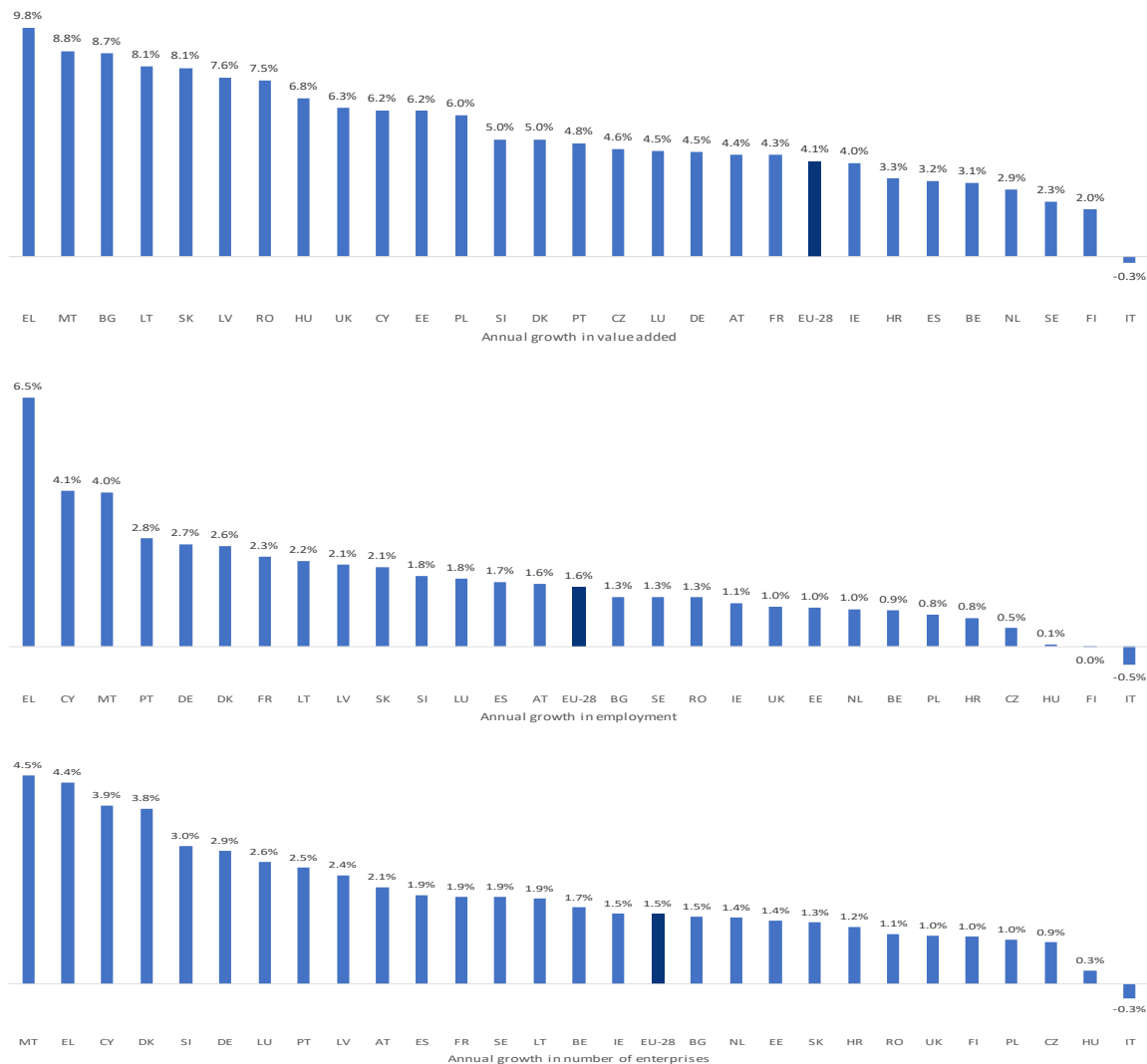
SME value added is projected to grow in all Member States in 2019 and 2020 except IT in 2019 (Figure 83 and Figure 84). The small decline in Italian SME value added reflects the

⁶¹ The forecasts are based on the EC's spring 2019 macro-economic projections.

quasi-stagnation of the Italian economy in 2019 – according to the EC forecast, Italian GDP (at constant prices) is projected to increase only marginally by 0.1% in 2019.⁶²

SME value added growth of 5% or more is projected for 14 Member States (BG, CY, DK, EE, EL, HU, LT, LV, MT, PL, RO, SI, SK and UK) in 2019 and 15 Member States (BG, CY, DE, DK, EE, EL, HU, LT, LV, MT, PL, PT, RO, SI and SK) in 2020 (Figure 83 and Figure 84).

Figure 83 The outlook for SMEs in the NFBS of EU-28 Member States – 2019



Source: DIW Econ

The outlook for SME employment in Member States

SME employment is forecasted to grow in all Member States in 2019 and 2020 except FI and IT in 2019 and FI, HU and IT in 2020 (Figure 83 and Figure 84).

Only in EL is SME employment projected to grow by more than 5% in 2019 and 2020. Moreover, SME employment growth of 2% or more is expected in only a further 9 Member

⁶² See European Commission (2019) Autumn 2019 Economic Forecast – Italy, available at https://ec.europa.eu/economy_finance/forecasts/2019/autumn/ecfin_forecast_autumn_2019_it_en.pdf.

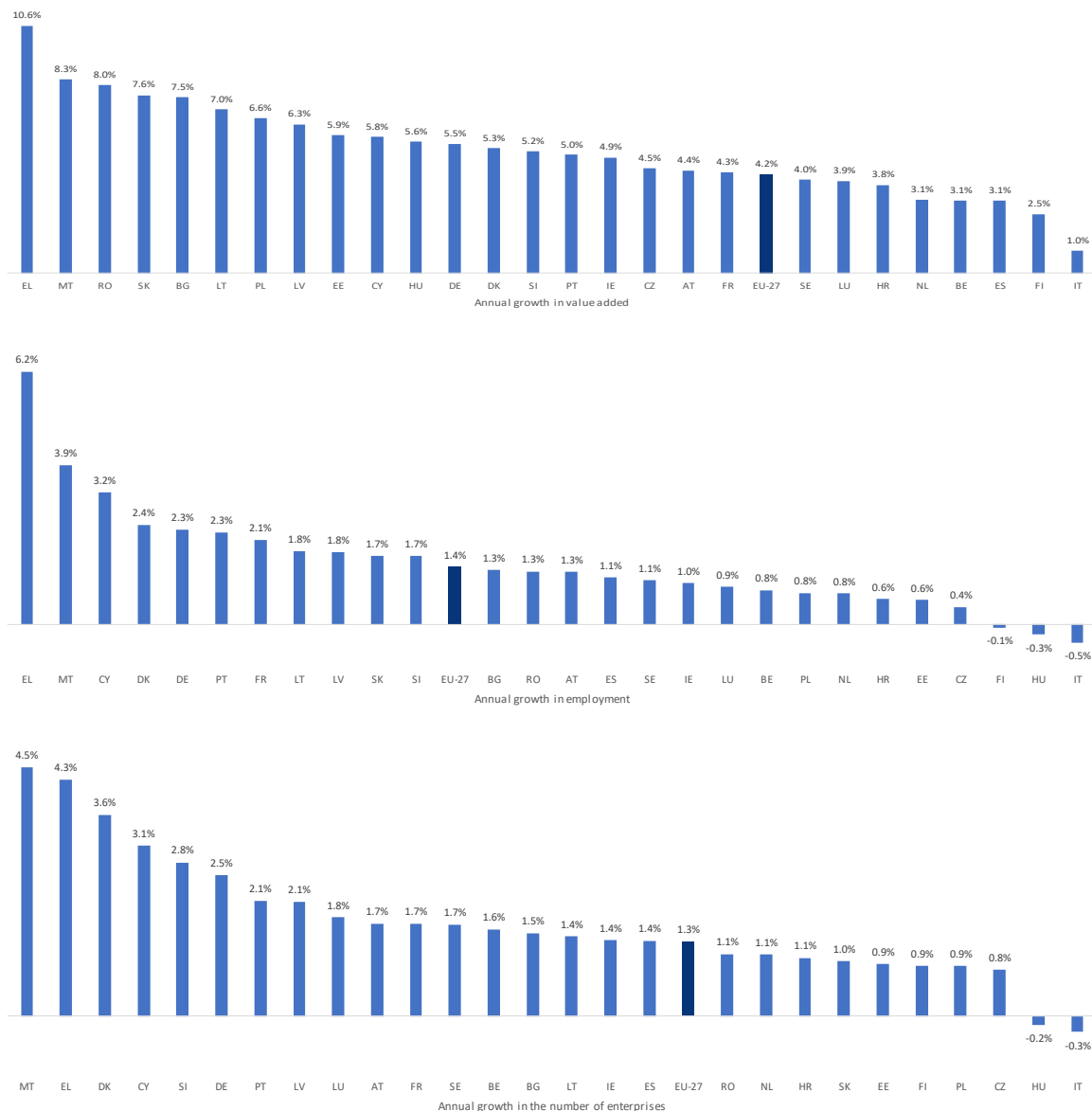
States (CY, DE, DK, FR, LT, LV, MT, PT and SK) in 2019 and in 6 Member States (CY, DE, DK, FR, MT and PT) in 2020 (Figure 83 and Figure 84).

The outlook for the number of SMEs in Member States

The number of SMEs is projected to grow in 2019 and 2020 in all Member States except IT in 2019 and HU and IT in 2020 (Figure 83 and Figure 84).

Growth of more than 3% in the number of SMEs is expected in CY, DK, EL, MT and SI in 2019 and in CY, DK, EL and MT in 2020 (Figure 83 and Figure 84).

Figure 84 The outlook for SMEs in the NFBS of EU-27 Member States – 2020



Source: DIW Econ

12.2 Comparison with forecast in 2017/18 SME Annual Report

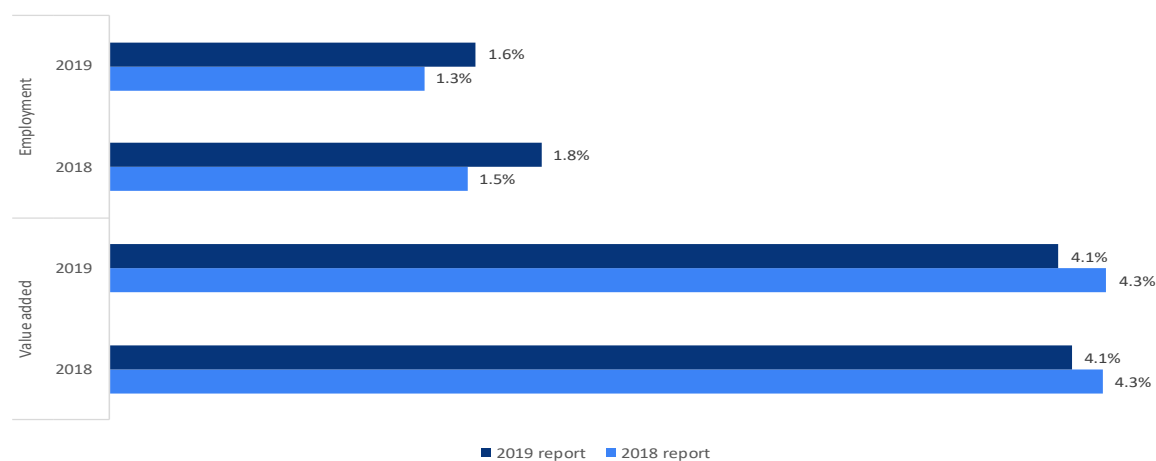
While the nowcast for EU-28 SME value added growth in 2018 in last year's Annual Report was only marginally higher than actual growth (nowcast of 4.3% versus actual of 4.1%), last year's nowcast underestimated SME employment growth in 2018 (nowcast of 1.5% versus actual of 1.8%).

The nowcast of SME value added growth of 4.1% in 2019 in this Annual Report is slightly lower than the 4.3% growth forecast made last year.

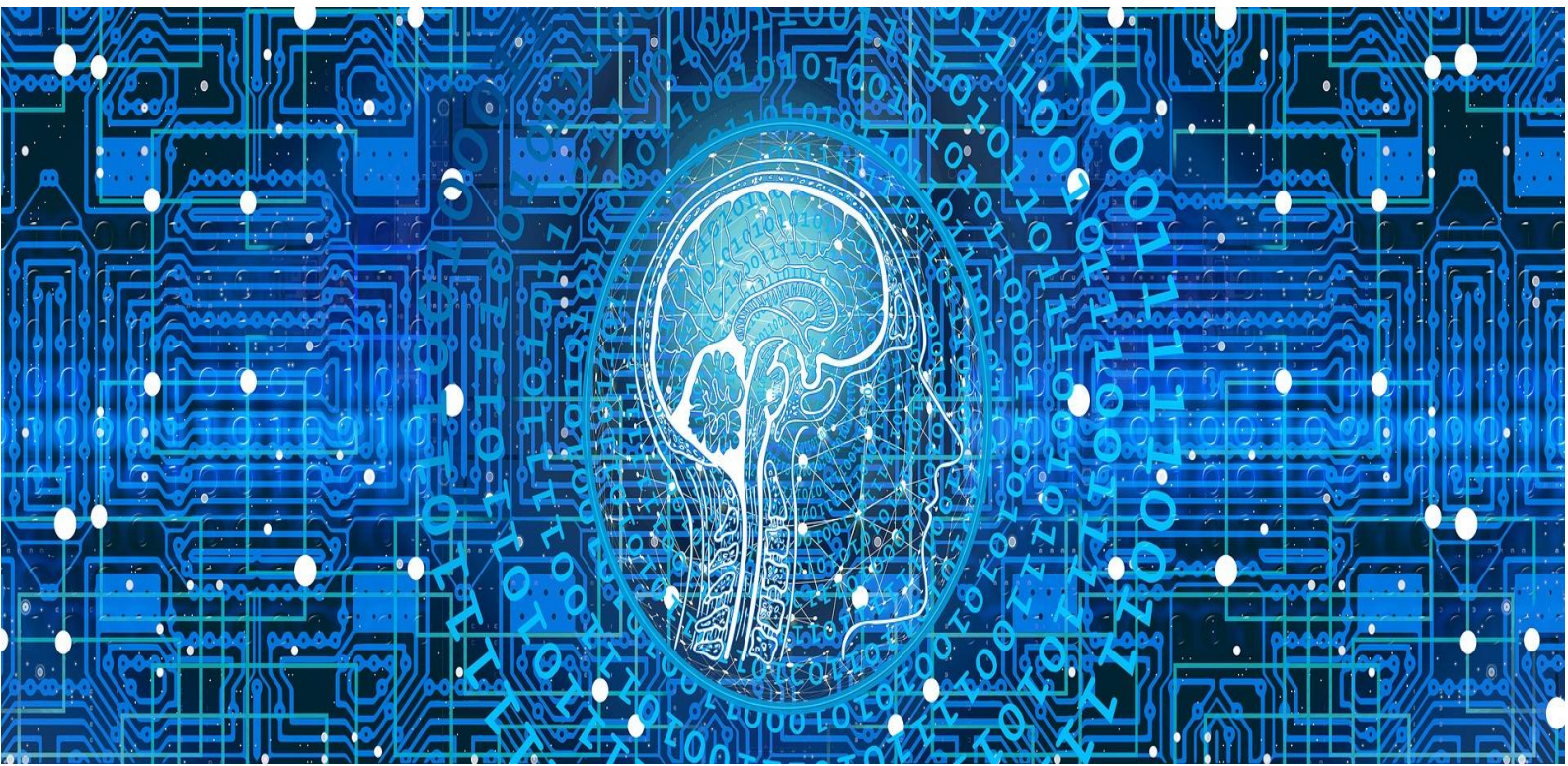
In contrast, the 2019 growth in EU-28 SME employment is nowcasted to be somewhat higher than forecasted last year (1.6% versus 1.3%).

Overall, the differences between the forecast of last year for 2019 and this year’s nowcast are small.

Figure 85 Nowcasts and forecasts of SME value added and employment growth in the EU-28 in 2018 and 2019



Source: DIW Econ



Pixabay

Part 2: R&D and Innovation by SMEs

Introduction to Part 2

This part of the report starts by presenting summary findings of a literature review of studies examining R&DI activities by SMEs.

A second chapter provides information on the extent to which EU-28 SMEs actually undertake innovation and R&D activities.

A third chapter presents the findings of an emerging literature on the impact of so-called 'superstar' firms on innovation by SMEs.

A fourth chapter examines why the innovation and R&D performance of SMEs varies across Member States.

A fifth chapter focuses on the problems SMEs face when they wish to innovate or undertake some R&D activity.

A sixth chapter focuses on public policy which supports RD&I by SMEs.

Finally, a seventh chapter draws some policy conclusions.

13 Some key facts about R&DI by SMEs – what does the literature say?

Key points

R&DI is a key factor in technological progress and thus the engine of economic growth.

Smaller firms are typically said to have 'behavioural advantages' in terms of rapid decision making and flexibility. However, they also face constraints in internal resources (given their size) and external resources (due to market failures).

Therefore, it is often argued, that SMEs should be specifically targeted by government funding for R&DI.

Although the empirical evidence on the impact of government financial support to businesses is mixed overall, it mostly suggests that government funding of SME R&D activities results in more positive outcomes than similar funding of large enterprises.

RD&I as engine of economic growth

The academic literature⁶³ largely acknowledges RD&I as a key factor in technological progress and thus the engine of economic growth (Romer, 1990; Grossman and Helpman, 1991; Aghion and Howitt, 1992). This is why RD&I has been placed at the heart of the 'Europe 2020' strategy, the EU's agenda for 'smart, sustainable and inclusive growth' (European Commission, 2010).

Firm size as crucial RD&I determinant

There is a long debate tracing back to Joseph Schumpeter (1934) about the impact of firm size on innovation activity. Smaller firms are typically said to have 'behavioural advantages' in terms of rapid decision making and flexibility. In contrast, the relative strengths of large businesses are predominantly material, as large firms have advantages linked to economies of scale and the availability of financial and technological resources (Vossen, 1998).

Because of constraints in internal resources (given their size) and external resources (due to market failures), it is often claimed that SMEs should be specifically targeted by public support for RD&I, since SMEs play a critical role in technological change and because they are the predominant form of enterprise in the OECD area (Okamuro, 2019).

SMEs in OECD economies are, on average, less innovative than large companies. However, at the same time, the contribution of SMEs to innovation has increased in recent decades thanks to changes in the way innovation takes place. Increasing niche market demand, shorter product life cycles and changing technologies (Chesbrough, 2006; Spithoven et al., 2013) have enabled SMEs to strengthen their comparative advantages and reduced their structural disadvantages due to resource constraints and limited ability to reap economies of scale (OECD, 2017).

'Policy interventions' and 'R&D outsourcing' as extensive research areas

There is a vast literature on the impact of policy interventions on RD&I outcomes (for a recent survey, see Petrin, 2018). The evidence is mixed but mostly suggests that government funding of SME R&D activities results in more positive outcomes than similar funding of large enterprises. (Castellacci and Lie, 2015; Dechezleprêtre et al., 2016). Another topic widely discussed in the economic literature is R&D outsourcing (e.g. Berchicci, 2013, and Bertrand and Mol, 2013). The global R&D

⁶³ A more extensive literature review is provided in the background document

outsourcing services market is expected to grow at a compound annual growth rate of 8.31% during the period 2017 to 2021 (HTF Market Intelligence, 2017). R&D outsourcing allows SMEs to benefit from risk sharing and to overcome internal resource constraints (Love and Roper, 2015), while large firms gain better access to talent/expertise and increased flexibility (Narula, 2004).

14 Innovation activities of SMEs

Key points

In 2014 to 2016, the most recent period for which data are available, the innovation performance of EU small and medium-sized SME was close to the average for those OECD countries for which SME innovation data are available. The EU share of innovating SMEs was almost 50% and the average across all non-EU countries, for which similar data exist, was 45% (no data are available for CN and the US). Some of these innovative SMEs⁶⁴ are engaged in disruptive innovation or breakthrough innovation, while others are focusing on more incremental innovation.

It is particularly noteworthy that the share of innovative SMEs in CH was 24 percentage points higher than the share of innovative EU SMEs. In contrast, the share of innovating SMEs was the same in the EU and KR and somewhat higher in the EU than in JP.

Although at EU-28 level, 49.5% of SMEs undertook some form of innovation activity, the share of innovating SMEs varied greatly across Member States. The proportion of innovative SMEs covered ranged:

- from slightly over half of all SMEs in 13 Member States (AT, BE, DE, EL, FI, FR, IE, IT, LU, NL, PT, SE and UK); and,
- to a third or less of SMEs in 7 Member States (BG, HU, LV, MT, PL, RO and SK)

In contrast, in every Member State, there was a much greater likelihood that large enterprises would be innovative.

There was, on average, a much larger difference between the shares of innovating SMEs and large enterprises in the EU, compared to the OECD average: 28 percentage points versus only 18 percentage points.

The difference in the shares of innovating large enterprises and SMEs reflects to a large extent the greater sensitivity of SMEs to the general innovation environment.

Among the innovating EU-28 SMEs, almost half had introduced both product and/or process and organisation and/or marketing innovations, slightly more than a quarter had introduced product and/or process innovative enterprises only, and slightly less than a quarter had introduced organisation and/or marketing innovations only.

Overall, in 2014 to 2016, the shares of EU SMEs that had introduced both product and/or process innovations and marketing and/or organisational innovations did not differ much between the services and manufacturing industries.

Since 2002, the share of SMEs and large enterprises that have undertaken product and process innovation activities over time has remained broadly stable in the EU economy overall, as well as in the EU manufacturing and services sectors.

While 48.5% of innovative large enterprises in the EU28 undertook in-house R&D in 2014 to 2016, only 18.8% of EU-28 SMEs did so.

⁶⁴ Disclaimer: For the purposes of this report, the term “innovating company” refers to the companies that have introduced a new or significantly improved product or service to the market; a new or significantly improved production process or method; a new way of selling goods or services, or a new organisation of management. The data comes from the companies’ self-assessment of relevant activities. Innovating companies come from all sectors and are not limited to the disruptive or digital sectors. Non-innovating companies are not precluded from introducing innovations in the future.

14.1 Introduction

This chapter provides a comparative analysis over time and selected countries of the level and type of innovation activity undertaken by SMEs and large enterprises.

Some of these innovative SMEs are engaged in disruptive innovation or breakthrough innovation, while others are focusing on more incremental innovation.

The present chapter focuses on all innovative SMEs. The main data source is the EU Community Innovation Survey (CIS), a survey mandated by European Commission Regulation No 995/2012 and run every two years by Member States.

The CIS defines an innovative firm as one which undertakes one or several product and/or process and/or marketing and/or organisational innovations.⁶⁵

The basic requirement for an innovation is that it must significantly differ from the firm's previous products or business processes.

Often, innovative firms adopt innovation strategies which combine different and complementary innovation processes.

It is important to note that, during the survey reference period, the enterprises' innovation activities could have been⁶⁶:

- successful (having resulted in the implementation of an innovation, although the innovation need not have been commercially successful);
- on-going (with work in progress that has not yet resulted in the implementation of an innovation); and,
- abandoned (before the implementation of an innovation).

Enterprises considering innovating were defined as having had no innovation activity whatsoever during the reference period.

The CIS covers all enterprises with 10 employees or more which are active in the industries in which innovation is considered a core activity. The list of these industries is provided at Annex 18.

As previously noted, the CIS is run every two years and the survey results (extrapolated to the national enterprise population) are available from Eurostat. In order to compare the innovation performance of EU SMEs over time, it is necessary to combine the results of several CIS surveys. However, not all Member States have provided the granular information required for the analysis of innovation performance by enterprise size class, type of innovation and industry, therefore the EU aggregate shown in this chapter's figures is not always the EU-28. Whenever this is the case, a note to the figure lists of the Member States included in the EU aggregate.

Data from non-EU countries are sourced from the OECD Innovation Indicators database. As in the case of the CIS, the OECD database provides information on the incidence of SME activity only for small and medium-sized SMEs.⁶⁷ Unfortunately data on innovation by enterprise size class are not available for China and the USA, two of the major competitors of the EU.

The reference periods of the CIS and similar surveys by non-EU OECD Member States are not strictly identical (see Annex 18 for details). Nevertheless, as the incidence of SME innovation does not change markedly from year to year, cross-country

⁶⁵ A 'product/service innovation' involves the introduction of new and significantly improved goods and/or services; a 'process innovation' is the implementation of new and significantly improved production technologies or new and significantly improved methods of supplying services and delivering products; an 'organisational innovation' is the adoption of new organisational methods in the enterprise's business practices, workplace organisation or external relations; and, a 'marketing innovation' is the adoption of new marketing methods involving significant changes in product design or packaging, product placement, product promotion or pricing.

⁶⁶ See Metadata for Results of the community innovation survey 2016 available at https://ec.europa.eu/eurostat/cache/metadata/en/inn_cis10_esms.htm.

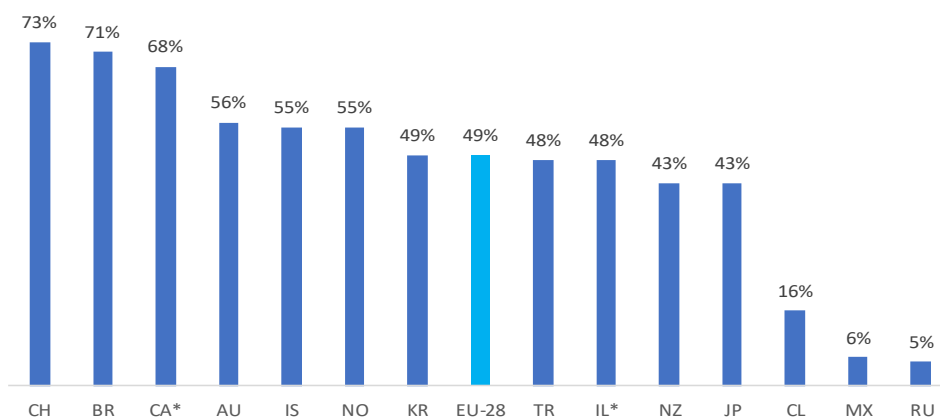
⁶⁷ See Annex 19 for reference period of non-EU innovation data.

comparisons of the innovation performance of SMEs based on these surveys do provide a good picture of how well SMEs in the EU perform relative to their peers in other OECD countries.

Over the period 2014 to 2016, the reference period for the latest CIS, the innovation performance of EU small and medium-sized SMEs was close to the average of the OECD countries for which SME innovation data are available: the EU share of innovating SMEs was 49% and the average across all non-EU countries shown in Figure 86 was 45% (Figure 86).

Of particular note is the fact that the share of innovative SMEs in CH was 24 percentage points higher than the share of innovative EU SMEs. In contrast, the share of innovating SMEs was the same in the EU and KR and somewhat higher in the EU than in JP (Figure 86).

Figure 86 Share of innovating SMEs in EU-28 and other selected OECD countries in 2014-2016



Notes: * refers to a 2010-2012 reference period. Share of SMEs with 10 or more employees.

Source: Eurostat, Community Innovation Survey (CIS-2016) for EU and 2015 and 2017 OECD Innovation Statistics databases for non-EU countries

14.2 Overall innovation performance by EU-28 SMEs

Although at EU-28 level, 49.5% of SMEs undertook some form of innovation activities, the share of innovating SMEs varied greatly across Member States.

The proportion of innovative SMEs ranged:

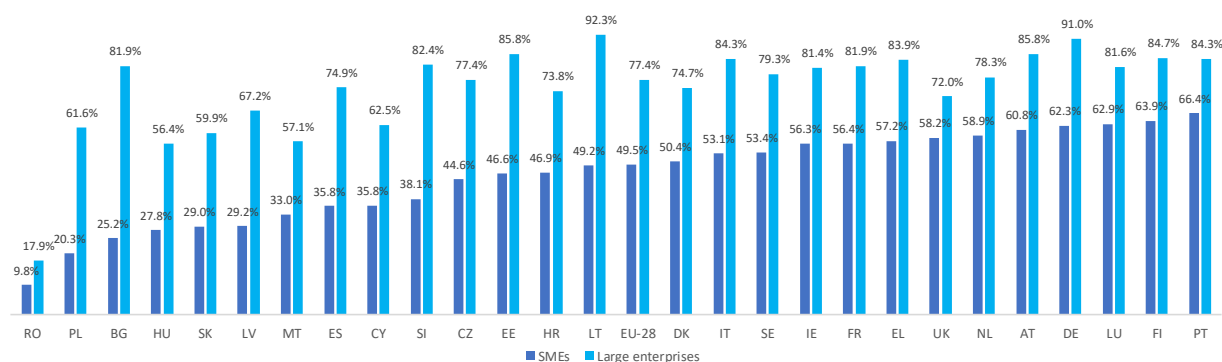
- from just over half of all SMEs in 13 Member States (AT, BE, FR, DE, DK, EL, FI, IE, IT, LU, NL, PT, SE and UK); and,
- to a third or less of SMEs in 7 Member States (BG, HU, LV, MT, PL, RO and SK) (Figure 87).

Moreover, differences between the shares of innovative SMEs and innovative large enterprises was substantial across all Member States (Figure 88). Large enterprises were more likely to be innovative in every Member State. In the 2014 to 2016 period, at EU-28 level, 77.4% of large firms reported some innovation activity, while only 49.5% of SMEs had undertaken an innovation activity (Figure 87).

In a number of cases, the difference between the shares of innovating SMEs and large enterprises decreased as the share of innovating SMEs increased, but this negative correlation is not statistically significant.⁶⁸

⁶⁸ The correlation coefficient between the shares of innovating SMEs and large enterprises is -0.37.

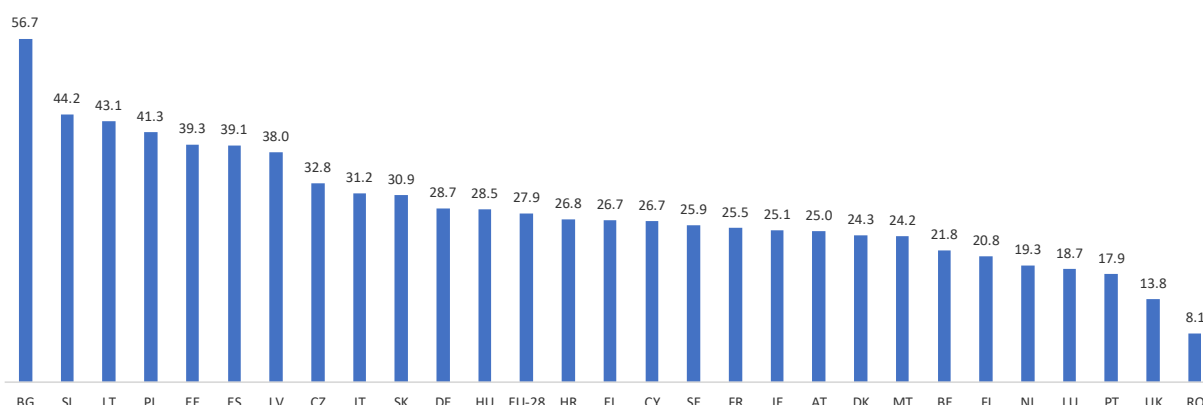
Figure 87 Share of enterprises undertaking innovation activities in 2014-2016 in EU Member States



Note: The share of innovating SMEs and large enterprises is expressed as a percentage of the number of enterprises in the relevant enterprise size class. Share of SMEs with 10 or more employees.

Source: Eurostat, Community Innovation Survey (CIS-2016)

Figure 88 Difference (in percentage points) between share of SMEs and large enterprises undertaking innovation activities in 2014-2016



Note: Share of all SMEs with 10 or more employees.

Source: Eurostat Community Innovation Survey (CIS-2016)

Within the EU-28, the difference between the share of innovating large enterprises and innovating SMEs is particularly large in a number of central European countries (BG, EE, LT, LV, PL and SI) and in ES.

A statistical analysis of the relationship over 2014-2016 between this difference and the level of the Summary Innovation Index⁶⁹, published by the EC as part of the 2018 EU Innovation Scoreboard, adjusted for the exclusion of the index component 'Innovators' shows a strong and statistically significant negative relationship (see Box 3). This result suggests that SMEs are more sensitive to a less favourable innovation climate than large enterprises.⁷⁰

⁶⁹ The Summary Innovation Index is essentially the average of the scores of 10 different major components (see European Commission, 2019). One of these components, i.e. the 'Innovators' component, includes three indicators measuring the share of firms that have introduced innovations onto the market or within their organisations, covering both product and process innovators, marketing and organisational innovators, and SMEs that innovate in-house (see European Commission 2019). As the analysis in the present report focuses on the shares of innovative enterprises in the enterprise population, the component 'Innovators' was excluded from the Summary Innovation Index and the Adjusted Summary Innovation Index is simply the average of the scores of the nine other components.

⁷⁰ As will be shown in chapter 17, small and medium-sized SMEs are impacted differently by a Member State's overall innovation climate.

Box 3

Relationship between the difference in the shares of innovating large enterprises and SMEs and a Member State's overall innovation climate in the EU-28

The **Adjusted Summary Innovation Index** available from the EU Innovation Scorecard is used in the analysis below as a proxy for the overall innovation climate prevailing in Member States. This adjusted summary index is an unweighted average of all the major components of the Summary Innovation Index excluding the component 'Innovators'. The components included in the Adjusted Summary Index are 'human resources', 'research systems', 'innovation-friendly environment', 'finance and support', 'firm investments', 'linkages', 'intellectual assets', 'employment impacts' and sales impacts.⁷¹ The index is equal to 0.491 in the EU28 in 2018 and ranges from 0.232 in Hungary to 0.712 in Sweden.

The statistical relationship between the level of the difference in innovation shares and the level of the summary innovation index was estimated econometrically⁷² using the data from figure 88 and the average value of the Adjusted Summary Innovation Index over the period 2014 to 2016.

The estimated relationship reported below shows that an increase in the Adjusted Summary Innovation Index of 0.1 points reduces the difference in innovation shares by 3.9 percentage points.

$$(1) \text{ Difference in innovation shares} = 47.17 - 39.48 * \text{Adjusted Summary Innovation Index} \\ (8.93) \dots (3.49)$$

Adjusted R-squared = 0.301 t-statistic shown in (..)

Romania is excluded from the analysis because it was identified as a clear outlier.

Compared to other OECD countries, the EU posts one of the largest differences between the shares of innovating SMEs and large enterprises: 28 percentage points versus an average of only 18 percentage points for the non-EU countries. (Figure 89). In other words, the performance of EU SMEs is significantly lagging behind that of their peers in almost all OECD countries when taking into account the performance of large enterprises.

Figure 89 Differences (in percentage points) between the shares of large enterprises and SMEs undertaking innovation activities in 2014-2016



Notes: * refers to a 2010-2012 reference period. Share of all SMEs with 10 or more employees.

Source: Eurostat, Community Innovation Survey (CIS-2016) for EU and 2015 and 2017 OECD Innovation Statistics databases for non-EU countries

In order to assess whether the observed differences between the EU-28 and other countries are also due to a greater sensitivity of SMEs to the overall innovation climate, the analysis described in Box 3 was repeated using the Index of Innovation Capability shown in the Global Competitiveness Report published by the World Economic Forum.

⁷¹ For details on the construction of the Summary Innovation Index see European Commission (2019).

⁷² Using an ordinary least squares (OLS) estimation.

The reason for using this Innovation Capability Index is that the Adjusted Summary Innovation Index used in the analysis above is not available for all but one of the non-EU countries covered by Figure 89. The statistical analysis which covers all EU-28 Member States and the countries in Figure 89 yields for EU-28 Member States very similar results to those obtained using the Adjusted Summary Innovation Index, namely an increase in innovation capability reduces the difference between the shares of innovating large enterprises and innovating SMEs.

In other words, in the EU-28 SMEs are more sensitive to a less favourable innovation climate than large enterprises. However, the statistical analysis shows that among the few non-EU countries such a relationship is not observed. As the non-EU countries comprise a set of countries at very different development stages, the lack of a statistically significant relationship may be due to the heterogeneity of this group of countries (Box 4).

Box 4

Relationship between the difference in the shares of innovating large enterprises and SMEs and a country's overall innovation climate in the EU-28 and other selected countries

The **Innovation Capability Index** from the Global Competitiveness Report is used in the analysis below as a proxy for the overall innovation climate prevailing in a country. In the latest Global Competitiveness Report, this index is the average of the scores of the following ten indicators: diversity of workforce, state of cluster development, international co-inventions, multistakeholder collaboration, scientific publications, patent applications, R&D expenditures, research institutions prominence index, buyer sophistication and trademark applications.⁷³ The index ranges from 1 to 7. This index is highly correlated with the Adjusted Summary Innovation Index.⁷⁴

The statistical relationship between the level of the difference in innovation shares (large enterprises minus SMEs) and the level of the Innovation Capability Index was estimated econometrically⁷⁵ using the data from figure 88 and the average value of the Innovation Capability Index over the period 2014 to 2016. Because a preliminary analysis of the data had shown that the relationship of the difference in innovation shares of non-EU countries may be different from the one prevailing for EU Member States, the econometric analysis included a dummy variable (Dummy Non-EU) taking a value of 1 when the country was a non-EU country.

The estimated relationship reported below shows that an increase in the Innovation Capability Index of 1 point reduces the difference in innovation shares by 6.6 percentage points in the EU Member States and has no statistically significant impact in non-EU countries.

(1) Difference in innovation shares = 57.42 – 52.11 * Dummy Non-EU – 6.644 * Innovation
(7.30) (3.87) (3.61)

Capability Index + 9.519 * Dummy Non-EU * Innovation Capability Index
(3.12)

The combined value of the coefficient of the Innovation Capability Index and the coefficient times the dummy variable is 2.875 and is not statistically significant.

Adjusted R-squared = 0.436 t-statistic shown in (..)

14.3 Type of innovation activity undertaken by SMEs

Firms which do innovate, both large firms and SMEs, often introduce product or process innovations alongside new marketing or organisational methods. Product and process innovation mostly involve traditional technological innovation.

⁷³ See World Economic Forum (2019) for further details on the scores of these 10 indicators and data sources.

⁷⁴ The correlation coefficient is equal to 0.948.

⁷⁵ Using an ordinary least squares (OLS) estimation.

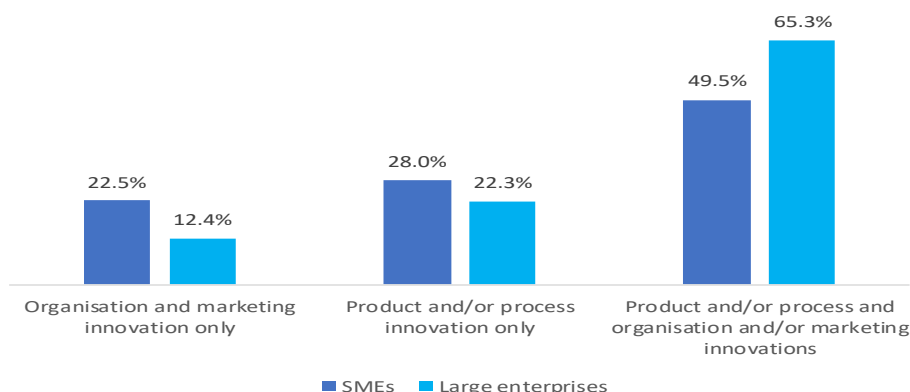
Among the innovating EU-28 SMEs, almost half of SMEs introduced both product and/or process and organisation and/or marketing innovations, slightly more than a quarter product and/or process innovative enterprises only, and slightly less than a quarter organisation and/or marketing innovations only (Figure 90). Large enterprises tended to undertake even more innovation activities in all areas (see Annex 21 for detailed information at Member State level on the shares of innovating SMEs and large enterprises undertaking the various types of innovation activities).

In all Member States a majority (absolute or relative) of innovating SMEs undertook both product and/or process and organisation and/or marketing innovations. In 13 Member States (BG, CZ, DK, EE, ES, HU, MT, PL, RO, SE, SK, SI and UK) such SMEs accounted for more than half of the innovating SMEs (See Annex 20 for details).

Other noteworthy facts are:

- Innovative SMEs that had undertaken only product and/or process innovation activities accounted for more than 40% of all innovating SMEs in IE, LU and NL in 2014-16 (see Annex 20 for details).
- Innovative SMEs that had undertaken only organisation and/or marketing innovation activities accounted for more than 40% of all innovating SMEs in CY and EL (see Annex 20 for details).

Figure 90 Shares of innovating EU enterprises introducing various types of innovation in 2014-2016



Note: Share of innovating SMEs with 10 or more employees.

Source: Eurostat, Community Innovation Survey (CIS-2016)

Across the EU-28, 38.3% of SMEs reported at least one product or process innovation, compared to 67.8% of large enterprises. The corresponding figures for enterprises that had introduced at least one organisation/marketing innovation were 35.6% for SMEs and 60.1% for large enterprises (Annex 21).

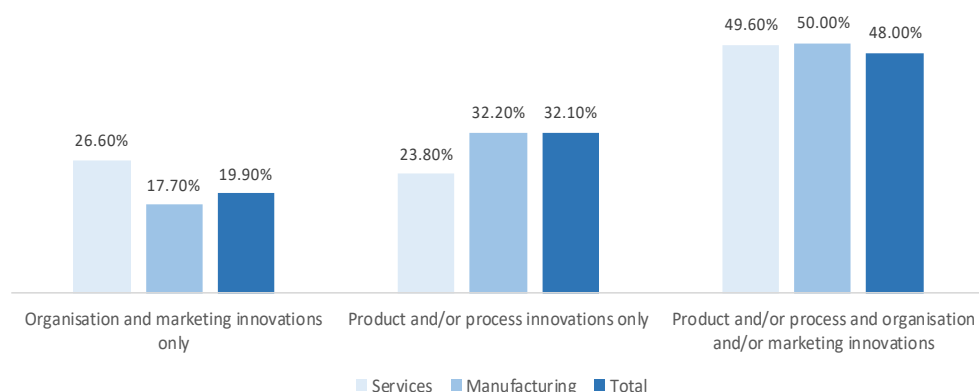
When considering enterprises that had undertaken at least one process/product innovation or at least one organisation/marketing innovation, the differences between the incidence of innovation activity by SMEs and large enterprises were larger in the case of process/product innovation than in the case of organisation/marketing innovation in all but three Member States (Annex 22).

14.4 Type of innovation activities undertaken by EU SMEs in services and manufacturing industries

Overall, the shares of EU SMEs that had introduced both product and/or process innovations and marketing and/or organisational innovations did not differ much between the services and manufacturing industries in 2014 to 2016 (Figure 91).

However, of the EU SMEs which undertook only product and/or process innovations or only marketing and/or organisational innovations, a larger share of EU SMEs in the services industry engaged in the latter type of innovation activities, and in the case of EU SMEs in the manufacturing industry, a larger share of SMEs undertook the former type of innovation activities (Figure 91).

Figure 91 Shares of innovating EU SMEs in services and manufacturing industries introducing various types of innovation in 2014-2016

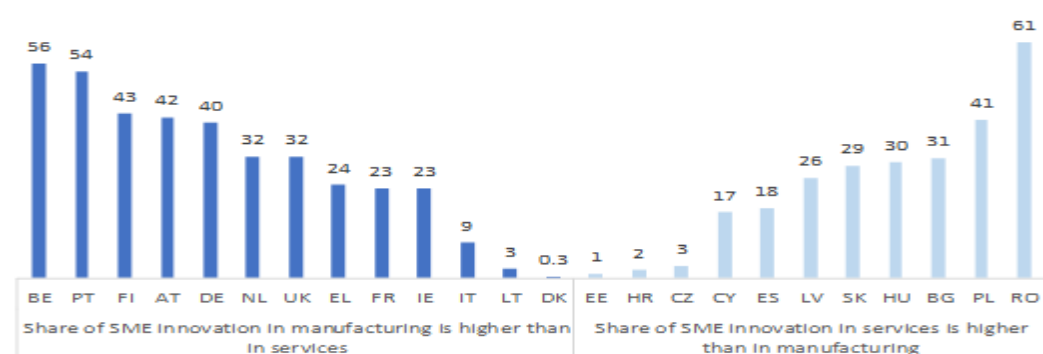


Notes: Because of missing data, the EU aggregate excludes LU and SI in the case of services and LU, MT and SI in the case of manufacturing. Share of innovating SMEs with 10 or more employees.

Source: Eurostat, Community Innovation Survey (CIS-2016)

In 2014 to 2016, the SME innovation incidence rate was higher (sometimes markedly so) in the manufacturing sector than in the services sector in 11 Member States (BG, CY, CZ, EE, ES, HR, HU, LV, SK, PL and RO). The opposite was true in 13 Member States (AT, BE, DE, DK, EL, FI, FR, IE, IT, LT, PT, NL and UK) (Figure 92).

Figure 92 Difference (in percentage points) between incidence rates of SME innovation in the manufacturing and services industries



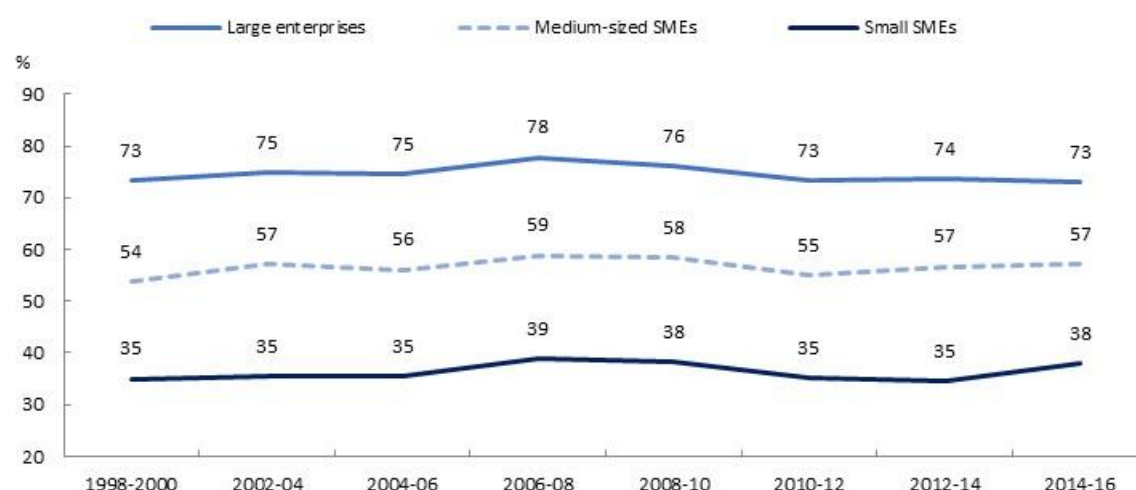
Notes: Because of missing data, LU, MT and SI are not shown in the figure. Share of innovating SMEs with 10 or more employees.

Source: Eurostat, Community Innovation Survey (CIS-2016)

14.5 Evolution of product and process innovation activities by SMEs and large enterprises since the early 2000s

Since 2002, the share of SMEs and large enterprises that have undertaken product and process innovation activities over time has remained broadly stable in the EU economy overall (Figure 93) as well as in the EU manufacturing and service sectors (Figure 94 and Figure 95).

