EUROPEAN
COMMISSION

Brussels, 4.2.2022
SWD(2022) 24 final

PART 3/16

COMMISSION STAFF WORKING DOCUMENT

Cohesion in Europe towards 2050

Accompanying