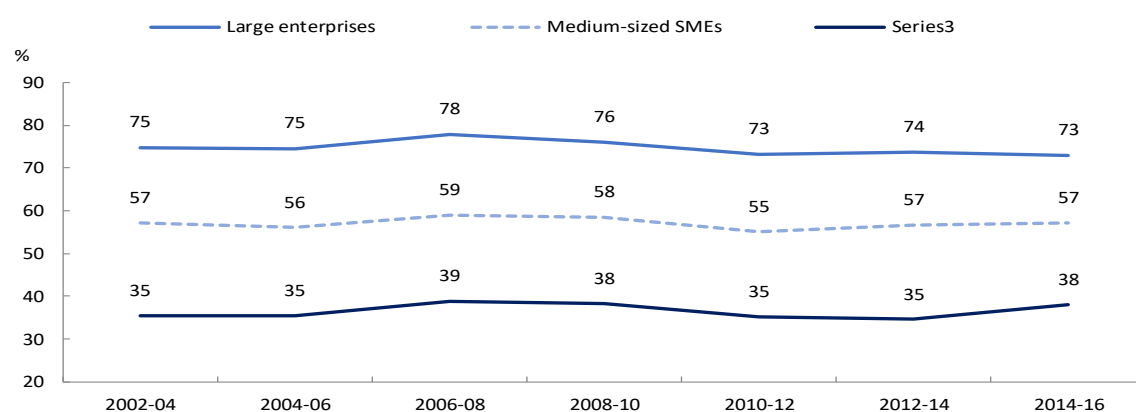
Figure 93 Share of EU enterprises undertaking product and/or process innovation activities by enterprise size class, 2002-2004 to 2014-2016



Note: As a percentage of total enterprise population in each size class. In each reference period, only Member States with non missing values for all enterprise size classes are included. Countries with missing data in more than one reference period are excluded from the EU aggregate. Data refer to 3-year reference periods corresponding to each CIS survey round. No data are available for 2000-2002.

Source: Eurostat, Community Innovation Survey (CIS-2004 to CIS-2016)

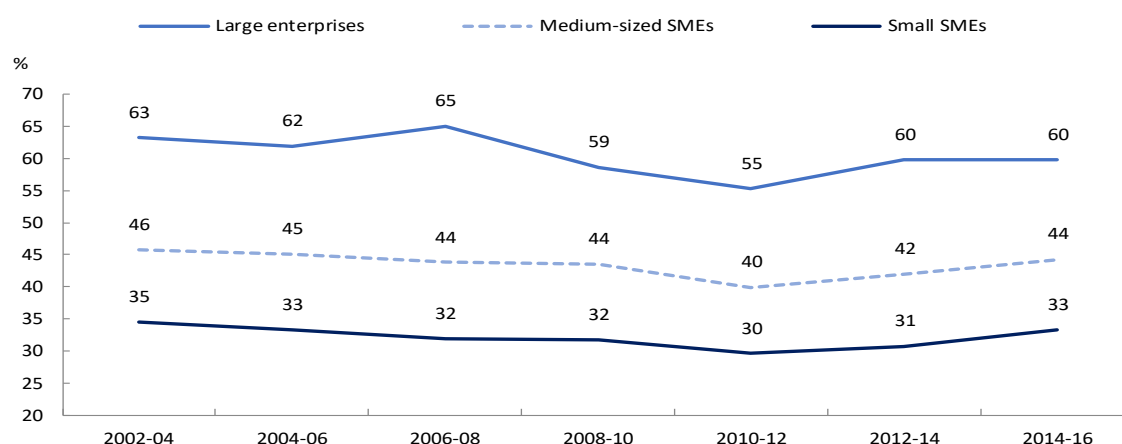
Figure 94 Manufacturing sector: share of EU enterprises undertaking product and/or process innovation activities by enterprise size class, 2002-2004 to 2014-2016



Notes: As a percentage of total enterprise population in each size class. In each reference period, only Member States with non missing values for all enterprise size classes are included. Countries with missing data in more than one reference period are excluded from the EU aggregate. Data refer to 3-year reference periods corresponding to each CIS survey round. No data are available for 2000-2002.

Source: Eurostat, Community Innovation Survey (CIS-2004 to CIS-2016)

Figure 95 Services sector: share of EU enterprises undertaking product and/or process innovation activities by enterprise size class, 2002-2004 to 2014-2016



Notes: As a percentage of total enterprise population in each size class. In each reference period, only Member States with non missing values for all enterprise size classes are included. Countries with missing data in more than one reference period are excluded from the EU aggregate. Data refer to 3-year reference periods corresponding to each CIS survey round. No data are available for 2000-2002.

Source: Eurostat, Community Innovation Survey (CIS-2004 to CIS-2016)

14.6 Introduction of new-to-market product innovations

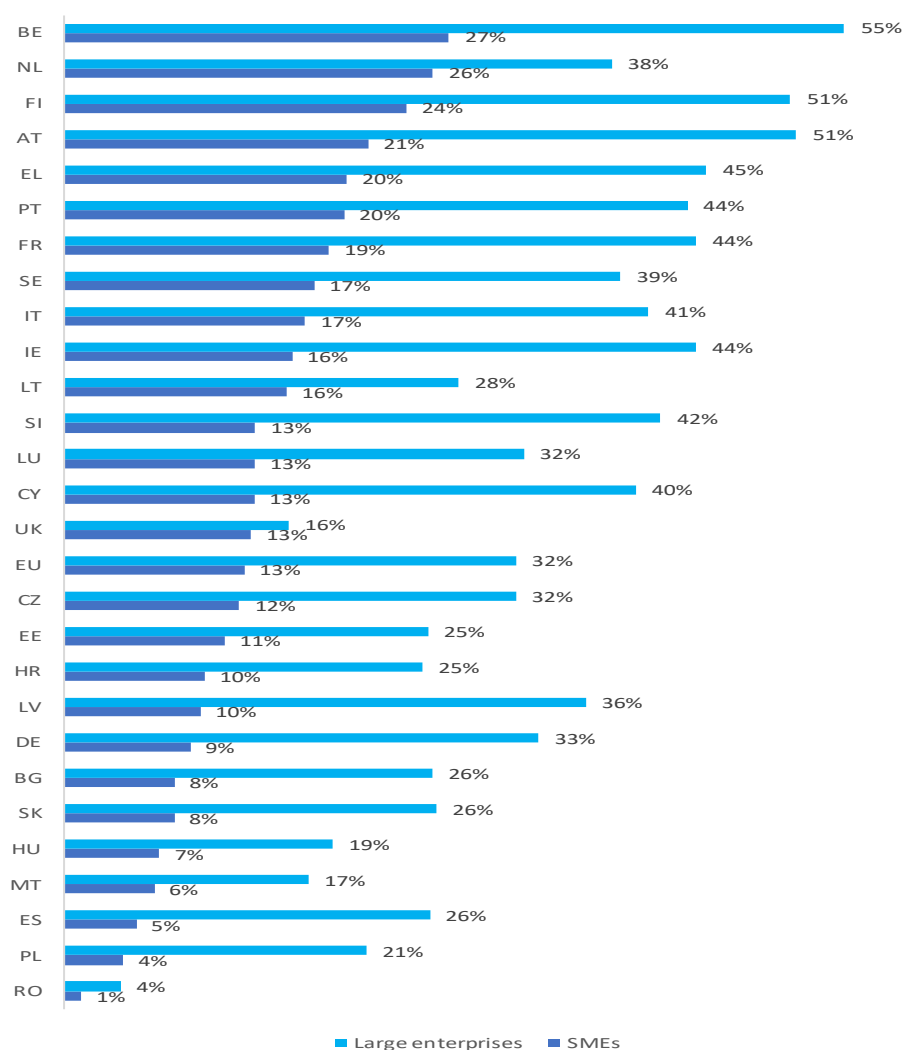
New-to-market product innovations refer to the introduction of a new or significantly improved product into a enterprise's market before any other competitors. Identifying the subset of enterprises that are new-to-market product innovators gives an indication of the quality of product innovation among enterprises.

The proportion of innovative SMEs that introduced a new-to-market innovation in the period 2014 to 2016 varies significantly across EU Member States, ranging from 27% in BE to 1.2% in RO (Figure 96).

In most Member States, there was a very marked difference in the incidence of new-to-market innovations between innovative SMEs and innovative large enterprise. Large enterprises are more likely to be new-to-market innovators in every Member State. At EU level, 32% of large enterprises had such an innovation activity compared to 13% of SMEs (Figure 96).

Since 2006, NL, FI and LT have generated the strongest growth in the share of innovative SMEs introducing a new-to-market innovation (an increase of 9.2 percentage points, 7.9 percentage points and 7.4 percentage points, respectively). In contrast, DE experienced the largest drop in this share (9.9 percentage points) (Figure 97).

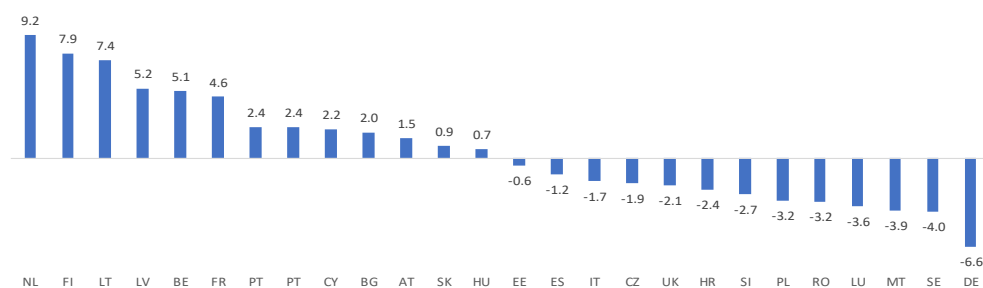
Figure 96 New-to-market product innovation by innovating SMEs and large enterprises (as a percentage of the population of innovative enterprises in each size class) - 2014-2016



Notes: EU-28 minus DK due to lack of data.

Source: Eurostat, Community Innovation Survey (CIS-2016)

Figure 97 Percentage point(s) change in the rate of innovative SMEs having introduced new-to-market product innovation - 2006-2008 to 2014-2016



Notes: Due to lack of data, DK, IE and EL are not included.

Source: Eurostat, Community Innovation Survey (CIS-2008 and 2016)

14.7 R&D activities by enterprises

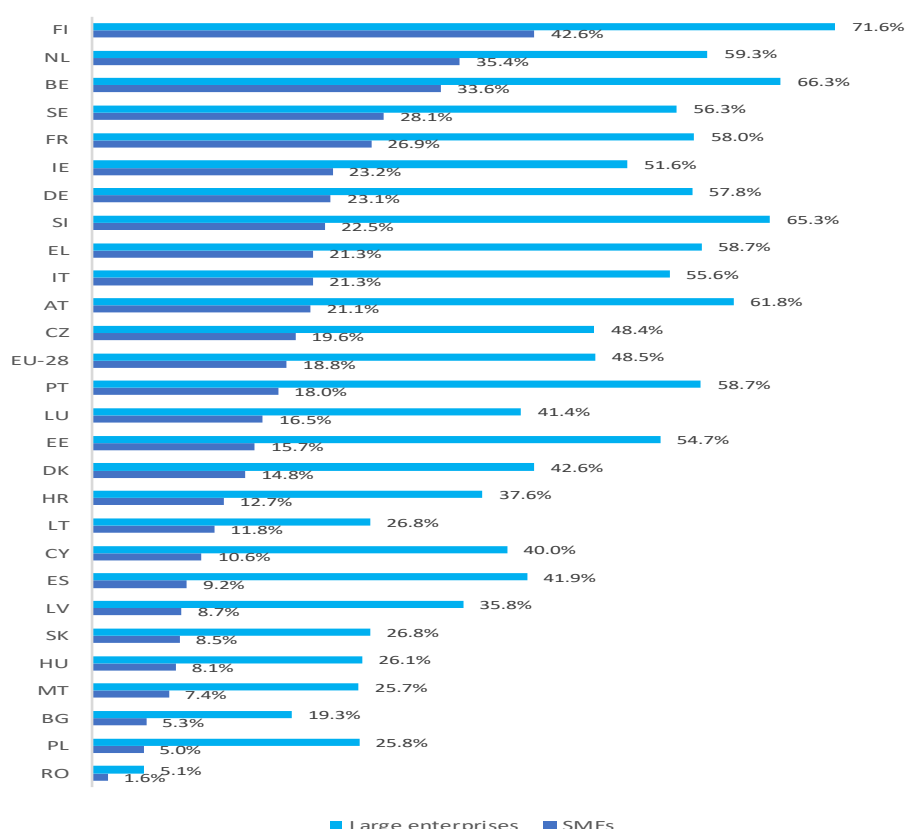
14.7.1 In-house R&D by innovating EU SMEs and large enterprises

Over the period 2014 to 2016, the proportion of innovative SMEs with in-house R&D expenditure varied significantly across EU Member States, ranging from 42.6% in FI to 1.6% in RO (Figure 98). BE, FI and NL were the Member States with the highest proportion of innovative SMEs performing in-house R&D.

Innovative large enterprises in all Member States were more likely to perform in-house R&D than innovative SMEs (Figure 98). In 2014 to 2016, at EU level, 48.5% of innovative large enterprises performed in-house R&D, compared to 18.8% of innovative SMEs. BE and FI had the greatest proportion of large enterprises undertaking in-house R&D. In general, Member States with a high prevalence of SME in-house R&D spending tended to have a similarly high prevalence of in-house R&D spending in large enterprises.

This differential was notably higher in ES and PL where innovative large enterprises were about five times as likely to undertake in-house R&D compared to innovative SMEs, and a similarly high differential was also in evidence in BG, CY and LV.

Figure 98 Share of Innovative enterprises which undertook in-house R&D, by enterprise size class, 2014-2016



Notes: As a percentage of the total number of enterprises undertaking innovation activities in each size class. EU-28 excludes UK because no data are available.

Source: Eurostat, Community Innovation Survey (CIS-2016)

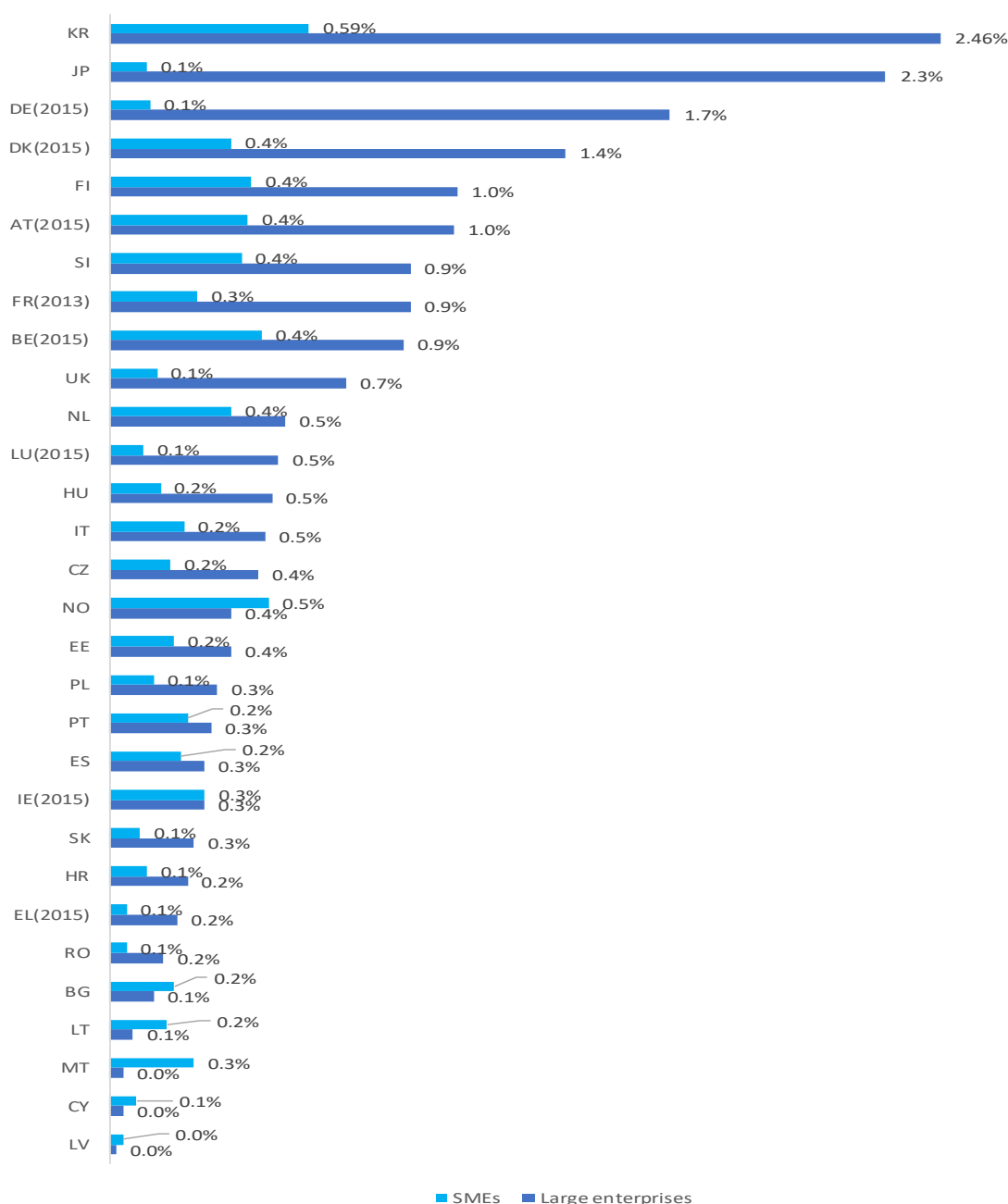
14.7.2 R&D expenditure by SMEs in the EU, Korea and Japan

In most countries there was a notable difference between the R&D spending by SMEs and large enterprises. Large enterprises showed higher R&D expenditure in 24 of the 27 Member States for which these data are available. The exceptions were BG, CZ,

LT and RO, in which SMEs spent marginally more on R&D than large enterprises (Figure 99).

In KR and JP there were also notable differences between SMEs and large enterprises. For example, in JP, the R&D expenditure of large enterprises amounted to 2.2% of GDP compared to 0.11% for SMEs.

Figure 99 R&D expenditure as a % of GDP by enterprise size class in 2016 (or nearest year for which data are available)



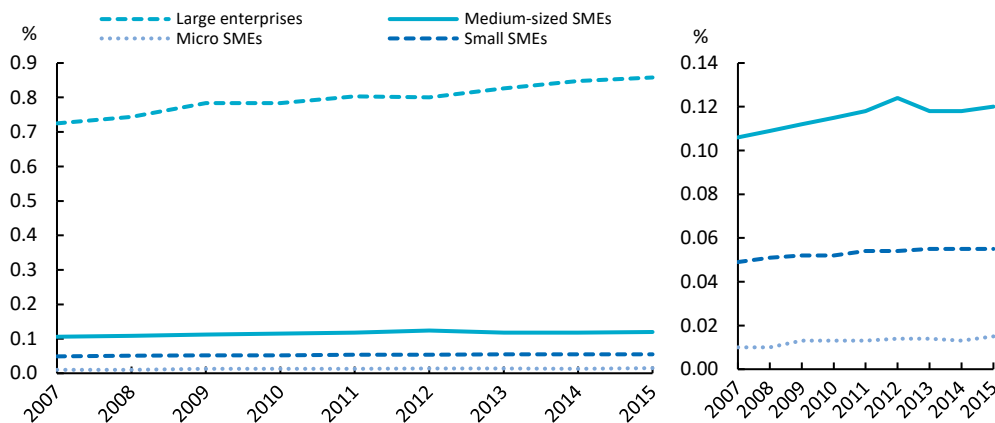
Note: Data for SE are not available

Source: Eurostat

Information on R&D spending by SME size class exists for a number of EU Member States (AT, BE, CY, CZ, DE, EE, ES, FI, HU, IT, LT, LV, PL, PT, RO, SI, SK and UK). EU micro, small, and medium-sized SMEs have recorded consistent growth in the level of their R&D spending since 2007. However, this increase in R&D spending only broadly kept pace with the growth in GDP and the ratio of SME R&D expenditure to GDP has remained broadly stable, averaging 18.5% over the period 2007-2015 (Figure 107).

In contrast, R&D spending (as a percentage of GDP) by EU large enterprises has slightly increased since 2007.

Figure 100 EU business enterprise R&D expenditure as a % of GDP by enterprise size class - 2007-2016

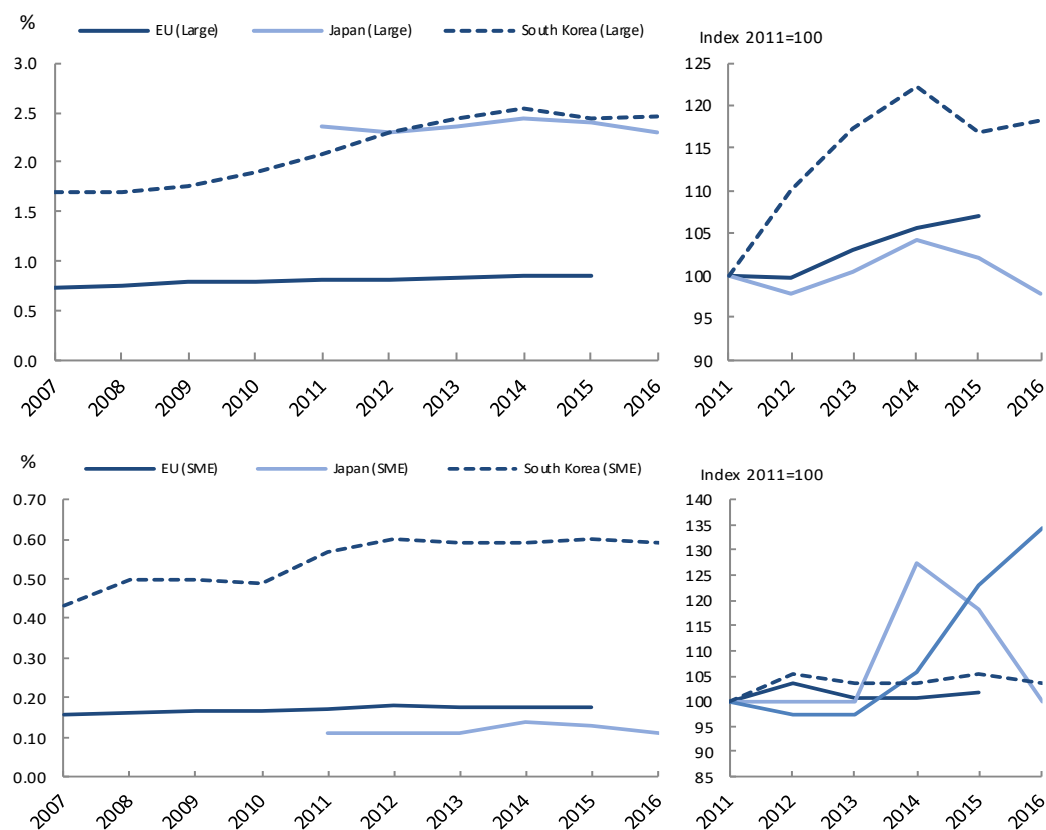


Notes: The EU aggregate includes AT, BE, CY, CZ, DE, EE, ES, FI, HU, IT, LT, LV, PL, PT, RO, SI, SK and UK.

Source: Eurostat - Science, Technology, and Innovation database

SMEs in KR and JP also show a relatively low ratio of R&D expenditure to GDP. In 2016, SMEs in Japan accounted for only 4.5% of total business enterprise sector R&D expenditure, and in Korea this figure stood at 19%. While KR has experienced similar growth in R&D expenditure relative to GDP for both SMEs and large enterprises in recent years, the R&D spending by SMEs and large enterprises in JP remained broadly stable (Figure 101).

Figure 101 R&D expenditure as a % of GDP by enterprise size class for KR, JP and the EU 2007-2017



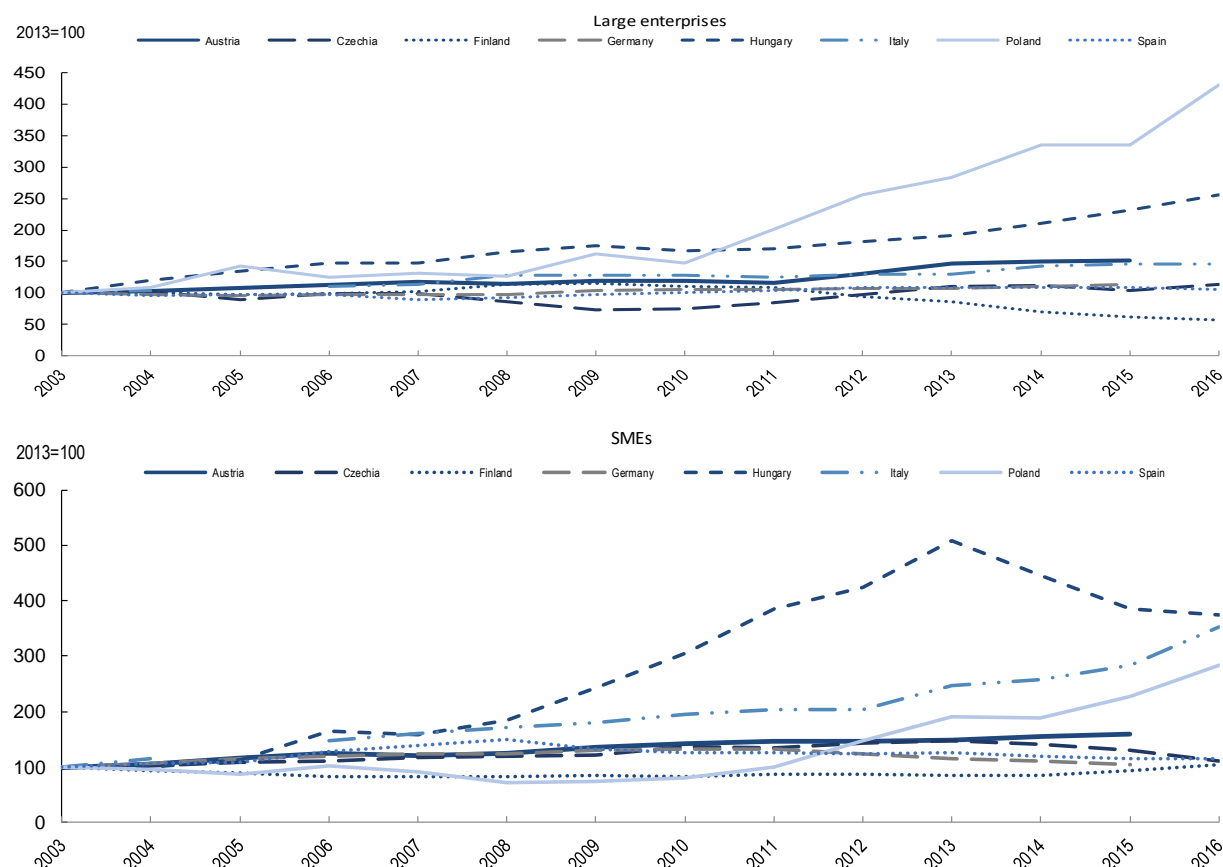
Notes: The EU aggregate includes AT, BE, CY, CZ, DE, EE, ES, FI, HU, IT, LT, LV, PL, PT, RO, SI, SK and UK. Data for JP are not available for years prior to 2011.

Source: Eurostat, Science, Technology, and Innovation database

Trends in R&D spending relative to GDP vary significantly between EU Member States (Figure 102). Since 2003, HU, IT and PL have experienced notable growth in the R&D spending of SMEs as a percentage of GDP. The R&D expenditure of large enterprises (relative to GDP) also increased similarly in these countries.

HU and PL also experienced notable growth in the R&D spending of micro enterprises relative to GDP. In PL, the R&D of micro enterprises increased from 0.001% of GDP in 2003 to 0.047% of GDP in 2016, while in HU it increased from 0.01% in 2003 to 0.018% in 2016.

Figure 102 R&D spending as a proportion of GDP by enterprise size for selected countries 2003-2016



Notes: R&D expenditure as % of GDP (2003=100). In each year only countries with non missing values for all size classes are included. In cases where one year of data is missing, but data for the year before and year after are available, data have been linearly interpolated.

Source: Eurostat, Science, Technology, and Innovation database

In most EU Member States, the R&D expenditure of SMEs and large enterprises has increased since 2003. Only large enterprises in Finland have experienced declines in R&D expenditure, from 1.8 % of GDP to 1.0 % (Table 11).

Table 11 R&D expenditure as a % of GDP by enterprise size class and Member State - 2003 & 2016

Member State	SMEs		Large enterprises	
	2003	2016	2003	2016
AT	.23(2002)	.41(2015)	.64(2002)	1.02(2015)
BE	.3	.45(2015)	.7	.87(2015)
BG	.03	.18	.06	.13(2015)
CY	.02	.08	.03	.04
CZ	.16	.18	.4	.45
DE	.12	.13(2015)	1.47	1.66(2015)
DK	.4	.43(2017)	1.01	1.3(2017)
EE	.11	.18	.1	.36(2015)
EL	.07	.05(2015)	.06	.2(2015)
ES	.18	.21	.28	.29
FI	.4	.42	1.79	1.03
FR	.17	.27(2013)	.86	.89(2013)
HR	.07(2005)	.12		.23
HU	.04	.15	.19	.48
IE	.32	.28(2015)	.33	.29(2015)
IT	.06	.22	.32	.46
LT	.03	.18	.04	.07
LU	.33(2005)	.1(2015)	.92(2005)	.5(2015)
LV	.04	.04	.03	.02
MT	.05(2002)	.25	.12(2005)	.04
NL	.21	.36	.53(2005)	.51
PL	.05	.13	.07	.32
PT	.07	.23	.13	.3
RO	.02	.05	.11	.16
SI	.11	.39	.47	.9
SK	.09	.09	.14	.24
UK	.12(2006)	.14	.54(2006)	.7

Note: When data for 2003 and 2016 are unavailable, the nearest available data point has been used and is shown in (..) in the table. No data are available for SE.

Source: Eurostat, Science, Technology, and Innovation database

15 The impact of innovation by ‘superstar’ firms on innovation by SMEs

Key points

Evidence suggests that markets are becoming increasingly ‘winner takes most/all’, with the best performers (the so-called ‘superstar’ firms such as the FANGs: Facebook, Amazon, Netflix and Google) surging ahead. Such a development may result in the stifling of innovation by smaller enterprises.

There is evidence that R&D expenditure, as well as innovative output (in the form of patents and trademarks), are highly concentrated, in that a small number of firms are responsible for a large proportion of total business R&D in various industrialised economies.

While the available data suggest an increase in market concentration in the EU, as well as a slight increase in innovation concentration, the currently available data do not permit a comprehensive assessment as to whether the rise of ‘superstar’ firms has been the direct cause of SMEs undertaking less innovation.

Evidence suggests that markets are becoming increasingly ‘winner takes most/all’, with the best performers (the so-called ‘superstar’ firms⁷⁶), surging ahead and taking a greater share of the rewards (Veugelers, 2018). The potential impact of such superstar firms on market concentration, competition intensity, productivity and income distribution has attracted the growing attention of economists and policymakers.⁷⁷ The discussion below examines whether the emergence of ‘superstar’ firms has had any impact on the level of SME R&D and innovation activities.

The FANGs (Facebook, Amazon, Netflix and Google) are often cited as prime examples of modern ‘superstar’ firms, but many other ‘superstar’ firms exist, and some of these are active in the offline world, for example, large supermarkets or coffeehouse chains and pharmaceutical companies (Manyika et al., 2018).⁷⁸ While the academic literature does not offer a standard definition of a ‘superstar’ firm, they are typically characterised as having particularly high levels of innovation and productivity, high returns on invested capital, low labour intensity and wages which are not rising apace with the marked growth in productivity (Autor et al., 2017; Van Reenen and Patterson, 2017, and Ayyagari et al., 2018).

Empirical evidence shows that R&D expenditure, as well as innovative output (in the form of patents and trademarks), are highly concentrated. A small number of firms are responsible for a large proportion of total business R&D (OECD, 2017) in various economies.⁷⁹ Nevertheless, in OECD Member States, SMEs play a critical role in the innovation system of the 21st century.

Economies of scale in R&D are no longer the barriers they once were to small firm participation in innovation, as shown by Silicon Valley, which has become a fertile ground for newcomers and a hotbed for innovation. Some SMEs, benefiting from

⁷⁶ The notion of ‘superstar’ companies was first applied by University of Chicago economist Sherwin Rosen (1981), who argued that modern technologies allow ‘superstar’ firms to greatly expand the scope of their market, while reducing market opportunities for everyone else.

⁷⁷ Market concentration measures the extent to which market shares are concentrated between a small number of firms (see <https://www.oecd.org/daf/competition/market-concentration.htm>, accessed on 28/05/2019).

⁷⁸ The McKinsey Global Institute labels firms as ‘superstar’ if they are among the top 10% of firms which capture 80% of economic profit among companies with annual revenues greater than \$1 billion.

⁷⁹ As observed in the OECD Science, Technology and Industry Scoreboard since 2004, this characteristic R&D concentration has remained practically unchanged from year to year (OECD, 2018b).

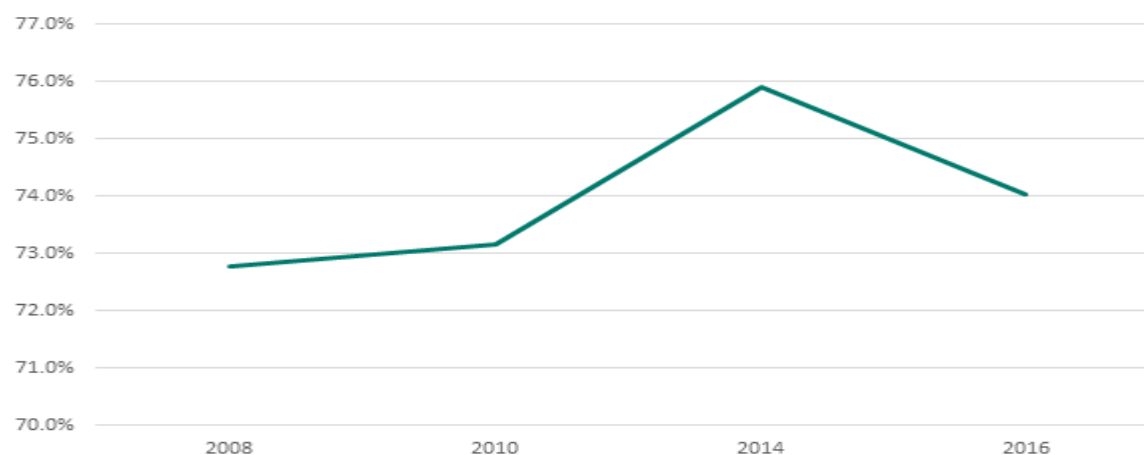
flexibility in responding to technological, competitive and market changes, have developed breakthrough innovations themselves (especially in science-driven sectors like biotech and nanotech). Others have adopted incremental innovations generated by large firms (OECD, 2018a). By introducing innovations to the market, SMEs have challenged existing structures, set industrial dynamics into motion, contributed to productivity gains and, consequently, strengthened their economy's competitiveness.

At issue, however, is whether 'superstars', which benefit from network effects⁸⁰, vast financial and human resources and economies of scale⁸¹, may become so dominant that SMEs, the backbone of all economies,⁸² will be discouraged from engaging in innovation activities themselves. Such dominance could be manifested by increased concentration in the R&D and innovation landscape.

Nonetheless, on a global scale, there is little evidence of increasing R&D concentration over the past decade. A slight increase in concentration can be detected only in digital sectors, where, in particular, the top 1% of R&D spending firms are forging ahead (Veugelers, 2018).

Within the EU, R&D concentration has increased in only two industries, automobile and software. About 30% of the EU's R&D is undertaken in the automotive industry and 6% by ICT services (incl. software). Together, these two industries account for more than one third of total EU R&D spending (European Union 2017). Moreover, innovation concentration in the EU (measured as the innovation expenditure of large firms over total innovation expenditure) has increased only slightly over the past decade⁸³ (Figure 103).

Figure 103 Development of innovation concentration in the EU (measured as innovation expenditure of large firms over total innovation expenditure from 2008 -2016)



Note: Countries included: AT, BE, BG, CY, CZ, DE, EE, ES, FI, FR, HR, HU, IT, LT, LV, LU, MT, NL, PL, PT, RO and SE. Data are not available for EL, IE, RO, SI and UK.

Source: DIW Econ based on Eurostat (2019).

The slight increase in innovation concentration can largely be explained by a growing share of German innovation expenditure in total EU innovation expenditure during the period under review. Germany shows by far the highest innovation concentration

⁸⁰ When a network effect is present, the value of a product or service increases with the number of people or participants using it. Online platforms are an example: the more users participate, the more useful the platform becomes to the public.

⁸¹ Economies of scale is the competitive advantage that large entities have over smaller ones. The larger the business, the lower its per unit costs of output (for example, because fixed costs can be spread over more units of production).

⁸² SMEs account for approximately 99% of all firms in OECD economies (see <http://www.oecd.org/cfe/smes/>, accessed on 10/05/2019).

⁸³ Data are from the CIS.

of all EU Member States. Large firms' innovation expenditure accounted for 85% of total German innovation expenditure in 2016, most of which was undertaken by the automotive industry and the non-automotive manufacturing industry.

The Fraunhofer Institute for Systems and Innovation Research finds that the share of innovators has declined in Germany since the late 1990s and that innovation has become more concentrated over time (Rammer and Schubert, 2018). The authors argue that the most likely explanation for this phenomenon is SMEs withdrawing from innovation activities on a large scale, especially in low-tech sectors. In line with this finding, the KfW SME Innovation Report 2017 speaks of a "long-term trend towards fewer innovators" among German SMEs (Zimmermann, 2018, p.1). Another KfW report gives several factors which have contributed to the shrinking share of innovators among SMEs. They range from poor sales prospects (due to a weak economic environment and political uncertainties) and a decline in the creation of new businesses and lower returns on innovation to skills shortage (Zimmermann, 2017).

While the available data suggest increasing market concentration as well as a slight increase in innovation concentration in the EU, the currently available data do not allow a comprehensive assessment as to whether the rise of 'superstar' firms has been the direct cause of SMEs undertaking less innovation.

16 What explains differences in R&DI performance by SMEs?

Key points

A number of empirical analyses were undertaken to identify the key factors which explain the difference in innovation activity by SMEs as a group as well as at the level of individual SMEs.

At the macro level (i.e. focusing on the share of SMEs undertaking some type of innovation activity in the EU-28 Member States), the econometric analysis finds that, over the period 2010-2016, differences in GDP per capita among Member States was the key factor explaining differences in the share of innovative SMEs across the EU. A higher level of GDP per capita was associated with a higher share of SMEs undertaking innovation activities. In addition, a larger share of innovative SMEs was associated with a higher share of university graduates in science, manufacturing, engineering and construction and a higher level in the IMD quality of scientific research institutions index.

At the micro level, firm level data from the CIS, SAFE and 2016 Innobarometer were used to identify factors explaining why some SMEs innovate and others do not. The SAFE data can be used to track the behaviour of a number of firms over time. Among the SMEs that participated in several SAFEs, approximately half were consistently undertaking innovation, while the other half were only doing so occasionally.

The analyses of the three datasets yield consistent results. The following key factors were found to be associated with innovation by an SME:

- Sector economic activity: SMEs operating in 'manufacturing', 'wholesale and retail trade' or in the 'services' sectors were more likely to innovate, conduct R&D or apply for intellectual property protection than SMEs in industry. Additionally, SMEs in the 'manufacturing' and 'services' sectors were more likely in general to engage in innovation than those in 'wholesale and retail trade'.
- Size: small and medium-sized SMEs were more likely to innovate than micro SMEs.
- Age: younger SMEs were more likely to innovate.
- Ownership: SMEs owned by public shareholders or, unsurprisingly, venture capital enterprises or business angels, were more likely to innovate than SMEs owned by a family or group of entrepreneurs, which, in turn, were more likely to innovate than SMEs owned by other enterprises or business associates, or by a natural person.
- Growth: growing SMEs (especially high-growth SMEs) were more likely to innovate than SMEs that had not grown during the previous three years, both in terms of employment and turnover. Interestingly, SMEs in which employment or turnover had declined were more likely to innovate.
- Exports: SMEs which exported were more likely to engage in innovation.
- Independence: the estimated effects of age, ownership and turnover growth are larger for independent SMEs (i.e. for SMEs which are not subsidiaries or branches). However, the evidence is mixed regarding the impact of independence on whether or not an SME innovates. One analysis finds no impact, while another finds a positive impact.

In terms of whether an SME undertakes innovation on a regular basis, or only occasionally, the analysis finds that SMEs in the manufacturing sector were most likely to conduct R&D 'continuously', followed by SMEs in 'wholesale and retail trade' and in industry. SMEs that were part of an enterprise group, or that had exported, were also more likely to conduct R&D on a consistent basis.

This chapter presents the results of a number of statistical analyses of the factors explaining differences in R&DI performance of EU-28 SMEs using various macro/micro datasets such as the Community Innovation Survey (CIS), the ECB/EC Survey on Access to Finance (SAFE) and the 2016 Innobarometer.

The first analysis uses the aggregate innovation data published by Eurostat and seeks to identify the factors which explain why the share of SMEs which undertake innovation activities varies across the EU.

16.1 Factors explaining differences across the EU in the share of SMEs undertaking innovation activities

16.1.1 The analysis

The analysis⁸⁴ focuses on the share of the total SME population reported in three waves of the Community Innovation Survey (CIS) database, covering the following three-year reference periods: 2010-2012, 2012-2014 and 2014-2016⁸⁵. Data prior to 2010 have not been used due to a) a lack of data for some of the explanatory variables considered by the analysis and b) CIS methodology differences prior to 2008⁸⁶.

The variables that could potentially explain differences in the share of innovative SMEs are listed in Annex 25. The empirical analysis sought to relate both historical developments and cross-Member States variation in the shares of innovative SMEs in the total SME population innovation to a number of potentially relevant factors:

- General structural factors that may impact incentives to innovate, such as the ease of getting credit, the level of competition, product market regulation or barriers to entrepreneurship. Also, structural factors relating to industry composition, such as high-technology exports as a percentage of total exports.
- Cyclical factors such as the short-term and long-term interest rates, the unemployment rate and the output gap in each respective country.
- Factors reflecting the specific innovation environment faced by SMEs, such as the countrywide SME R&D tax subsidy rate or the quality and quantity of RD&I infrastructure and resources. These factors include a range of broad structural and cyclical factors, as well as indicators specific to SME innovation.

16.1.2 The main results of the analysis

The econometric analysis had to address a number of estimation difficulties due to, among other factors, the small sample size (three CIS waves only) and the presence of multicollinearity between many potential explanatory variables. Nevertheless, across a wide range of different model specifications, the analysis yielded three stable and robust results:

1. GDP per capita was the key factor explaining differences in the share of innovative SMEs across the EU. A higher level of GDP per capita was associated with a higher share of SMEs undertaking innovation activities.
 - a. In addition, a higher share of university graduates in science, manufacturing, engineering, and construction was associated with a greater share of innovative SMEs.
 - b. Furthermore, a higher level in the IMD quality of scientific research institutions index was associated with a larger share of innovative SMEs.

⁸⁴ The detailed results of the econometric analysis are presented in the background Document.

⁸⁵ As each CIS wave spans a three-year period, while the explanatory variables are annual variables, the values of the explanatory variables in the second year of a CIS wave were used for each wave. For example, in the case of the 2014-16 wave, the annual data refer to the year 2015.

⁸⁶ The industry coverage of the aggregate CIS data for CIS 2012-2016 differs from CIS 2008. Specifically, post-2008, the reference sector for the CIS includes NACE Rev. 2 industries: B, C, D, E, G46, H, J, K and M71-72-73. In 2008, the reference sector included only the NACE Rev. 2 industries: B, C, D, E, G46, H, J58, J61, J62, J63, K and M71.

16.2 Key findings from the analysis of enterprise level data of SAFE

16.2.1 Introduction

SAFE (Survey on the Access to Finance of Enterprises) is a pan-European survey which, although focused on the financing of businesses, contains a question that can be used to identify innovative firms (European Central Bank, 2018).

In various survey waves, respondents were asked whether, in the previous 12 months, they had introduced:

- “... a new or significantly improved product or service to the market”;
- “... a new or significantly improved production process or method “
- “... a new organisation of management”; and,
- “... a new way of selling [their] goods or services ”

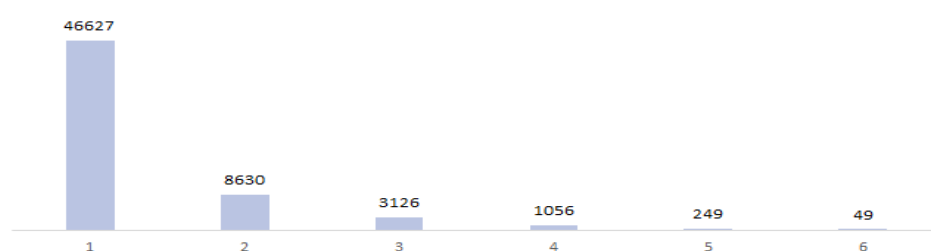
These questions closely overlap with the definitions of product, process, organisational and marketing innovation set out in the Oslo manual (OECD/Eurostat, 2005).

Although SAFE covers SMEs and large companies across all EU-28 Member States and a number of other countries, the analysis described below was restricted to enterprises which were located in the EU in all waves in which they were surveyed.⁸⁷

The SAFE question on innovation was only asked in survey waves 1, 5, 9, 11, 13, 15, 17, 19 (i.e. the ‘common rounds’, which are conducted jointly by the ECB and the European Commission)⁸⁸. The reference periods in these waves were October to September, except for wave 1, in which the reference period for the innovation questions ranged from July 2008 to June 2009. The survey responses were assigned to specific years based on the reference period end date.

Overall, the data panel is short and unbalanced. A large majority of firms that are included in the econometric analysis only appeared once in the dataset (Figure 104).

Figure 104 Number of enterprises, by number of years in dataset – 2009 to 2018



Source: LE Europe analysis of various waves of the SAFE survey

⁸⁷ Further details are provided in the Background Document.

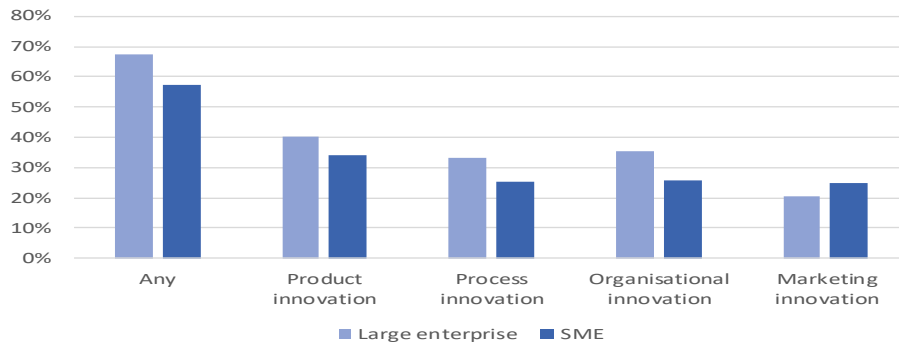
⁸⁸ The survey waves refer to the year in which the fieldwork was conducted, but also to the year in which the majority of the reference period of the innovation question sits (e.g. in wave 17, the reference period of the innovation question covers October 2016 to September 2017, therefore the majority of this period lies in Year 2017).

Wave	1	5	9	11	13	15	17	19
Fieldwork	2009	2011	2013	2014	2015	2016	2017	2018

16.2.2 Key findings from a descriptive statistical analysis of the SAFE enterprise level data

Most enterprises which participated in the SAFE surveys had undertaken some innovation. Large enterprises comprised a somewhat larger share of innovators than SMEs for most types of innovation, except for marketing innovation (Figure 105).

Figure 105 Share of innovating enterprises, by type of innovation and size – 2009 to 2018

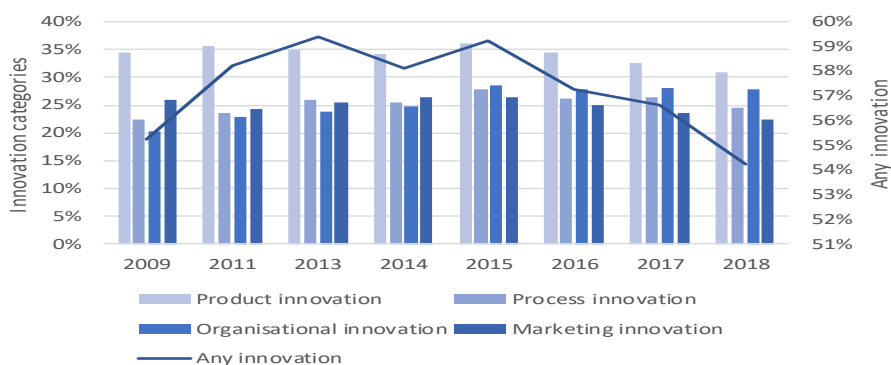


Note: Number of observations: 110316. This analysis draws on all EU-based SAFE respondents for which all innovation indicators are available.

Source: LE Europe analysis of various waves of the SAFE survey

Since 2015, there has been a decline in the share of SME SAFE respondents that have innovated (Figure 106). This has been the case for most types of innovation, except for organisational innovation.

Figure 106 Share of innovating SMEs 2009 to 2018

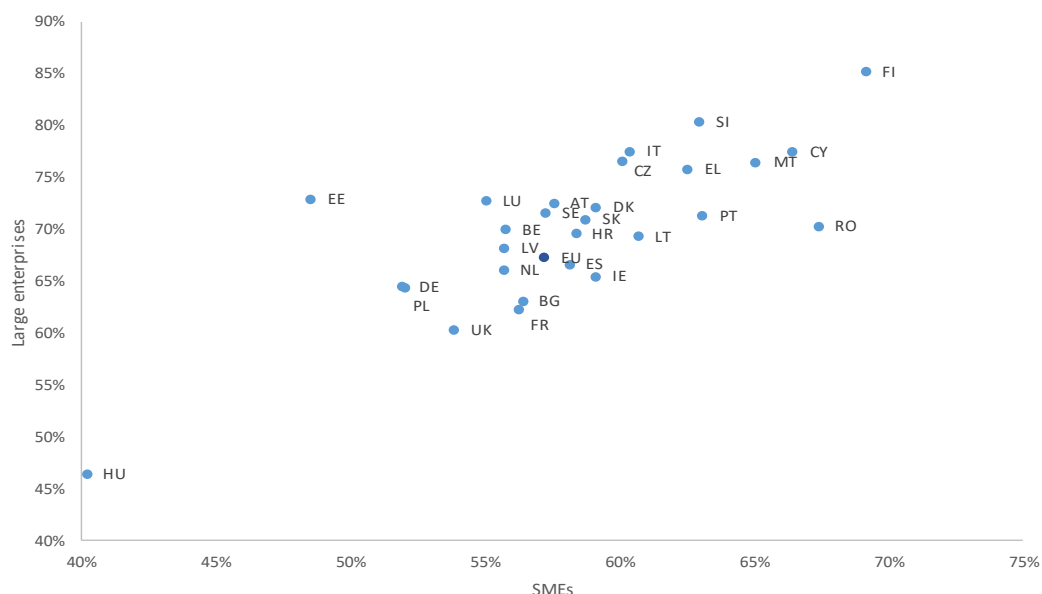


Note: Number of observations: 92160.

Source: LE Europe analysis of the SAFE survey

Across Member States, the share of SME innovators was positively correlated with the share of large enterprise innovators (Figure 107).

Figure 107 Share of innovating enterprises in Member States - large enterprises and SMEs – 2009 to 2018



Note: Number of observations: 110316. This analysis draws on all EU-based respondents for which all innovation indicators are available.

Source: *LE Europe analysis of the SAFE survey*

An econometric analysis of the relationship between the shares of innovating enterprises in different enterprise size classes shows that the overall innovation climate of a Member State, as proxied by the Adjusted Innovation Summary Index from the EU Innovation Scoreboard, has a statistically significant impact on the share of innovating SMEs but not on the share of innovating large enterprises (see details in Box 5).

An increase in the Innovation Summary Index of 10 percentage points increases the share of:

- innovating small SMEs by 6.3 percentage points;
- innovating medium-sized SMEs by 5.4 percentage points.

Box 5

Relationship between the shares of innovating large enterprises, medium-sized SMEs and small SMEs and a country's overall innovation climate in the EU-28

As already shown in Box 3, the differences across EU Member States in the shares of innovating large enterprises and innovating SMEs reflect the Member States' overall innovation framework conditions as proxied by the Adjusted Summary Innovation Index from the EU Innovation Scoreboard. The previous analysis was extended to assess separately the impact of Member States' overall innovation framework conditions on the share of innovating large enterprises, the share of innovating medium-sized SMEs and the share of innovating small SMEs.

The results of the econometric analysis reported below show that the state of a Member State's overall innovation framework conditions has a statistically significant impact on the shares of innovating small and medium-sized SMEs but not on the share of innovating large enterprises. The innovation shares are from the 2016 CIS and the Adjusted Summary Innovation Index is the average over the period 2014-2016 (see Box 3 for details).

The estimated relationship reported below shows that an increase in the Adjusted Innovation Summary Index of 10 percentage points increases the share of innovating small SMEs by 6.33 percentage points, innovating medium-sized SMEs by 5.38 percentage points.

Small SMEs

$$(1) \text{ Share of innovating small SMEs} = 0.162 + 0.633 * \text{Adj. Summary Innovation Index}$$

(2.18) (3.96)

Adjusted R-squared = 0.361 t-statistic shown in (..)

Medium-sized SMEs

$$(2) \text{ Share of innovating medium-sized SMEs} = 0.376 + 0.538 * \text{Adj. Summary Innovation Index}$$

(5.51) (3.68)

Adjusted R-squared = 0.326 t-statistic shown in (..)

Large enterprises

$$(3) \text{ Share of innovating large enterprises} = 0.671 + 0.228 * \text{Adj. Summary Innovation Index}$$

(10.32) (1.64)

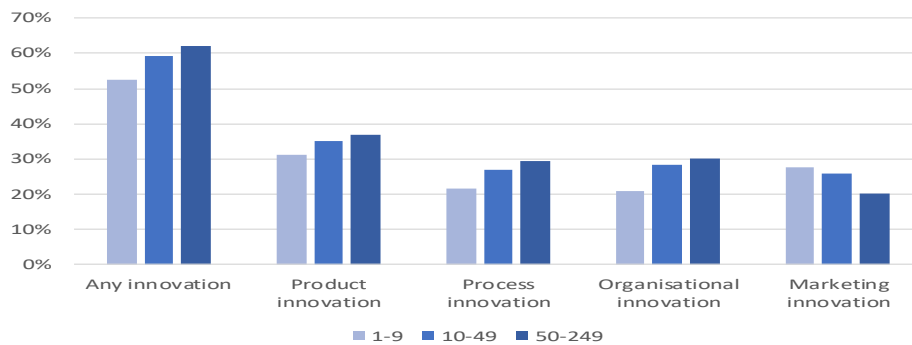
Adjusted R-squared = 0.061 t-statistic shown in (..)

For most innovation types, innovators were more prevalent among larger SMEs, although the share of marketing innovations was larger in smaller SMEs (Figure 108).

Innovators were more prevalent among younger SMEs, although the shares of innovators are fairly similar across age groups in the case of process innovations (Figure 109).

Unsurprisingly, the share of innovators was highest among SMEs owned by venture capital enterprises or business angels (Figure 110).

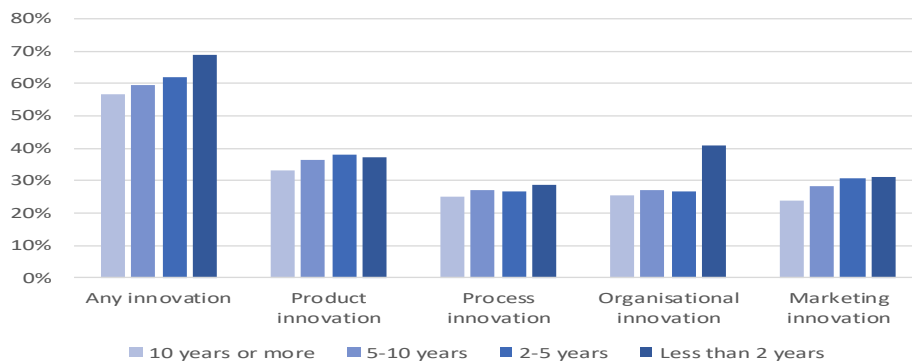
Figure 108 Share of innovating SMEs by employment size class - 2009 to 2018



Note: Number of observations: 92160. Size classes are based on the number of employees (full-time or part-time, excluding the owner) working for at least 12 hours per week.

Source: LE Europe analysis of the SAFE survey

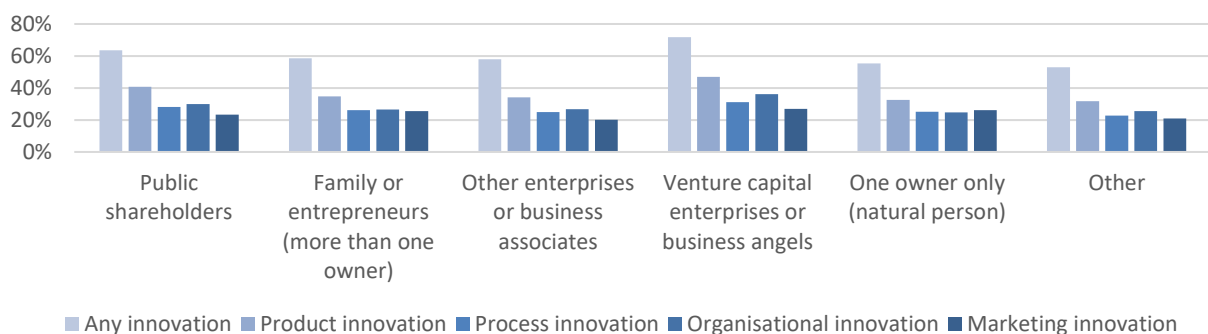
Figure 109 Share of innovating SMEs by age of the SME – 2009 to 2018



Note: Number of observations: 92160.

Source: LE Europe analysis of the SAFE survey

Figure 110 Share of innovating SMEs by ownership – 2009 to 2018



Note: Number of observations: 92160. In the first wave of the SAFE survey, multiple responses were possible for question D6 on ownership. The microdata contains a recoded version of this variable with a single value for each observation. Therefore, in the first wave, the variable on ownership may reflect one of several answers that were given to the relevant question.

Source: LE Europe analysis of the SAFE survey

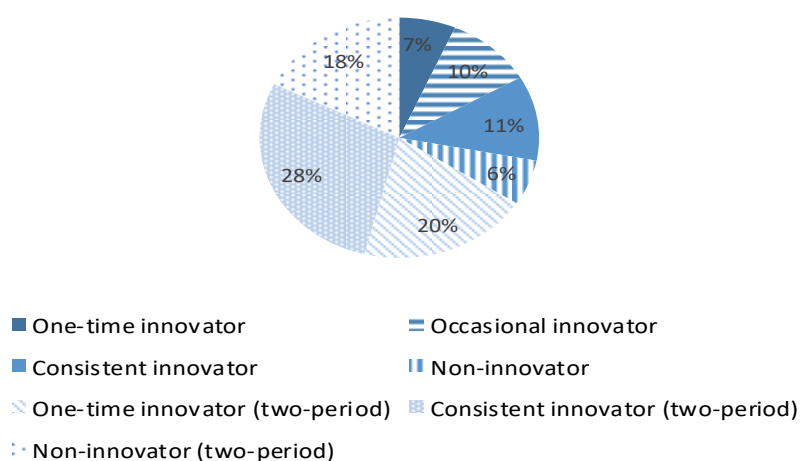
To assess the extent to which SMEs were repeat innovators (in the SAFE survey), the analysis draws on the panel structure of the dataset to analyse the innovation pattern of SMEs for which information on innovation behaviour was available for at least two periods. We distinguish between the following types of SMEs:

- Non-innovators have been observed in the dataset for at least three periods and have not innovated in any of these periods.

- One-time innovators (two-period) are SMEs that have been in the dataset for two periods and have innovated in one of these periods.
- Consistent innovators (two-period) have been observed in the dataset for two periods and innovated in both periods.
- Non-innovators (two-period) have been observed in the dataset for two periods and have not innovated in any of these periods.
- One-time innovators are SMEs that have been observed in the dataset for at least three periods and have innovated in one of these periods.
- Occasional innovators have been observed in the dataset for at least three periods and have innovated more than once, but not consistently.
- Consistent innovators have been observed in the dataset for at least three periods and have innovated in every single one of these periods.

Consistent innovators make up the largest category of firms that were surveyed only twice (Figure 111). This is also the case for firms that were surveyed at least three times, although the combined share of 'occasional' and 'one-time' innovators makes up a larger proportion of SMEs than consistent innovators.

Figure 111 Innovation pattern of SMEs 2009 to 2018



Note: Number of observations: 11459. This is based on years 2009-2017. This analysis focuses on unique firms and is based on observations for which information on innovation behaviour is available. For instance, if a firm takes part in four waves of the SAFE survey, does not have information on innovation behaviour in two of these waves, and has innovated in the other two waves, it will be counted as a Consistent innovator (two-period).

Source: LE Europe analysis of the SAFE survey

16.2.3 Key findings from an econometric analysis of the SAFE data

The analysis aims to identify potential determinants of innovation by SMEs.⁸⁹ The dependent variable in the analysis is whether an SME had reported in SAFE that any type of innovation had been undertaken within the previous 12 months. Thus, this variable is a binary variable (yes/no) and various models were estimated econometrically using logistic regressions.

A first set of models investigates how innovation behaviour is associated with some of the firm characteristics discussed in the descriptive analysis above (see EQ2 below).

⁸⁹ The detailed estimation results are presented in the Background Document.

$$\begin{aligned}
(EQ2) \text{ Probit}(\text{innovation}_{it}) &= \beta_0 + \beta_1 \text{sector}_{it} + \beta_2 \text{employment}_{it} + \beta_3 \text{turnover}_{it-1} \\
&+ \beta_4 \text{employment growth}_{it-1} + \beta_5 \text{turnover growth}_{it-1} \\
&+ \beta_6 \text{age}_{it} + \beta_7 \text{ownership}_{it} + \beta_8 \text{independent}_{it} + \delta \text{year}_{it} \\
&+ \varepsilon_{it}^{90}
\end{aligned}$$

The key results of the econometric analysis which are reported below show the impact of various firm characteristics on the likelihood that a firm is innovating. For example, a small SME is found econometrically to be more likely to innovate than a micro SME. This means that an SME which grows from being a micro SME to a small SME is more likely to innovate once it has grown in size. In that sense, the econometric analysis establishes a causal relationship between a particular firm characteristic (size in the present case) and the likelihood that the firm is innovating. This general observation of how to view the results of the econometric analysis applies to all the firm-level analyses of the relationship between firm characteristics and firm innovation presented in this report.

Additional key findings of the econometric analysis are that:

- Younger SMEs were more likely to innovate.
- SMEs owned by public shareholders or, unsurprisingly, venture capital enterprises or business angels, were more likely to innovate than SMEs owned by a family or group of entrepreneurs, which, in turn, were more likely to innovate than SMEs owned by other enterprises or business associates, or a natural person.
- Growing SMEs (especially high-growth businesses) were more likely to innovate than SMEs that had not grown during the previous three years, both in terms of employment and turnover. Interestingly, SMEs in which employment or turnover had declined were more likely to innovate.
- Innovation does not appear to be associated with SMEs' independence status (i.e. whether it is independent or a branch or subsidiary).

In order to test whether the relationship between firm characteristics differs across independent SMEs and branches or subsidiaries, the baseline model was estimated using the two samples of firms. The results show that the hypothesis that the coefficients are equal across the two models is rejected and further tests on individual coefficients indicate that the estimated coefficient on employment growth (reduction in employment) is smaller for independent firms, and the estimated coefficients on age, ownership and turnover growth are larger for independent firms.

16.3 Key findings from an analysis of the firm level data from the CIS 2012-2014

As the results of the CIS have already been extensively discussed in chapter 14, this section presents only the key findings of the econometric analysis of the firm level data from the CIS 2012-2014.⁹¹ These were used to identify key enterprise characteristics among the EU SME population which explain differences in innovation activity among SMEs.

This analysis is based on the scientific use files from the CIS 2014. These microdata files contain information on the innovation behaviour and firm characteristics of 68,476 businesses across thirteen Member States and Norway, including 55,555 EU-

⁹⁰The variable *ownership_{it}* refers to the type of owner. As specified above, ownership categories include (i) public shareholders, (ii) a family or entrepreneurs, (iii) other enterprises or business associates, (iv) venture capital enterprises or business associates, (v) one owner only, and *independent_{it}* refers to whether the firm is independent, or a branch or subsidiary. The reference year for turnover, as well as the last reference year for turnover and employment growth, was the year prior to the reference period of the innovation variable. Therefore, these covariates are indexed at $t - 1$.

⁹¹ The microdata of the CIS 2014-2016 were not yet available at the time this report was prepared.

based SMEs.⁹² As already noted in chapter 14, the CIS covers only enterprises with at least 10 employees, i.e. it does not include micro SMEs. A subset of these enterprises were considered for the analysis, based on the following criteria:

- only data on SMEs from EU Member States were used in the econometric analysis;
- in the case of CY, no information was available on the number of employees, therefore no data from CY were used in the analysis; and,
- for each strand of analysis, the sample was further restricted to SMEs for which all the relevant variables were available.

16.3.1 *Innovation behaviour and firm characteristics*

The key variables of interest in this analysis are whether in the period 2012-2014 an SME had:

- innovated;
- applied for intellectual property protection; and,
- conducted R&D.

The explanatory variables included in the model are all binary and include the following:

- the sector in which the SME was operating;
- the size of the SME (based on its employment size);
- the SMEs' administrative status (i.e. whether the SME was an independent SME or part of an enterprise group);
- whether the SME exported in 2012;
- the SME's turnover growth (based on different growth ranges); and,
- the SME's employment growth (also based on different growth ranges).⁹³

Member State dummies⁹⁴ were added to the model in order to control for potential country-level factors that could influence both firms' propensity to innovate and some of the other variables of interest.⁹⁵ Standard errors were clustered at Member State level to account for potential correlation of unexplained factors across SMEs within Member States.⁹⁶

The key results of the econometric analysis⁹⁷ are as follows:

- Medium-sized enterprises were more likely to engage in innovation activities than small SMEs.
- SMEs that were part of an enterprise group were also more likely to engage in innovation activities than SMEs which were independent.
- SMEs that had exported at the beginning of the CIS 2012-2014 reference period were more likely to innovate than SMEs which did not.
- SMEs whose turnover or employment was growing were more likely to innovate than SMEs whose turnover or employment was flat or declining. There was less evidence of a link between growth and other types of innovation behaviour (namely, in-house R&D and applications for intellectual property rights).

⁹² Here, an SME is defined as a business with 10-249 employees. Note that the 55,555 SMEs do not include CY businesses as no information was available on their employment.

⁹³ A number of growth ranges were defined (e.g. 0% to less than 5%, 5% to less than 10%, 10% to less than 15%). Each of the growth ranges is a separate variable which takes a value of 1 when the SME's actual growth falls within the specific range and is 0 otherwise.

⁹⁴ A Member State's dummy has a value of 1 when the SME is from that Member State. Otherwise it takes a value of 0.

⁹⁵ Models explaining whether SMEs innovated between 2012 and 2014 were estimated both with and without country dummies via seemingly unrelated estimation. Hypothesis tests indicated that a number of coefficients were different. These included the coefficient on the export indicator as well as most of the coefficients on the employment growth range indicators.

⁹⁶ The estimation samples include SMEs from CZ (except in the model explaining applications for intellectual property), DE, EE, EL, HR, HU, LT, LV, PT and RO.

⁹⁷ See Background Document for details of the econometric analysis.

16.3.2 Pattern of R&D activity and firm characteristics

The second part of the econometric analysis focuses on the pattern of SME innovation behaviour. Specifically, the following analysis investigates whether businesses conduct R&D consistently or only occasionally. This is proxied by an indicator of whether an SME had permanent staff in-house dedicated to R&D between 2012 and 2014, as opposed to conducting R&D only as needed. The explanatory variables are the same as above.⁹⁸

The key results of this analysis are that:

- SMEs in the manufacturing sector were most likely to conduct R&D 'continuously', followed by SMEs in trade, and finally, industry.
- Medium-sized SMEs were more likely than small SMEs to have permanent R&D staff in-house.
- SMEs that were part of an enterprise group, or that had exported, were more likely to conduct R&D on a consistent basis than SMEs which were independent or did not export.
- An SME's turnover growth did not appear to influence whether it conducted R&D occasionally or regularly.
- In contrast, SMEs with growing employment were more likely to have permanent staff dedicated to R&D than SMEs with stable or declining employment.

⁹⁸ The estimation sample includes SMEs from CZ, DE, EE, EL, HR, HU, LT, LV, PT and RO.

17 Problems SMEs face when they wish to undertake R&DI

Key points

A survey of SME associations and the CIS 2016 identified the same major problems for both innovating SMEs and SMEs considering innovation.

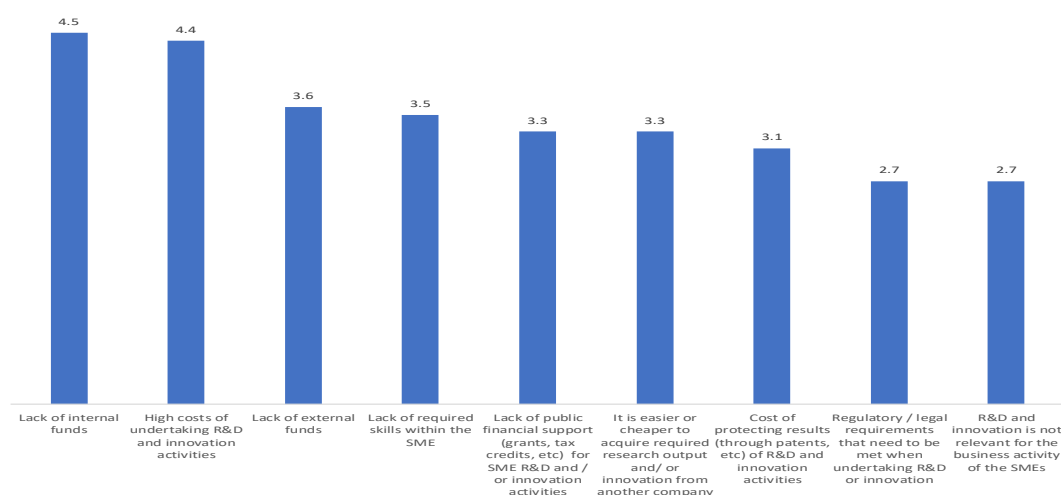
These were: the costs of undertaking innovation, lack of internal and external funding, lack of required skills within the business and the complexity and difficulties of accessing public grants and subsidies.

It is noteworthy that a lower share of SMEs considering innovation viewed these problems as major issues compared to innovating SMEs. The most frequently identified major problem by SMEs considering innovation was a lack of market demand.

A survey of SME associations in Member States shows that a lack of internal funds and the costs of innovation are thought by these associations to be by far the most important reasons why SMEs may not undertake any R&D and innovation activities (Figure 112).

Also important, but less so than the first two reasons, are a lack of external funds, a lack of required skills within the SME, a lack of public financial support (grants, tax credits, etc) for SME R&D and/or innovation activities, the fact that it is easier or cheaper to acquire required research output and/or innovation from another company, and the cost of protecting the results (through patents, etc) of R&D and innovation activities (Figure 112).

Figure 112 Why SMEs do not undertake R&D and innovation activities - views of 19 SME associations
(1 = not important at all, 5 = very important)



Note: The scores shown in the figure are the average of 19 survey responses from SME associations.

Source: LE Europe

17.1 Barriers to innovation - findings from the CIS

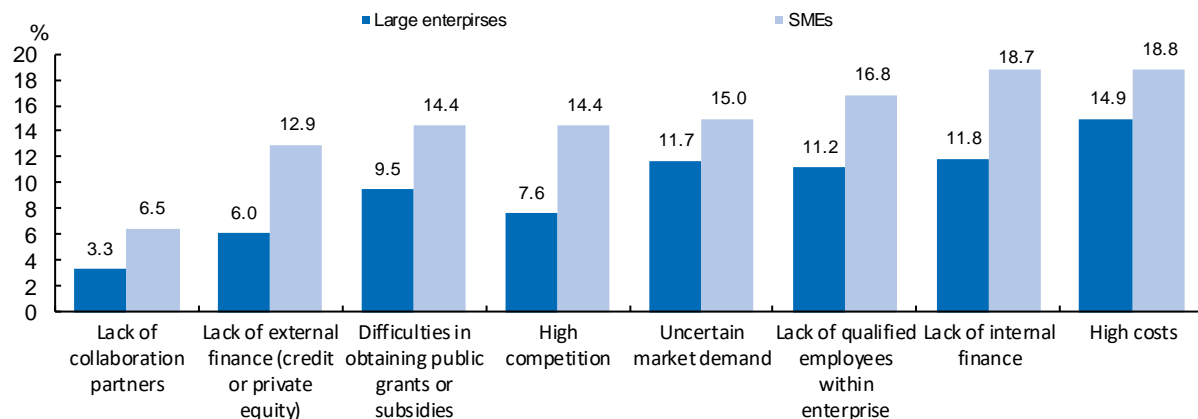
The CIS assesses the impact of barriers to innovation by asking both firms which are innovating or considering innovating to assign a level of importance (high, medium, low) to factors that prevent or hamper their innovation activities. Different sets of factors are explored for both innovative firms and firms considering innovating.

Together, these indicators provide an understanding of the specific challenges faced by SMEs, giving insight into both the revealed barriers to innovation among those that innovate and the perceived barriers to innovation that firms considering innovating may see as insurmountable.

17.1.1 Factors that hamper innovation activities in innovative enterprises

For the group of EU Member States for which data are available from the CIS, Figure 113 shows the innovation-hampering factors explored by the CIS-2016, and the percentage of firms that ranked these factors as being of high importance. These figures represent firms that have been identified as innovative.

Figure 113 Innovative SMEs: factors that hamper innovation activities, (2014-16)



Notes: Percentage of innovative firms that identified each barrier as being of 'high importance'. These aggregates refer to firms from the aggregated sector 'Innovation core activities', encompassing NACE Rev. 2 sectors: B, C, D, E, G46, H, J, K and M71-72-73. These EU level aggregates are constructed as the total of all firms in the scope of the CIS. The countries included in the aggregate of each barrier varies. 'Lack of collaboration partners' includes AT, BE, BG, CY, DE, EE, EL, FI, FR, HR, HU, IT, LT, LU, LV, PL, PT, RO, SI, SK. 'Lack of external finance (credit or private equity)' and 'Difficulties in obtaining public grants or subsidies' includes: AT, BE, BG, CY, CZ, DE, EE, EL, FI, HR, HU, IT, LT, LU, LV, MT, PL, PT, RO, SI, SK. 'High competition' and 'Uncertain market demand' includes: AT, BE, BG, CY, DE, EE, EL, FI, FR, HR, HU, IT, LT, LU, LV, MT, PL, PT, RO, SI, SK. 'Lack of qualified employees within enterprise' and 'Lack of internal finance' includes: AT, BE, BG, CY, CZ, DE, EE, EL, FI, FR, HR, HU, IT, LT, LU, LV, MT, PL, PT, RO, SI, SK. 'High costs' includes: AT, BG, CZ, DE, EE, EL, FI, HR, HU, IT, LT, LU, LV, PL, PT, RO, SI, SK.

Source: Eurostat, Community Innovation Survey (CIS-2016)

For all factors considered, a greater proportion of innovative SMEs considered each hampering factor to be of higher importance than large enterprises. This suggests:

- Firstly, that innovative SME's generally face a much wider range of challenges than innovative large enterprises. SMEs find it more difficult to obtain finance for their innovation, whether from external, internal or government sources. Furthermore, SMEs are less likely to have employees that are qualified to undertake innovation and find it more difficult to find collaboration partners.
- Secondly, that certain factors are particularly relevant for SMEs. For example, 6% of large enterprises noted that a 'lack of external finance' was important in hampering innovation efforts, compared to 12.9% of SMEs. Moreover, 14.4% of SMEs cited 'high competition' to be a significant hampering factor, compared to 7.6% of large firms. These differences reflect the specific market context of SMEs, which appears less conducive to innovation at the aggregate level. Overall, SMEs appear to find it comparatively more difficult to scale up and maintain their innovation activity.

The importance of the challenges faced by innovative SMEs varied greatly across Member States⁹⁹. For example, with regards to individual barriers:

- The share of small innovating SMEs reporting that 'high competition' is viewed as an important challenge was 49.8% in Cyprus and only 8.3% in Belgium. This is the barrier which, in 2016, showed the largest variation (30 percentage points) across EU Member States in the share of SMEs reporting the barrier as being important (Figure 114).
- The difference across EU Member States in the share of small innovating SMEs reporting a barrier to be important was greater than 10 percentage points in the case of all the other barriers shown in Figure 114 and stood at 20 percentage points in the case of the barrier 'lack of collaboration partners'.
- Medium-size SMEs also showed a great variation across Member States in the share of SMEs reporting a particular barrier as being problematic and the variation was much greater than in the case of small SMEs. Typically the highest share was higher and the lowest share was lower than in the case of small SMEs (Figure 114).

Moreover, in general, when a high (low) share of SMEs reported one barrier to be problematic, they did so as well for many other barriers. As a result the average share across all barriers of SMEs reporting a barrier to be problematic tended to be high in some Member States and low in others (Figure 115):

- Member States in which small and medium-sized innovative SMEs faced a challenging environment¹⁰⁰ include CY, EL, HR and SI;
- Member States with a favourable environment¹⁰¹ for small and medium-sized innovative SMEs included BE, DE, EE, FI, LU and MT.

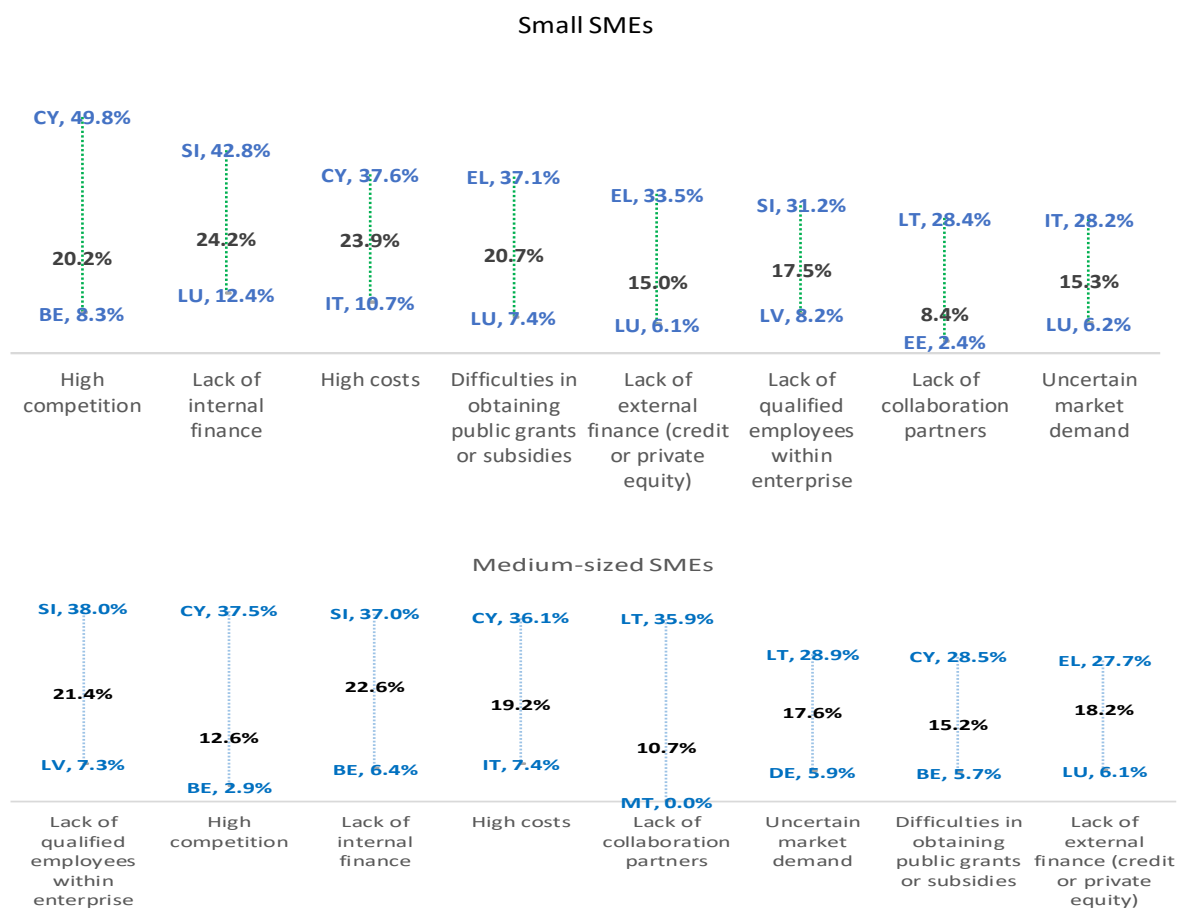
Finally, a larger share of small innovating SMEs than of medium-sized innovative SMEs faced barriers to innovation in all Member States except FI and LT. In the case of FI, there was practically no difference between small and medium-sized SMEs.

⁹⁹ See Annex 27 for detailed information at Member State level.

¹⁰⁰ In these Member States, the average share across all barriers of SMEs identifying barriers to be important was equal to 25% or more.

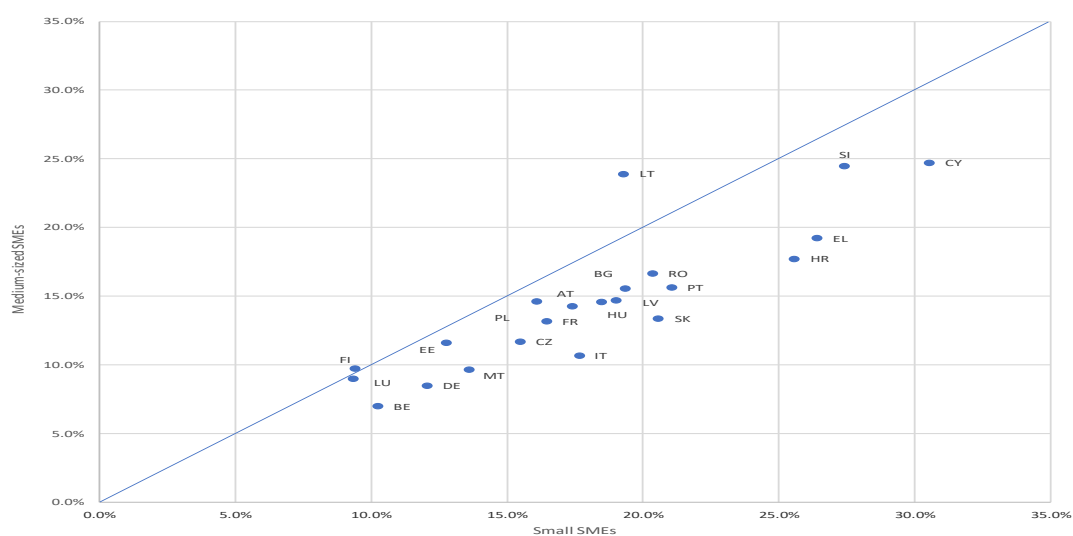
¹⁰¹ In these Member States, the average share across all barriers of SMEs identifying barriers to be important was less than 15%.

Figure 114 Innovative SMEs: factors that hamper innovation activities in EU Member States (2014-16)



Source: Eurostat, Community Innovation Survey (CIS-2016)

Figure 115 Innovative SMEs: factors that hamper innovation activities by small and medium-sized SMEs in EU Member States (2014-16)



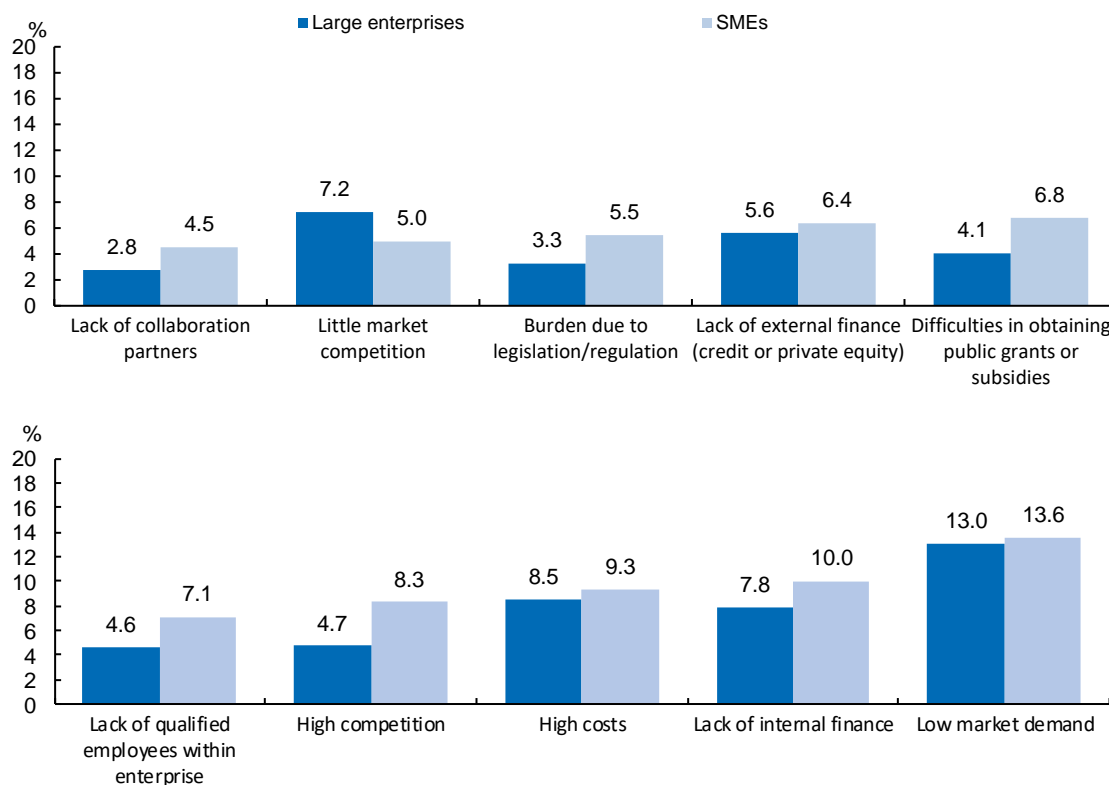
Note: no data for DK, ES, IE, NL, SE and UK.

Source: Eurostat, Community Innovation Survey (CIS-2016)

17.1.2 Factors that prevent innovation in enterprises considering innovating– the picture from the latest CIS

Overall, compared to innovative firms, firms considering innovating were much less likely to rank a barrier as being of high importance. Furthermore, compared to innovative firms, the differences between SMEs considering innovating and large enterprises were much less marked.

Figure 116 SMEs considering innovating: factors that hamper innovation activities, (2014-16)



Notes: Percentage of firms considering innovating that identified each barrier as being of 'high importance'. These aggregates refer to firms from the aggregated sector 'Innovation core activities', encompassing NACE Rev. 2 sectors: B, C, D, E, G46, H, J, K and M71-72-73. These EU level aggregates are constructed as the total of all firms in the scope of the CIS. The countries included in the aggregate of each barrier varies. 'Lack of collaboration partners' includes: BG, CZ, DE, EL, HR, HU, IT, LT, LV, PL, RO, SK. 'Little market competition' includes: BG, CY, DE, EE, HR, HU, IT, LV, PL, PT, RO, SI, SK. 'Burden due to legislation/regulation' includes: AT, BG, HR, HU, IT, LV, PL, PT, RO, SI. 'Lack of external finance (credit or private equity)' includes: AT, BG, DE, EE, EL, HR, HU, IT, LT, LV, PL, PT, RO, SK. 'Difficulties in obtaining public grants or subsidies' includes: AT, BG, CZ, DE, EE, HR, HU, IT, LT, LV, PL, RO, SI, SK. 'Lack of qualified employees within enterprise' includes: AT, BG, CZ, DE, HR, HU, IT, LT, LV, PL, RO, SK. 'High competition' includes: BG, DE, EE, FR, HR, HU, IT, LT, LV, PL, RO, SI, SK. 'High costs' includes: AT, BG, DE, EE, FR, HR, HU, IT, LT, LV, PL, PT, RO, SK. 'Lack of internal finance' includes: AT, BG, CZ, DE, EE, EL, FR, HR, HU, IT, LT, LV, PL, PT, RO, SK. 'Low market demand' includes: BG, CY, DE, EE, EL, HR, HU, IT, LU, LV, MT, PL, PT, RO, SE, SI, SK.

Source: Eurostat, Community Innovation Survey (CIS-2016)

Notable differences exist in the percentage of SMEs and large firms which cited 'high competition' as a barrier to undertaking innovation: 8.3% of SMEs compared to 4.7% of large enterprises. Furthermore, SMEs were more likely than large enterprises to cite 'burden due to legislation/regulation' or 'difficulties in obtaining public grants or subsidies' as being a high importance barrier.

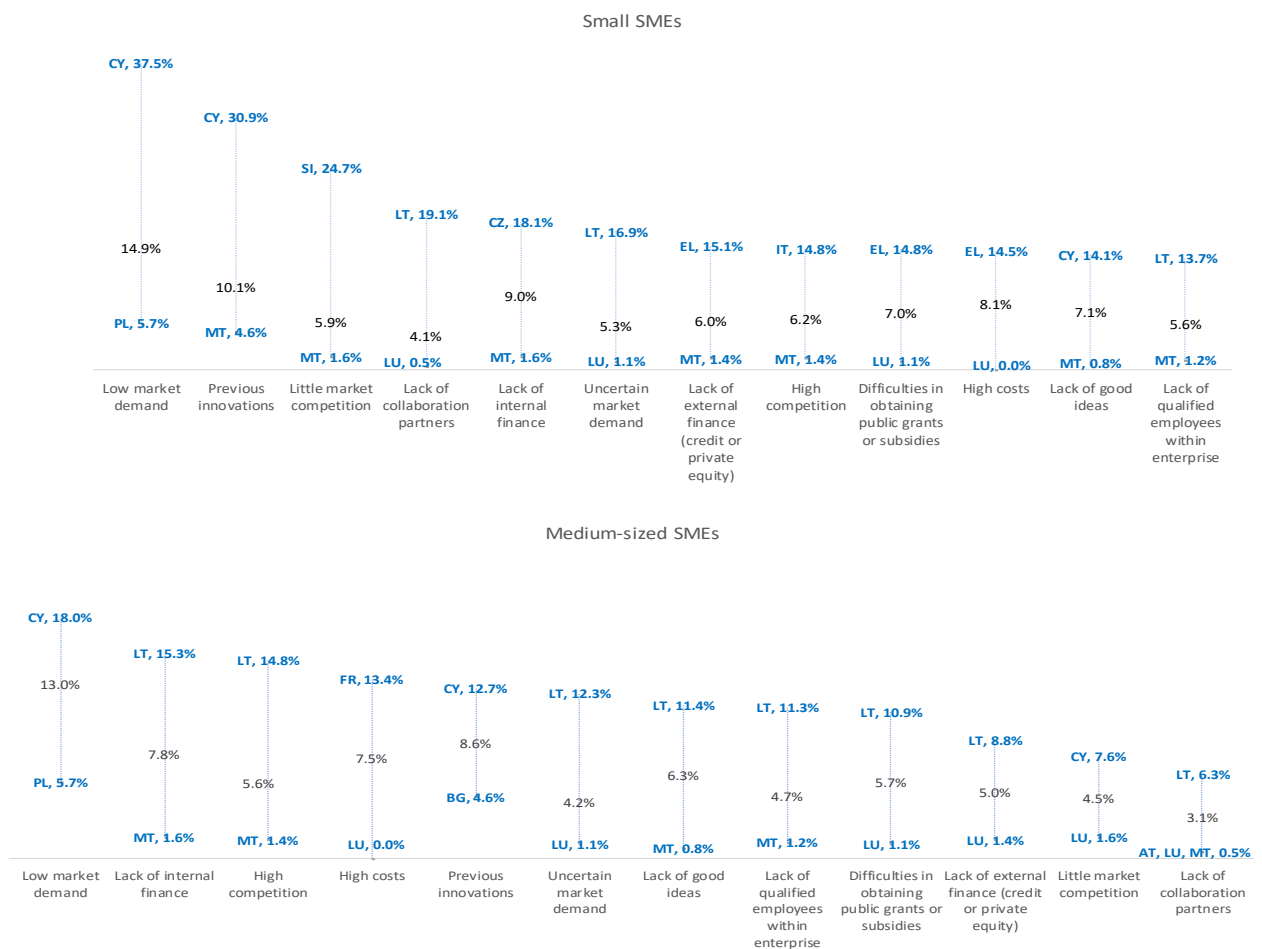
'low market demand' was cited as a particularly significant barrier to innovation by all sizes of firms considering innovation: 13.6% of SMEs ranked 'low market demand' as being of high importance, as did 13.0% of large enterprises.

As in the case on innovative SMEs, large differences were observed across Member States in the shares of SMEs considering innovation which report a barrier as being problematic. This was particularly the case for the barriers 'low market demand', 'previous innovations' and 'little market competition' (Figure 116).

Overall, within Member States, there were no marked differences between the responses of small and medium-sized SMEs considering innovation but the differences across Member States were more notable (Figure 117)¹⁰²:

- 10% or more of SMEs considering innovation reported that, on average, the various barriers were a problem in some Member States (CY, CZ, EL,FR, IT and IT)
- In contrast, fewer than 5% of SMEs considering reported this to be the case in AT, LU and MT.

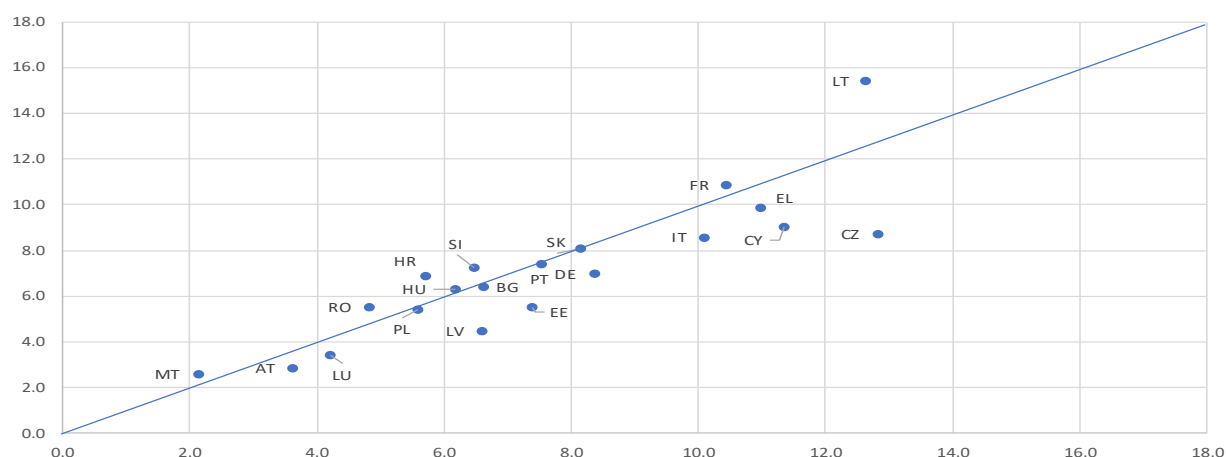
Figure 117 SMEs considering innovation: factors that hamper innovation activities in EU Member States (2014-16)



Source: Eurostat, Community Innovation Survey (CIS-2016)

¹⁰² See Annex 28 for detailed information at the Member State level.

Figure 118 SMEs considering innovating: factors that hamper innovation activities by small and medium-sized SMEs in EU Member States (2014-16)



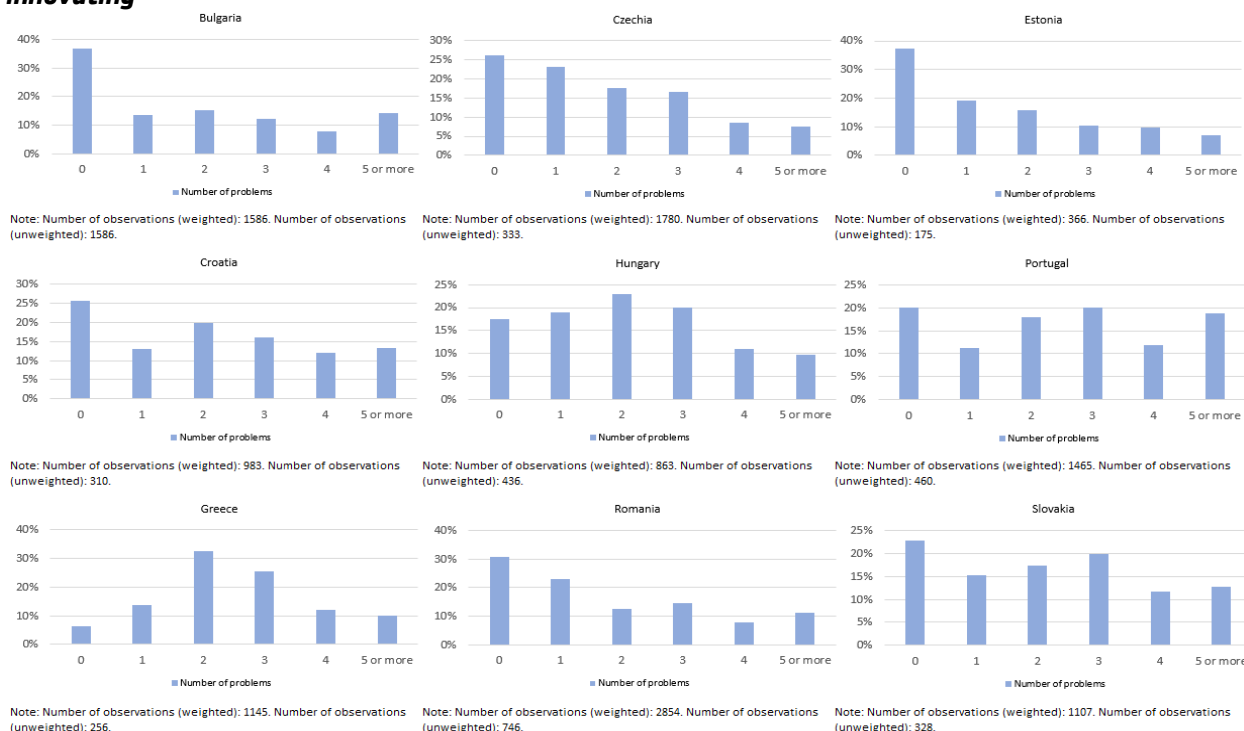
Note: no data for DK, ES, IE, NL, SE and UK.

Source: Eurostat, Community Innovation Survey (CIS-2016)

The firm-level data from the 2014-2016 CIS show that the number of problems (i.e. barriers to innovation judged to be of high importance) reported by SMEs considering innovating varies markedly among the Member States for which this information is available in the microdata (Figure 119).

- In some Member States (BG, CZ, EE and RO) the number of high-importance barriers faced by SMEs is markedly right-skewed (i.e. most SMEs experience either no highly important barriers or only a very small number, and a minority of SMEs face many barriers).
- In other Member States (EL, HR, HU, PT and SK) a larger proportion of SMEs face multiple barriers.

Figure 119 Number of barriers to innovation reported by SMEs considering innovating



Source: LE Europe analysis of the Community Innovation Survey 2014

17.2 Trends in the rate of enterprises considering innovation

Among Member States, trends from 2004 to 2016 in the share of enterprises considering innovation among both SMEs and large enterprises (the 'non-innovation rate') vary markedly (Table 12). Trends in the non-innovation rate are characterised as having increased, declined or remained stable.^{103 104}

Overall, the rate of non-innovation among SMEs:

- decreased in 11 Member States: AT, BE, EE, EL, FR, HR, HU, LT, LV, PT and UK;
- remained stable in 7 Member States: BG, DK, IE, IT, LU, NL and PL; and,
- increased in 10 Member States: CY, CZ, DE, ES, FI, MT, RO, SI, SK and SE

Among the 10 Member States in which the rate of non-innovation among SMEs increased, only 3 (CZ, DE and ES) show an opposite trend among large enterprises and in the other 7 (CY, FI, MT, RO, SI, SK and SE) show a trend increase in the non-innovation rate among both SMEs and large enterprises.

More generally, in 16 Member States (BE, CY, EE, EL, FI, HU, IE, IT, LT, LV, MT, RO, SI, SK, SE and UK) the trends in the rate of non-innovation among SMEs and large enterprises were similar.

Finally, in 4 Member States, the rate of non-innovation by SMEs declined while among large enterprises it remained stable (AT, FR, HR) or increased (PT).

This short review of trends in non-innovation rates shows that no EU-28 Member State except 3 (CZ, DE and ES) show a trend towards a growing concentration by large enterprises of innovation activity.

Moreover, as shown in Appendix 30, the incidence of barriers to innovation reported by SMEs and large enterprises considering innovation has declined over time.

Table 12 Trends in the 'non-innovation rate'

		SMEs		
		Increased	Stable	Decreased
Large enterprises	Increased	Finland, Malta, Cyprus, Romania, Slovakia, Slovenia, Sweden	Denmark, Luxembourg, Netherlands, Poland	Portugal
	Stable	Germany, Czechia, Spain	Ireland, Italy	Austria, Croatia, France
	Decreased	-	Bulgaria	Belgium, Estonia, Hungary, Latvia, Lithuania, Greece, United Kingdom

Source: LE Europe analysis of the Community Innovation Survey (CIS-2004 – CIS-2016)

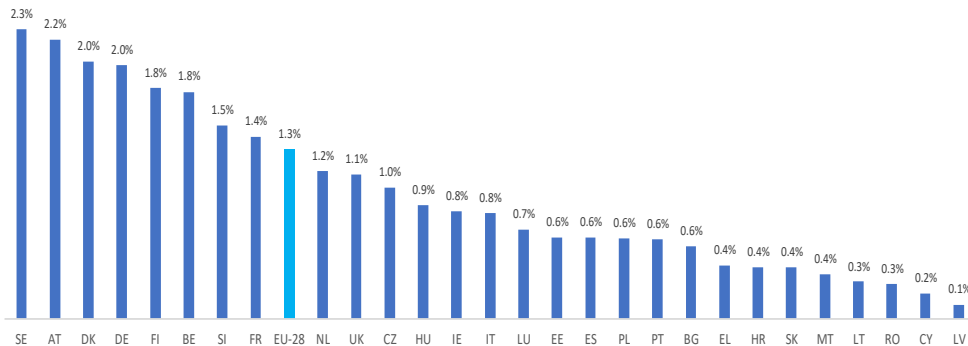
17.3 Non-innovation rates of SMEs and concentration of R&D spending by businesses

The share of business expenditure on R&D (BERD) accounted for by enterprises in 2016 (the latest year for which data are available) varied greatly among Member States, ranging from a low of 0.1% of GDP in LV to 2.3% of GDP in SE. For the EU-28 as a whole, this figure stood at 1.3% (Figure 124).

¹⁰³ SMEs are classified based on trends in both small and medium-sized enterprises rather than their aggregate. If one size class experienced an increase (decrease) in the non-innovation rate and the other experienced a stable non-innovation rate, the non-innovation rate was classified as having increased (decreased). No cases were identified in which trends went in opposite directions.

¹⁰⁴ As there have been methodological changes across different CISs, a degree of caution is required when analysing these trends. Because of this, when trends have changed (e.g. the share of enterprises considering innovating was increasing in early years, but declining in more recent years), countries were classified based on the more recent years. Notable differences relate to sectoral coverage and the definition of innovation. See notes to Figure 146 and in Annex 29 for more details.

Figure 120 Business expenditure on R&D in the EU-28 in 2016 (as % of GDP)

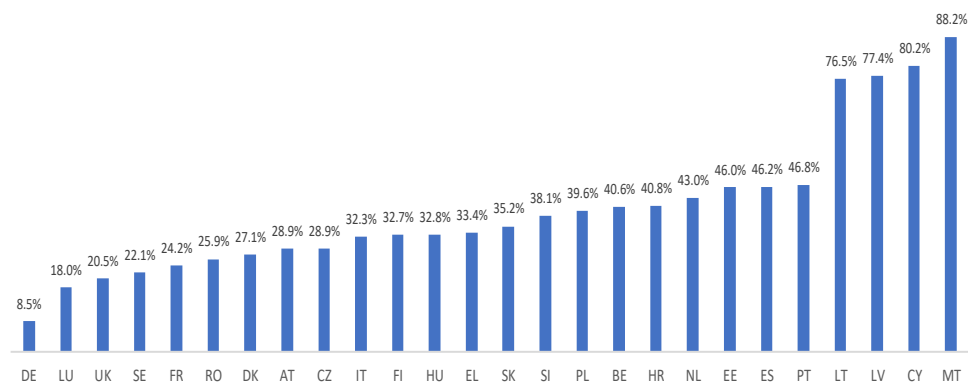


Source: Eurostat

The split of the total BERD between large enterprises and SMEs also varied markedly in 2016 in the EU-28 (Figure 121).

- In many of the smaller economies (i.e., CY, MT, LT and LV), SMEs accounted for more than 75% of total BERD in 2016.
- In sharp contrast, in DE, BERD was heavily concentrated in the large enterprise size class as SMEs accounted for only 8.5% of BERD.
- More generally, SMEs accounted for one third or less of total BERD in 13 Member States (AT, CZ, DE, DK, EL, FI, FR, HU, IT, LU, RO, SE, and UK) and for more than one third and half of BERD in 9 Member States (BE, EE, ES, HR, NL, PL, PT, SI and SK).

Figure 121 SME share of business expenditure on R&D in the EU-28 in 2016 (as % of GDP)



Notes: No data for BG and IE. 2013 for FR, 2015 for AT, BE, DK, EL, LU and SE.

Source: Eurostat

As highlighted by Table 12, the trend in the non-innovation rate of SMEs shows markedly different patterns across the EU-28.

In general, an increase in the share of SMEs which do not innovate is accompanied by a decrease in the SME share of BERD but this is not always the case.

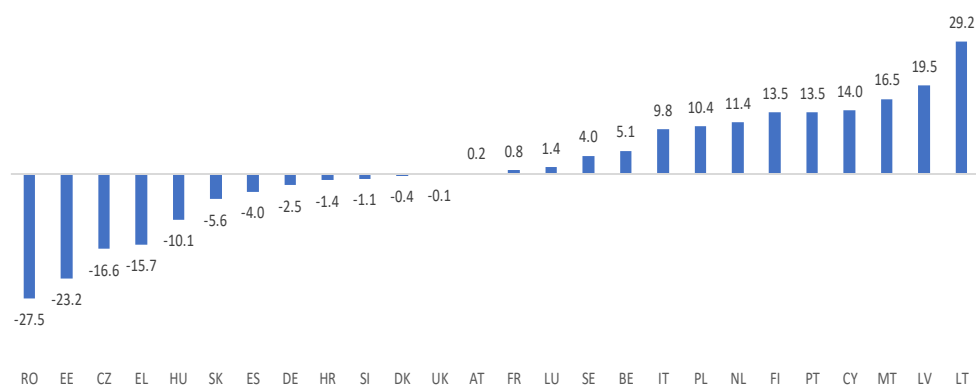
In total, 12 Member States (CZ, DE, DK, EE, EL, ES, HR, HU, RO, SI, SK and UK) show a decline in the SME share of BERD although the decline is marginal in DK and UK (Figure 122).

Interestingly, of the 10 Member States showing a trend increase in the share of SMEs which do not innovate (Table 12), 6 Member States (CZ, DE, ES, RO, SI and SK) also show a decrease in the share of BERD by SMEs. In these 6 Member States, the increase in the share of SMEs which do not innovate was clearly accompanied by a greater concentration of BERD by the large enterprise size class.

Among the 6 other Member States showing a decrease in the SME share of BERD, 4 (EE, EL, HU and UK) show decreases in the shares of both SMEs and large enterprises

which do not innovate, HR shows a decrease in the share of SMEs which do not innovate and a stable share of large enterprises which do innovate, and DK shows a stable share of SMEs which do not innovate and an increase in the share of large enterprises.

Figure 122 Change in the SME share of business expenditure on R&D in the EU-28 from 2010 in 2016 (in percentage points)



Notes: No data for BG and IE. Beginning of the period is 2009 for AT, DE, DK, LU, SE, 2011 for EL. End of the period is 2013 for FR, 2015 for AT, BE, DK, EL, LU and SE.

Source: Eurostat

18 Public policies in support of SME R&DI

Key points

The level of government funding of business expenditure on R&D by both SMEs and large enterprises varies greatly across the EU. In 2015, the average level of government funding of business expenditure on R&D across EU Member States was EUR 8.0 per inhabitant for SMEs and EUR 9.5 per inhabitant for large enterprises. In Japan, government funding of business expenditure on R&D in 2015 stood at EUR 1.2 for SMEs and EUR 7.1 for large enterprises. These figures were respectively EUR 23.3 and EUR 17.7 in South Korea and EUR 9.3 and EUR 66.4 in the USA.

Trends in government funding of SME R&D expenditure diverged markedly in the EU from 2009/10 to 2014/15. Government funding of SME R&D expenditure increased in 15 Member States and fell in 8 Member States. The increases were particularly large in AT, BE, FR, HU and UK and the decreases were substantial in ES and SI.

On average, in the EU in 2015, governments funded 11.5% of SME R&D expenditure, but only 4.4% of R&D expenditure by large enterprises.

Generally, the share of SME R&D expenditure in the EU in 2015 was inversely related to the size of the SME. On average, in 2015, governments funded 16.2% of R&D spending by micro SMEs, 13.3% of R&D spending by small SMEs and only 8.5% of spending in the case of medium-sized SMEs.

A statistical analysis of the relationship between various components of the Summary Innovation Index published by the EC in the European Innovation Scoreboard and the share of innovating enterprises shows that a multi-pronged policy approach aiming to i) improve the quality of the innovation system; ii) increase the availability of private funding for enterprise R&DI; and iii) increase public support for R&D in universities and government research organisations is likely to increase the share of innovating SMEs among all SMEs.

Overall, the SME associations of EU Member States view SME innovation programmes as working well. In broad terms, these programmes fell into one of the following categories:

- Programmes aiming to improve framework conditions for SMEs (such as making it easier to give entrepreneurs a second chance if their company failed or strengthening the implementation of the SBA).
- Programmes providing funding in the form of grants or low-cost loans.
- Programmes providing tied funding through vouchers (i.e. funding which can only be used for purchasing specific services/skills).
- Programmes providing training in improving the effectiveness and efficiency of the innovation activity/activities undertaken by the beneficiary SME.
- Programmes facilitating networking.
- Programmes facilitating collaboration with other innovators from the private and/or public sector.
- One-stop facilities or programmes offering holistic support to innovators and would-be innovators (education, training, networking, mentoring, funding, help with protecting the intellectual property associated with the innovation, etc.).

The first section of this chapter provides information on government funding of SME expenditure on R&D and the importance of such support to SMEs of different sizes.

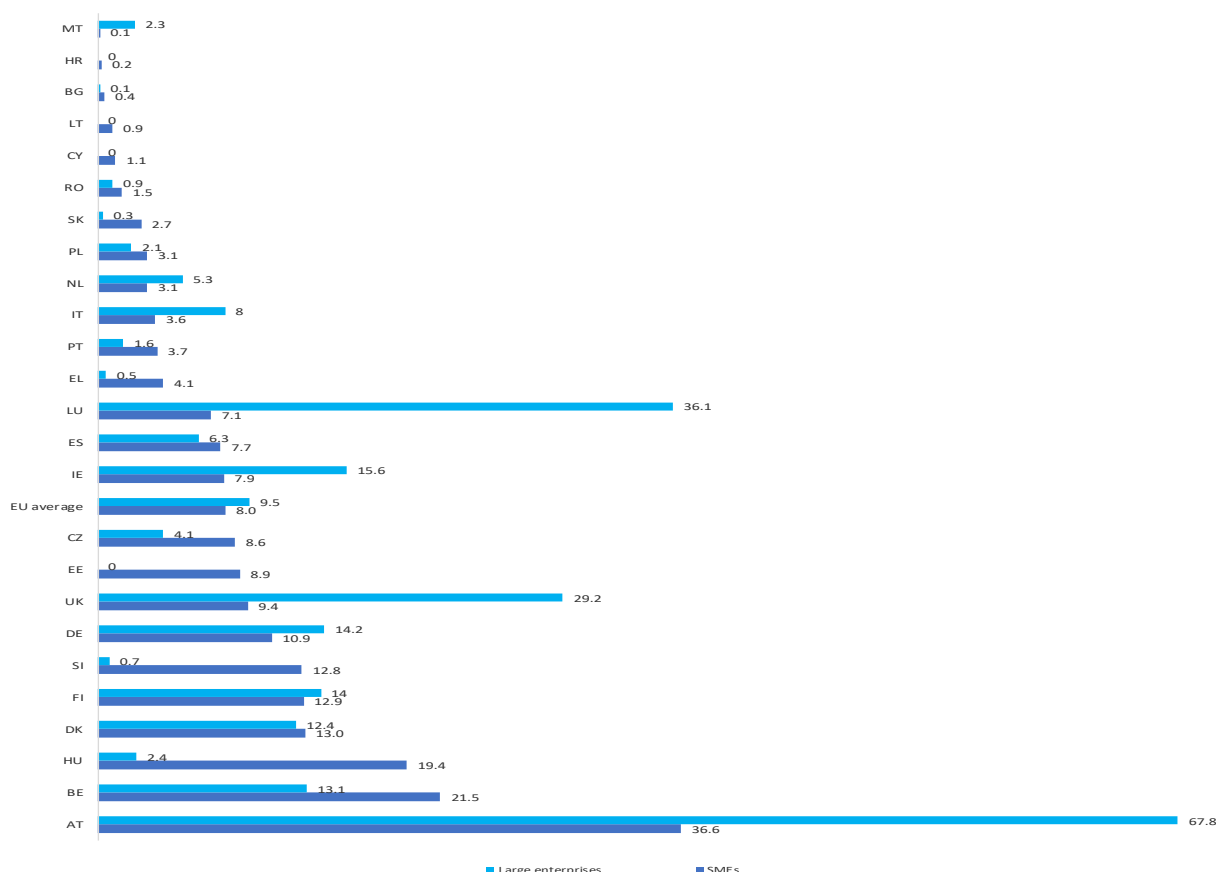
The next sections present the views of stakeholders and the results of analyses of the Summary Innovation Index, the CIS and the 2016 Innobarometer. They identify problems faced by SMEs and potential solutions.

18.1 Government funding of SME R&DI

The level of government funding of business expenditure on R&D by both SMEs and large enterprises varies greatly across the EU.

- In 2015¹⁰⁵, the average level of government funding of SME expenditure on R&D across EU Member States¹⁰⁶ was EUR 8.0 per inhabitant, with the level of funding ranging from EUR 0.1 per inhabitant in MT to EUR 36.6 in AT (Figure 123). In JP, government funding of business expenditure on R&D in 2015 stood at EUR 1.2 for SMEs and EUR 7.1 for large enterprises. These figures were respectively EUR 23.3 and EUR 17.7 in KR and EUR 9.3 and EUR 66.4 in the US.
- In the case of large enterprises, the level of funding ranged from less than EUR 0.1 per inhabitant in CY, EE, HR and LT to EUR 67.8 per inhabitant in AT. The average across Member States was EUR 9.5 per inhabitant (Figure 123).
- The difference in the level of government R&D funding provided to large enterprises and SMEs also varied greatly across the EU (Figure 123). There was no correlation between the SME share of total government R&D funding to businesses and the amount of funding that was provided to SMEs (Figure 124).

Figure 123 Business expenditure on R&D funded by government – 2015, EUR per inhabitant



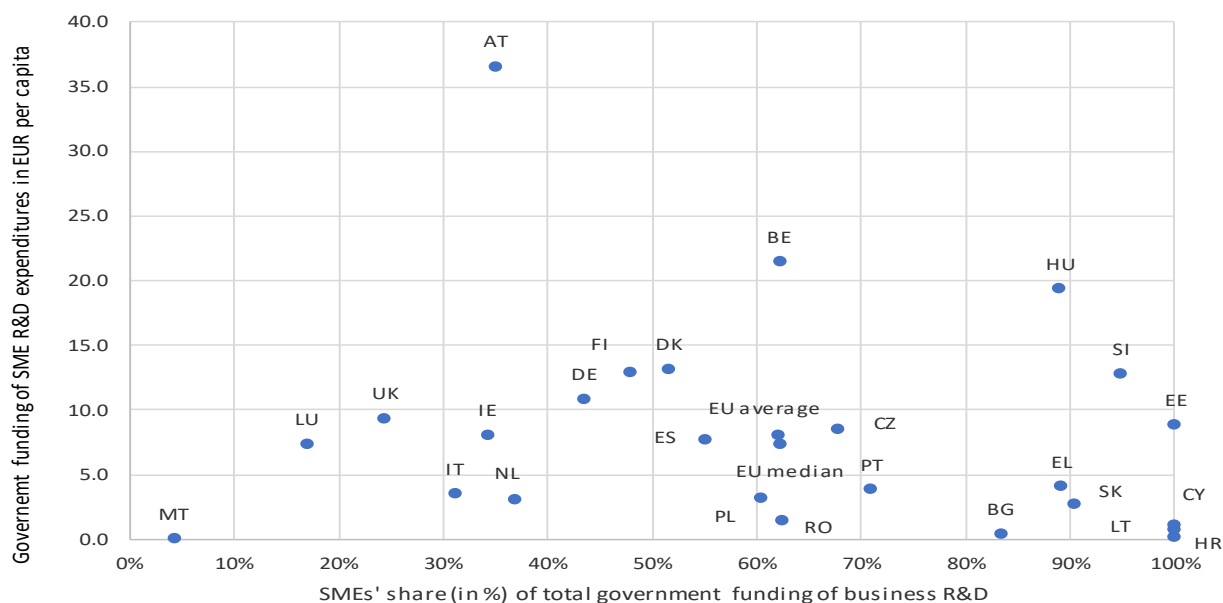
Note: no data are available for FR, LV and SE.

Source: Eurostat

¹⁰⁵ 2015 is the most recent year for which data are available for almost all EU Member States.

¹⁰⁶ No data are available for 2015 for FR, LV and SE.

Figure 124 SME expenditure on R&D funded by government and share of SMEs in total R&D funding provided by government to businesses



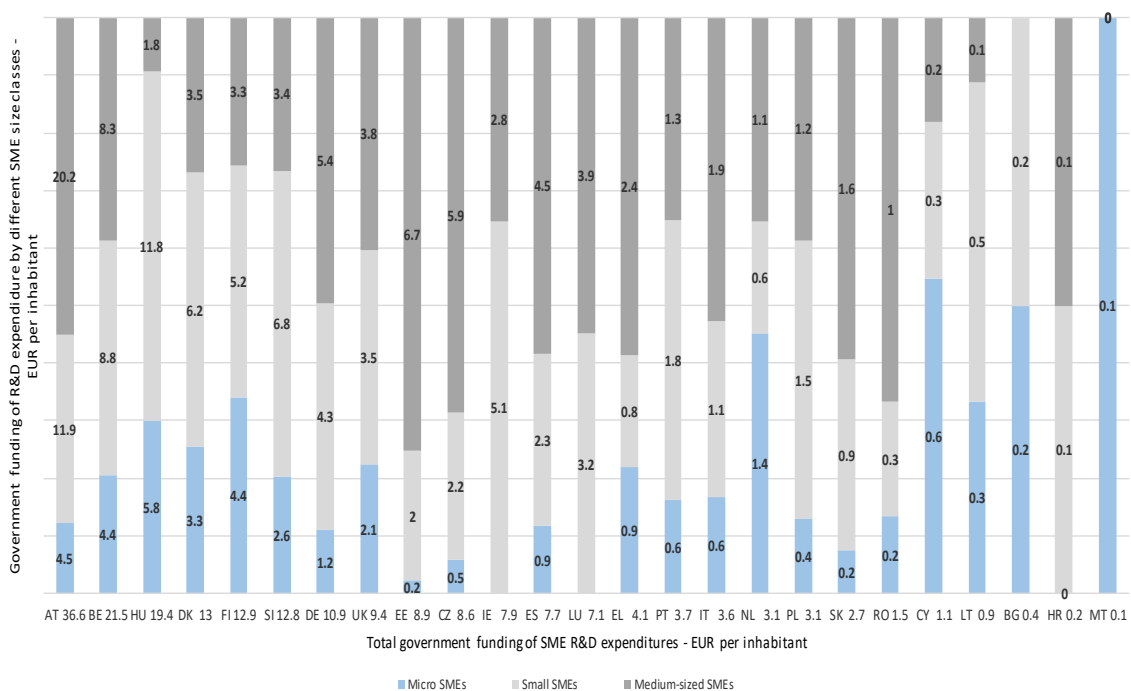
Note: The figure for Malta is EUR 0.1. No data are available for FR, LV and SE.

Source: Eurostat

The distribution of government funding provided to SMEs for R&D expenditure also varied greatly across Member States in terms of the three SME size classes (Figure 125).

In 2015, 50% or more of the funding went to micro SMEs in three Member States (BG, CY and MT), to small SMEs in six Member States (CY, HR, HU, IE, LT and SI) and to medium-sized SMEs in 11 Member States (AT, CZ, DE, EE, EL, ES, HR, IT, LU, SK, RO) (Annex 26). UK medium-sized SMEs also received the largest share of government R&D funding given to SMEs, among the three SME size classes, but their share was less than 50% (Annex 26).

Figure 125 SME expenditure on R&D funded by government – 2015, EUR per inhabitant



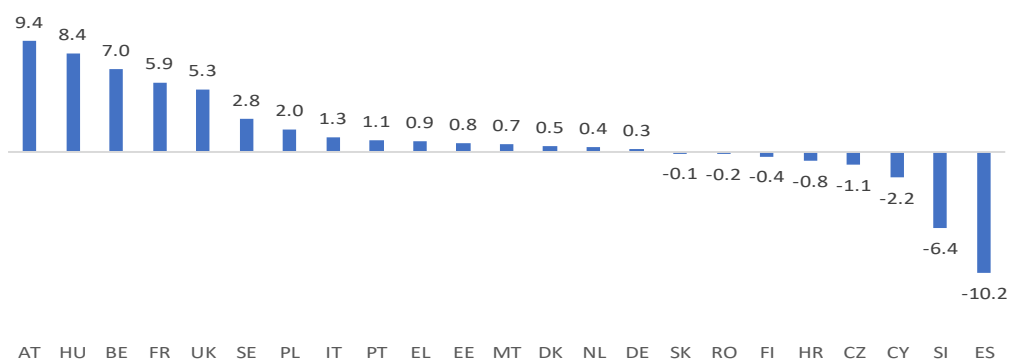
Note: no data are available for FR, LV and SE. The figure shown next to the country label is the total amount of government funding of SME R&D expenditure in EUR per inhabitant.

Source: Eurostat

Trends in government funding of SME R&D expenditure diverged markedly in the EU from 2009/10 to 2014/15 (Figure 126).

- Government funding of SME R&D expenditure increased in 15 Member States (AT, BE, DE, DK, EE, EL, FR, HU, IT, MT, NL, PL, PT, SE and UK) and fell in 8 Member States (CY, CZ, ES, FI, HR, RO, SI and SK).
- The increases were particularly large in AT, BE, FR, HU and UK and the decreases were substantial in ES and SI.

Figure 126 Change in government funding of SME R&D expenditure from 2009/10 to 2014/15 in EUR per inhabitant



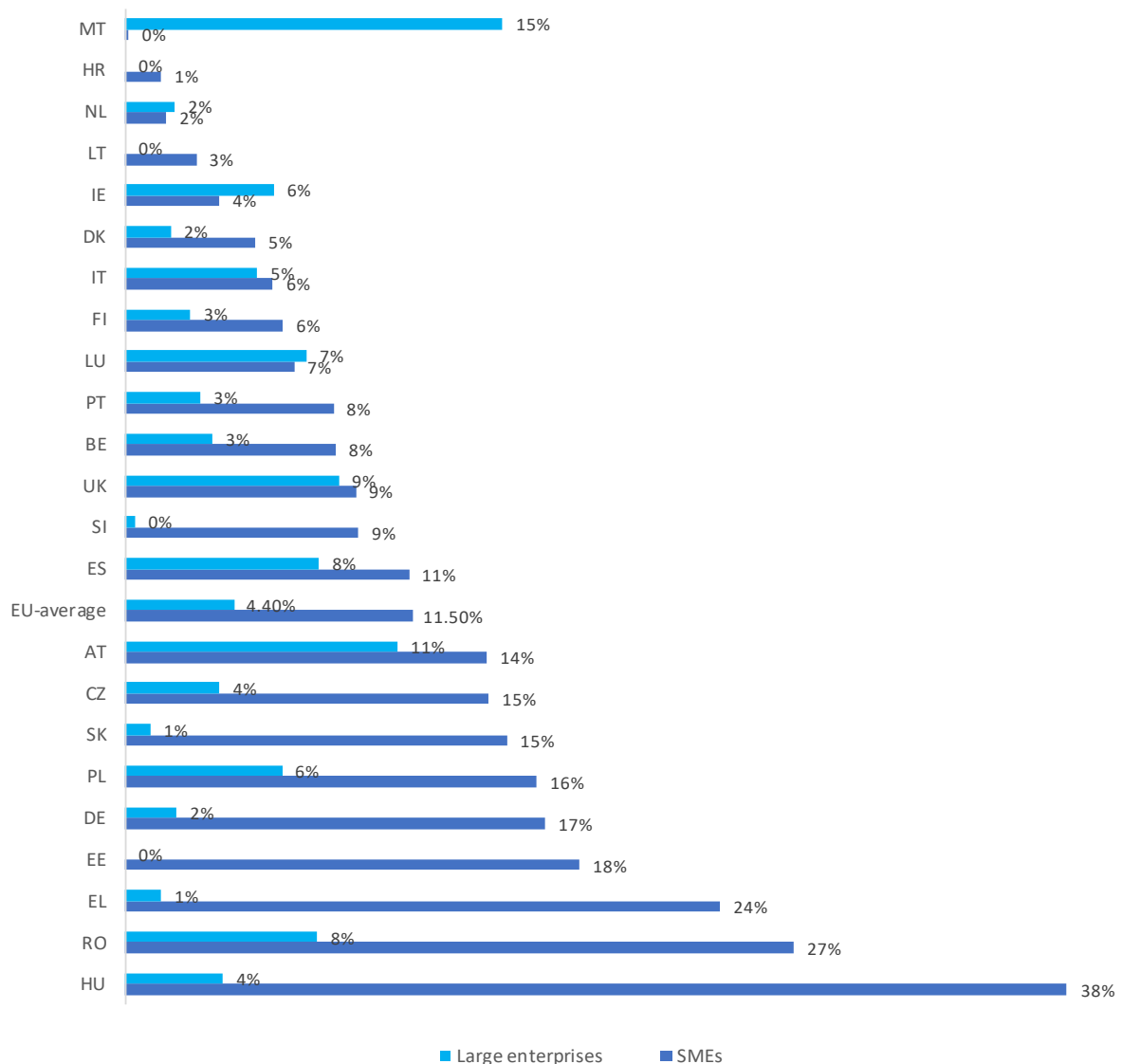
Note: no data are available for BG, IE, LV, LT, LU. The change in the EUR figure is the difference between the average funding level of 2014 and 2015 and the average level of 2009 and 2010. Due to lack of data, the reference periods are 2009/10 to 2015 for BE; 2009 to 2015 for DK, DE, AT; 2011 to 2014/15 for EL; 2009/10 to 2012/2013 for FR and 2009 to 2013 for SE.

Source: Eurostat

On average in the EU in 2015, government funded 11.5% of SMEs' expenditure on R&D and only 4.4% of large enterprises' R&D spending (Figure 127). The importance of the government funding of SME R&D expenditure varies greatly across Member States, ranging from less than 1% in MT to 38% in HU.

In general, in the EU in 2015, the share of SME R&D expenditure was inversely related to the size of the SME. On average in 2015, government funded 16.2% of R&D spending by micro SMEs, 13.3% of R&D spending by small SMEs and only 8.5% in the case of medium-sized SMEs (Figure 128). This pattern of a decreasing contribution of the government to R&D spending by SMEs was observed in almost all Member States.

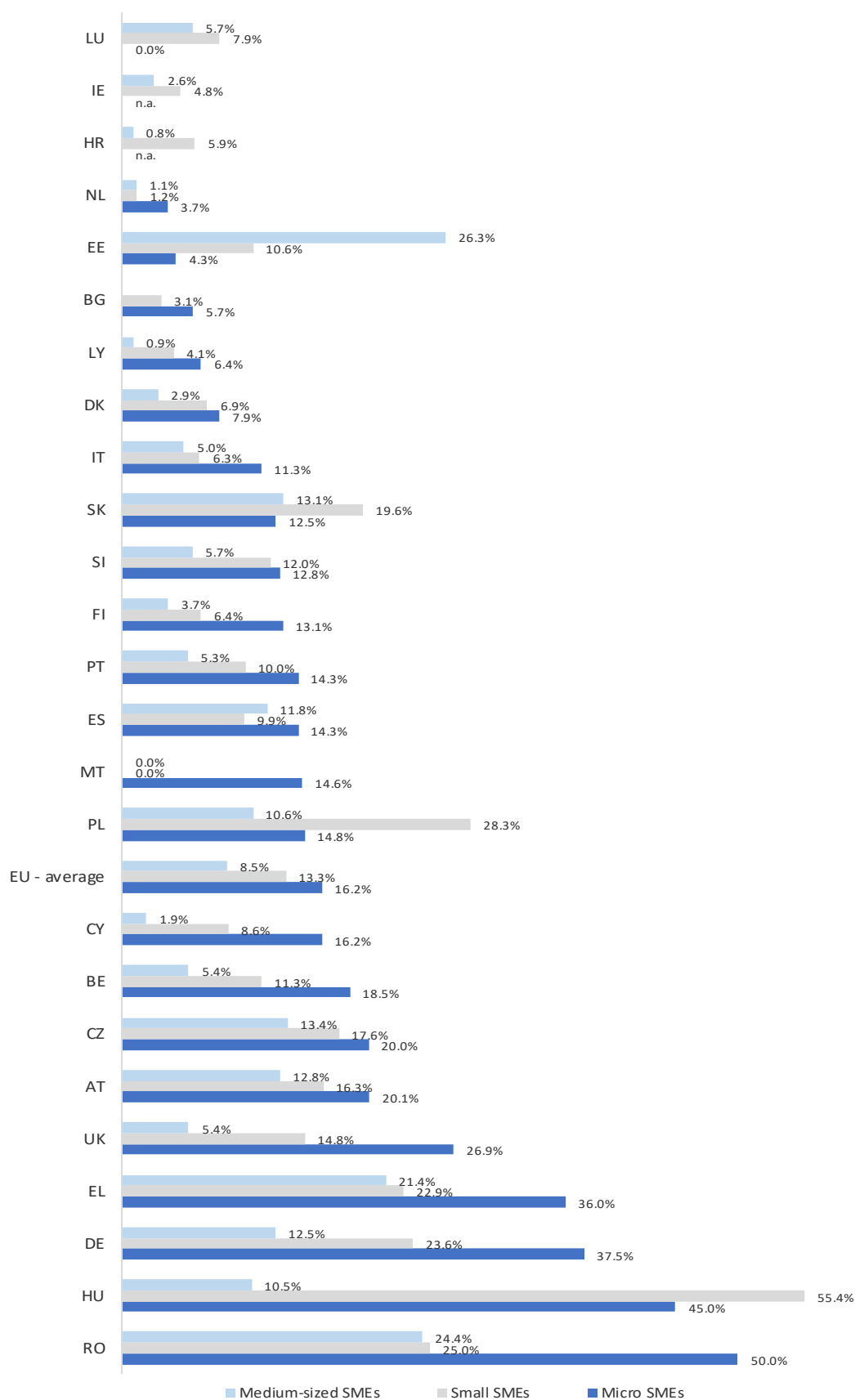
Figure 127 Share of R&D undertaken by enterprises and funded by government – large enterprises and SMEs, 2015



Note: no data are available for BG, CY, FR, LV and SE.

Source: Eurostat

Figure 128 Share of business R&D expenditure funded by government by type of SME - 2015



Note: no data are available for FR, LV and SE.

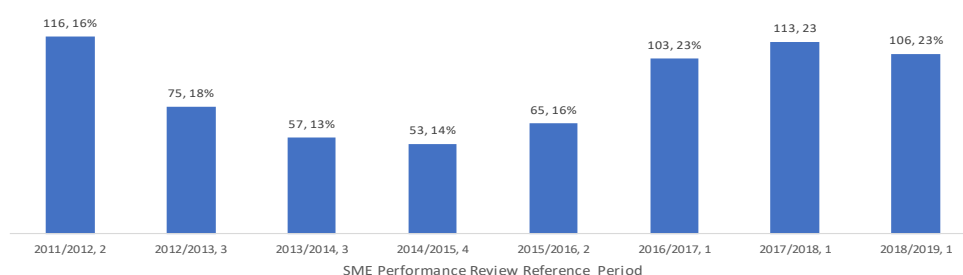
Source: Eurostat

18.2 Which SME innovation policies to implement

18.2.1 Background information for the policy discussion

As noted in the review of the implementation of the SBA in Chapter 11, one of the 10 SBA principles focuses specifically on skills and innovation. After the principle 'access to finance', the principle 'skills and innovation' is the principle with the second highest cumulative number of adopted measures since 2011/12 to 2018/19 (Figure 1). In recent years, this SBA principle has accounted for almost ¼ of all measures adopted/implemented for the 10 SBA principles and ranks first among the 10 principles in terms of the absolute number of measures adopted/implemented (Figure 129).

Figure 129 Number of policy measures adopted/implemented for SBA principle 'skills and innovation' from 2011/12 to 2018/19

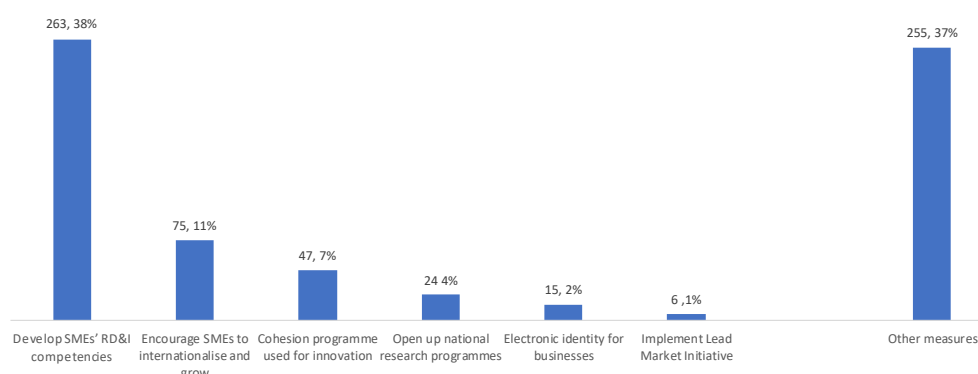


Notes: the percentage figure shown after the absolute number of measures is the share (in %) of measures adopted/implemented in the total number of SBA measures adopted/implemented. The integer number shown after the reference period of the SME Performance Review is the principle's ranking among the 10 principles in terms of the number of measures adopted/implemented.

Source: Carsa and PwC

By far the most commonly adopted/implemented measures by Member States with regard to the principle 'skills and innovation' from 2011/12 to 2018/2019 were measures aiming to develop the RD&I competencies of SMEs. During this period, these measures accounted for 38% of all 'skills and innovation' measures (Figure 130).

Figure 130 Types and number of specific policy measures adopted/implemented for SBA principle 'skills and innovation' from 2011/12 to 2018/19



Notes: the percentage figure shown after the absolute number of measures is the share (in %) of measures adopted/implemented in the total number of SBA measures adopted/implemented. The integer number shown after the reference period of the SME Performance Review is the principle's ranking among the 10 principles in terms of the number of measures adopted/implemented.

Source: Carsa

While the number of adopted/implemented measures to develop the R&DI competencies of SMEs is large, this figure is likely to underestimate the actual

number of measures adopted/implemented to support SMEs with their innovation activities, as a number of existing programmes provide funding for innovation activities and may therefore be counted as ‘access to finance’ measures.

18.2.2 Open innovation – a way forward to stimulate innovation by SMEs?

According to Chesbrough (2003, 2006), open innovation is “the use of purposive inflows and outflows of knowledge to accelerate innovation, and expand the markets for external use of innovation”. Since Chesbrough’s seminal book of 2003, numerous theoretical and empirical studies have further developed the concept of open innovation and assessed its impact on the innovation performance of companies, so far, mainly with reference to large enterprises.

Nowadays, the concept of open innovation encompasses three different types of open innovation mechanisms between an enterprise and the outside world¹⁰⁷:

- Outside-In flow: the inflow of ideas, innovations, etc, into an enterprise from the outside world.
- Inside-Out flow: the outflow of ideas and innovations which are brought to market by a third party.
- Combined or Coupled flows.

The flows may involve monetary payments, but this is not a necessary condition.

The idea underlying the concept of open innovation is that enterprises would benefit by moving away from a closed innovation environment, in which (a) all idea development and innovation activities and (b) the introduction of innovations to the market are all handled within an enterprise, towards an open innovation environment, in which ideas and innovations can be both imported and exported by an enterprise, in order to “leverage external sources of knowledge and commercialisation paths”¹⁰⁸.

In other words, the perimeters of an enterprise (as a business entity) and its innovation sphere no longer coincide.

- *Outside-In open innovation* involves “opening up a company’s own innovation processes to many kinds of external inputs and contributions”.¹⁰⁹ The literature has identified a wide range of mechanisms for operationalising such Outside-In open innovation: “scouting, inlicensing IP, university research programs, funding startup companies in one’s industry, collaborating with intermediaries, suppliers and customers, utilising non-disclosure agreements, crowdsourcing, competition and tournaments, communities, spin-ins or spin-backs”.¹¹⁰
- *Inside-Out open innovation* enables enterprises to “allow unused and under-utilised ideas and assets to go outside the organisation for others to use in their business and business models”.¹¹¹ Ideas and assets can be revealed or sold to third parties which may bring to market these innovations and assets in new ways. The typical outflow mechanisms include “outlicensing IP and technology, donating IP and technology, spin-outs, corporate venture capital, corporate incubators, joint ventures and alliances”.¹¹²
- *Coupled open innovation* involves two or more partners working collaboratively to develop and/or commercialise innovations. Specific mechanisms include strategic alliances, joint ventures, consortia, networks, ecosystems and platforms, etc.¹¹³

¹⁰⁷ Chesbrough and Bogers (2014).

¹⁰⁸ Ibid.

¹⁰⁹ Dahlander and Gann (2010).

¹¹⁰ Chesbrough and Bogers (2014).

¹¹¹ Ibid.

¹¹² Chesbrough (2003, 2006) and Chesbrough and Garman (2009).

¹¹³ Bogers (2011), Bogers et al. (2012).

Clearly, adopting an open innovation mindset and business model could help innovating SMEs (and, possibly, SMEs which consider innovating) to overcome some of the barriers and challenges they face. However, for a culture of open innovation to be successful, it is imperative that SMEs engaging in open innovation have the absorptive capacity to do so. Such absorptive capacity includes an SME's "ability to sense, value, assimilate and apply new knowledge".¹¹⁴ SMEs often have to radically overhaul their business and management practices and their approach to innovation in order to succeed with open innovation.¹¹⁵

The limited literature on the impact of open innovation on SME innovation performance suggests that, in general, the effect of open innovation is positive.¹¹⁶

Although there is no simple, one-size-fits-all formula for successfully adopting an open innovation business model which would meet the needs of all SMEs, Vanhaverbeke (2017) provides a few pointers:

- A simple way to embark on an open innovation business path is to start participating in or even organising one or several open innovation networks and/or developing collaborations with market partners, and extend such collaborations to universities, research labs, etc.
- Business moving to an open innovation model need to re-organise their internal structure and processes to ensure that any knowledge gained through such open innovation approaches can be harnessed and create value for the business.
- A more radical approach is to combine knowledge from different fields to develop a new product or service
- In all instances, collaborations need to be nurtured and supported, and open innovation networks will only be succesful if all the partners in the network(s) feel that they are getting a fair share of the benefits generated by the network(s).

18.2.3 *Lessons from an analysis of the Summary Innovation Indicator published in the EU Innovation Scoreboard?*

Previous sections have highlighted the relationship between a Member State's innovation environment (as proxied by the Member State's Adjusted Summary Innovation Index¹¹⁷) and the share of innovative SMEs and large enterprises.

The Adjusted Summary Innovation index captures various aspects of a Member State's innovation environment (see Box 6).

¹¹⁴ Hossain and Kauranen (2016).

¹¹⁵ See, for example, Brunswicker and Ehrenmann (2013) Caetano and Amaral (2011), Tranekjer and Knudsen (2012).

¹¹⁶ See summary of this literature in Hossain and Kauranen (2016).

¹¹⁷ See Box 6 for details of the Summary Innovation Index. The Adjusted Summary Innovation Index excludes from the published summary index the component which measures the innovation activities of enterprises (see Box 3 for details).

Box 6

The main components of the Summary Innovation Index

The Summary Innovation Index available from the EU Innovation Scorecard comprises 10 main components. As noted by the Scoreboard:

"Framework conditions captures the main drivers of innovation performance external to the firm and differentiates between three innovation dimensions:

- a. The Human resources dimension includes three indicators and measures the availability of a high-skilled and educated workforce. Human resources captures New doctorate graduates, Population aged 25-34 with completed tertiary education, and Population aged 25-64 involved in education and training.
- b. Attractive research systems includes three indicators and measures the international competitiveness of the science base by focusing on International scientific co-publications, Most cited publications, and Foreign doctorate students.
- c. Innovation-friendly environment captures the environment in which enterprises operate and includes two indicators - Broadband penetration among enterprises and Opportunity-driven entrepreneurship - measuring the degree to which individuals pursue entrepreneurial activities as they see new opportunities, for example resulting from innovation.

Investments captures investments made in both the public and business sector and differentiates between two innovation dimensions:

- a. Finance and support includes two indicators and measures the availability of finance for a innovation projects by Venture capital expenditures, and the support of governments for research and innovation activities by R&D expenditures in universities and government research organisations.
- b. Firm investments includes three indicators of both R&D and non-R&D investments that firms make to generate innovations, and the efforts enterprises make to upgrade the ICT skills of their personnel.

Innovation activities captures different aspects of innovation in the business sector and differentiates between three dimensions:

- a. Innovators includes three indicators measuring the share of firms that have introduced innovations onto the market or within their organisations, covering both product and process innovators, marketing and organisational innovators, and SMEs that innovate in-house.
- b. Linkages includes three indicators measuring innovation capabilities by looking at collaboration efforts between innovating firms, research collaboration between the private and public sector, and the extent to which the private sector finances public R&D activities.
- c. Intellectual assets captures different forms of Intellectual Property Rights (IPR) generated in the innovation process, including PCT patent applications, Trademark applications, and Design applications.

Impacts captures the effects of firms' innovation activities and differentiates between two innovation dimensions:

- a. Employment impacts measures the impact of innovation on employment and includes two indicators measuring Employment in knowledge-intensive activities and Employment in fast growing firms in innovative sectors.
- b. Sales impacts measures the economic impact of innovation and includes three indicators measuring Exports of medium and high-tech products, Exports of knowledge-intensive services, and Sales due to innovation activities"¹¹⁸

The Summary Innovation Index is essentially an average of the scores of the 10 components and the statistical analysis uses an adjusted summary innovation index which excludes from the published summary index the component 'Innovators' as the latter measures the innovation activities of enterprises. In other words, the Adjusted Summary Innovation index is an average of nine components.

Source: European Commission (2019)

A more detailed statistical analysis of the relationship over the period 2014-2016 between the share of innovative enterprises in different enterprise size classes and the various components of the Summary Innovation Index shows that (Table 13):

- The index components 'Research systems' and 'Finance and support' followed by the component 'Linkages' are the three components which are the mostly highly correlated with the share of innovative SMEs in the case of all SMEs, small SMEs and medium-sized SMEs. The components 'Firm investments' and 'Human resources' also show relatively strong positive correlations.

¹¹⁸ See European Commission (2019).

Table 13 Correlation between share of innovative enterprises in enterprise class and average value of summary innovation index and its components over period 2014-2016

	Small and medium-sized SMEs	Small SMEs	Medium-sized SMEs	Large enterprises
Summary Innovation Index	0.75	0.74	0.72	0.50
Human resources	0.56	0.56	0.53	0.41
Research systems	0.73	0.73	0.66	0.39
Innovation-friendly environment	0.41	0.41	0.37	0.25
Finance and support	0.72	0.71	0.71	0.57
Firm investments	0.59	0.56	0.63	0.55
Linkages	0.64	0.63	0.62	0.48
Intellectual assets	0.41	0.40	0.45	0.35
Employment impacts	0.25	0.25	0.23	0.15
Sales impacts	0.34	0.34	0.28	0.02

Note: The correlation for the component 'innovators' is not reported in the table as the latter measures the innovation activities of SMEs.

Source: European Commission (2019)

In order to assess the simultaneous impacts of the various components¹¹⁹ on the share of innovative enterprises in different size classes over the period 2014-2016, the following model was estimated cross-sectionally over the 28 Member States.

$$EQ\ 2\ Share\ of\ innovative\ enterprises\ in\ enterprise\ size\ class\ i \\ = \alpha + \sum_1^9 \beta_j * X_j + \varepsilon_i$$

Where i= enterprise size class (small and medium-sized SMEs, small SMEs, medium-sized SMEs and large enterprises), X = one of the nine components of the Innovation Summary Index described in Box 6¹²⁰ and j ranges from 1 to 9.

Of the estimation results reported in Box 6, the following are particularly noteworthy from a policy perspective:

- The estimated models explain almost 2/3 of the variation across Member States in the share of innovating small and medium-sized SME. In sharp contrast, the model explains only slightly more than 1/3 of the variation across Member States of the share of innovating SMEs.
- Among the nine components of the adjusted Summary Innovation Index, the component '**Attractive research systems**' is both statistically the most significant and is the component with the largest impact on the shares of innovating small and medium-sized SMEs. In sharp contrast, this component does not explain differences in the shares of innovating large enterprises.
- The component '**Finance support**' is also statistically significant in explaining differences in the shares of innovating enterprises across Member States. This is the case for both SMEs (small and medium-sized) and large enterprises.

Overall, the estimation results suggest that a multi-pronged policy approach aiming to i) improve the quality of the innovation system; ii) increase the availability of private funding for enterprise R&DI; and iii) public support for R&D in universities

¹¹⁹ The component 'innovators' is not used in the multivariate econometric analysis as this component measures the innovation activities of SMEs.

¹²⁰ Other than the 'Innovators' component.

and government research organisations is likely to increase the share of innovating SMEs.

Box 7 Results of estimation of EQ2 for small and medium-sized SMEs and large enterprises			
	Share of innovating large enterprises	Share of innovating small SMEs	Share of innovating medium SMEs
Human resources	0.0247 (0.12)	-0.226 (-1.05)	-0.158 (-0.82)
Attractive research systems	0.148 (0.92)	0.660*** (3.97)	0.471** (3.16)
Innovation friendly environment	-0.319 (-1.71)	-0.288 (-1.49)	-0.339* (-1.96)
Finance and support	0.329+ (2.07)	0.304+ (1.85)	0.354* (2.41)
Firm investments	0.143 (0.72)	0.374+ (1.83)	0.333+ (1.82)
Linkages	0.156 (0.85)	0.0235 (0.12)	0.0695 (0.41)
Intellectual assets	0.0302 (0.23)	-0.177 (-1.30)	-0.0511 (-0.42)
Employment impacts	-0.00223 (-0.02)	0.0352 (0.25)	-0.0138 (-0.11)
Sales impacts	-0.394* (-2.41)	-0.325+ (-1.92)	-0.302+ (-1.99)
Constant	0.744*** (9.16)	0.294** (3.50)	0.475*** (6.31)
<i>N</i>	27	27	27
<i>R</i> ²	0.575	0.766	0.762
adjusted. <i>R</i> ²	0.351	0.642	0.636

EQ2 was estimated using OLS.
t statistics in parentheses
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

18.2.4 Programs targeting specifically R&DI by SMEs

In order to gain a deeper insight into which types of SME innovation support programmes work well, SME associations were asked in the survey to identify up to three programmes which, in their view, provided good support to SMEs seeking to undertake innovation activities.

A wide range of types of SME innovation support programmes were identified. However, the success conditions of these programmes are likely to be idiosyncratic and, therefore, these programmes may not always be replicable.

In broad terms, these programmes fell into one of the following categories:

- Programmes aiming to improve framework conditions for SMEs (such as making it easier to give entrepreneurs a second chance if their company failed or strengthening the implementation of the SBA)
- Programmes providing funding in the form of grants or low-cost loans
- Programmes providing tied funding through vouchers (i.e. funding which can be used only for purchasing specific services/skills)
- Programmes providing training in improving the effectiveness and efficiency of the innovation activity/activities undertaken by the beneficiary SME
- Programmes facilitating networking
- Programmes facilitating collaboration with other innovators from the private and/or public sector
- One-stop facilities or programmes offering holistic support to innovators and would-be innovators (education, training, networking, mentoring, funding, help with protecting the intellectual property associated with the innovation, etc.)

The 10 case studies of innovative SMEs presented in the Background Document identify a range of challenges and issues faced by innovative SMEs. Although some of these issues are specific to one or the other SME, there are number of commonalities. In particular, many of the case studies highlight the importance for innovative SMEs of a) public financial support; b) access to networks (support and collaboration) and ecosystems; c) help to access skills; and d) support for finding customers (domestically and/or internationally)

19 Conclusions

Key points

Despite the many programmes aimed at supporting innovating SMEs¹²¹, the share of SMEs undertaking innovation activities has not changed substantially at EU-28 level since the early 2000s. As noted earlier, this masks a wide dispersion between Member States. The rate of non-innovating among SMEs fell in 11 Member States (AT, BE, EE, EL, FR, HR, HU, LT, LV, PT and UK), remained stable in 7 Member States (BG, DK, IE, IT, LU, NL and PL) and increased in 10 Member States: CY, CZ, DE, ES, FI, MT, RO, SI, SK and SE.

The analysis of the rate of innovation and non-innovation among SMEs (and large enterprises) in the previous chapters has shown that:

- a Member State's overall innovation climate is an important driver of the incidence of innovation activity among SMEs and large enterprises;
- there are three Member States (CZ, DE and ES), where the trend in the rate of non-innovation among SMEs increased over time despite remaining broadly stable among large enterprises.

This suggests that, to stimulate innovation by non-innovating SMEs, measures to improve the overall innovation climate may be as important as innovation programmes specifically targeting SMEs. The support of incremental innovation should receive as much attention as those of a breakthrough or disruptive nature..

Many of the existing programmes address a wide range of issues and challenges, which have been identified by innovating and non-innovating SMEs. Stakeholders have proposed a number of complementary actions, which could contribute to an increase in the innovation rate of EU SMEs.

However, there is clearly wide variation across the EU in terms of the incidence of innovating SMEs in the SME population, the range and type of problems they face, and the level of government support for SME R&D.

The challenge for policymakers is to support the groups of SMEs which are a) currently innovating, b) planning to innovate and c) not actively planning to undertake innovation activities because they underestimate the need for innovation to ensure the future viability of their business.

The problems identified by innovating and non-innovating SMEs and stakeholders provide a good basis for informing the development and strengthening of innovation support policies targeted specifically at SMEs.

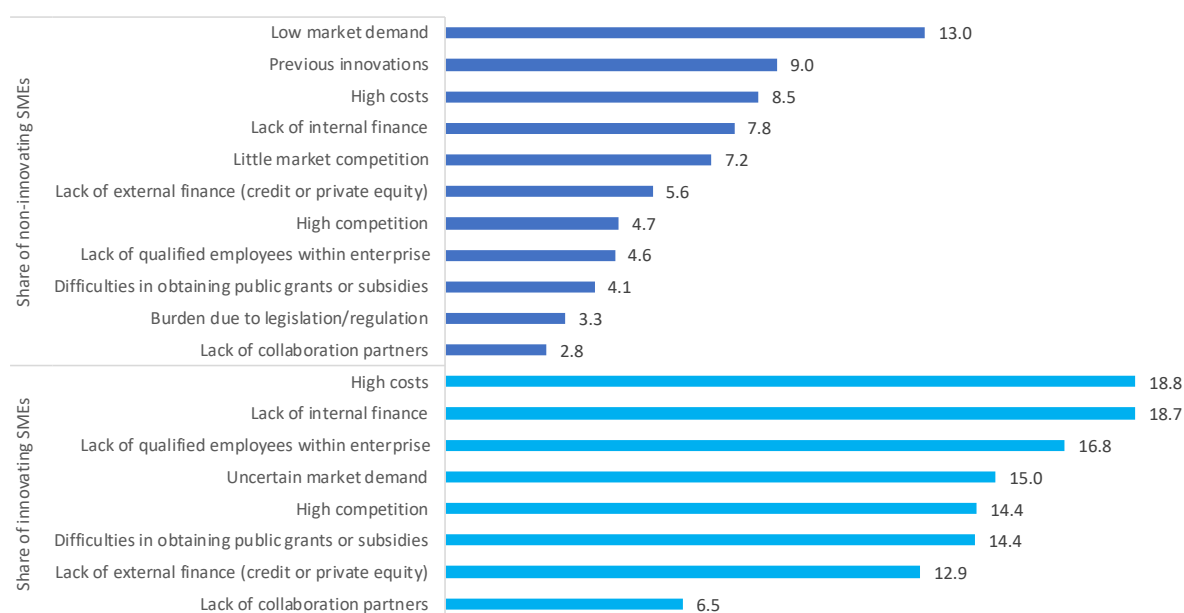
Some of the problems identified by both innovating and non-innovating SMEs are broader economic issues (such as lack of market competition or high competition and uncertain demand), which cannot be addressed through innovation support programmes.

All other issues (funding, access to grants and subsidies, lack of skilled staff and difficulties in establishing collaborations) are already addressed by existing programmes. The challenge is to increase the availability of such programmes

¹²¹ Disclaimer: For the purposes of this report, the term "innovating company" refers to the companies that have introduced a new or significantly improved product or service to the market; a new or significantly improved production process or method; a new way of selling goods or services, or a new organisation of management. The data comes from the companies' self-assessment of relevant activities. Innovating companies come from all sectors and are not limited to the disruptive or digital sectors. Non-innovating companies are not precluded from introducing innovations in the future.

or to develop additional complementary programmes targeting specific problems.

Figure 131 Share of innovating and non-innovating SMEs which find the listed issues to be a significant problem



Source: Eurostat (CIS – 2016)

The SME associations and participants in the case studies suggested some additional measures, which could reduce the number of non-innovating SMEs and make it easier for innovating SMEs to proceed with their plans. These were:

- Providing better marketing of the positive aspects of innovation to SMEs reluctant to undertake innovation because of actual or perceived risks and possibility of failure, etc;
- Providing greater support for SMEs to test and market their innovation, especially internationally;
- Providing better information on potential market opportunities, standards and other market technical issues;
- Improving technology transfer systems to ensure that these systems are all vibrant innovation hubs;
- Reducing administrative costs and burdens incurred when accessing public funding;
- Fostering greater international cooperation and collaboration.

The analysis in this report suggests that a two-pronged policy approach - by the EU as part of a new SME Strategy, and by Member States as part of their innovation and SME strategies - would be most conducive to stimulating innovation by SMEs.

Improvements in the overall innovation environment (such as improving the quality of the domestic research systems) would have important spill-over effects and stimulate innovation by SMEs, especially in those Member States which rank less highly in the EU Innovation Scoreboard.

Such broader policies would need to be complemented by policies directly targeting innovating SMEs and those that currently do not plan innovation activities, such as providing funding (grants, vouchers, tax credits), helping SMEs access the skills required for their innovation activities, and providing mentoring, advice and networking opportunities. Public funding of some of the SMEs' innovation activities would be particularly valuable in Member States, where such funding has declined in recent years.

Based on this overall strategic approach, the report highlights a number of specific policy conclusions:

1. There is a need to increase the in-house R&D activities of the SMEs. This could be achieved by increasing grant and non-grant support via the European Regional Development Fund (ERDF) operational programmes under the next long-term EU Budget. In the longer term, to incentivise SMEs to carry out in-house R&D, their cooperation with larger innovating enterprises and research and technology organisations should also be considered.

Adopting an open innovation mindset and business model could also help SMEs to overcome some of the barriers and challenges they face. However, for a culture of open innovation to be successful, it is essential that SMEs engaging in open innovation have the absorptive capacity to do so. Open innovation could also be supported through IT-based platforms, such as the platform of the Lombardy region, which is co-funded by the ERDF and which seamlessly integrates with the internationalisation services of the Enterprise Europe Network.

2. There is ample evidence to confirm that skills shortages represent a major barrier to innovation. EU level actions hand in hand with national/regional measures should help increase the innovation management capacity of SMEs. EU-level programmes could particularly support the cross-border access of SMEs to skills to allow them to engage in innovation.
3. As a higher share of university graduates in science, manufacturing, engineering and construction correlates with a higher share of innovating SMEs in the EU-28. Member States should continue to reinforce their support for their education systems so that more graduates from the STEM-disciplines (Science, Technology, Engineering and Mathematics) are available on labour markets.
4. Further barriers include a lack of internal and external funds, especially for innovating SMEs with regard to scaling up their innovations. European level programmes, such as the future Horizon Europe, plan to address market gaps in scale up financing through the European Innovation Council (EIC) and the future InvestEU programme plans to provide support for the financing of innovating SMEs at all stages of their development
5. For innovating SMEs, it is still important to receive support in finding collaboration partners. The Enterprise Europe Network as an EU-level action of the COSME programme should play an important role in connecting not only SMEs, but also different competencies (e.g. Key Enabling Technology centres, digital innovation hubs, testing laboratories, and investors) that are needed to implement innovation projects.
6. The support of incremental innovation should receive as much attention as those of a break-through or disruptive nature.

At EU-level, with the incoming Commission and the start of a new long-term EU budget, there will be a further improvement in the synergies between the various innovation policy tools.

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ANNEX 1: THE SME PERFORMANCE REVIEW

The SME Performance Review is one of the main tools used by the European Commission to monitor and assess the progress of Member States in implementing the Small Business Act (SBA) on a yearly basis.

The SBA strives to foster SME development and remove obstacles to SME growth. It does not constitute a legal requirement but instead is a series of guidance measures that can be adapted to suit each country's specific needs. This guidance is underpinned by ten core principles:

1. Entrepreneurship: creating an environment in which entrepreneurs and family businesses can thrive and entrepreneurship is rewarded.
2. 'Second Chance': ensuring that honest entrepreneurs who have experienced bankruptcy are promptly given a second opportunity to succeed.
3. 'Think Small First': designing rules modelled on the 'Think Small First' principle.
4. 'Responsive Administration': making public administrations responsive to the needs of SMEs.
5. State Aid & Public Procurement: adapting public policy tools to suit SME needs, facilitating SMEs' participation in public procurement and ensuring better access to State Aid for SMEs.
6. Access to Finance: facilitating SMEs' access to finance and developing a legal and business environment conducive to the specific requirements of SMEs, including timely payments in commercial transactions.
7. Single Market: helping SMEs to benefit more from the opportunities offered by the Single Market.
8. Skills & Innovation: promoting the enhancement of skills in the SME workforce and all forms of innovation.
9. Environment: enabling SMEs to transform environmental challenges into economic opportunities while acting sustainably.
10. Internationalisation: encouraging SMEs to benefit from the growth of global markets and supporting them in this pursuit.

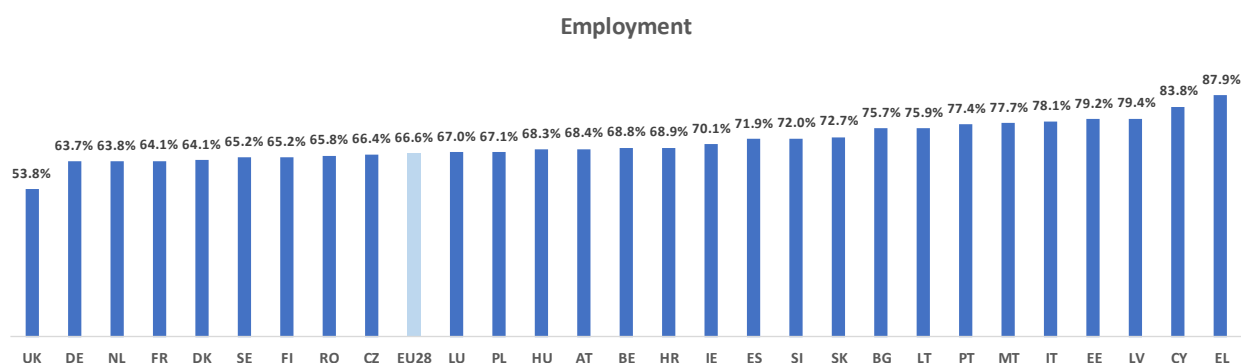
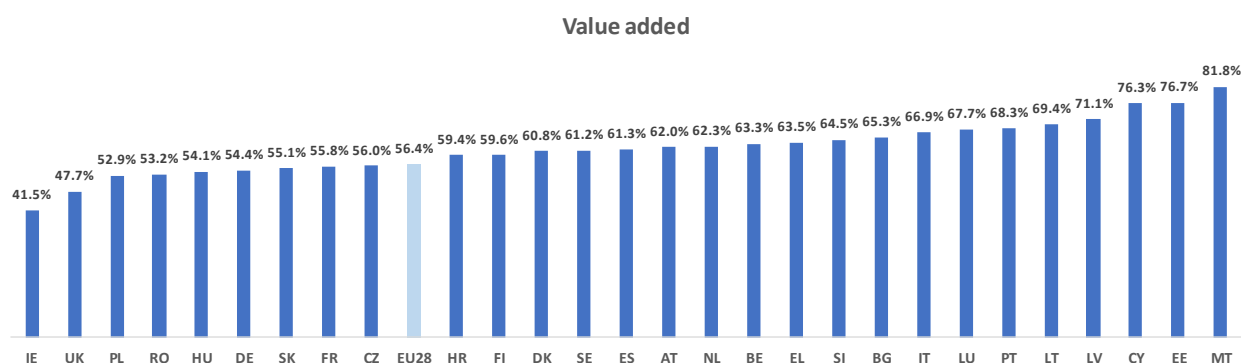
The Performance Review provides extensive information on the implementation of the measures from the SBA Action Plan and the performance of SMEs in EU Member States. This information can be accessed at https://ec.europa.eu/growth/smes/business-friendly-environment/performance-review_en.

ANNEX 2: SHARE (IN %) OF MICRO, SMALL, MEDIUM-SIZED AND LARGE ENTERPRISES IN TOTAL ENTERPRISE POPULATION IN EU-28 MEMBER STATES IN 2018

	Enterprise size class			
	Micro SMEs	Small SMEs	Medium- sized SMEs	Large enterprises
EU-28	93.0%	5.9%	0.9%	0.2%
DE	82.0%	15.1%	2.4%	0.5%
AT	87.1%	10.9%	1.6%	0.3%
LU	87.5%	10.1%	1.9%	0.5%
DK	88.2%	9.6%	1.9%	0.3%
RO	88.4%	9.5%	1.8%	0.3%
UK	90.0%	8.4%	1.3%	0.3%
HR	90.9%	7.5%	1.2%	0.3%
FI	90.9%	7.5%	1.3%	0.3%
EE	91.3%	7.1%	1.3%	0.2%
LV	91.6%	7.0%	1.3%	0.2%
BG	91.8%	6.8%	1.2%	0.2%
IE	91.9%	6.7%	1.2%	0.2%
CY	92.9%	6.1%	0.9%	0.1%
MT	93.1%	5.6%	1.1%	0.2%
LT	93.1%	5.6%	1.1%	0.2%
HU	94.1%	4.9%	0.8%	0.2%
SE	94.6%	4.5%	0.8%	0.1%
BE	94.6%	4.6%	0.7%	0.2%
ES	94.7%	4.7%	0.6%	0.1%
SI	94.7%	4.3%	0.8%	0.2%
IT	94.9%	4.5%	0.5%	0.1%
PT	95.4%	3.9%	0.6%	0.1%
FR	95.5%	3.8%	0.6%	0.1%
NL	95.6%	3.5%	0.8%	0.2%
CZ	96.0%	3.2%	0.7%	0.2%
PL	96.1%	2.9%	0.8%	0.2%
SK	97.2%	2.2%	0.5%	0.1%
EL	97.4%	2.3%	0.3%	0.0%

Source: Eurostat, National Statistical Offices, DIW Econ

ANNEX 3: SHARE OF VALUE ADDED AND EMPLOYMENT IN THE EU-28 NFBS ACCOUNTED FOR BY SMES IN 2018



Source: Eurostat, National Statistical Offices, DIW Econ

ANNEX 4: SHARE OF INDUSTRY SME VALUE IN TOTAL INDUSTRY VALUE ADDED AND SHARE OF INDUSTRY SME VALUE ADDED IN TOTAL VALUE ADDED OF THE NFBS

Rank of industry	Industry	Share of industry value added by SMEs in the industry	SMEs share of total NFBS value added	Cumulative SMEs share of total NFBS value added
1	G46	74.5%	12.2%	12.2%
2	F43	89.6%	7.3%	19.5%
3	G47	51.2%	6.6%	26.1%
4	L68	83.1%	5.8%	31.9%
5	M69	74.6%	3.9%	35.7%
6	M70	79.4%	3.8%	39.5%
7	J62	56.8%	3.7%	43.2%
8	H49	55.9%	3.4%	46.6%
9	G45	75.9%	3.3%	49.8%
10	I56	74.6%	3.2%	53.1%
11	M71	73.2%	3.2%	56.3%
12	C25	74.1%	3.1%	59.5%
13	F41	76.1%	3.0%	62.5%
14	C10	47.5%	2.2%	64.7%
15	C28	43.6%	2.2%	66.9%
16	H52	45.3%	2.1%	69.0%
17	N77	70.1%	2.0%	71.0%
18	N82	64.8%	1.7%	72.7%
19	I55	75.3%	1.7%	74.4%
20	N81	54.6%	1.4%	75.8%
21	N78	38.1%	1.4%	77.2%
22	D35	26.2%	1.4%	78.6%
23	C22	54.4%	1.2%	79.8%
24	F42	56.3%	1.2%	81.0%
25	M73	74.3%	1.1%	82.1%
26	M74	84.3%	1.1%	83.3%
27	C20	33.2%	1.1%	84.4%
28	C33	65.7%	1.0%	85.4%
29	J58	46.7%	0.9%	86.2%
30	C23	49.9%	0.8%	87.0%
31	C26	34.0%	0.7%	87.8%
32	C27	32.6%	0.7%	88.5%
33	E38	53.0%	0.6%	89.1%
34	J59	71.9%	0.6%	89.8%
35	C32	45.2%	0.6%	90.4%
36	C16	74.4%	0.6%	91.0%
37	C18	81.6%	0.6%	91.6%
38	J61	14.2%	0.6%	92.2%
39	C31	69.8%	0.6%	92.7%
40	J63	55.8%	0.6%	93.3%
41	N79	62.0%	0.5%	93.8%
42	C29	9.7%	0.5%	94.3%
43	C17	41.3%	0.5%	94.8%
44	C24	28.2%	0.4%	95.2%
45	C13	74.0%	0.4%	95.6%
46	M72	37.9%	0.4%	96.0%
47	C11	33.4%	0.4%	96.4%
48	N80	39.2%	0.4%	96.8%
49	C14	69.1%	0.3%	97.1%
50	H50	58.7%	0.3%	97.4%
51	C21	11.1%	0.3%	97.7%
52	E36	31.5%	0.3%	98.0%
53	H53	16.5%	0.2%	98.2%
54	C15	64.5%	0.2%	98.5%
55	E37	51.3%	0.2%	98.7%
56	M75	91.4%	0.2%	98.9%
57	C30	13.0%	0.2%	99.1%
58	H51	23.0%	0.2%	99.3%
59	B08	71.3%	0.2%	99.5%
60	J60	21.0%	0.1%	99.6%
61	B06	22.0%	0.1%	99.7%
62	B09	57.2%	0.1%	99.8%
63	C19	7.9%	0.1%	99.9%
64	E39	95.2%	0.1%	99.9%
65	B05	22.4%	0.0%	100.0%
66	C12	16.4%	0.0%	100.0%
67	B07	5.7%	0.0%	100.0%

Source: Eurostat, National Statistical Offices, DIW Econ

ANNEX 5: SHARE OF INDUSTRY SME EMPLOYMENT IN TOTAL INDUSTRY EMPLOYMENT AND SHARE OF INDUSTRY SME EMPLOYMENT IN TOTAL EMPLOYMENT OF THE NFBS

Rank of industry	Industry	Share of industry employment by SMEs in the industry	SMEs share of total NFBS employment	Cumulative SMEs share of total NFBS employment
1	G47	60.7%	12.1%	12.1%
2	G46	79.5%	8.8%	20.9%
3	I56	84.1%	8.2%	29.1%
4	F43	93.7%	8.1%	37.2%
5	H49	69.0%	4.4%	41.6%
6	G45	85.6%	3.6%	45.1%
7	M69	84.6%	3.4%	48.5%
8	C25	80.6%	3.1%	51.6%
9	F41	88.8%	3.1%	54.7%
10	M71	80.9%	2.8%	57.5%
11	N81	52.9%	2.8%	60.3%
12	C10	62.3%	2.8%	63.1%
13	L68	87.2%	2.7%	65.8%
14	J62	67.3%	2.7%	68.5%
15	I55	81.0%	2.4%	70.8%
16	M70	73.4%	2.4%	73.2%
17	N82	65.8%	1.9%	75.1%
18	N78	31.0%	1.8%	76.9%
19	C28	52.3%	1.6%	78.5%
20	H52	49.1%	1.5%	80.0%
21	M74	94.0%	1.2%	81.2%
22	C22	24.9%	1.1%	82.3%
23	C33	73.7%	1.0%	83.3%
24	F42	61.1%	1.0%	84.3%
25	M73	80.9%	1.0%	85.2%
26	C16	83.7%	0.9%	86.1%
27	C14	79.1%	0.8%	86.9%
28	C23	61.1%	0.8%	87.7%
29	C31	73.3%	0.8%	88.4%
30	C32	72.7%	0.7%	89.1%
31	N80	41.5%	0.7%	89.8%
32	C18	86.3%	0.7%	90.4%
33	C27	40.1%	0.6%	91.0%
34	N77	77.6%	0.6%	91.6%
35	J58	62.8%	0.6%	92.2%
36	E38	57.5%	0.6%	92.8%
37	C20	45.3%	0.5%	93.3%
38	C26	46.0%	0.5%	93.8%
39	C13	77.7%	0.5%	94.3%
40	J63	74.5%	0.5%	94.8%
41	N79	77.0%	0.4%	95.2%
42	J59	78.9%	0.4%	95.7%
43	C29	15.7%	0.4%	96.1%
44	C17	55.1%	0.4%	96.4%
45	M72	55.6%	0.4%	96.8%
46	C15	77.4%	0.4%	97.1%
47	D35	27.0%	0.3%	97.5%
48	C24	34.1%	0.3%	97.8%
49	H53	17.5%	0.3%	98.2%
50	J61	23.5%	0.3%	98.4%
51	C11	51.5%	0.3%	98.7%
52	M75	93.6%	0.3%	98.9%
53	C30	22.4%	0.2%	99.1%
54	E36	35.9%	0.2%	99.3%
55	B08	80.2%	0.1%	99.4%
56	C21	20.7%	0.1%	99.5%
57	H50	51.3%	0.1%	99.7%
58	E37	67.1%	0.1%	99.8%
59	J60	34.1%	0.1%	99.9%
60	H51	11.0%	0.0%	99.9%
61	E39	90.3%	0.0%	99.9%
62	B09	32.4%	0.0%	100.0%
63	C19	15.1%	0.0%	100.0%
64	C12	19.4%	0.0%	100.0%
65	B06	8.9%	0.0%	100.0%
66	B07	10.9%	0.0%	100.0%
67	B05	2.4%	0.0%	100.0%

Source: Eurostat, National Statistical Offices, DIW Econ

ANNEX 6: COMPOSITION OF GROUPINGS OF INDUSTRIES OF DIFFERENT TECHNOLOGY AND KNOWLEDGE INTENSITIES

Knowledge intensive services

The group of knowledge intensive services (KIS) is classified according to Eurostat and regroups the following service industries (NACE 2 classification):

High tech services:

- J59 Motion picture, video and television programme production, sound recording and music publishing activities
- J60 Programming and broadcasting services
- J61 Telecommunications
- J62 Computer programming, consultancy and related activities
- J63 Information service activities
- M72 Scientific research and development

Market services:

- H50 Water transport
- H51 Air transport
- M69 Legal and accounting activities
- M70 Activities of head offices, management consultancy activities
- M71 Architectural and engineering activities; technical testing and analysis
- M73 Advertising and market research
- M74 Other professional, scientific and professional services
- N78 Employment activities
- N80 Security and investigation activities

Other KIS

- J58 Publishing activities
- M75 Veterinary activities

Low knowledge-intensive services

Market services

- G45 Wholesale and retail trade and repair of motor vehicles and motorcycles
- G46 Wholesale trade except of motor vehicles and motorcycles
- G47 Retail trade, except of motor vehicles and motorcycles
- H49 Land transport and transport via pipelines
- H52 Warehousing and support activities for transportation
- I55 Accommodation
- I56 Food and beverage service activities
- L68 Real estate activities
- N77 Rental and leasing activities
- N79 Travel agency, tour operator reservation service
- N81 Services to buildings and landscape activities
- N82 Office administrative, office support and other business support activities

Other

- H53 Postal and courier activities

High-tech industries

- C21 Manufacture of basic pharmaceutical products and pharmaceutical preparations
- C26 Manufacture of computer, electronic and optical products

Medium-tech industries

Medium-High tech

- C20 Manufacture of chemicals and chemical products
- C27 Manufacture of electrical equipment
- C28 Manufacture of machinery and equipment n.e.c.
- C29 Manufacture of motor vehicles, trailers and semi-trailers
- C30 Manufacture of other transport equipment

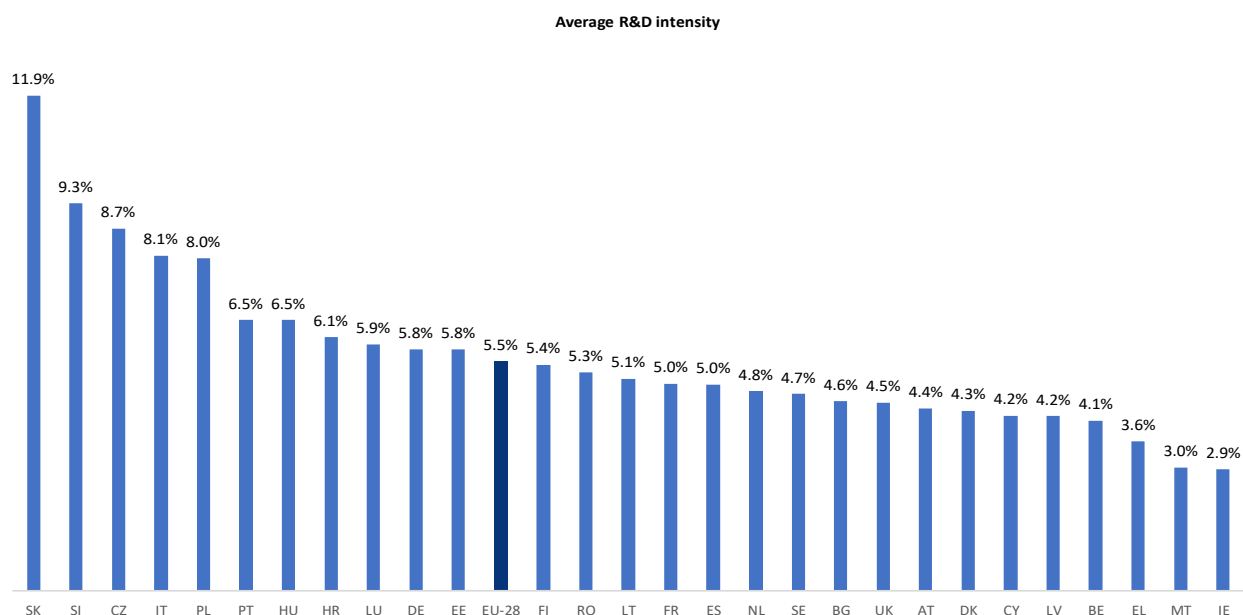
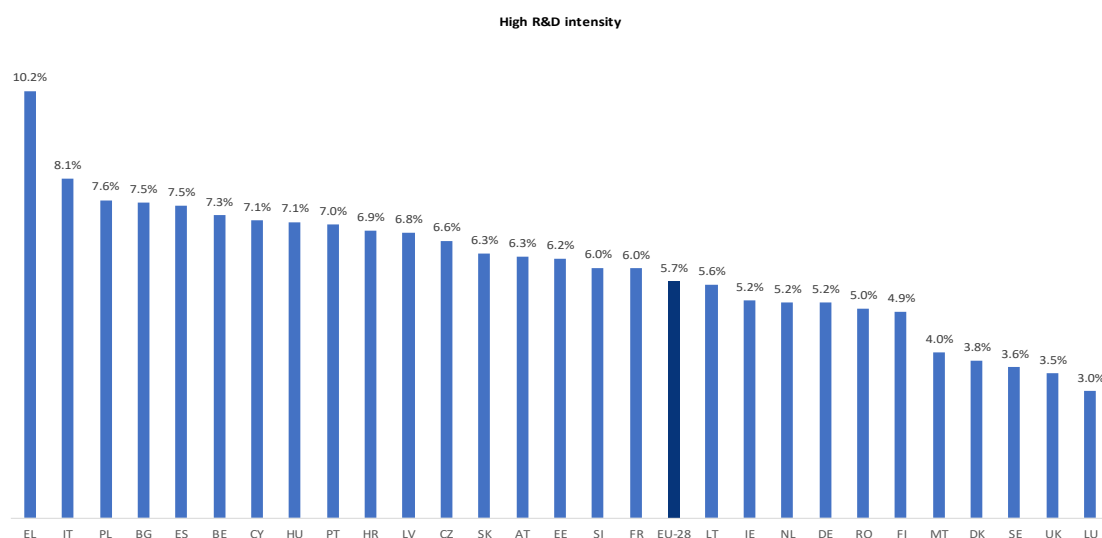
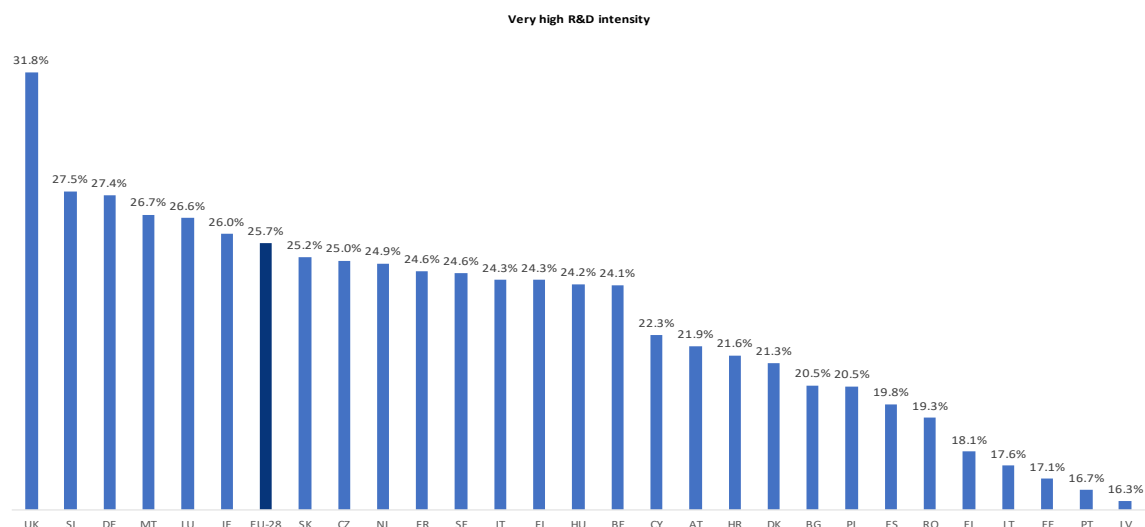
Medium-low tech

- C19 Manufacture of coke and refined petroleum products
- C22 Manufacture of rubber and plastic products
- C23 Manufacture of other non-metallic mineral products
- C24 Manufacture of basic metals
- C25 Manufacture of fabricated metal products, except machinery and equipment
- C33 Repair and installation of machinery and equipment

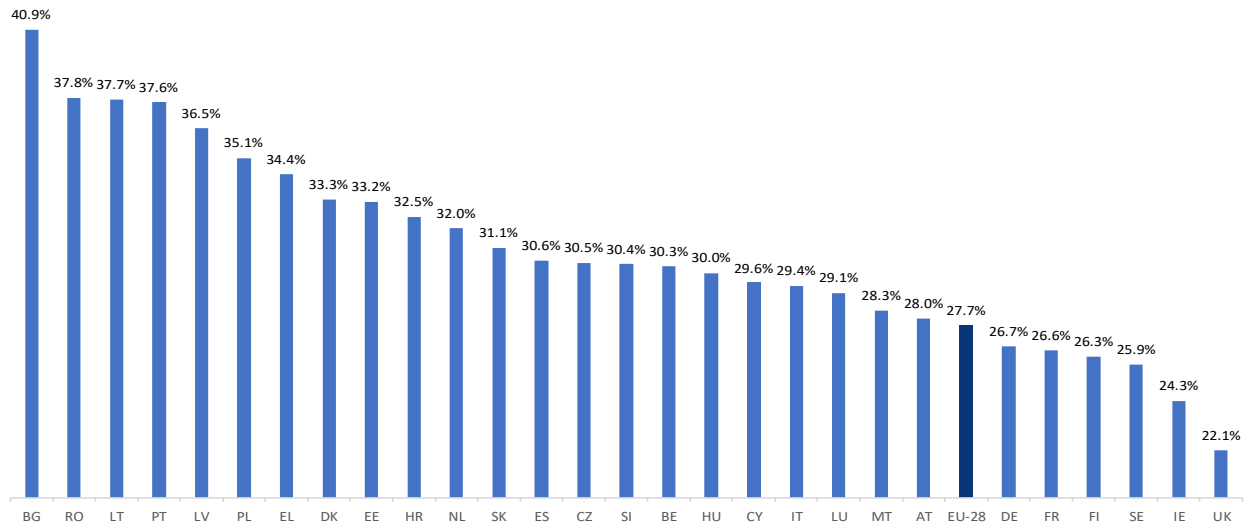
Low-tech industries

- C10 Manufacture of food products
- C11 Manufacture of beverages
- C12 Manufacture of tobacco products
- C13 Manufacture of textiles
- C14 Manufacture of wearing apparel
- C15 Manufacture of leather and related products
- C16 Manufacture of wood and of products of wood and cork, except furniture; Manufacture of articles of straw and plaiting materials
- C17 Manufacture of paper and paper products
- C18 Printing and reproduction of recorded media

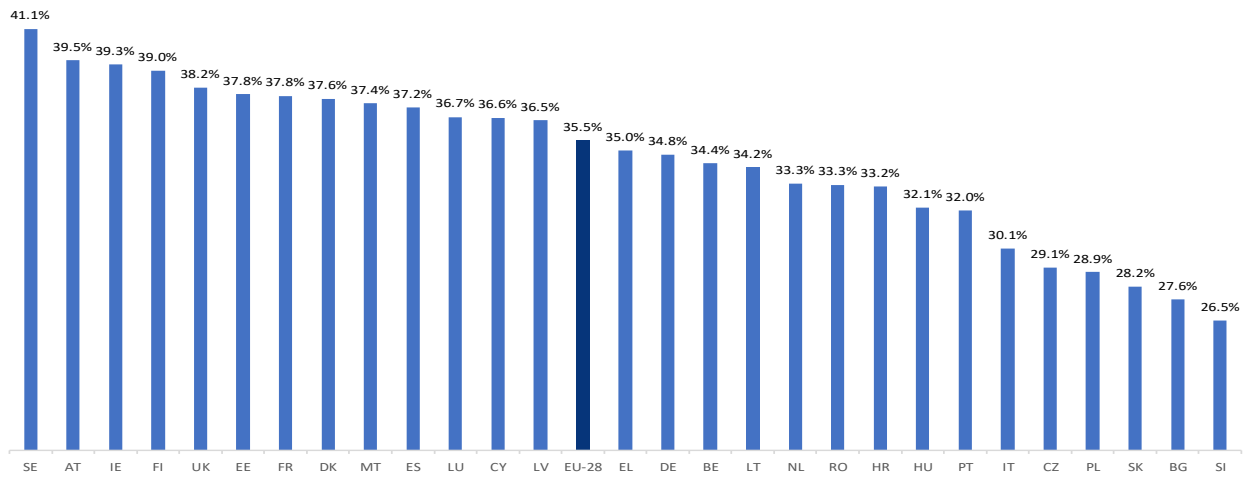
ANNEX 7: SHARE OF EU-28 SME VALUE ADDED IN NFBS GENERATED IN 2018 BY SMES IN INDUSTRIES OF DIFFERENT R&D INTENSITY



Low R&D intensity

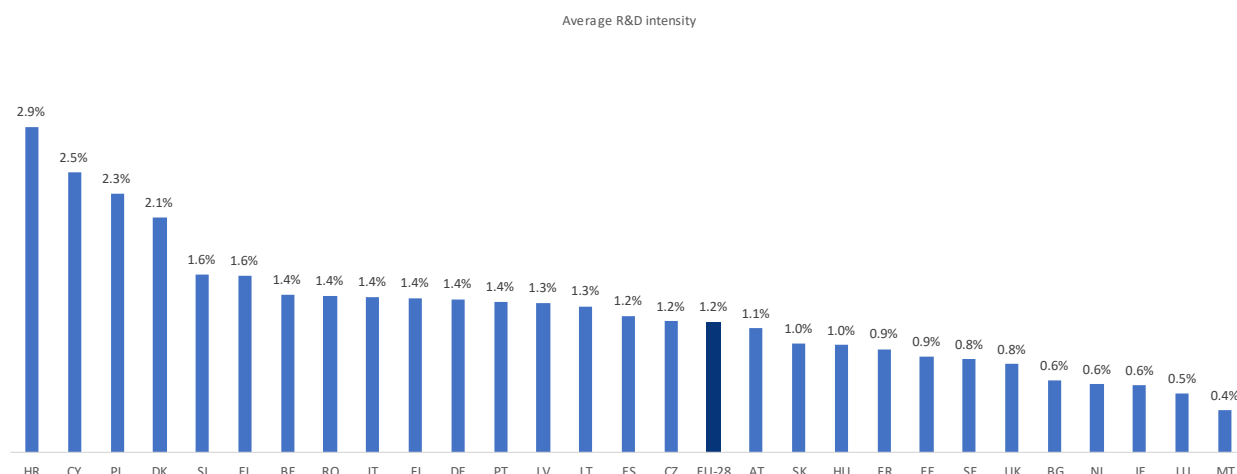
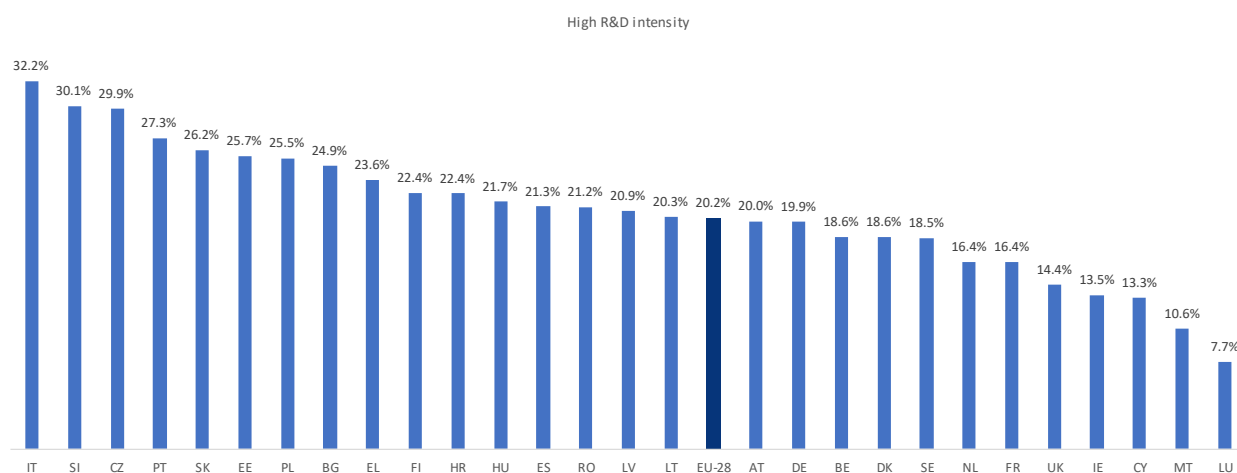
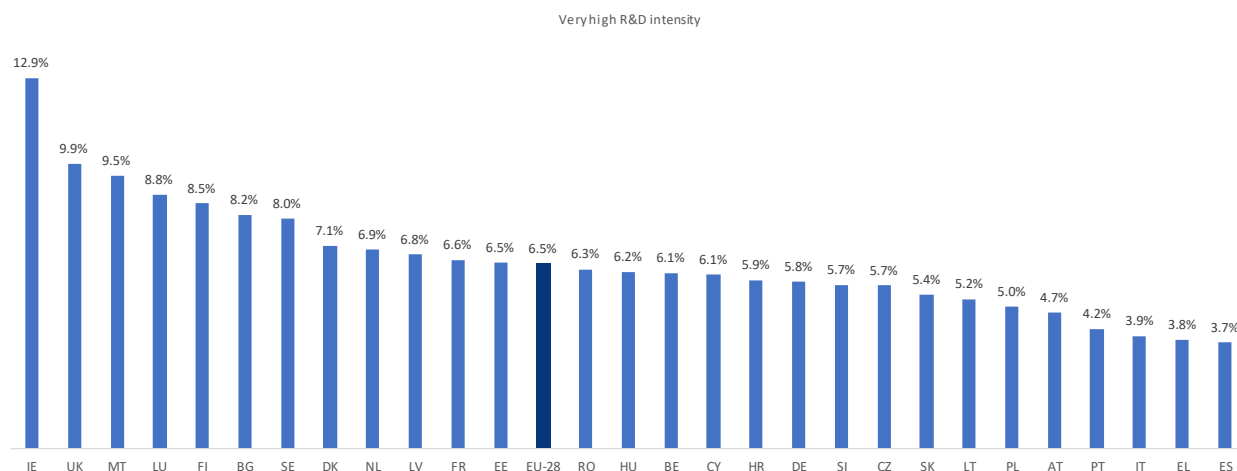


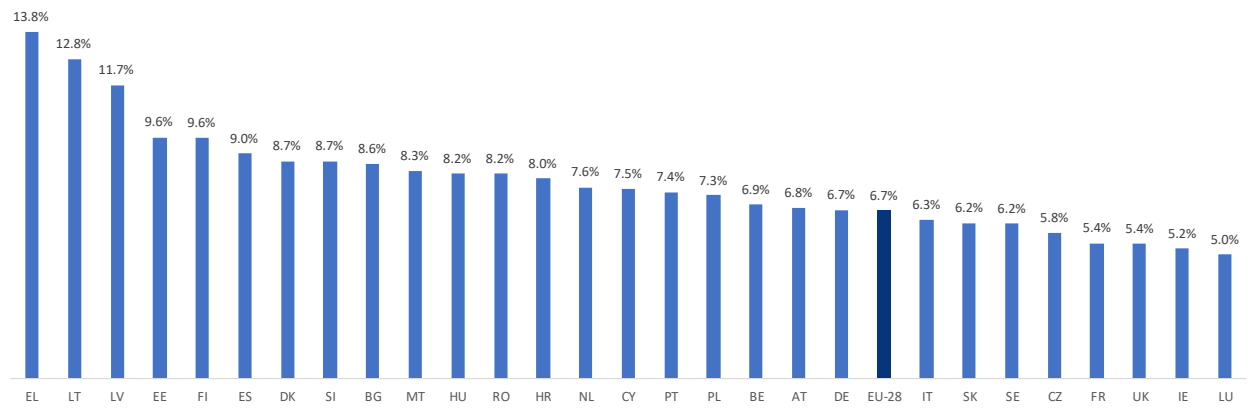
Very low R&D intensity



Source: Eurostat, OECD ANBERD, DIW Econ and LE Europe

ANNEX 8: SHARE OF EU-28 SME VALUE ADDED IN NFBS GENERATED IN 2018 BY SMES IN INDUSTRIES OF DIFFERENT INNOVATION INTENSITY





Source: Eurostat, OECD ANBERD, DIW Econ and LE Europe

ANNEX 9: GROWTH IN SME VALUE ADDED AND EMPLOYMENT IN INDUSTRIES OF DIFFERENT TECHNOLOGY OR KNOWLEDGE INTENSITIES

Technology industry groups															
Value added growth in 2018															
	Low-tech					Medium-tech					High-tech				
	Micro SMEs	Small SMEs	Medium-sized SMEs	SMEs	Large enterprises	Micro SMEs	Small SMEs	Medium-sized SMEs	SMEs	Large enterprises	Micro SMEs	Small SMEs	Medium-sized SMEs	SMEs	Large enterprises
AT	0.6%	1.3%	2.4%	1.8%	2.8%	0.6%	1.3%	2.4%	1.8%	2.8%	0.6%	1.3%	2.4%	2.0%	2.8%
BE	6.6%	0.5%	2.3%	2.4%	1.1%	6.6%	0.5%	2.3%	2.4%	1.1%	6.2%	0.5%	2.3%	2.2%	1.1%
BG	13.0%	17.8%	6.7%	10.9%	11.9%	13.0%	17.7%	6.4%	10.6%	11.9%	13.0%	17.8%	6.7%	10.8%	11.9%
CY	9.2%	9.9%	4.3%	7.4%	-2.1%	9.2%	9.9%	4.3%	7.8%	0.0%	9.2%	9.9%	4.3%	7.9%	-2.1%
CZ	1.2%	2.6%	1.5%	1.7%	3.4%	1.2%	2.6%	1.5%	1.8%	3.4%	1.2%	2.6%	1.5%	1.7%	3.4%
DE	1.6%	1.9%	1.4%	1.6%	1.9%	1.6%	1.9%	1.4%	1.6%	1.9%	1.6%	1.9%	1.4%	1.5%	1.9%
DK	0.1%	5.4%	5.7%	4.9%	3.6%	0.1%	5.4%	5.7%	4.8%	3.6%	0.1%	5.4%	5.7%	5.0%	3.6%
EE	14.1%	7.8%	7.6%	8.4%	8.9%	14.3%	7.5%	7.8%	8.7%	7.1%	17.1%	4.8%	7.1%	7.3%	7.0%
EL	2.9%	29.9%	4.7%	13.1%	-4.0%	2.9%	29.9%	4.7%	13.5%	-4.0%	2.9%	29.9%	4.7%	12.0%	-4.0%
ES	1.7%	-1.3%	0.9%	0.2%	2.6%	1.7%	-1.3%	0.9%	0.2%	2.6%	1.7%	-1.3%	0.9%	0.3%	2.6%
EU-28	2.5%	0.9%	1.1%	1.3%	2.7%	2.8%	0.8%	1.2%	1.3%	2.6%	3.2%	0.5%	1.1%	1.1%	2.6%
FI	-1.6%	3.0%	5.3%	3.6%	7.9%	-1.6%	2.9%	5.3%	3.2%	7.9%	-1.6%	3.0%	5.3%	3.7%	7.9%
FR	0.9%	-0.6%	-2.1%	-0.8%	1.9%	0.9%	-0.6%	-2.1%	-0.9%	1.9%	0.9%	-0.6%	-2.1%	-1.4%	1.9%
HR	8.8%	5.0%	-10.9%	-2.6%	-13.9%	1.4%	3.0%	0.0%	1.3%	24.0%	5.2%	14.3%	0.0%	4.7%	25.0%
HU	2.0%	3.3%	2.8%	2.8%	8.4%	1.9%	3.3%	2.9%	2.8%	7.2%	2.0%	3.3%	2.8%	2.8%	8.4%
IE	8.8%	-9.0%	-18.9%	-8.0%	3.5%	8.8%	-9.0%	-18.9%	-8.3%	3.5%	8.8%	-9.0%	-18.9%	-9.9%	3.5%
IT	-0.8%	-1.5%	0.6%	-0.6%	2.8%	-0.8%	-1.5%	0.6%	-0.6%	2.8%	-0.8%	-1.5%	0.6%	-0.3%	2.8%
LT	22.4%	8.5%	1.4%	5.2%	5.9%	22.5%	8.5%	1.4%	5.1%	5.9%	22.5%	8.5%	1.4%	6.3%	5.9%
LU	5.7%	3.6%	2.7%	3.3%	5.5%	5.7%	3.6%	2.7%	3.2%	5.5%	5.7%	3.6%	2.7%	3.0%	5.5%
LV	23.2%	13.8%	4.6%	9.2%	9.9%	4.2%	17.1%	6.4%	9.3%	-5.9%	19.8%	19.7%	13.0%	14.3%	22.5%
MT	19.9%	24.5%	5.0%	15.3%	2.1%	19.9%	24.5%	5.0%	18.7%	2.1%	17.8%	24.5%	5.0%	11.9%	2.1%
NL	2.2%	1.2%	3.4%	2.6%	3.5%	2.2%	1.2%	3.4%	2.5%	3.5%	2.2%	1.2%	3.4%	2.7%	3.5%
PL	14.9%	4.7%	4.5%	6.3%	4.5%	14.9%	4.7%	4.5%	6.6%	4.5%	14.9%	4.7%	4.5%	5.7%	4.5%
PT	-0.8%	0.6%	2.7%	1.3%	5.0%	10.6%	0.6%	2.7%	3.1%	-0.8%	4.3%	0.6%	2.7%	2.2%	4.5%
RO	28.9%	13.7%	6.2%	11.9%	13.7%	28.9%	13.7%	6.2%	11.2%	13.7%	28.9%	13.7%	6.2%	14.0%	13.7%
SE	5.8%	1.5%	3.2%	3.1%	-2.5%	5.8%	1.5%	3.2%	3.1%	-2.5%	5.6%	1.5%	3.2%	3.1%	-2.5%
SI	8.0%	7.3%	5.4%	6.6%	3.3%	9.2%	8.3%	6.6%	7.7%	7.8%	9.1%	7.9%	4.2%	5.7%	7.0%
SK	10.5%	0.9%	2.9%	4.0%	4.4%	10.5%	0.9%	2.9%	4.3%	4.4%	9.7%	0.9%	2.9%	3.1%	4.4%
UK	3.8%	0.1%	-0.5%	0.7%	2.3%	3.8%	0.1%	-0.5%	0.6%	2.3%	3.8%	0.1%	-0.5%	0.3%	2.3%
Employment growth in 2018															
	Low-tech					Medium-tech					High-tech				
	Micro SMEs	Small SMEs	Medium-sized SMEs	SMEs	Large enterprises	Micro SMEs	Small SMEs	Medium-sized SMEs	SMEs	Large enterprises	Micro SMEs	Small SMEs	Medium-sized SMEs	SMEs	Large enterprises
AT	3.9%	2.9%	3.2%	3.3%	4.6%	2.8%	1.9%	2.1%	2.2%	3.5%	1.8%	1.1%	1.1%	1.1%	2.1%
BE	3.2%	0.5%	1.1%	1.5%	0.7%	2.4%	-1.0%	-0.8%	-0.2%	0.0%	6.8%	3.9%	3.1%	3.7%	1.5%
BG	4.8%	4.7%	3.2%	4.0%	1.0%	1.6%	-0.2%	-2.2%	-0.7%	-5.4%	-0.8%	-2.0%	-3.8%	-2.9%	-7.6%
CY	5.3%	5.7%	5.1%	5.4%	2.3%	2.8%	3.0%	1.6%	2.6%	0.0%	6.7%	5.9%	8.1%	6.7%	8.1%
CZ	2.4%	-0.1%	-0.6%	0.6%	2.3%	2.4%	-0.1%	-0.6%	0.4%	2.3%	2.4%	-0.1%	-0.6%	0.0%	2.3%
DE	3.7%	3.8%	3.4%	3.6%	2.2%	2.8%	2.6%	2.0%	2.3%	1.5%	1.6%	1.6%	1.2%	1.3%	0.4%
DK	-1.8%	-0.4%	3.5%	1.3%	2.2%	-2.6%	-1.9%	1.3%	-0.5%	0.7%	-0.5%	-0.4%	3.4%	2.0%	2.3%
EE	-3.5%	-4.3%	-4.2%	-4.1%	-6.6%	-3.6%	-5.3%	-5.3%	-4.9%	-1.1%	-1.4%	-3.0%	-4.1%	-3.5%	-4.0%
EL	8.1%	3.7%	-4.2%	4.0%	-6.6%	3.0%	-0.7%	-7.9%	-0.5%	-11.6%	2.3%	-1.6%	-9.9%	-3.4%	-12.7%
ES	0.2%	0.2%	-1.4%	-0.3%	0.8%	-2.1%	-1.3%	-1.6%	-1.6%	1.8%	-0.1%	0.4%	-0.3%	0.0%	2.5%
EU-28	4.1%	2.2%	1.1%	2.3%	1.7%	3.4%	0.9%	0.0%	1.1%	0.6%	2.4%	0.2%	-0.4%	0.1%	0.2%
FI	3.6%	3.5%	4.3%	3.9%	3.1%	3.5%	3.1%	3.9%	3.5%	4.8%	-0.9%	-0.5%	0.7%	0.1%	2.8%
FR	6.3%	0.5%	-1.6%	2.2%	-1.4%	6.3%	0.5%	-1.6%	1.1%	-1.4%	6.3%	0.5%	-1.6%	-0.1%	-1.4%
HR	3.6%	1.1%	-0.6%	1.1%	1.6%	3.6%	1.1%	-0.6%	1.2%	1.6%	3.6%	1.1%	-0.6%	0.7%	1.6%
HU	0.9%	0.6%	1.4%	1.0%	1.6%	0.9%	0.6%	1.3%	1.0%	2.1%	0.9%	0.6%	1.4%	1.1%	1.6%
IE	0.2%	-1.8%	-3.4%	-2.1%	-0.3%	1.0%	-0.1%	-1.3%	-0.3%	2.4%	1.5%	-0.5%	-2.5%	-1.4%	-0.3%
IT	3.0%	1.3%	-0.2%	1.6%	3.1%	2.4%	0.7%	-0.7%	0.9%	2.8%	2.4%	0.7%	-0.5%	0.4%	3.6%
LT	15.1%	8.3%	4.6%	7.9%	2.7%	8.2%	1.2%	-1.6%	1.4%	-2.1%	4.3%	-3.4%	-6.5%	-4.6%	-5.2%
LU	1.3%	-0.9%	2.1%	1.0%	2.5%	-4.4%	-5.3%	-3.0%	-3.9%	1.7%	1.0%	-2.0%	-0.4%	-0.8%	3.7%
LV	4.2%	1.5%	1.0%	1.8%	0.0%	4.2%	1.5%	1.0%	2.0%	0.0%	4.1%	1.4%	1.0%	1.5%	0.0%
MT	-10.8%	-1.7%	5.9%	-3.0%	7.0%	-7.5%	-0.1%	1.5%	-1.7%	12.2%	-11.9%	-5.9%	-7.8%	-7.4%	56.4%
NL	3.0%	-0.2%	2.9%	2.0%	2.6%	2.9%	-0.4%	2.1%	1.5%	2.0%	4.6%	0.4%	3.2%	2.6%	3.3%
PL	3.9%	0.6%	-1.8%	0.6%	-1.2%	3.9%	0.6%	-1.8%	0.5%	-1.2%	3.9%	0.6%	-1.8%	-0.4%	-1.2%
PT	3.4%	2.2%	2.0%	2.4%	1.4%	3.2%	2.2%	1.9%	2.4%	1.9%	3.2%	2.2%	1.9%	2.2%	1.2%
RO	6.5%	5.0%	5.5%	5.5%	3.4%	4.3%	2.0%	1.7%	2.2%	0.1%	1.1%	-1.1%	-1.3%	-1.0%	-4.8%
SE	1.0%	1.7%	2.7%	2.0%	1.1%	0.9%	1.2%	2.5%	1.7%	1.3%	-0.3%	0.1%	0.8%	0.4%	-2.3%
SI	4.7%	3.4%	2.2%	3.5%	7.9%	4.6%	-0.3%	0.9%	1.5%	5.3%	5.0%	-0.3%	1.3%	1.4%	6.1%
SK	10.5%	5.7%	-1.3%	5.2%	0.1%	11.7%	6.8%	-1.1%	6.0%	0.0%	8.9%	4.4%	-3.5%	-0.4%	-3.1%
UK	8.7%	5.6%	0.4%	3.9%	5.5%	8.7%	0.6%	-2.3%	0.9%	-1.6%	0.9%	-4.8%	-4.6%	-3.9%	-1.4%

Source: Eurostat, National Statistical Offices, DIW Econ

Knowledge industry groups

Value added growth in 2018

	Less knowledge-intensive					Knowledge-intensive				
	Micro SMEs	Small SMEs	Medium-sized SMEs	SMEs	Large enterprises	Micro SMEs	Small SMEs	Medium-sized SMEs	SMEs	Large enterprises
AT	3.3%	4.0%	3.2%	3.5%	5.6%	3.3%	4.3%	3.2%	3.6%	5.0%
BE	1.5%	7.8%	-0.5%	3.3%	0.5%	3.1%	12.6%	-0.1%	4.9%	1.9%
BG	22.5%	28.4%	6.3%	20.4%	13.4%	20.3%	23.4%	4.2%	16.8%	11.2%
CY	10.3%	11.4%	5.4%	9.2%	7.9%	6.6%	7.3%	3.0%	6.1%	3.7%
CZ	10.9%	7.7%	5.1%	8.4%	9.4%	9.1%	6.2%	4.5%	6.9%	8.7%
DE	4.3%	3.7%	4.0%	4.0%	5.0%	3.4%	2.3%	2.8%	2.8%	3.4%
DK	2.4%	0.4%	3.6%	2.2%	3.3%	5.4%	1.0%	9.1%	5.4%	6.9%
EE	11.4%	9.7%	5.6%	9.5%	6.8%	19.2%	9.1%	6.1%	12.9%	19.1%
EL	4.8%	22.6%	14.2%	15.0%	5.8%	5.3%	19.3%	13.2%	10.9%	3.9%
ES	3.8%	2.1%	2.9%	3.0%	2.5%	7.6%	3.6%	4.5%	5.6%	3.2%
EU-28	4.5%	3.9%	3.7%	4.1%	4.1%	5.4%	4.6%	3.7%	4.7%	4.6%
FI	2.4%	4.1%	6.7%	4.1%	7.0%	2.7%	4.2%	6.4%	4.7%	6.4%
FR	4.3%	2.2%	0.0%	2.6%	1.1%	8.3%	6.1%	0.9%	5.8%	3.4%
HR	9.5%	5.6%	17.3%	10.2%	21.5%	1.4%	3.2%	10.2%	4.1%	11.8%
HU	7.7%	9.3%	10.6%	9.0%	11.7%	5.2%	5.7%	5.2%	5.3%	5.1%
IE	10.0%	3.5%	2.6%	6.8%	2.9%	20.8%	10.6%	7.9%	14.8%	11.4%
IT	4.3%	1.2%	3.2%	3.2%	3.4%	2.4%	0.2%	0.7%	1.6%	0.4%
LT	16.4%	11.1%	12.8%	13.4%	9.2%	15.1%	7.6%	8.6%	10.7%	6.1%
LU	8.1%	8.2%	8.8%	8.4%	12.2%	9.6%	10.5%	11.6%	10.7%	15.9%
LV	8.2%	13.5%	9.2%	10.4%	8.8%	13.1%	20.4%	18.0%	16.7%	19.6%
MT	11.2%	10.5%	3.0%	9.2%	4.4%	10.3%	11.0%	2.7%	8.9%	2.8%
NL	3.1%	6.2%	7.5%	5.8%	6.5%	4.3%	7.6%	8.7%	6.4%	7.5%
PL	8.7%	4.7%	3.8%	5.9%	5.5%	6.8%	4.0%	3.3%	5.3%	5.6%
PT	4.4%	6.5%	3.7%	4.9%	3.1%	5.6%	8.0%	5.9%	6.3%	3.1%
RO	15.7%	12.0%	7.8%	12.0%	13.4%	23.5%	16.3%	10.4%	17.0%	16.3%
SE	0.0%	-0.8%	-0.6%	-0.4%	-1.6%	-0.6%	0.1%	0.4%	-0.1%	1.4%
SI	10.5%	9.8%	12.0%	10.7%	13.0%	8.3%	6.3%	8.5%	7.8%	9.6%
SK	12.0%	1.5%	-0.5%	6.4%	11.4%	6.9%	0.5%	-0.8%	3.5%	6.6%
UK	3.8%	4.0%	3.9%	3.9%	4.5%	4.7%	4.7%	4.6%	4.6%	5.1%

Employment growth in 2018

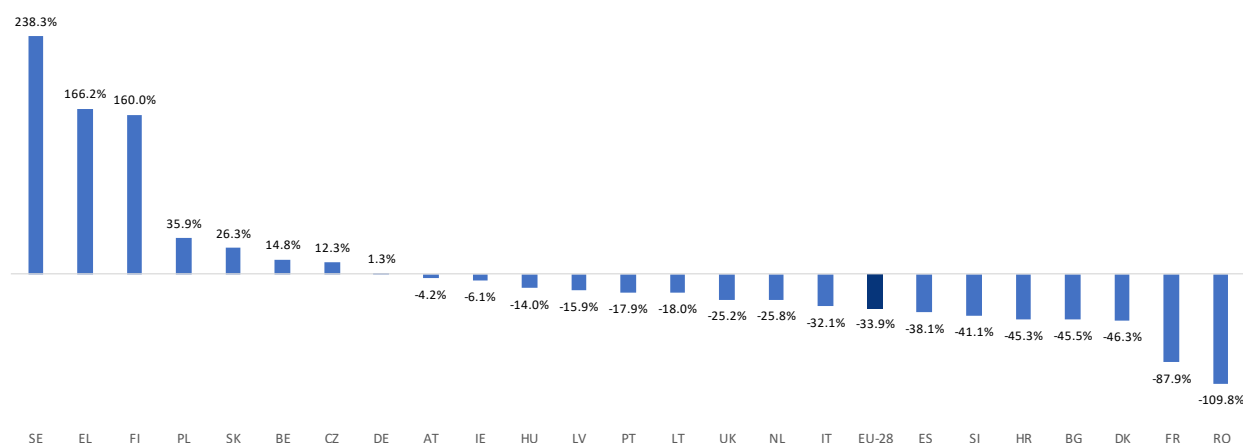
	Less knowledge-intensive					Knowledge-intensive				
	Micro SMEs	Small SMEs	Medium-sized SMEs	SMEs	Large enterprises	Micro SMEs	Small SMEs	Medium-sized SMEs	SMEs	Large enterprises
AT	1.4%	0.9%	1.5%	1.2%	2.5%	3.2%	2.1%	1.7%	2.5%	3.0%
BE	2.0%	1.7%	2.0%	1.9%	2.5%	2.2%	3.1%	1.1%	2.2%	0.5%
BG	1.0%	0.8%	0.7%	0.9%	0.7%	1.0%	2.3%	3.0%	1.9%	4.1%
CY	6.8%	7.1%	4.3%	6.2%	6.5%	5.6%	6.2%	2.6%	5.2%	13.1%
CZ	0.6%	1.0%	0.9%	0.8%	3.0%	0.8%	1.2%	1.0%	0.9%	3.5%
DE	1.3%	1.0%	1.5%	1.3%	1.1%	1.2%	0.8%	1.1%	1.0%	0.8%
DK	-0.9%	1.2%	3.8%	1.3%	2.9%	-0.8%	2.2%	5.7%	2.4%	5.3%
EE	1.7%	2.5%	2.4%	2.1%	6.2%	4.1%	-0.2%	-1.7%	1.9%	-7.8%
EL	10.1%	-7.7%	-10.2%	4.0%	-6.8%	9.5%	-9.6%	-7.9%	5.2%	-2.7%
ES	3.2%	2.5%	1.8%	2.8%	3.1%	2.9%	2.7%	2.2%	2.7%	2.0%
EU-28	2.1%	1.3%	1.6%	1.8%	1.5%	2.9%	1.1%	1.1%	2.0%	1.8%
FI	2.1%	3.3%	4.9%	3.1%	8.3%	2.7%	1.4%	1.6%	1.9%	4.1%
FR	2.7%	1.0%	0.7%	1.8%	1.1%	4.7%	1.5%	1.1%	3.1%	1.7%
HR	-1.5%	-0.9%	-0.5%	-1.1%	-4.4%	5.4%	5.4%	4.6%	5.3%	17.7%
HU	1.2%	1.8%	2.1%	1.6%	4.4%	4.5%	5.4%	4.9%	4.7%	11.5%
IE	1.3%	2.4%	3.4%	2.3%	6.9%	3.0%	3.8%	4.5%	3.7%	8.1%
IT	0.9%	1.2%	0.7%	1.0%	2.0%	3.0%	2.7%	0.3%	2.6%	-1.1%
LT	2.8%	1.1%	1.3%	1.9%	2.1%	3.5%	2.7%	4.6%	3.6%	5.7%
LU	4.0%	2.2%	4.0%	3.3%	3.8%	4.4%	2.8%	5.1%	4.1%	4.6%
LV	2.8%	1.7%	2.3%	2.3%	2.4%	3.8%	2.1%	3.0%	3.3%	3.4%
MT	8.2%	9.1%	2.6%	7.0%	13.0%	6.2%	7.7%	0.3%	4.7%	16.6%
NL	1.5%	1.6%	2.6%	1.8%	4.9%	1.6%	2.1%	3.0%	2.1%	5.5%
PL	0.1%	0.0%	0.0%	0.0%	-0.1%	0.7%	0.4%	0.7%	0.6%	1.2%
PT	4.5%	1.8%	2.6%	3.6%	0.2%	4.7%	1.2%	4.0%	3.9%	1.0%
RO	3.3%	4.9%	4.5%	4.1%	4.7%	-0.6%	0.6%	1.7%	0.5%	1.7%
SE	2.1%	2.1%	3.3%	2.4%	3.1%	1.6%	2.1%	3.3%	2.3%	2.3%
SI	1.9%	1.2%	2.3%	1.8%	4.3%	2.6%	-0.3%	3.2%	2.1%	9.3%
SK	2.4%	1.4%	-0.2%	1.8%	0.7%	4.5%	3.1%	3.5%	4.1%	5.4%
UK	1.8%	1.2%	2.8%	1.9%	0.1%	3.5%	-1.2%	-1.3%	0.7%	0.5%

Source: Eurostat, National Statistical Offices, DIW Econ

ANNEX 10: CHANGE (IN %) OF PROFITABILITY OF SMEs IN VARIOUS INDUSTRIES IN EU MEMBER STATES

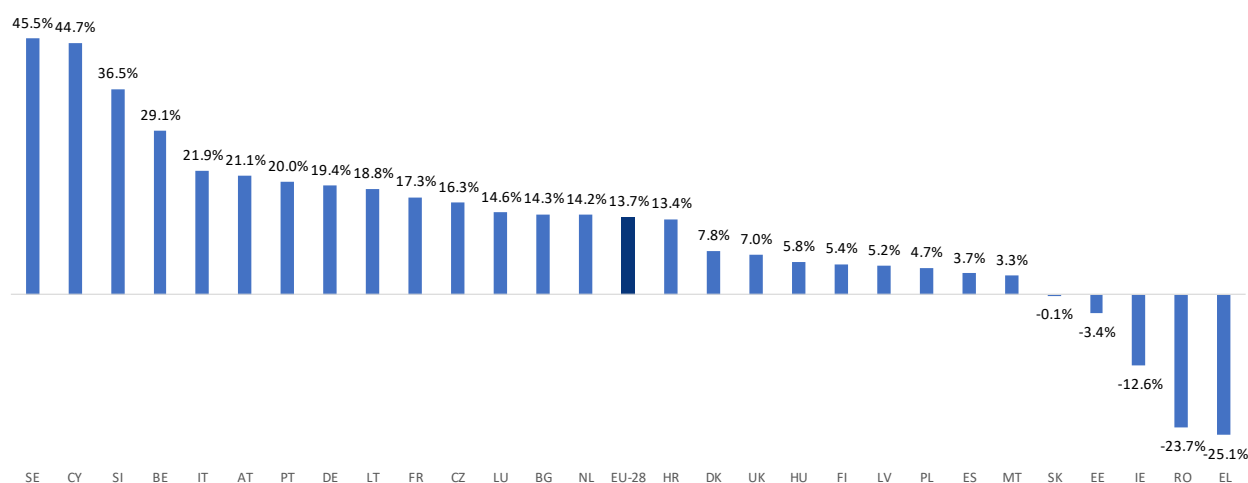
The number of Member States for which data on the profitability of SMEs varies and the Member States included in Figure 132 to Figure 141 are the only ones for which the data are available.

Figure 132 Change (in %) from 2013 to 2016 of SME profitability in mining and quarrying in EU Member States



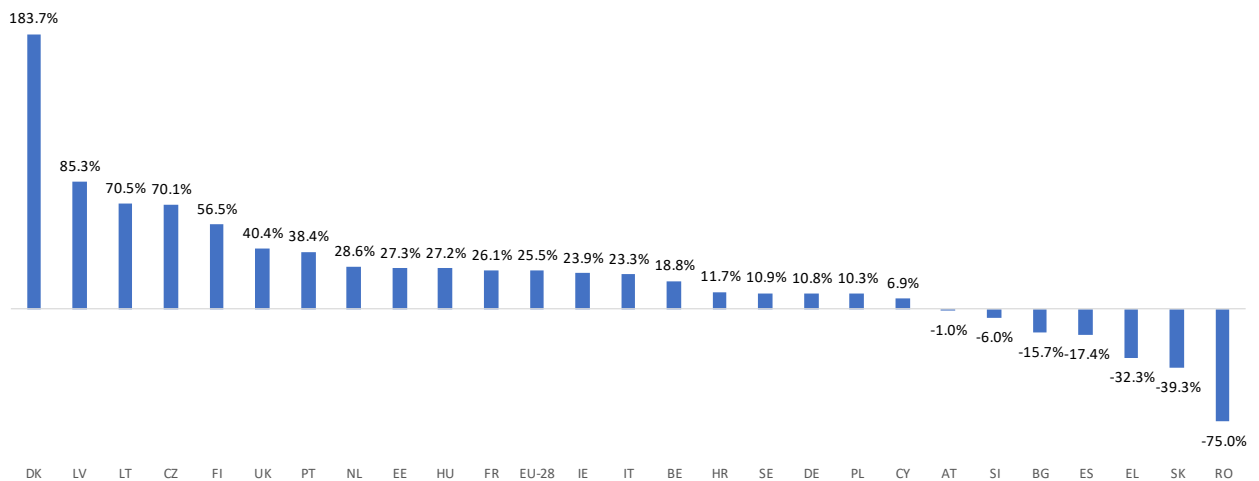
Source: Eurostat

Figure 133 Change (in %) from 2013 to 2016 of SME profitability in manufacturing in EU Member States



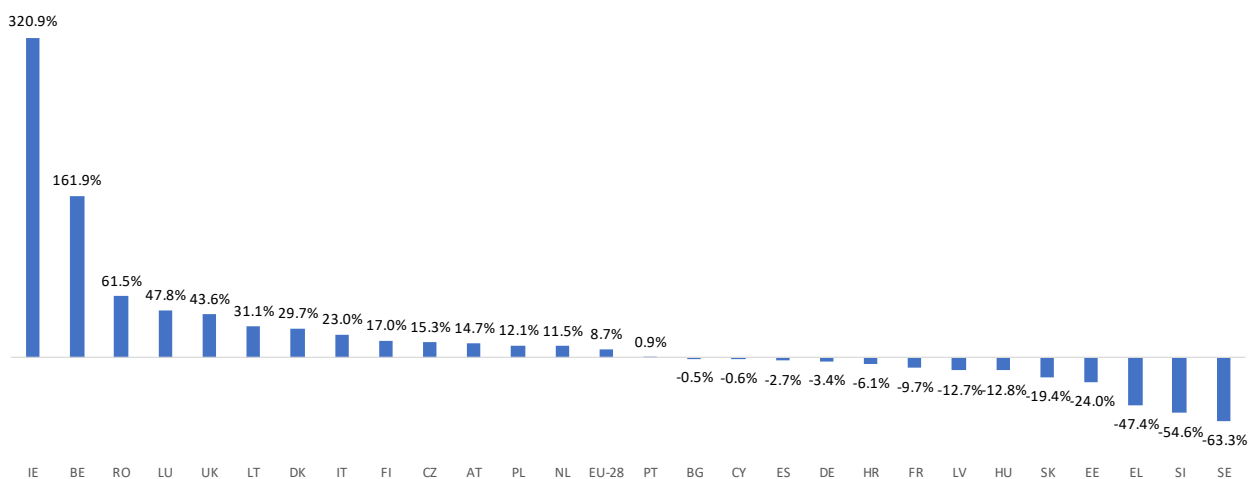
Source: Eurostat

Figure 134 Change (in %) from 2013 to 2016 of SME profitability in electricity, gas, steam and air-conditioning supply in EU Member States



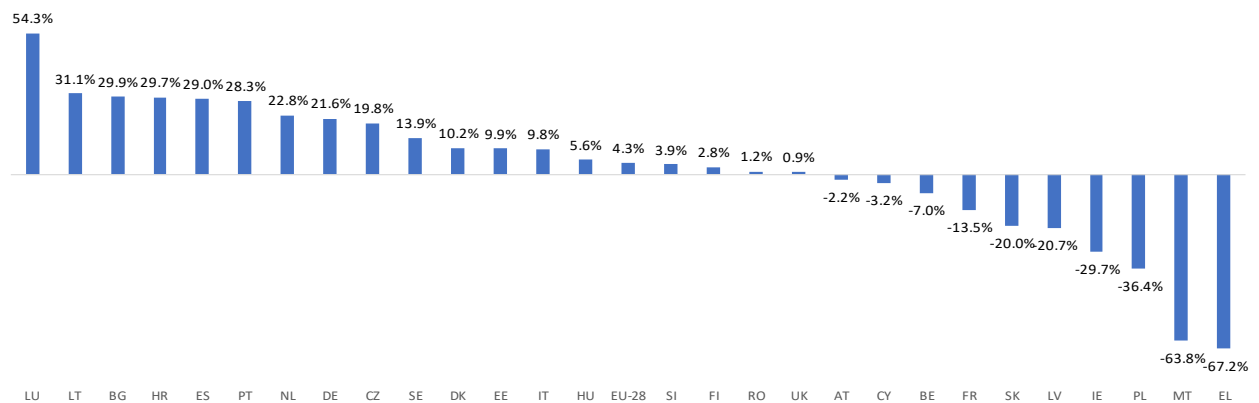
Source: Eurostat

Figure 135 Change (in %) from 2013 to 2016 of SME profitability in water supply, sewerage, waste management and remediation in EU Member States



Source: Eurostat

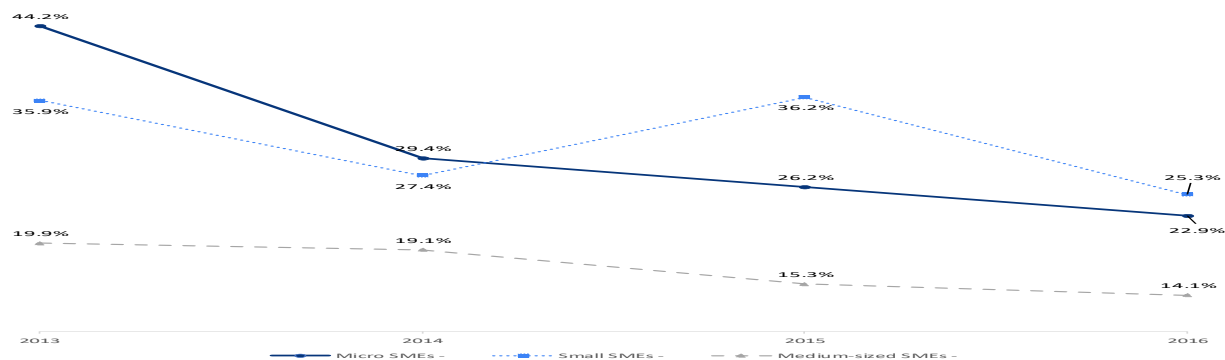
Figure 136 Change (in %) from 2013 to 2016 of SME profitability in construction in EU Member States



Source: Eurostat

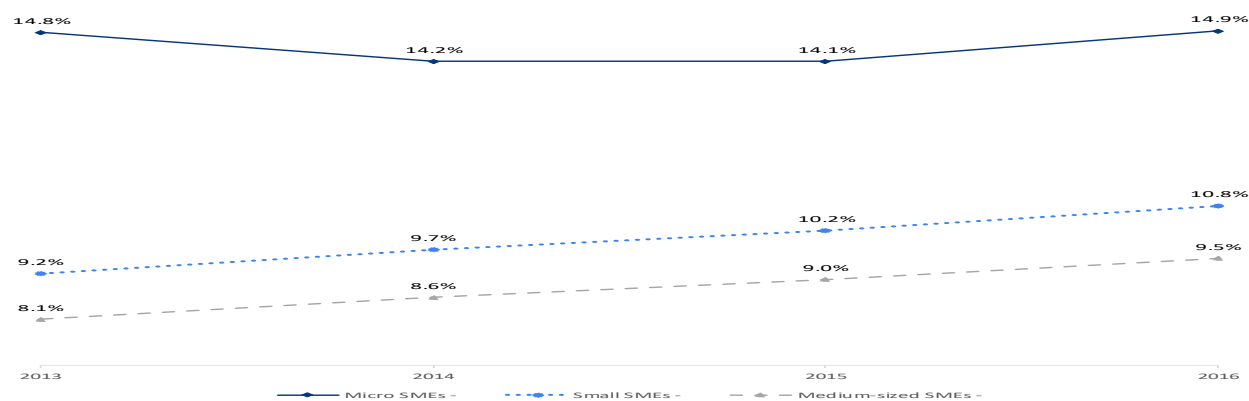
ANNEX 11: LEVEL OF MICRO, SMALL AND MEDIUM-SIZED SME PROFITABILITY IN VARIOUS INDUSTRIES IN EU – 2013 TO 2016

Figure 137 Level of SME profitability by SME size class in EU-28 mining and quarrying – 2013-2016



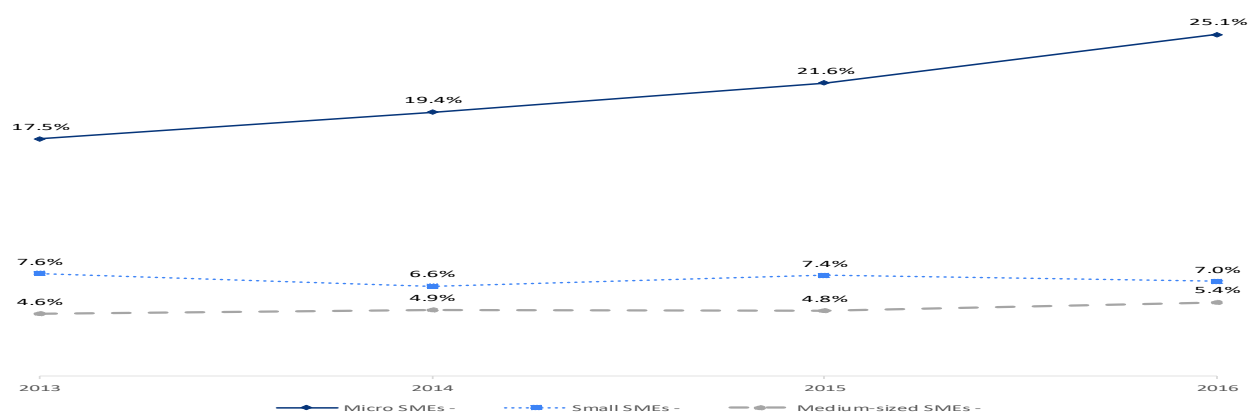
Source: Eurostat

Figure 138 Level of SME profitability by SME size class in EU-28 manufacturing – 2013-2016



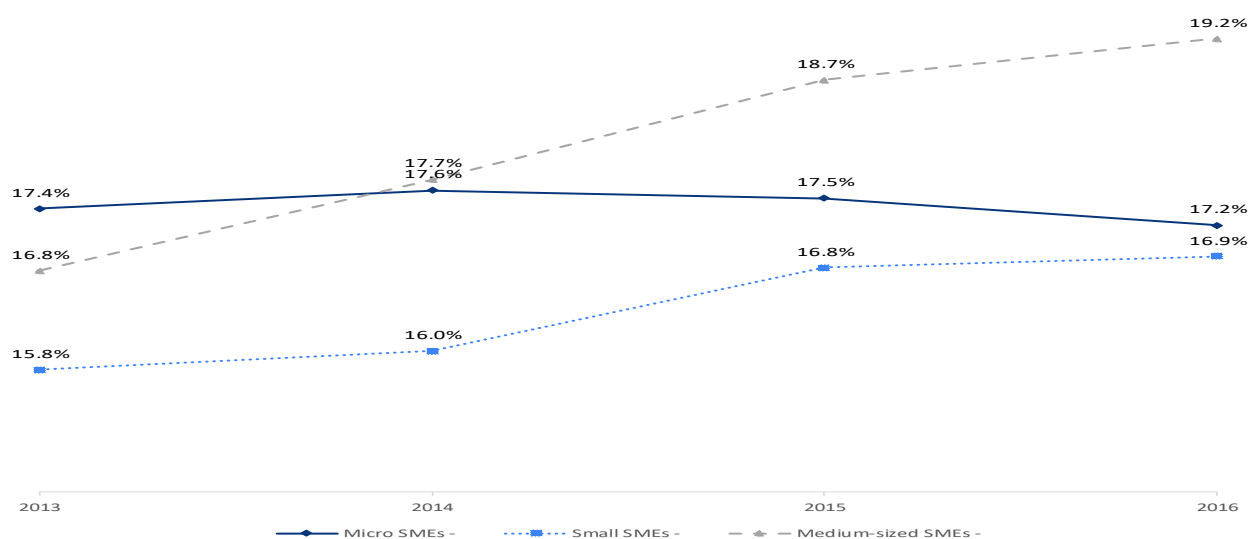
Source: Eurostat

Figure 139 Level of SME profitability by SME size class in EU-28 electricity, gas, steam and air-conditioning supply – 2013-2016



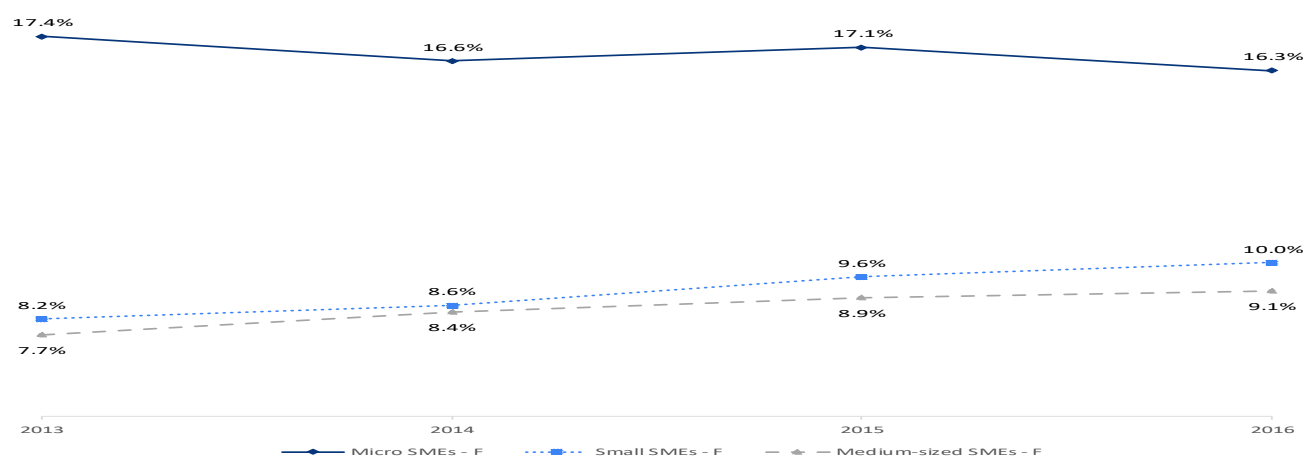
Source: Eurostat

Figure 140 Level of SME profitability by SME size class in EU-28 water supply, sewerage, waste management and remediation – 2013-2016



Source: Eurostat

Figure 141 Level of SME profitability by SME size class in EU-28 construction – 2013-2016



Source: Eurostat

ANNEX 12: ANNUAL GROWTH (IN %) IN APPARENT SME LABOUR PRODUCTIVITY BY SME SIZE CLASS IN 2017 AND 2018

	SME apparent labour productivity growth 2017					SME apparent labour productivity growth 2018			
	Micro SMEs	Small SMEs	Medium-sized SMEs	All SMEs		Micro SMEs	Small SMEs	Medium-sized SMEs	All SMEs
AT	0.9%	2.5%	1.4%	1.6%		0.8%	2.1%	1.0%	1.3%
BE	5.4%	8.1%	0.7%	5.1%		1.7%	6.2%	-0.3%	2.5%
BG	6.6%	8.7%	1.1%	5.3%		15.8%	19.7%	4.1%	13.1%
CY	3.4%	5.2%	0.7%	3.1%		3.6%	5.6%	0.7%	3.4%
CZ	11.8%	13.2%	3.5%	9.1%		9.7%	6.6%	3.2%	6.3%
DE	1.9%	1.5%	1.1%	1.4%		4.4%	3.0%	1.6%	2.9%
DK	1.5%	-0.2%	-2.9%	-0.6%		3.8%	0.5%	1.8%	2.0%
EE	2.7%	7.2%	5.6%	4.8%		11.8%	9.9%	8.0%	9.8%
EL	-5.7%	16.4%	12.8%	2.8%		-4.7%	34.3%	20.3%	9.3%
ES	6.3%	2.3%	4.2%	4.4%		2.0%	-0.9%	0.8%	0.6%
EU-28	2.5%	2.4%	1.8%	2.1%		2.7%	2.4%	1.8%	2.2%
FI	4.0%	6.2%	9.8%	6.7%		1.1%	2.2%	2.3%	2.1%
FR	1.5%	3.7%	0.1%	1.5%		0.6%	2.0%	-0.3%	0.6%
HR	6.4%	0.5%	-0.1%	2.3%		4.3%	3.1%	6.3%	4.5%
HU	16.4%	10.3%	10.4%	12.8%		7.7%	8.8%	6.3%	7.6%
IE	14.2%	2.2%	-2.0%	6.6%		11.2%	-0.4%	-3.5%	4.6%
IT	1.4%	-0.9%	3.1%	0.9%		1.8%	-1.0%	1.7%	0.7%
LT	9.7%	7.2%	6.7%	7.2%		14.1%	8.3%	6.0%	8.6%
LU	-0.4%	-0.5%	-2.5%	-1.1%		4.6%	6.2%	4.6%	5.2%
LV	4.8%	2.8%	4.7%	4.8%		9.9%	14.9%	8.7%	10.8%
MT	14.9%	17.0%	5.4%	13.3%		2.7%	3.1%	-0.3%	2.5%
NL	1.5%	4.0%	3.6%	3.1%		2.1%	4.5%	4.1%	3.6%
PL	15.2%	18.7%	8.7%	11.5%		13.0%	5.9%	5.6%	7.8%
PT	4.9%	3.4%	2.2%	3.8%		0.0%	3.4%	1.5%	1.2%
RO	13.0%	8.1%	3.6%	7.9%		18.8%	10.7%	6.4%	11.7%
SE	1.2%	1.1%	0.4%	0.9%		-2.8%	-3.0%	-3.1%	-2.9%
SI	9.6%	2.0%	3.1%	5.3%		7.1%	8.1%	6.2%	6.9%
SK	1.9%	-3.5%	0.8%	-0.7%		9.0%	-1.2%	2.2%	3.6%
UK	-0.7%	-1.7%	-1.2%	-1.1%		2.7%	2.1%	1.6%	2.2%

Source: Eurostat, DIW Econ

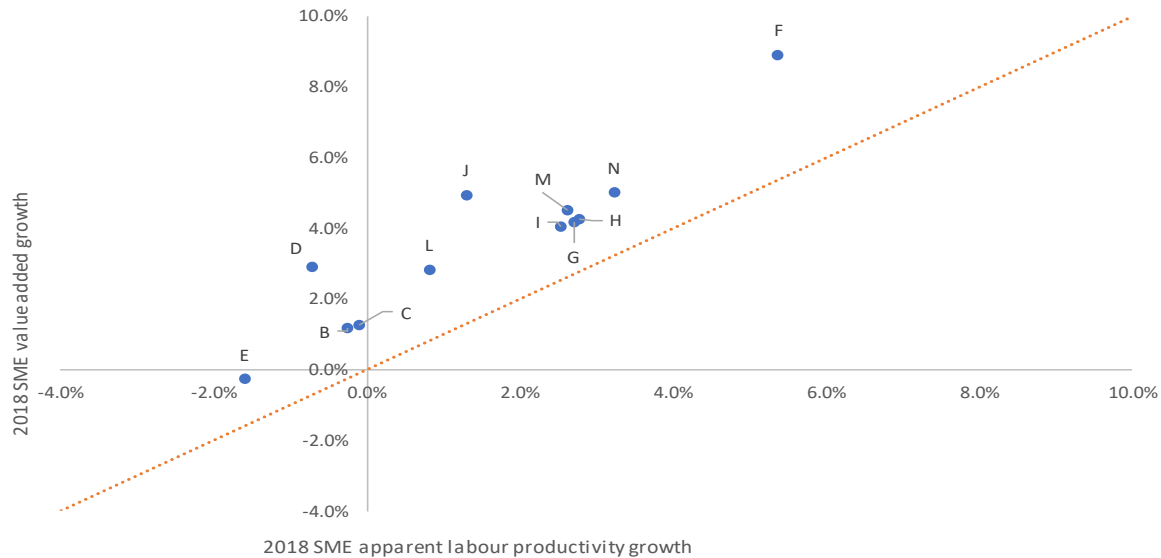
ANNEX 13: ANNUAL GROWTH (IN %) IN APPARENT SME LABOUR PRODUCTIVITY BY TECHNOLOGY AND KNOWLEDGE INTENSITY IN 2017 AND 2018

	SME apparent labour productivity growth 2017					SME apparent labour productivity 2018				
	Low-tech	Medium-tech	High-tech	Less knowledge-intensive	Knowledge-intensive	Low-tech	Medium-tech	High-tech	Less knowledge-intensive	Knowledge-intensive
AT	2.4%	1.4%	0.7%	1.7%	0.9%	-1.5%	-0.3%	0.9%	2.2%	1.1%
BE	1.9%	0.5%	5.7%	5.6%	11.3%	0.9%	2.5%	-1.5%	1.4%	2.7%
BG	1.5%	-2.2%	-18.5%	5.3%	4.6%	6.6%	11.4%	14.2%	19.4%	14.7%
CY	4.0%	0.8%	4.9%	-0.1%	6.0%	1.9%	5.0%	1.1%	2.8%	0.9%
CZ	5.8%	5.8%	5.0%	12.5%	8.8%	1.1%	1.4%	1.8%	7.5%	5.9%
DE	3.4%	2.2%	1.3%	1.3%	-0.6%	-1.9%	-0.7%	0.2%	2.7%	1.8%
DK	1.2%	-0.4%	0.7%	0.3%	-6.2%	3.5%	5.3%	3.0%	0.8%	3.0%
EE	7.4%	1.2%	3.2%	3.3%	6.8%	13.0%	14.4%	11.2%	7.2%	10.8%
EL	6.3%	1.5%	1.6%	3.5%	6.1%	8.8%	14.1%	16.0%	10.5%	5.5%
ES	2.9%	1.5%	3.7%	5.4%	2.7%	0.4%	1.8%	0.3%	0.2%	2.8%
EU28	2.6%	2.0%	1.5%	2.4%	2.4%	-1.0%	0.2%	1.0%	2.3%	2.6%
FI	6.2%	6.2%	1.9%	6.8%	5.0%	-0.3%	-0.3%	3.6%	1.0%	2.8%
FR	-1.7%	0.4%	-0.3%	3.1%	1.5%	-2.9%	-2.0%	-1.2%	0.8%	2.6%
HR	-23.7%	6.2%	2.3%	0.6%	7.0%	-3.6%	0.2%	4.0%	11.5%	-1.1%
HU	9.8%	12.4%	3.1%	11.7%	15.2%	1.8%	1.9%	1.7%	7.3%	0.6%
IE	16.8%	21.6%	29.7%	4.5%	17.8%	-6.0%	-8.0%	-8.6%	4.4%	10.8%
IT	1.2%	0.8%	1.7%	1.7%	0.1%	-2.2%	-1.4%	-0.7%	2.2%	-1.0%
LT	7.7%	0.9%	-4.1%	5.7%	5.3%	-2.5%	3.6%	11.5%	11.3%	6.8%
LU	-3.5%	-8.4%	-5.2%	1.8%	-8.6%	2.2%	7.4%	3.8%	4.9%	6.3%
LV	3.4%	5.8%	4.0%	3.2%	3.5%	7.2%	7.2%	12.6%	7.8%	12.9%
MT	13.0%	10.9%	-0.1%	9.2%	12.4%	18.8%	20.7%	20.8%	2.1%	4.0%
NL	3.6%	3.2%	4.8%	3.7%	2.6%	0.6%	1.0%	0.1%	3.9%	4.2%
PL	8.8%	9.1%	9.3%	12.3%	11.8%	5.7%	6.1%	6.2%	5.9%	4.6%
PT	1.3%	4.9%	-0.2%	5.9%	2.6%	-1.0%	0.8%	0.0%	1.3%	2.3%
RO	7.3%	3.4%	2.7%	8.5%	9.3%	6.0%	8.7%	15.2%	7.5%	16.4%
SE	7.1%	6.9%	4.8%	0.6%	-2.6%	1.1%	1.4%	2.6%	-2.8%	-2.3%
SI	3.6%	1.7%	2.7%	5.4%	7.7%	3.0%	6.0%	4.2%	8.8%	5.6%
SK	-9.6%	-9.1%	-7.8%	-1.2%	-1.2%	-1.2%	-1.6%	3.5%	4.5%	-0.6%
UK	2.2%	-0.8%	-5.4%	-2.8%	6.2%	-3.1%	-0.2%	4.4%	2.0%	3.9%

Source: Eurostat, DIW Econ

ANNEX 14: ANNUAL GROWTH IN SME LABOUR PRODUCTIVITY AND VALUE ADDED IN DIFFERENT EU-28 INDUSTRIES

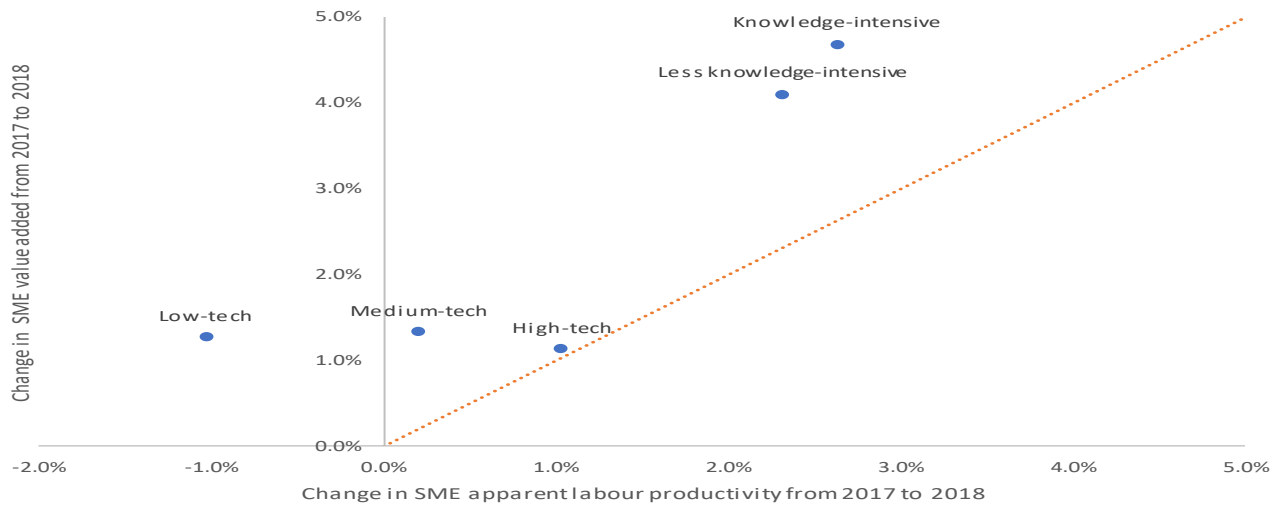
Figure 142 Annual growth in EU-28 SME value added and apparent labour productivity (in %) in various industries in EU-28 in 2018



Notes: industry B = 'mining and quarrying', industry C = 'manufacturing', industry D = 'electricity, gas, steam and air conditioning supply' , industry E = 'water supply, sewerage, waste management and remediation', industry F = 'construction', industry G = 'wholesale and retail trade; repair of motor vehicles and motorcycles', industry H = 'transportation and storage', industry I = 'accommodation and food services', industry J = 'information and communication', industry L = 'real estate activities', industry M = 'professional, scientific and technical activities', industry N = 'administrative and support service activities'

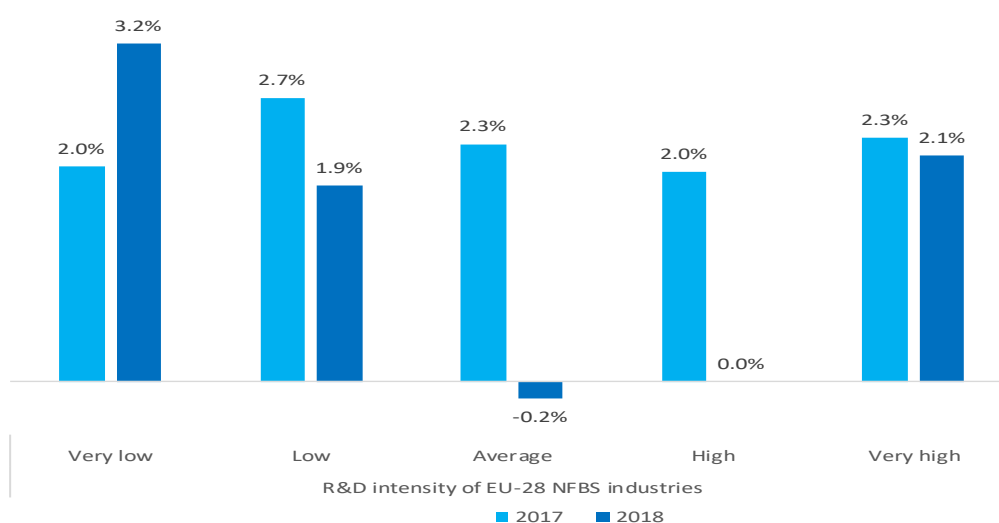
Source: Eurostat, National Statistical Offices, DIW Econ

Figure 143 Annual growth in EU-28 SME value added and apparent labour productivity (in %) in EU-28 industries of various technology and knowledge intensities from 2017 to 2018



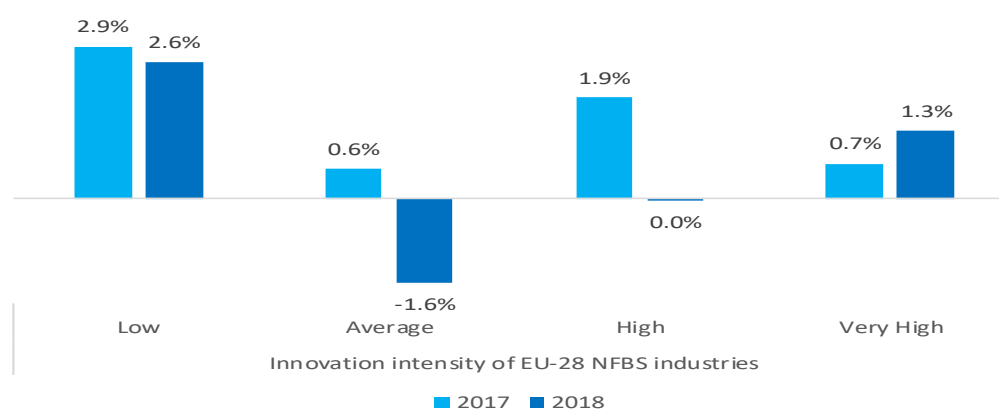
Source: Eurostat, National Statistical Offices, DIW Econ

Figure 144 Annual growth in EU-28 SME value added and apparent labour productivity (in %) in EU-28 industries of various R&D intensities in 2018



Source: Eurostat, National Statistical Offices, DIW Econ

Figure 145 Annual growth in EU-28 SME value added and apparent labour productivity (in %) in EU-28 industries of various innovation intensities in 2018



Source: Eurostat, National Statistical Offices, DIW Econ

ANNEX 15: SME CONTRIBUTION TO CHANGE IN NFBS VALUE ADDED AND EMPLOYMENT FROM 2013 TO 2018 BY MEMBER STATE

	SME contribution to change in NFBS value added from 2013 to 2018	SME contribution to change in NFBS employment from 2013 to 2018
AT	63.9%	70.8%
BE	73.9%	46.8%
BG	66.1%	81.7%
CY	77.6%	82.4%
CZ	58.8%	34.0%
DE	60.7%	74.5%
DK	57.5%	53.7%
EE	81.5%	93.2%
ES	58.4%	62.9%
EU-28	50.7%	65.7%
FI	54.2%	123.5%
FR	39.1%	82.4%
HR	75.0%	88.4%
HU	55.3%	54.1%
IE	27.6%	63.2%
IT	60.9%	42.3%
LT	69.5%	78.0%
LU	54.7%	53.8%
LV	73.5%	88.1%
MT	87.1%	65.6%
NL	66.8%	51.0%
PL	57.2%	54.5%
PT	71.8%	71.0%
RO	61.7%	56.5%
SE	82.0%	61.4%
SI	67.6%	64.8%
SK	43.2%	89.9%
UK	28.7%	59.1%

Source: Eurostat, National Statistical Offices, DIW Econ

ANNEX 16: THE PERFORMANCE OF SMEs IN SELECTED COUNTRIES IN 2016, 2017 AND 2018

	Annual growth of					
	SME value added in			SME employment in		
	2016	2017	2018	2016	2017	2018
Albania	7.5%	9.6%	-	11.8%	3.3%	-
Bosnia and Herzegovina	7.1%	-	-	5.3%	-	-
Brazil	-	-	-	-	-	-
EU-28	2.0%	3.8%	4.1%	3.9%	1.7%	1.8%
Iceland	25.6%	17.3%	-	13.4%	2.8%	-
Japan	11.8%	-3.4%	-	-0.7%	-0.2%	1.3%
Moldova	-5.7%	29.9%	-	-1.9%	2.4%	-
North Macedonia	8.2%	3.3%	-	3.9%	1.1%	-
Russia	-	-	-	-5.5%	-	-
Serbia	8.9%	12.1%	-	4.5%	3.2%	-
Turkey	23.5%	-2.1%	-	13.2%	3.4%	-
Ukraine	18.1%	20.2%	-	0.3%	1.6%	-
USA	-6.9%	9.6%	-	1.4%	-	-

	Annual growth of		
	number of SMEs		
	2016	2017	2018
Albania	10.4%	-1.3%	-
Bosnia and Herzegovina	2.2%	-	-
Brazil	-	-	-
EU-28	3.9%	1.5%	2.0%
Iceland	11.6%	0.3%	-
Japan	-2.5%	-	-
Moldova	-1.1%	2.1%	-
North Macedonia	1.3%	-0.1%	-
Russia	24.9%	-	-
Serbia	4.6%	2.1%	-
Turkey	10.8%	3.9%	-
Ukraine	-5.7%	-4.6%	-
USA	-0.2%	-1.3%	-

Note: “-” = data not available.

Source: National Statistical Agencies, DIW Econ

ANNEX 17: GAZELLES' SHARE OF ENTERPRISES AND EMPLOYMENT IN ENTERPRISE POPULATION OF 10 OR MORE EMPLOYEES IN BUSINESS ECONOMY OF SELECTED MEMBER STATES

	Share of enterprises					Share of employment			
	2013	2014	2015	2016		2013	2014	2015	2016
CZ	0.90	0.87	0.94	0.85		1.23	1.39	1.39	1.37
EE	3.12	4.26	3.61	:		3.79	4.68	4.31	:
ES	0.69	0.74	0.80	0.92		:	:	:	:
FR	0.81	0.66	0.68	0.66		:	:	:	:
IT	0.68	0.69	0.76	0.80		0.84	0.79	0.94	0.93
LV	1.73	2.18	1.81	1.78		1.04	4.79	3.77	3.26
LT	:	2.01	2.00	1.91		:	3.41	3.45	3.20
LU	1.22	1.06	1.04	0.85		:	:	:	:
HU	1.05	1.15	1.14	3.26		1.54	1.50	1.64	4.63
PT	1.01	0.83	0.93	1.10		1.26	1.18	1.30	1.40
RO	0.32	0.32	0.36	0.39		0.53	0.58	0.71	0.98
SK	1.61	0.64	1.38	1.18		1.01	0.77	1.64	1.50

Note: 2015 data are shown for EE. No employment data are available for ES, FR and LU. No data are available for the Member States not shown in the table. Gazelles are high-growth enterprises that are up to five years old with average annualised growth (turnover or employment) greater than 10% per annum, over a three year period.

Source: Eurostat

ANNEX 18: LIST OF INDUSTRIES COVERED BY THE CIS SURVEY

NACE Rev 2 level 1 industry	NACE Rev 2 level 2 industry
Mining and quarrying	All industries in mining and quarrying
Manufacturing	Manufacture of textiles, wearing apparel, leather and related products
	Manufacture of food products, beverages and tobacco
	Manufacture of wood, paper, printing and reproduction
	Manufacture of chemicals and chemical products
	Manufacture of basic pharmaceutical products and pharmaceutical preparations
	Manufacture of petroleum, chemical, pharmaceutical, rubber and plastic products
	Manufacture of other non-metallic mineral products
	Manufacture of basic metals
	Manufacture of fabricated metal products, except machinery and equipment
	Manufacture of computer, electronic and optical products
	Manufacture of fabricated metal products (except machinery and equipment), computer, electronic and optical products, electrical equipment, motor vehicles and other transport equipment
	Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment
Electricity, gas, steam and air conditioning supply	All industries
Water supply, sewerage, waste management and remediation activities	Water collection, treatment and supply
	Sewerage, waste management, remediation activities
Wholesale and retail trade, repair of motor vehicles and motorcycles	Wholesale trade, except of motor vehicles and motorcycles
Transportation and storage	Land transport and transport via pipelines, water transport and air transport
	Warehousing and support activities for transportation and postal and courier activities
Information and communication	Publishing activities
	Telecommunications
	Computer programming, consultancy and related activities
	Information service activities
Financial and insurance activities	Financial service activities, except insurance and pension funding
	Insurance, reinsurance and pension funding, except compulsory social security
	Activities auxiliary to financial services and insurance activities
Professional, scientific and technical activities	Architectural and engineering activities; technical testing and analysis
	Scientific research and development
	Advertising and market research
	Architectural and engineering activities; technical testing and analysis; Scientific research and development; Advertising and market research

Source: Metadata of Results of the community innovation survey 2016 (CIS2016) available at <https://ec.europa.eu/eurostat/web/science-technology-innovation/data/database>

ANNEX 19: INNOVATION DATA SOURCES FROM NON-EU COUNTRIES

Country	Name of survey	Survey reference years
AU	Business Characteristics Survey 2014-15 (BCS)	2014-15 (financial year)
CA	Survey on Innovation and Business Strategy 2009 (SIBS)	2010-12
CH	Survey on Innovation Activities in the Swiss economy	2012-14
CL	9th Innovation Survey	2013-14
IL	The Israel Innovation Survey, 2010-12	2010-12
JP	Japanese National Innovation Survey (J-NIS 2015)	2012-14 (fiscal years)
KR	Korean Innovation Survey	2013-15
MX	Survey of Technological R&D 2014 (ESIDET)	2012/13
NO	Eurostat Community Innovation Survey 2014 and National Innovation Survey	2012-14
NZ	Business Operation Survey (BOS)	2012-14 (financial years)
TR	Eurostat Community Innovation Survey 2014 and National Innovation Survey	2012-14
BR	Technological Innovation Survey (PINTEC)	2012-14
RU	Russian Innovation Survey	2012-14

Source : OECD Innovation Statistics databases 2017 and 2015

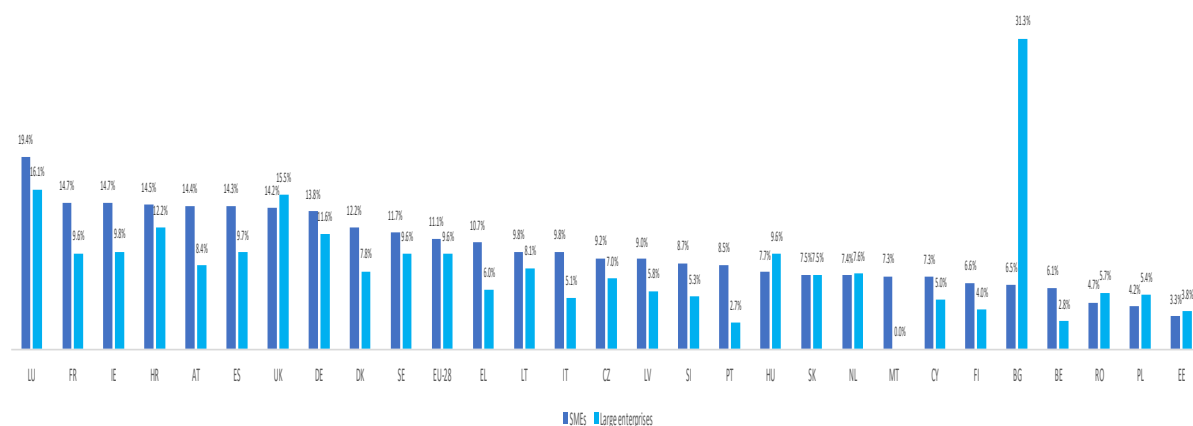
ANNEX 20: SHARES OF INNOVATING SMEs HAVING INTRODUCED DIFFERENT TYPES OF INNOVATION

Member State	Organisation and marketing only	Member State	Product and/or process only	Member State	Product and/or process and organisation and/or marketing innovation
EL	48.0%	LU	56.3%	SK	62.2%
CY	40.1%	NL	46.4%	SE	60.2%
DE	30.9%	IE	45.2%	ES	59.8%
BE	30.9%	FI	37.7%	HU	59.2%
BG	30.8%	AT	33.8%	PL	58.6%
AT	27.6%	RO	32.9%	RO	58.0%
UK	26.1%	EU-28	32.1%	CZ	56.8%
SE	26.1%	LT	31.9%	MT	56.7%
FI	25.8%	PT	31.1%	DK	56.3%
PT	25.7%	LV	31.0%	SI	54.9%
CZ	25.6%	ES	29.8%	UK	54.1%
LV	24.3%	FR	29.8%	BG	51.9%
HU	23.7%	IT	29.2%	EE	51.0%
IT	22.7%	PL	28.7%	FR	49.7%
HR	22.5%	HR	28.0%	HR	49.5%
DK	22.2%	EE	26.9%	DE	49.3%
EE	22.1%	SI	26.8%	IT	48.1%
LT	21.8%	BE	26.7%	EU-28	48.0%
IE	20.9%	EL	25.0%	LT	46.2%
FR	20.5%	CY	24.1%	LV	44.7%
MT	20.4%	MT	23.0%	PT	43.2%
EU-28	19.9%	DK	21.5%	BE	42.5%
SK	18.7%	DE	19.8%	NL	41.0%
SI	18.4%	UK	19.8%	AT	38.6%
PL	12.7%	SK	19.1%	LU	36.7%
NL	12.6%	CZ	17.6%	FI	36.5%
ES	10.4%	BG	17.3%	CY	35.8%
RO	9.1%	HU	17.1%	IE	33.9%
LU	7.0%	SE	13.7%	EL	27.0%

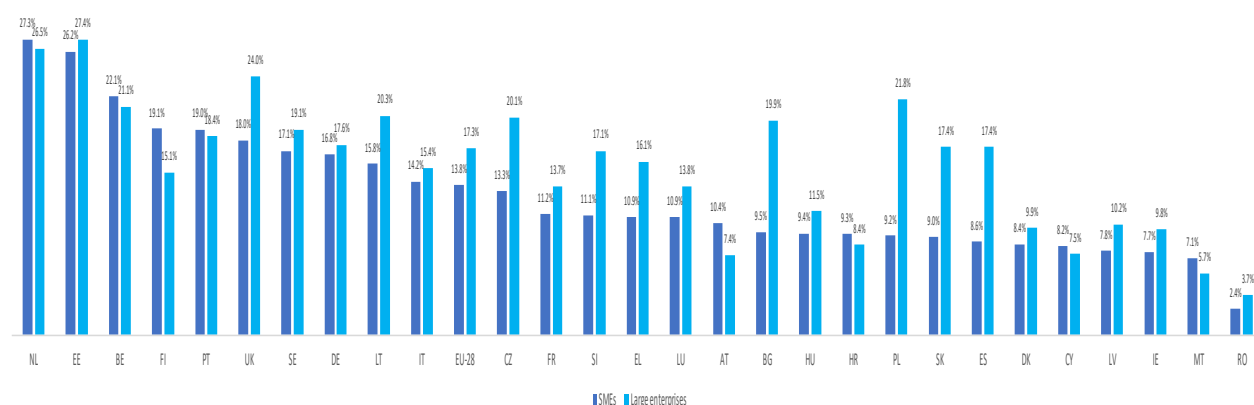
Source: Eurostat, Community Innovation Survey (CIS-2016)

ANNEX 21: SHARES OF INNOVATIVE SMEs AND LARGE ENTERPRISES HAVING INTRODUCED DIFFERENT TYPES OF INNOVATIONS

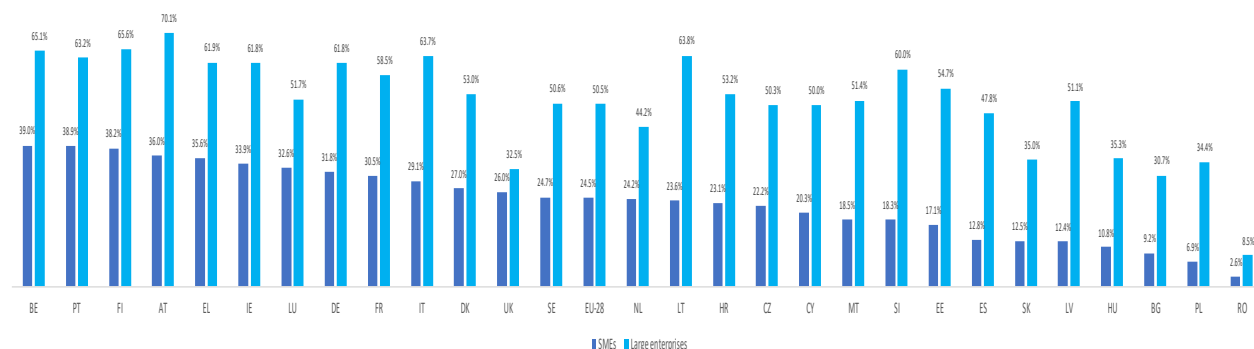
Organisation and marketing innovations only



Product and/or process innovation only



Product and/or process innovation and organisation and marketing innovation



Source: Eurostat, Community Innovation Survey (CIS-2016)

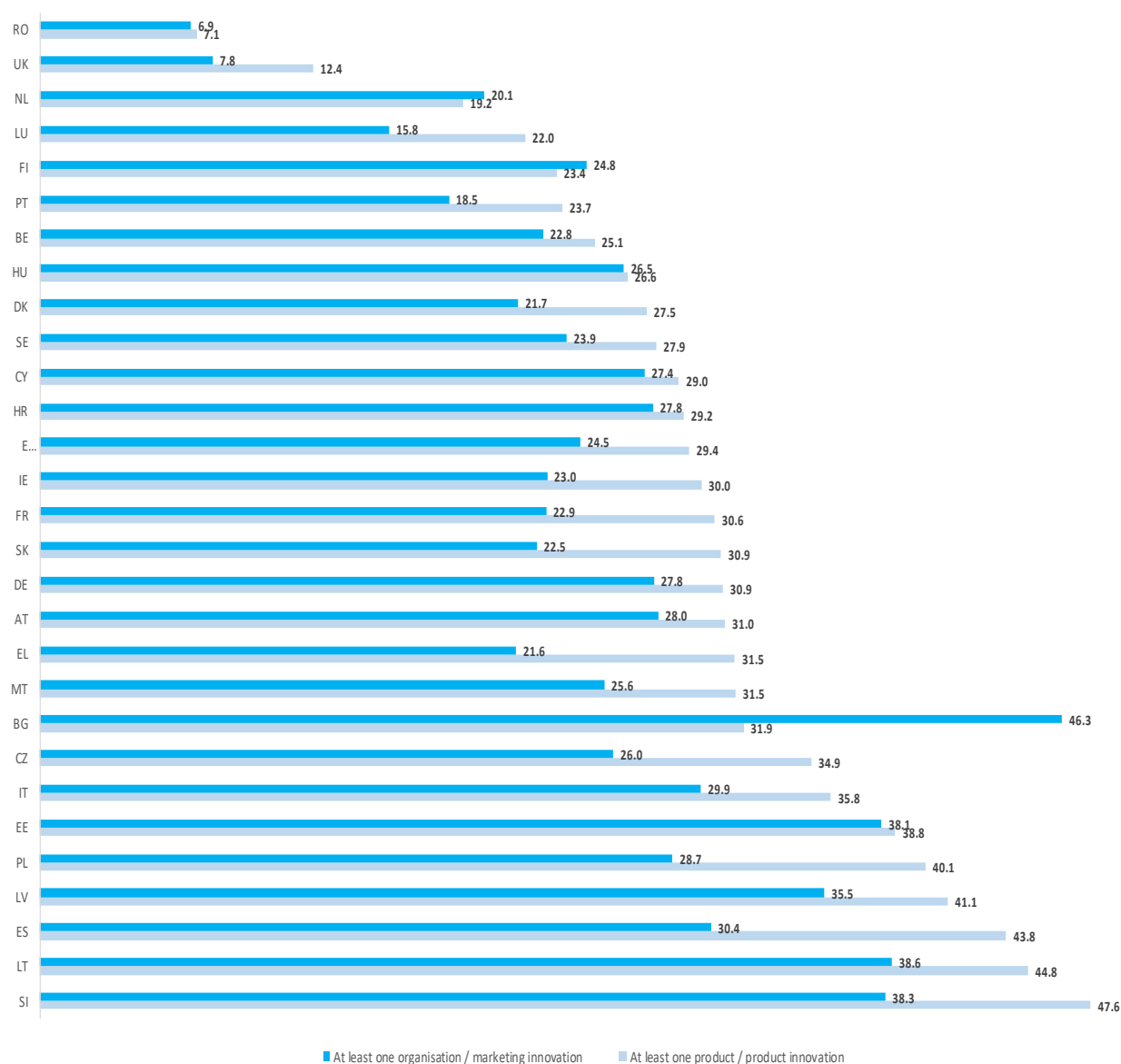
ANNEX 22: SHARES OF SMEs AND LARGE ENTERPRISES HAVING UNDERTAKEN AT LEAST ONE PRODUCT/PROCESS OR ONE ORGANISATION / MARKETING INNOVATION IN 2014 – 2016

	At least one product/process innovation		At least one organisation/marketing innovation	
	SMEs	Large enterprises	SMEs	Large enterprises
AT	46.4%	77.4%	50.4%	78.4%
BE	61.1%	86.2%	45.1%	67.9%
BG	18.7%	50.6%	15.7%	62.0%
CY	28.5%	57.5%	27.6%	55.0%
CZ	35.4%	70.4%	31.3%	57.3%
DE	48.5%	79.5%	45.6%	73.4%
DK	35.4%	62.9%	39.2%	60.9%
EE	43.3%	82.1%	20.4%	58.5%
EL	46.5%	78.0%	46.3%	67.9%
ES	21.5%	65.2%	27.2%	57.6%
EU-28	38.3%	67.8%	35.6%	60.1%
FI	57.3%	80.7%	44.8%	69.6%
FR	41.7%	72.2%	45.2%	68.2%
HR	32.4%	61.6%	37.6%	65.4%
HU	20.2%	46.8%	18.4%	44.9%
IE	41.6%	71.6%	48.6%	71.6%
IT	43.3%	79.2%	38.9%	68.8%
LT	39.4%	84.1%	33.4%	72.0%
LU	43.5%	65.5%	52.0%	67.8%
LV	20.2%	61.3%	21.4%	56.9%
MT	25.6%	57.1%	25.9%	51.4%
NL	51.5%	70.7%	31.6%	51.7%
PL	16.1%	56.2%	11.1%	39.8%
PT	57.9%	81.6%	47.4%	65.9%
RO	5.1%	12.2%	7.4%	14.2%
SE	41.7%	69.6%	36.3%	60.2%
SI	29.5%	77.1%	27.0%	65.3%

Notes: Percentages of total population of SMEs and large enterprises. No data available for SK and UK.

Source: Eurostat, Community Innovation Survey (CIS-2016)

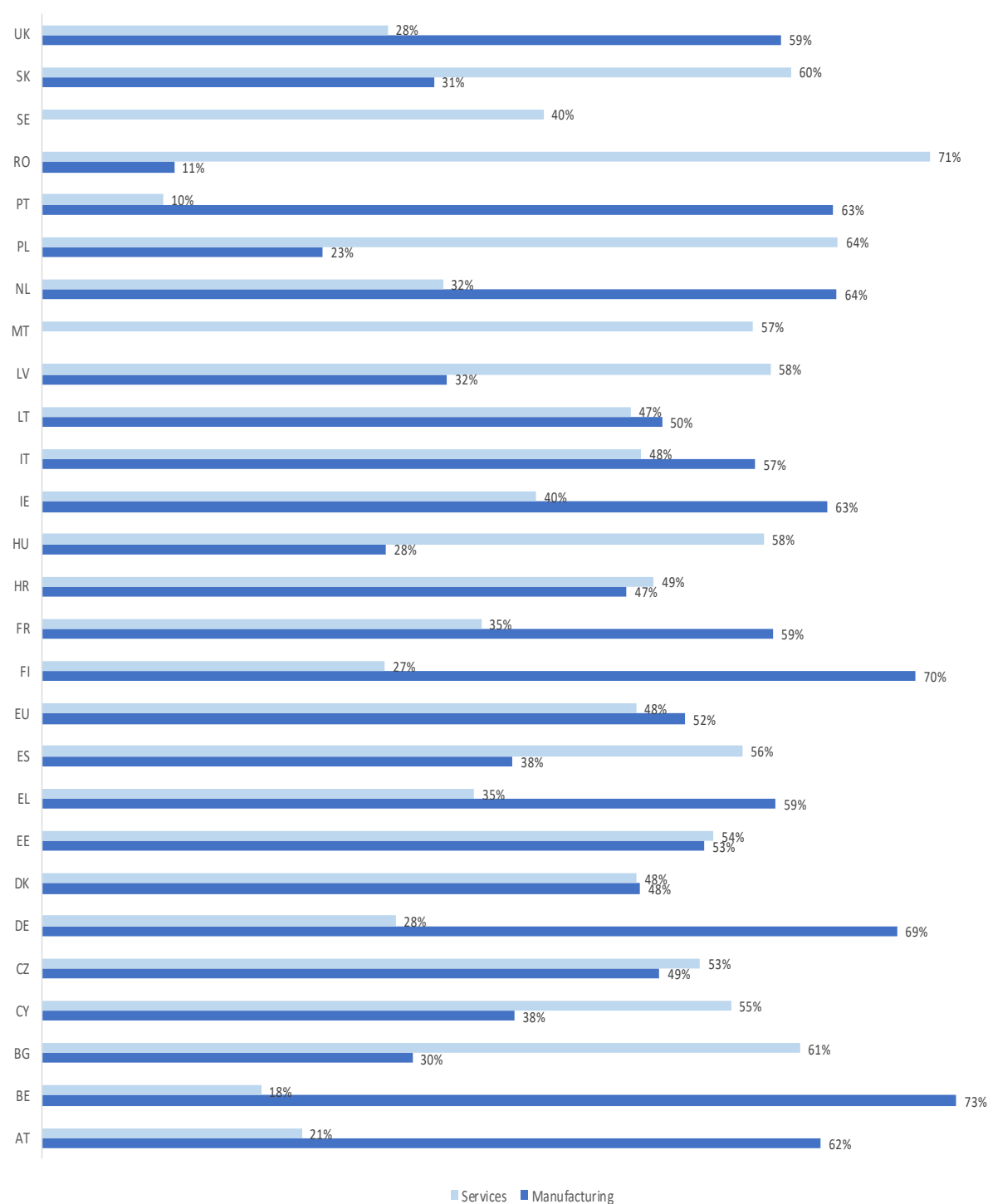
ANNEX 23: DIFFERENCE BETWEEN A) THE DIFFERENCE IN SHARES OF SMEs AND LARGE ENTERPRISES HAVING UNDERTAKEN AT LEAST ONE PRODUCT/PROCESS INNOVATION AND B) THE DIFFERENCE IN SHARES OF SMEs AND LARGE ENTERPRISES HAVING UNDERTAKEN AT LEAST ONE ORGANISATION / MARKETING INNOVATION



Notes: Percentages of total population of SMEs and large enterprises.

Source: Eurostat, Community Innovation Survey (CIS-2016)

ANNEX 24: SHARE OF INNOVATING SMEs IN MANUFACTURING AND SERVICES INDUSTRIES



Notes: Percentages of total population of SMEs and large enterprises. Because of missing data, the EU aggregate does not include LU and SI in the case of services and LU, MT, SE and SI in the case of manufacturing.

Source: Eurostat, Community Innovation Survey (CIS-2016)

ANNEX 25: MACROECONOMETRIC ANALYSIS OF DETERMINANTS OF INNOVATION ACTIVITY BY SMES – MODEL AND EXPLANATORY VARIABLES USED IN MODEL

Table 14 Potential explanatory variables

Variable	Description	Source
Structural/Cyclical		
Output gap	Output gap as a percentage of potential GDP	OECD
LT interest rate	Long-term interest rate on government bonds	OECD
ST interest rate	Short-term interest rate	OECD
High-tech exports	High-technology exports as a % of total exports	Eurostat
GDP per capita	GDP: current prices, purchasing power standard per capita	Eurostat
Unemployment	Unemployment rate: percentage of the labour force	Eurostat
Gross fixed capital formation	Index based on ratio of total gross capital formation in current local currency to GDP in current local currency.	Global Innovation Index
Quality of innovation linkages		
Uni-industry collaboration	University-industry collaboration in R&D index	IMD World Competitiveness Report
Linkages	Innovation linkages index	Global Innovation Index
Collaboration	University/industry research collaboration index	Global Innovation Index
Cluster development	State of cluster development index (geographic concentrations of firms, suppliers, producers of related products and services)	Global Innovation Index
Availability of funding		
Loan access	Ease of access to loans index	IMD World Competitiveness Report
Venture capital	Venture capital availability index	IMD World Competitiveness Report
R&D GERD	Gross expenditure on R&D (GERD) index	Global Innovation Index
Credit access	Ease of getting credit index	Global Innovation Index
Innovation infrastructure		
Top 500 universities	Top 500 universities, per million population	OECD
Research institution quality	Quality of scientific research institutions index	IMD World Competitiveness Report
Science graduates	Index of the share of all tertiary graduates in science, manufacturing, engineering, and construction in all tertiary graduates.	Global Innovation Index
ICT	Information and communication technologies (ICTs) infrastructure index	Global Innovation Index
Tertiary education	Government expenditure on education, % of GDP	Eurostat
Education	Government expenditure on tertiary education, % of GDP	Eurostat
Regulatory framework		
PMR-1	Product market regulation index: barriers to entrepreneurship, administrative burdens on start-ups	OECD
PMR-2	Product market regulation index: ease of entrepreneurship index	OECD
PMR-3	Product market regulation index: barriers to entrepreneurship, complexity of regulatory procedures	OECD
PMR-4	Product market regulation index: barriers to trade and investment, explicit barriers	OECD
IP Protection	Intellectual property protection index	IMD World Competitiveness Report
Regulatory quality	Regulatory quality	Global Innovation Index
Incentives		
SME b-index	SME tax subsidies (b-index)	OECD
Competition	Intensity of local competition index	IMD World Competitiveness Report

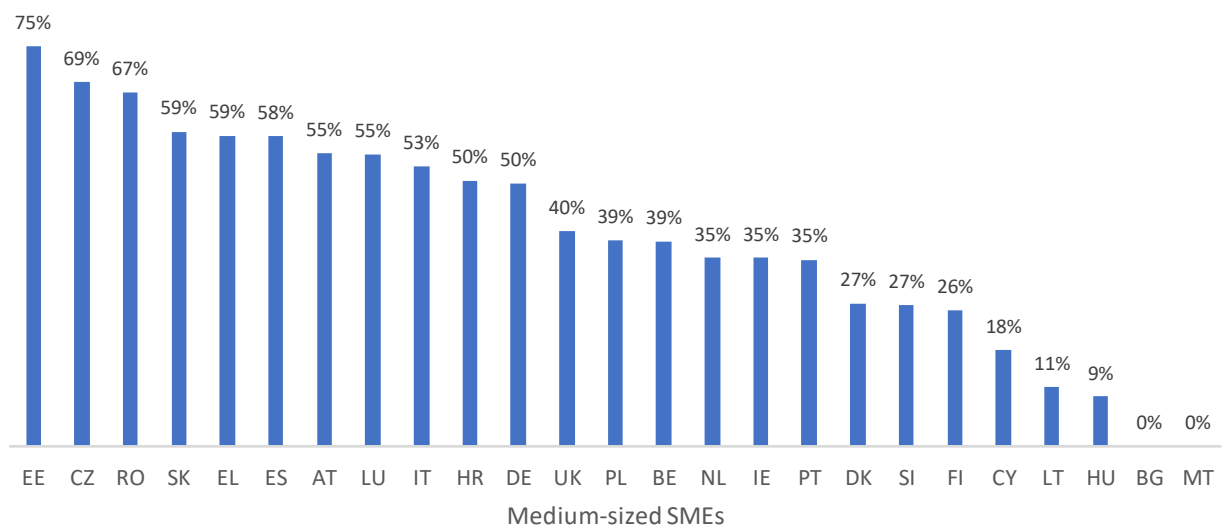
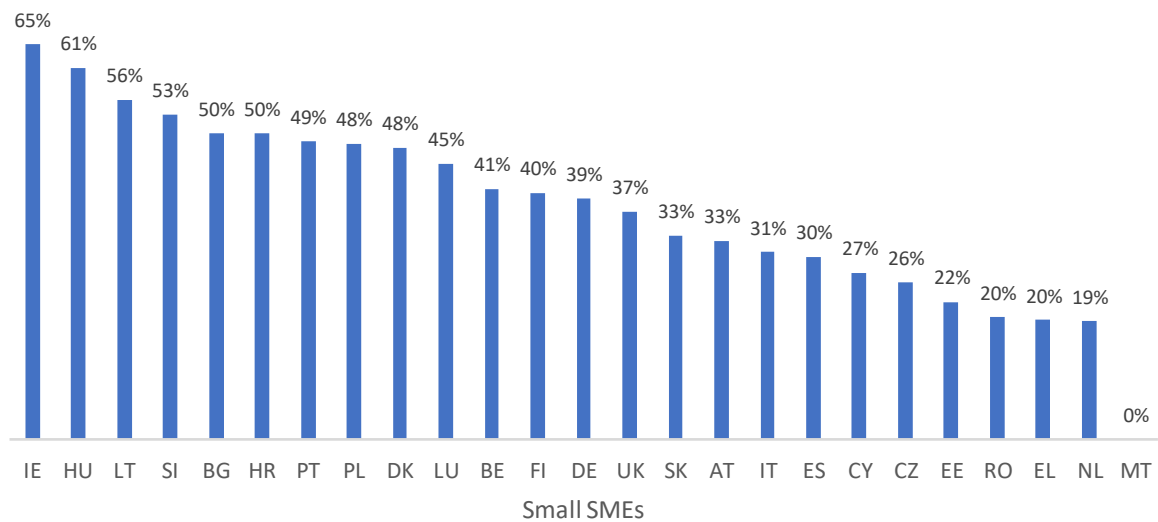
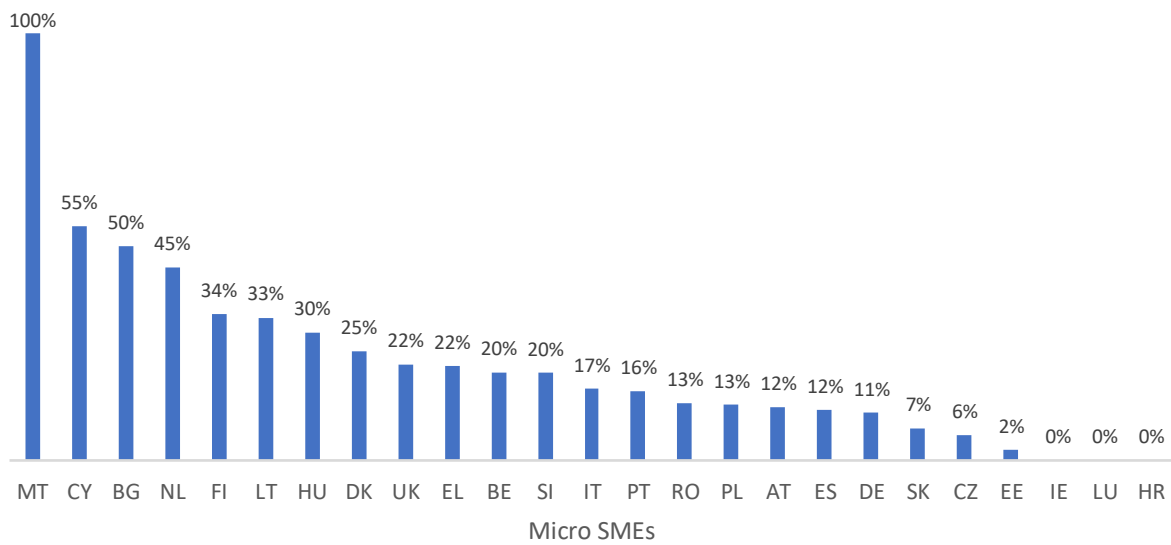
Model

The general form of the econometric model used in the analysis is shown in equation 1 below, where a, b, c, d, e and f are the coefficients which measure the impact of the various explanatory variables on the share of innovating SMEs in the SME population: 'i' refers to Member States and 't' to time.

These coefficients were estimated econometrically using a fractional response panel model, where the dependent variable is specified with a logistic function to account for non-linearities. Non-linearities result from the fact that the dependent variable (i.e. the share of innovating SMEs in the SME population) is a proportion and therefore bounded by a unit interval. The data of all three CIS waves (i.e. 2010-2012, 2012-2014 and 2014-2016) were used in the panel estimation.

$$\begin{aligned}
(EQ1) \text{SME product/process innovation}_{i,t} &= f(a * \text{Structural/cyclical factors}_{i,t} + b \\
&\quad * \text{quality of innovation linkages}_{i,t} + c \\
&\quad * \text{quality of innovation infrastructure}_{i,t} + d \\
&\quad * \text{availability of funding}_{i,t} + e \\
&\quad * \text{regulatory framework}_{i,t} + f * \text{RD\&I Incentives}_{i,t})
\end{aligned}$$

ANNEX 26: THE THREE SME SIZE CLASSES' SHARE OF GOVERNMENT FUNDING OF SME R&D EXPENDITURE



Note: no data are available for FR, LV and SI.

Source: Eurostat

ANNEX 27: SHARE OF INNOVATIVE SMEs REPORTING A BARRIER TO BE A PROBLEM IN EU MEMBER STATES IN 2016

Small SMEs

	Lack of internal finance	Lack of external finance (credit or private equity)	High costs	Lack of qualified employees within enterprise	Lack of collaboration partners	Difficulties in obtaining public grants or subsidies	Uncertain market demand	High competition	Average	Highest	Lowest	Median
CY	38.2	31.3	37.6	18.3	9.2	37.0	22.8	49.8	30.5	49.8	9.2	34.2
SI	42.8	19.1	33.2	31.2	13.5	30.6	20.9	27.9	27.4	42.8	13.5	29.3
EL	38.5	33.5	30.0	13.9	8.9	37.1	23.8	25.5	26.4	38.5	8.9	27.8
HR	39.8	20.0	33.1	20.2	12.7	32.2	21.7	24.8	25.6	39.8	12.7	23.3
PT	25.9	17.1	32.7	14.6	11.4	25.5	14.2	27.0	21.1	32.7	11.4	21.3
SK	32.0	12.7	30.6	17.0	7.6	25.2	15.5	23.9	20.6	32.0	7.6	20.5
RO	27.1	18.5	30.1	17.5	12.4	22.4	13.0	21.8	20.4	30.1	12.4	20.2
BG	24.7	13.0	30.3	15.2	8.7	26.2	14.7	21.9	19.3	30.3	8.7	18.6
LT	12.9	19.7	12.0	26.5	28.4	12.1	25.1	17.6	19.3	28.4	12.0	18.7
LV	26.6	13.8	31.7	8.2	7.7	22.5	18.0	23.6	19.0	31.7	7.7	20.3
HU	23.2	12.3	29.3	22.4	5.6	26.2	11.9	16.9	18.5	29.3	5.6	19.7
IT	20.3	19.3	10.7	23.3	6.6	10.3	28.2	22.5	17.7	28.2	6.6	19.8
AT	22.9	12.6	19.9	25.4	7.2	22.9	11.6	16.7	17.4	25.4	7.2	18.3
FR	25.9	12.8	19.0	16.6	:	:	13.6	10.8	16.5	25.9	10.8	15.1
PL	21.1	11.2	27.0	10.8	8.4	18.5	16.3	15.4	16.1	27.0	8.4	15.9
CZ	23.7	:	:	13.4	5.4	19.4	:	:	15.5	23.7	5.4	16.4
MT	15.9	8.4	14.5	18.2	5.6	12.1	11.2	22.9	13.6	22.9	5.6	13.3
EE	16.9	9.3	20.6	16.8	2.4	14.7	7.6	13.7	12.8	20.6	2.4	14.2
DE	14.1	10.1	21.1	15.7	5.2	12.5	8.6	9.2	12.1	21.1	5.2	11.3
BE	12.9	7.6	15.2	14.4	4.0	11.6	7.9	8.3	10.2	15.2	4.0	10.0
FI	14.4	7.2	12.1	12.5	2.4	9.3	8.0	9.4	9.4	14.4	2.4	9.4
LU	12.4	6.1	11.7	12.9	3.6	7.4	6.2	14.4	9.3	14.4	3.6	9.6

Medium-sized SMEs

	Lack of internal finance	Lack of external finance (credit or private equity)	High costs	Lack of qualified employees within enterprise	Lack of collaboration partners	Difficulties in obtaining public grants or subsidies	Uncertain market demand	High competition	Average	Highest	Lowest	Median
CY	29.1	26.7	36.1	18	6.2	28.5	15.5	37.5	24.7	37.5	6.2	27.6
SI	37	13.4	25.6	38	10.4	25.7	19.4	26.4	24.5	38	10.4	25.7
LT	19.8	26.1	16.2	26.9	35.9	16.5	28.9	20.9	23.9	35.9	16.2	23.5
EL	28	27.7	18.7	8.3	7.3	23.8	16.5	23.4	19.2	28	7.3	21.1
HR	24.1	10.6	26.7	14.9	9.1	22.7	14.4	19.3	17.7	26.7	9.1	17.1
RO	21.2	11.7	27.7	12.1	11.7	20.7	11.8	16.2	16.6	27.7	11.7	14.2
PT	17.9	11.7	25.8	11.1	5.8	17.5	14.6	20.7	15.6	25.8	5.8	16.1
BG	18.5	8.7	24.4	15.4	7.1	20.4	12.3	17.8	15.6	24.4	7.1	16.6
LV	19.7	7.2	27.3	7.4	4.6	19.2	14.7	17.4	14.7	27.3	4.6	16.1
PL	18.3	11.5	26.4	9.7	5.8	18.7	13.3	13.1	14.6	26.4	5.8	13.2
HU	15.6	8.1	22.7	21.1	4.8	21.2	10.3	12.7	14.6	22.7	4.8	14.2
AT	14.2	5.8	19.4	25.9	4.4	14.5	15.6	14.2	14.3	25.9	4.4	14.4
SK	25.9	7.6	18.8	11.6	2.7	17.6	9.3	13.6	13.4	25.9	2.7	12.6
FR	22.5	10.4	16.1	15	4.6	:	13.7	9.8	13.2	22.5	4.6	13.7
CZ	14.2	:	:	15.3	4	13.2	:	:	11.7	15.3	4	13.7
EE	16	6	19.5	15.2	3.1	10.9	9	13.1	11.6	19.5	3.1	12.0
IT	10.8	10.3	6.4	13.1	4.1	9.2	20.7	10.9	10.7	20.7	4.1	10.6
FI	14.4	6.1	14.1	11.8	1.9	8.3	11.1	10.1	9.7	14.4	1.9	10.6
MT	9.5	4.1	18.9	13.5	0	9.5	8.1	13.5	9.6	18.9	0	9.5
LU	13.5	2.9	11.1	11.9	2.7	7.3	8.9	13.6	9.0	13.6	2.7	10.0
DE	8.1	5.6	18	11.4	3.8	8.4	5.7	6.8	8.5	18	3.8	7.5
BE	7.3	4.9	11.6	10.9	2.4	5.9	6.8	6.1	7.0	11.6	2.4	6.5

Note: no data for DK, ES, IE, NL, SE and UK.

Source: Eurostat, Community Innovation Survey (CIS-2016)

ANNEX 28: SHARE OF SMEs CONSIDERING INNOVATING WHICH REPORT A BARRIER TO BE A PROBLEM IN EU MEMBER STATES IN 2016

Small SMEs

	Lack of internal finance	Lack of external finance (credit or private equity)	High costs	Lack of qualified employees within enterprise	Lack of collaboration partners	Difficulties in obtaining public grants or subsidies	Uncertain market demand	Low market demand	High competition	Little market competition	Lack of good ideas	Previous innovations	Average	Highest	Lowest	Median
CZ	18.1	:	:	11.1	7.8	14.3	:	:	:	:	:	:	12.8	18.1	7.8	12.7
LT	8.2	12.2	8.5	13.7	19.1	12.5	16.9	:	9.5	:	13.2	:	12.6	19.1	8.2	12.5
CY	5.3	4.3	4.7	2.1	0.9	5.0	2.1	37.5	4.5	24.7	14.1	30.9	11.3	37.5	0.9	4.9
EL	17.5	15.1	14.5	4.2	3.3	14.8	9.1	21.1	9.2	6.8	5.9	10.2	11.0	21.1	3.3	9.7
FR	14.5	8.0	14.2	11.0	5.2	:	9.7	:	10.5	:	:	:	10.4	14.5	5.2	10.5
IT	14.8	8.8	7.3	11.3	6.3	8.4	12.3	17.5	14.8	4.3	2.6	12.7	10.1	17.5	2.6	10.1
DE	7.3	6.0	12.8	9.0	4.1	6.9	4.6	17.7	8.2	7.6	7.1	9.0	8.4	17.7	4.1	7.5
SK	15.3	7.6	13.4	5.3	3.0	10.9	5.8	12.0	7.9	4.5	4.6	7.6	8.2	15.3	3.0	7.6
PT	8.9	7.6	9.3	4.1	3.6	7.4	5.5	13.6	6.7	5.5	5.7	12.6	7.5	13.6	3.6	7.1
EE	9.6	6.3	9.8	4.8	4.0	7.2	3.9	13.1	7.5	4.8	8.0	9.5	7.4	13.1	3.9	7.4
BG	8.4	4.8	9.3	5.8	3.1	7.1	5.4	12.2	6.2	3.8	8.3	5.1	6.6	12.2	3.1	6.0
LV	7.2	3.6	7.1	2.9	1.9	5.8	3.4	14.4	3.6	5.6	11.4	12.4	6.6	14.4	1.9	5.7
SI	8.1	4.1	7.5	5.1	3.0	5.1	3.3	14.9	4.4	5.9	6.7	9.7	6.5	14.9	3.0	5.5
HU	7.0	3.3	7.2	5.4	2.1	5.9	3.0	18.0	3.8	4.8	6.0	7.6	6.2	18.0	2.1	5.7
HR	8.4	5.4	7.7	3.9	5.2	5.5	3.2	9.7	3.9	3.6	5.3	6.7	5.7	9.7	3.2	5.4
PL	7.1	5.5	8.0	3.7	2.9	5.7	4.4	5.7	4.8	4.3	9.2	5.7	5.6	9.2	2.9	5.6
RO	5.1	3.8	6.0	2.8	3.7	2.9	3.4	10.0	4.1	2.5	5.9	7.6	4.8	10.0	2.5	4.0
LU	3.3	2.9	0	1.7	0.5	1.1	1.1	17.3	3.0	3.9	5.9	9.7	4.2	17.3	0.0	3.0
AT	4.7	3.2	4.8	3.2	1.9	4.3	3.0	:	3.9	:	:	:	3.6	4.8	1.9	3.6
MT	1.6	1.4	2.2	1.2	0.6	1.6	1.2	7.4	1.4	1.6	0.8	4.6	2.1	7.4	0.6	1.5
SE	:	:	:	:	:	:	:	11.3	:	:	:	:				

Note: no data for DK, ES, IE, NL and UK

Source: Eurostat, Community Innovation Survey (CIS-2016)

Medium-sized SMEs

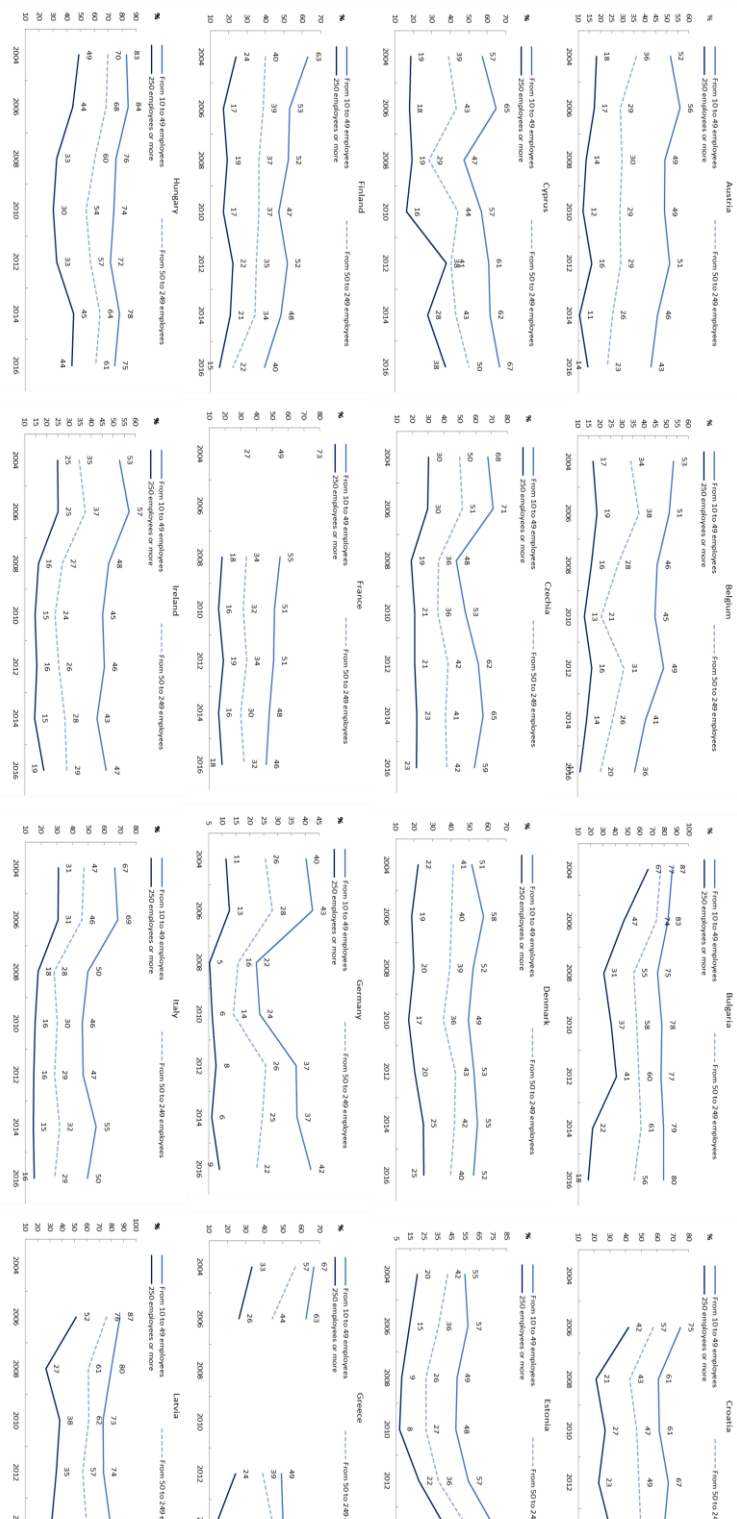
	Lack of internal finance	Lack of external finance (credit or private equity)	High costs	Lack of qualified employees within enterprise	Lack of collaboration partners	Difficulties in obtaining public grants or subsidies	Uncertain market demand	Low market demand	High competition	Little market competition	Lack of good ideas	Previous innovations	Average	Highest	Lowest	Median
LT	15.6	14.1	9.5	15.3	23.9	14.5	19.8	:	11.8	:	14.1	:	15.4	23.9	9.5	14.5
FR	14.1	:	11.7	:	:	:	:	:	6.8	:	:	:	10.9	14.1	6.8	11.7
EL	12.7	11.3	:	2.7	4.9	:	7.5	20.4	:	9.6	:	:	9.9	20.4	2.7	9.6
CY	3.8	2.3	2.3	2.3	0.8	2.3	0.8	38.0	1.5	18.0	12.1	23.8	9.0	38.0	0.8	2.3
CZ	15.1	:	:	7.3	4.4	8.0	:	:	:	:	:	:	8.7	15.1	4.4	7.7
IT	11.1	9.8	3.0	8.2	2.9	4.7	6.6	18.0	11.1	5.4	6.9	15.2	8.6	18.0	2.9	7.6
SK	12.5	7.4	11.7	5.1	2.5	7.9	5.7	16.2	4.9	7.2	5.6	10.3	8.1	16.2	2.5	7.3
PT	9.0	7.4	8.7	2.8	2.4	:	:	12.7	:	2.6	:	13.4	7.4	13.4	2.4	8.1
SI	:	:	7.6	:	4.1	5.9	:	14.0	3.4	8.4	:	:	7.2	14.0	3.4	6.8
DE	5.2	5.1	11.5	5.8	4.4	5.4	5.5	12.3	8.0	3.7	6.4	10.2	7.0	12.3	3.7	5.7
HR	12.5	8.4	9.9	5.6	6.2	6.7	5.7	7.1	3.8	4.5	5.8	6.5	6.9	12.5	3.8	6.4
BG	8.0	4.2	10.3	5.7	2.4	6.8	5.1	11.4	5.6	3.7	7.5	6.0	6.4	11.4	2.4	5.9
HU	8.0	4.6	7.8	5.5	2.0	5.5	3.6	19.3	3.5	4.7	4.1	7.2	6.3	19.3	2.0	5.1
EE	4.4	2.6	6.1	4.4	2.2	2.6	3.1	10.1	5.7	4.4	10.1	10.5	5.5	10.5	2.2	4.4
RO	6.5	5.0	8.2	3.4	4.5	4.0	3.9	9.3	5.0	3.4	5.3	7.7	5.5	9.3	3.4	5.0
PL	6.6	5.1	7.9	3.5	2.8	5.1	4.4	5.5	4.7	4.5	8.0	6.8	5.4	8.0	2.8	5.1
LV	3.7	2.2	5.0	1.7	1.4	4.8	2.6	9.3	2.6	3.9	4.7	11.7	4.5	11.7	1.4	3.8
LU	4.0	1.2	0	2.1	0	0	0	18.4	3.0	2.0	1.8	8.3	3.4	18.4	0.0	1.9
AT	5.3	3.2	3.5	2.4	0	2.8	1.5	:	4.2	:	:	:	2.9	5.3	0.0	3.0
MT	1.2	1.2	1.2	0	0	1.2	2.4	8.4	1.2	2.4	0	12.0	2.6	12.0	0.0	1.2
SE	:	:	:	:	:	:	:	12.6	:	:	:	:				

Note: no data for DK, ES, IE, NL, SE and UK

Source: Eurostat, Community Innovation Survey (CIS-2016)

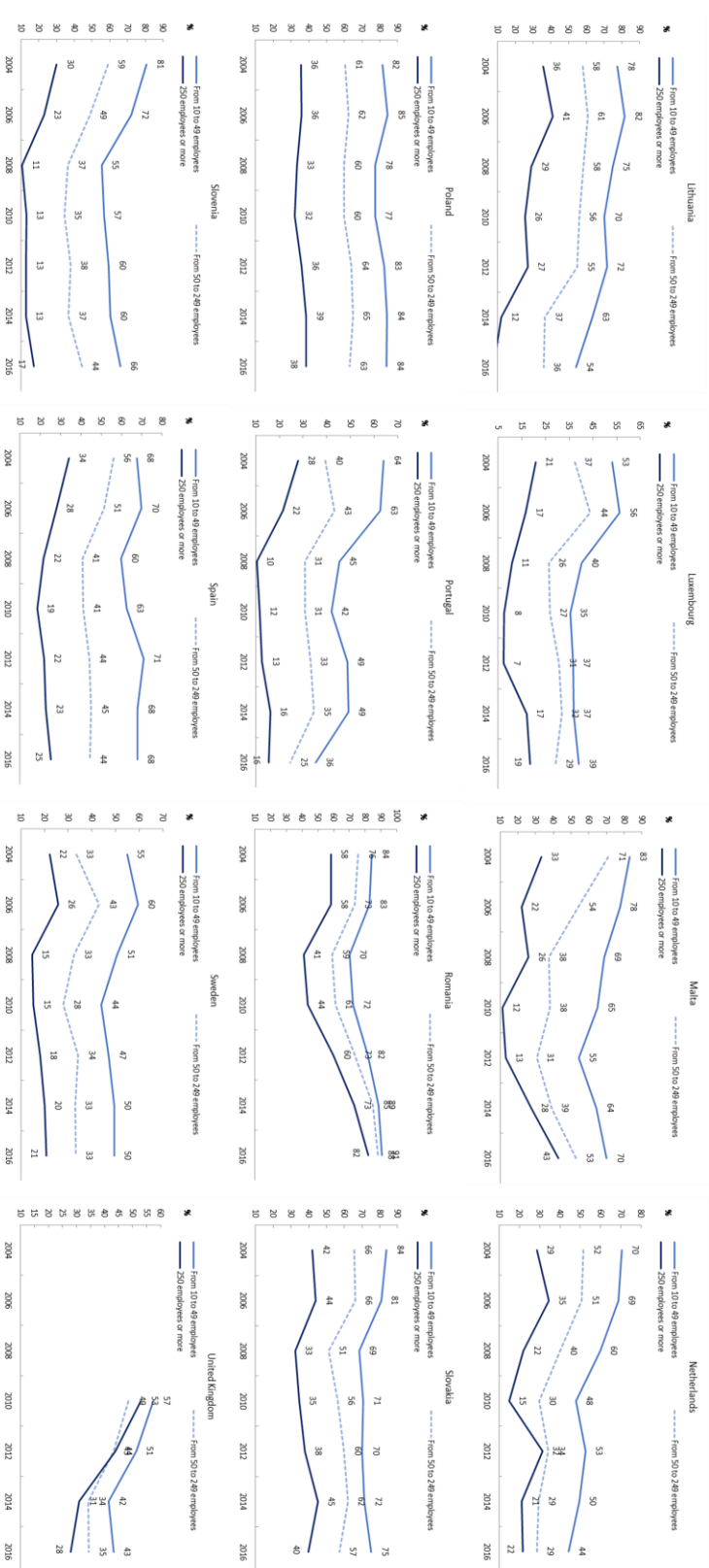
ANNEX 29: TRENDS IN THE RATE OF ENTERPRISES CONSIDERING INNOVATING AMONG SMES AND LARGE ENTERPRISES

Figure 146 Rate of non-innovation by size class (%)



Note: Shares are relative to the total number of enterprises in each size category within the relevant industries and reference period. The industry coverage refers to firms from the aggregated sector 'Innovation core activities', encompassing NACE Rev. 2 sectors: B, C, D, E, G46, H, J, K and M71-72-73. For reference period 2006-08 and 2008-10 industry group 'Innovation core activities' does not include NACE Rev. 2 sub sectors: M72, and M73 and from sector J, only J58, J61, J62.

Figure 147 Rate of non-innovation by size class (%) (continued)



Note: Shares are relative to the total number of enterprises in each size category within the relevant industries and reference period. The industry coverage refers to firms from the aggregated sector 'innovation core activities', encompassing NACE Rev. 2 sectors: B, C, D, E, G46, H, J, K and M71-72-73. For reference period 2006-08 and 2008-10 industry group 'innovation core activities' does not include NACE Rev. 2 sub sectors: M72, and M73 and from sector J, only J58, J61, J62, J63 are included. For reference period 2004-2004, 'innovation core activities' include NACE Rev. 1.1 industries: C, D, E, I, J, G51, K72, K74.2, K74.3 (these map to Nace Rev. 2 industries: B, C, D, E, G46, H, J, K, M71). In addition, the definition of innovative firms changed from 2004-2006 to 2006-2008 to include firms that introduced organisational and/or marketing innovations. Caution should therefore be taken when interpreting these reference periods relative to other years. Only enterprises with 10 or more employees are covered. Data refers to 3-year reference periods corresponding to each CIS survey round.

Source: Eurostat, Community Innovation Survey (CIS-2004 – CIS-2016)

ANNEX 30: EVOLUTION OF THE INCIDENCE OF MAJOR BARRIERS TO INNOVATION REPORTED BY SMES AND LARGE ENTERPRISES

Table 15 and Table 16 present the shares of businesses considering innovation and which experience barriers to innovation judged to be of high importance by the enterprises participating in the CIS. Not all waves of the CIS cover this theme and the barriers that are reported are not always consistent across waves. In the interest of drawing comparisons across time, similar barriers have been grouped together. The focus of this analysis is on highly important barriers.

Overall trends

In order to better visualise trends, each row in the following tables is coloured such that darker cells within a row represent a relatively higher incidence of a given barrier (therefore, the shading of cells should be compared within rows for a given size class). For instance, a row becoming lighter in later years indicates that the incidence of a given barrier in a given country is declining.¹²² In the last table on regulatory barriers to innovation, the same colour coding is applied, but to columns, as these barriers are only covered in the latest wave of the survey (the shading should therefore be compared within columns).

It can be seen that in most cases the incidence of barriers has declined across time among SMEs (and also among large enterprises). This could be explained by different factors.

One possible explanation is that businesses may increasingly be hindered by barriers of 'low' or 'medium' importance (which could be interpreted as 'moderate intensity'): indeed, as shown by the analysis of the CIS2014 microdata in Chapter 7 of the Background Document, a sizeable proportion of SMEs considering innovation (approximately one in eight) reported no 'high-importance' barrier, but seven low or medium importance barriers, which suggests the combined effect of many 'moderate intensity' barriers may be important in impeding innovation.¹²³

Incidence by size class

On average, barriers have a higher incidence among smaller businesses.¹²⁴ The degree of heterogeneity varies across barriers. For instance, average incidence rates are very similar across size classes with respect to lack of external finance (but still marginally higher among smaller companies).

¹²² In addition to the methodological differences described in the Background Document, some barriers are not exactly identical across time. In addition, the set of barriers assessed by respondents varied across years. Furthermore, the structure of the questions on barriers to innovation evolved across different waves: in earlier waves, non-innovators had the possibility to select both barriers and other reasons for not innovating (e.g. no need to innovate because of prior innovations) whereas in the last two waves, businesses were routed either to barriers or other reasons and could not select a combination of both. Therefore, care should be taken when drawing comparisons across time.

¹²³ Other potentially important explanations include methodological changes, as well as the possibility that barriers listed in the questionnaire may have become less relevant in later waves and that the factors preventing SMEs from engaging in innovation may not be covered by the survey. Regarding methodological changes, in the CIS4, CIS2006 and CIS2010, all non-innovators had the possibility of selecting both barriers as well as other reasons (e.g. no need to innovate because of prior innovations) as driving their lack of innovative activity. However, in the CIS2014 and CIS2016, non-innovators were required to choose between barriers and other reasons, meaning that if a business responded that it had no compelling reason to innovate but also faced barriers to innovation, the latter would not be covered due to the survey routing. This could have led to a lower response rate to the questions concerning barriers to innovation.

¹²⁴ This is based on an average across Member States and reference periods (and within a given size class) rather than a simple average across the Member State averages which are reported in the last column for each size class. While informative, comparisons based on averages should be interpreted with caution in the present context, as they are not always based on the same number of observations due to missing data (e.g. data are not available for all size classes for some years).

Furthermore, in some Member States, the incidence rate of certain barriers among SMEs is lower than among large companies, often in smaller economies (e.g. CY, EE and MT), in which the number of large enterprises considering innovation is low (e.g. less than 20 in the CIS2016).

Relative incidence of individual barriers

High innovation costs are the barrier with the highest average incidence rate (over 15% for both small and medium-sized SMEs), followed by lack of internal finance.

These are followed by the lack of external financing (e.g. credit, private equity, grants), competition-related barriers (e.g. highly competitive market, market dominated by incumbents), and uncertainty regarding demand for innovation (e.g. innovative products).

Lack of skilled employees and lack of co-operation partners have an average incidence rate of under 10% for both small and medium-sized businesses, while the share of SMEs that experienced information-related barriers (either with respect to technology or markets) is close to 5%.

Barriers related to regulation (only covered in the latest CIS wave), had the lowest incidence.

Table 15 Incidence of barriers to innovation among enterprises which do not innovate, by size class (%)

	Lack of internal finance										Lack of external finance										High innovation costs									
	Small					Medium					Large					Small					Medium					Large				
	2004	2006	2010	2014	2016	2004	2006	2010	2014	2016	2004	2006	2010	2014	2016	2004	2006	2010	2014	2016	2004	2006	2010	2014	2016	2004	2006	2010	2014	2016
Austria	15%	10%	6%	5%	12%	10%	7%	4%	5%	6%	6%	7%	2%	3%	4%	13%	10%	13%	9%	13%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Belgium	14%	11%	12%	10%	12%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	14%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Bulgaria	6%	3%	3%	7%	8%	3%	3%	3%	3%	6%	8%	2%	3%	3%	3%	6%	3%	3%	3%	3%	6%	3%	3%	3%	3%	6%	3%	3%	3%	3%
Croatia	21%	20%	8%	8%	16%	27%	25%	11%	13%	18%	12%	13%	13%	13%	13%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%
Cyprus	22%	17%	6%	13%	5%	21%	14%	7%	6%	7%	4%	13%	20%	6%	0%	22%	22%	22%	22%	22%	22%	22%	22%	22%	22%	22%	22%	22%	22%	22%
Denmark	13%	18%	25%	9%	18%	19%	10%	2%	7%	15%	14%	13%	13%	12%	3%	7%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Estonia	26%	16%	18%	6%	10%	22%	16%	13%	6%	4%	12%	25%	12%	4%	14%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
Finland	11%	10%	10%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%
France	20%	17%	17%	5%	15%	14%	15%	12%	5%	14%	13%	13%	10%	5%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%
Germany	14%	17%	17%	11%	9%	11%	9%	12%	5%	14%	13%	13%	10%	5%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%
Greece	16%	14%	17%	14%	16%	12%	12%	6%	8%	15%	20%	19%	13%	6%	7%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Hungary	21%	20%	21%	5%	7%	16%	21%	22%	10%	6%	15%	20%	19%	13%	6%	7%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Ireland	16%	13%	20%	16%	12%	8%	12%	8%	11%	14%	13%	22%	9%	9%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Italy	24%	23%	5%	13%	15%	22%	17%	2%	8%	11%	14%	13%	22%	9%	9%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Latvia	26%	24%	20%	5%	7%	15%	18%	2%	4%	12%	20%	19%	7%	7%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Lithuania	20%	19%	20%	6%	8%	18%	25%	21%	20%	8%	16%	19%	16%	19%	3%	5%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%
Luxembourg	20%	6%	1%	4%	3%	5%	2%	2%	1%	6%	4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Malta	22%	8%	2%	2%	2%	11%	15%	7%	3%	3%	8%	14%	6%	1%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Netherlands	24%	11%	20%	20%	7%	23%	25%	20%	21%	7%	21%	22%	21%	21%	16%	6%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Poland	13%	28%	31%	11%	9%	18%	17%	20%	24%	8%	15%	20%	13%	12%	5%	8%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Portugal	8%	31%	40%	6%	5%	18%	8%	29%	34%	4%	7%	17%	6%	27%	31%	5%	8%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Romania	8%	11%	40%	6%	5%	18%	8%	29%	34%	4%	7%	17%	6%	27%	31%	5%	8%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Slovakia	21%	18%	24%	20%	15%	22%	22%	17%	20%	24%	13%	15%	15%	15%	6%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%
Slovenia	22%	22%	13%	8%	15%	25%	21%	20%	24%	13%	20%	12%	15%	15%	6%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%
Spain	21%	21%	13%	9%	20%	16%	14%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
Sweden	21%	21%	13%	9%	20%	16%	14%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
United Kingdom	21%	21%	13%	9%	20%	16%	14%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%

Note: Shares are relative to the total number of enterprises in each size category within the relevant industries and reference period. The industry coverage refers to firms from the aggregated sector 'Innovation core activities', encompassing NACE Rev. 2 sectors: B, C, D, E, G46, H, J, K and M71-72-73. For reference period 2006-08 and 2008-10 industry group 'Innovation core activities' does not include NACE Rev. 2 sub sectors: M72, and M73 and from sector J, only J58, J61, J62, J65 are included. For reference period 2004-2004, 'Innovation core activities' include NACE Rev. 1, 1 industries: C, D, E, I, J, G51, K72, K74.2, K74.3 (these map to Nace Rev. 2 industries: B, C, D, E, G46, H, J, K, M71). In addition, the definition of innovative firms changed from 2004-2006 to 2006-2008 to include firms that introduced organisational and/or marketing innovations. In addition, not all barriers were exactly identical or formulated in the same way in the questionnaires. The barriers covered by the tables refer to the following questionnaire response options: *lack of internal finance*: "Lack of funds within your enterprise or group" (2004, 2006, 2010)/"Lack of internal finance for innovation" (2014, 2016); *lack of external finance*: "Lack of finance from sources outside your enterprise" (2004, 2006, 2010)/average of "Lack of credit or private equity" and "Difficulties in obtaining government grants or subsidies for innovation" (2014, 2016); *high innovation costs*: "Innovation costs too high" (2004, 2006, 2010, 2016); *lack of qualified personnel*: "Lack of qualified employees within your enterprise" (2014, 2016); *lack of information on technology*: "Lack of information on technology" (2004, 2006, 2010), *lack of information on markets*: "Lack of information on markets" (2004, 2006, 2010), *lack of co-operation partners*: "Difficulty in finding cooperation partners for innovation" (2004, 2006, 2010)/"Lack of collaboration partners" (2014, 2016), *competition*: "Market dominated by established enterprises" (2004, 2006, 2010)/"Too much competition in your market" (2014, 2016), *uncertain demand for innovation*: "Uncertain demand for innovative goods or services" (2004, 2006, 2010)/"Uncertain market demand for your ideas for innovations" (2014, 2016); *burden due to legislation/regulation*: "Legislation/regulation that generated excessive burden" (2016), *underainty due to legislation/regulation*: "Legislation/regulation that created uncertainty" (2016), *lack of consistency across the EU in legislation/regulation*: "Legislation/regulation that lacked consistency across the EU" (2016). The incidence of a barrier being described as 'highly important' by respondents. Only enterprises with 10 or more employees are covered. Data refers to 3-year reference periods corresponding to each CIS survey round. Cells are left blank when they are confidential, non-applicable, unreliable, or if data is not available.

Source: Eurostat, Community Innovation Survey (CIS-2004 – CIS-2016)

Table 16 Incidence of barriers to innovation among enterprises which do not innovate, by size class (%) (continued)

	Lack of qualified employees														
	Small					Medium					Large				
	2004	2006	2010	2014	2016	2004	2006	2010	2014	2016	2004	2006	2010	2014	2016
Austria	9%	12%													
Belgium	1%		8%			7%	6%	2%	3%	2%					
Bulgaria	1%	14%	15%	3%	6%	9%	10%	15%	14%	4%	6%	5%	6%	7%	6%
Croatia	1%	1%	1%			1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Cyprus	1%	14%	15%	3%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Denmark	5%	7%	6%	2%	11%	6%	6%	6%	4%	2%	5%	4%	5%	3%	4%
Estonia	14%	16%	6%	3%	5%	9%	13%	12%	4%	3%	7%	5%	13%	4%	0%
Finland	6%	7%	7%			7%	6%	2%	2%		4%	2%	3%	3%	4%
France	14%		9%	3%	11%	9%	8%				5%	5%		4%	2%
Germany	5%					1%					4%	3%			
Greece	12%	21%		4%		11%	0%	21%			3%	8%	0%	21%	0%
Hungary	5%	2%	8%	2%	4%	6%	2%	2%	2%	6%	6%	3%	1%	2%	4%
Ireland	1%					1%					1%				
Italy	2%	7%	8%	4%	11%	9%	4%	3%	5%	5%	6%	5%	4%	5%	4%
Lithuania	12%	11%	2%	3%	10%	12%	12%	2%	2%	6%	12%	6%	2%	4%	5%
Luxembourg	11%	21%	16%	2%	14%	13%	11%	14%	13%	1%	12%	2%	0%	21%	8%
Malta	3%	2%	2%	2%	1%	2%	8%	11%	1%	1%	2%	5%		0%	0%
Netherlands	3%	2%	2%	2%	1%	2%	2%	2%	0%	2%	0%	0%	0%	0%	0%
Poland	6%	12%	10%	10%	4%	9%	5%	6%	10%	4%	3%	4%	6%	1%	3%
Portugal	2%	15%	11%	3%	4%	11%	20%	13%	2%	3%	12%	11%	3%	0%	6%
Romania	2%	12%	11%	2%	3%	6%	25%	15%	2%	3%	6%	3%	8%	2%	6%
Slovakia	6%	6%	6%			5%	5%	5%			4%	4%	6%	1%	4%
Slovenia	15%	10%	16%			9%	10%	14%	9%		10%	6%	6%	5%	7%
Spain						10%	10%	14%	9%		10%	6%	6%	5%	4%
Sweden			4%					3%			6%	4%			
United Kingdom															

	Lack of information on technology														
	Small					Medium					Large				
	2004	2006	2010	2014	2016	2004	2006	2010	2014	2016	2004	2006	2010	2014	2016
Austria	4%	5%				4%	3%	5%			4%	4%	4%		
Belgium			3%			3%	0%	3%	0%	0%	2%	0%	1%		
Bulgaria	7%	4%	5%			8%	6%	6%	6%	3%	7%	4%	5%		2%
Croatia	1%	1%	1%			1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Cyprus	1%	1%	1%			1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Denmark	4%		2%			1%	1%	2%	1%		2%	0%	2%	1%	1%
Estonia	4%	4%	2%			3%	4%	2%	1%		2%				
Finland	3%					4%	4%	0%	0%		2%	2%	0%	0%	1%
France	3%					5%	7%		2%		3%	2%	1%		
Germany	3%					3%	3%				3%	2%			
Greece	17%	2%	21%			17%	2%	21%			4%	1%	2%	1%	
Hungary	5%	3%	4%			4%	3%	3%	3%		4%	1%	1%		
Ireland	2%	3%	5%			2%	3%	5%			2%	3%	5%		
Italy	5%	5%	5%			5%	5%	5%	2%		5%	5%	5%	1%	
Lithuania	4%	6%	6%			6%	4%	6%	6%		5%	4%	6%	2%	
Luxembourg	3%	0%	0%			2%	4%	0%	0%		7%	4%		2%	
Malta	3%	2%	1%			2%	4%	0%	0%		3%	2%	0%	0%	
Netherlands	4%	2%				3%	2%	2%	2%		2%	2%	2%		
Poland	4%	6%	14%			9%	4%	5%	14%		8%	3%	4%	15%	2%
Portugal	20%	12%	8%			10%	11%				31%	24%			24%
Romania	2%	1%	6%			2%	3%	6%	3%		7%	2%	4%	6%	1%
Slovakia	3%	1%	6%			3%	3%	3%	3%		2%	2%	3%	1%	1%
Slovenia	5%	6%				5%	6%				6%	4%	5%	4%	5%
Spain	10%	11%	11%			12%	7%	8%	8%		6%	4%	5%	4%	1%
Sweden			2%					2%			2%				
United Kingdom															

	Lack of information on markets														
	Small					Medium					Large				
	2004	2006	2010	2014	2016	2004	2006	2010	2014	2016	2004	2006	2010	2014	2016
Austria	4%	4%				4%	3%	3%			3%	3%	3%		
Belgium			3%			3%	4%	3%			4%	6%	3%	4%	0%
Bulgaria	7%	4%	5%			8%	7%	6%	6%	3%	6%	7%	5%	4%	0%
Croatia	1%	1%	1%			1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Cyprus	1%	1%	1%			1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Denmark	4%		2%			4%	3%	3%	3%		4%	3%	3%	3%	1%
Estonia	5%	4%	2%			4%	4%	1%	1%		2%		6%		6%
Finland	2%					3%	4%	0%	0%		2%	1%			1%
France	2%		4%			3%	4%	0%			3%	2%	1%		
Germany	3%					3%	1%				1%	6%			6%
Greece	5%	24%	5%			12%	6%	23%			15%	0%	13%		2%
Hungary	4%	4%	5%			5%	3%	5%	3%		4%	3%	5%	2%	2%
Ireland	4%	4%	5%			6%	4%	5%	3%		5%	3%	5%	2%	2%
Italy	4%	4%	6%			6%	4%	6%	3%		3%	1%	2%		2%
Lithuania	4%	6%	6%			5%	4%	6%	6%		5%	4%	6%	1%	2%
Luxembourg	3%	0%	0%			2%	4%	0%	0%		6%	1%			1%
Malta	3%	2%	1%			2%	4%	0%	0%		0%		0%		0%
Netherlands	4%	1%				2%	4%	2%	2%		4%	3%	1%		2%
Poland	4%	7%	13%			8%	4%	5%	13%		7%	4%	5%	11%	7%
Portugal	20%	10%	9%			10%	17%				32%	20%			25%
Romania	6%	1%	6%			4%	0%	5%	2%		4%	0%	3%	5%	2%
Slovakia	2%	2%	4%			2%	0%	5%	2%		2%	0%	5%	2%	2%
Slovenia	6%	6%				6%	6%				6%	6%			12%
Spain	9%	10%	12%			10%	5%	6%	8%		6%	4%	2%	2%	5%
Sweden			1%					2%							
United Kingdom															

Note: Shares are relative to the total number of enterprises in each size category within the relevant industries and reference period. The industry coverage refers to firms from the aggregated sector 'Innovation core activities', encompassing NACE Rev. 2 sectors: B, C, D, E, G46, H, J, K and M71-72-73. For reference period 2006-08 and 2008-10 industry group 'Innovation core activities' does not include NACE Rev. 2 sub sectors: M72, and M73 and from sector J, only J58, J61, J62, J63 are included. For reference period 2004-2004, 'Innovation core activities' include NACE Rev. 1, 1 industries: C, D, E, I, J, G51, K72, K74.2, K74.3 (these map to Nace Rev. 2 industries: B, C, D, E, G46, H, J, K, M71). In addition, the definition of innovative firms changed from 2004-2006 to 2006-2008 to include firms that introduced organisational and/or marketing innovations. In addition, not all barriers were exactly identical or formulated in the same way in the questionnaires. The barriers covered by the tables refer to the following questionnaire response options: *lack of internal finance*: "Lack of funds within your enterprise or group" (2004, 2006, 2010) "Lack of internal finance for innovation" (2014, 2016); *lack of external finance*: "Lack of finance from sources outside your enterprise" (2004, 2006, 2010) (average of "Lack of credit or private equity" and "Difficulties in obtaining government grants or subsidies for innovation" (2014, 2016); *high innovation costs*: "Innovation costs too high" (2004, 2006, 2010, 2016); *lack of qualified employees*: "Lack of qualified personnel" (2004, 2006, 2010) "Lack of skilled employees within your enterprise" (2014, 2016); *lack of information on technology*: "Lack of information on technology" (2004, 2006, 2010); *lack of information on markets*: "Lack of information on markets" (2004, 2006, 2010); *lack of co-operation partners*: "Lack of information on finding cooperation partners for innovation" (2004, 2006, 2010) "Lack of collaboration partners" (2014, 2016); *competition*: "Market dominated by established enterprises" (2004, 2006, 2010) "Too much competition in your market" (2014, 2016); *uncertain demand for innovation*: "Uncertain demand for innovative goods or services" (2004, 2006, 2010) "Uncertain market demand for your ideas for innovations" (2014, 2016); *burden due to legislation/regulation*: "Legislation/regulation that generated excessive burden" (2016), *underainty due to legislation/regulation*: "Legislation/regulation that created uncertainty" (2016), *lack of consistency across the EU in legislation/regulation*: "Legislation/regulation that lacked consistency across the EU" (2016). The incidence of a barrier is defined as that barrier being described as 'highly important' by respondents. Only enterprises with 10 or more employees are covered. Data refers to 3-year reference periods corresponding to each CIS survey round. Cells are left blank

Table 17 Incidence of barriers to innovation among enterprises which do not innovate, by size class (%) (continued)

[illegible]

Note: Shares are relative to the total number of enterprises in each size category within the relevant industries and reference period. The industry coverage refers to firms from the aggregated sector 'innovation core activities', encompassing NACE Rev. 2 sectors: B, C, D, E, G46, H, J, K and M71-72-73. For reference period 2006-08 and 2008-10 industry group 'innovation core activities' does not include NACE Rev. 2 sub sectors: M72, and M73 and from sector J, only J58, J61, J62, J63 are included. For reference period 2004-2004, 'innovation core activities' include NACE Rev. 1.1 industries: C, D, E, I, J, G51, K72, K74.2, K74.3 (these map to Nace Rev. 2 industries: B, C, D, E, G46, H, J, K, M71). In addition, the definition of innovative firms changed from 2004-2006 to 2006-2008 to include firms that introduced organisational and/or marketing innovations. In addition, not all barriers were exactly identical or formulated in the same way in the questionnaires. The barriers covered by the tables refer to the following questionnaire response options: *lack of internal finance*: "Lack of funds within your enterprise or group" (2004, 2006, 2010)/"Lack of internal finance for innovation" (2014, 2016); *lack of external finance*: "Lack of finance from sources outside your enterprise" (2004, 2006, 2010)/average of "Lack of credit or private equity" and "Difficulties in obtaining government grants or subsidies for innovation" (2014, 2016); *high innovation costs*: "Innovation costs too high" (2004, 2006, 2010, 2016); *lack of qualified employees*: "Lack of qualified personnel" (2004, 2006, 2010)/"Lack of skilled employees within your enterprise" (2014, 2016); *lack of information on technology*: "Lack of information on technology" (2004, 2006, 2010); *lack of information on markets*: "Lack of information on markets" (2004, 2006, 2010); *lack of co-operation partners*: "Difficulty in finding cooperation partners for innovation" (2004, 2006, 2010)/"Lack of collaboration partners" (2014, 2016); *competition*: "Market dominated by established enterprises" (2004, 2006, 2010)/"Too much competition in your market" (2014, 2016); *uncertain demand for innovation*: "Uncertain demand for innovative goods or services" (2004, 2006, 2010)/"Uncertain market demand for your ideas for innovations" (2014, 2016); *burden due to legislation/regulation*: "Legislation/regulation that generated excessive burden" (2016); *uncertainty due to legislation/regulation*: "Legislation/regulation that created uncertainty" (2016); *lack of consistency across the EU in legislation/regulation*: "Legislation/regulation that lacked consistency across the EU" (2016). The incidence of a barrier is defined as that barrier being described as 'highly important' by respondents. Only enterprises with 10 or more employees are covered. Data refers to 3-year reference periods corresponding to each CIS survey round. Cells are left blank when they are confidential, non-applicable, unreliable, or if data is not available.

Table 18 Incidence of barriers to innovation among enterprises which do not innovate, by size class (%) (continued)

	Regulation (2016)					
	Small		Medium		Large	
	Burden due to legislation/regulation	Uncertainty due to legislation/regulation	lack of consistency across the EU in legislation/regulation	Burden due to legislation/regulation	Uncertainty due to legislation/regulation	lack of consistency across the EU in legislation/regulation
Austria	5%	5%	3%	6%	5%	3%
Belgium						
Bulgaria	6%	6%	4%	6%	5%	4%
Croatia	5%	5%	3%	6%	6%	4%
Cyprus	3%	2%		2%	0%	0%
Czechia						
Denmark						
Estonia	6%	5%	3%	2%	4%	2%
Finland						
France						
Germany						
Greece	10%	11%	7%	10%	10%	9%
Hungary	5%	3%	2%	4%	4%	2%
Ireland						
Italy	8%	10%	6%	4%	5%	3%
Latvia	4%	3%	2%	3%	3%	3%
Lithuania						
Luxembourg	2%	2%	1%	2%	1%	1%
Malta	1%	0%	0%	1%	0%	0%
Netherlands						
Poland	5%	5%	4%	5%	5%	4%
Portugal	5%	4%	3%	4%	3%	3%
Romania	3%	3%	2%	3%	3%	2%
Slovakia						
Slovenia	7%	6%	4%	6%	4%	4%
Spain						
Sweden						
United Kingdom						

Note: Shares are relative to the total number of enterprises in each size category within the relevant industries and reference period. The industry coverage refers to firms from the aggregated sector 'innovation core activities', encompassing NACE Rev. 2 sectors: B, C, D, E, G46, H, J, K and M71-72-73. For reference period 2006-08 and 2008-10 industry group 'innovation core activities' does not include NACE Rev. 2 sub sectors: M72, and M73 and from sector J, only J58, J61, J62, J63 are included. For reference period 2004-2004, 'innovation core activities' include NACE Rev. 1.1 industries: C, D, E, I, J, G51, K72, K74.2, K74.3 (these map to Nace Rev. 2 industries: B, C, D, E, G46, H, J, K, M71). In addition, the definition of innovative firms changed from 2004-2006 to 2006-2008 to include firms that introduced organisational and/or marketing innovations. In addition, not all barriers were exactly identical or formulated in the same way in the questionnaires. The barriers covered by the tables refer to the following questionnaire response options: *lack of internal finance*: "Lack of funds within your enterprise or group" (2004, 2006, 2010)/"Lack of internal finance for innovation" (2014, 2016); *lack of external finance*: "Lack of finance from sources outside your enterprise" (2004, 2006, 2010)/average of "Lack of credit or private equity" and "Difficulties in obtaining government grants or subsidies for innovation" (2014, 2016); *high innovation costs*: "Innovation costs too high" (2004, 2006, 2010, 2016); *lack of qualified employees*: "Lack of qualified personnel" (2004, 2006, 2010)/"Lack of skilled employees within your enterprise" (2014, 2016); *lack of information on technology*: "Lack of information on technology" (2004, 2006, 2010); *lack of information on markets*: "Lack of information on markets" (2004, 2006, 2010); *lack of co-operation partners*: "Difficulty in finding cooperation partners for innovation" (2004, 2006, 2010)/"Lack of collaboration partners" (2014, 2016); *competition*: "Market dominated by established enterprises" (2004, 2006, 2010)/"Too much competition in your market" (2014, 2016); *uncertain demand for innovation*: "Uncertain demand for innovative goods or services" (2004, 2006, 2010)/"Uncertain market demand for your ideas for innovations" (2014, 2016); *burden due to legislation/regulation*: "Legislation/regulation that generated excessive burden" (2016), *uncertainty due to legislation/regulation*:

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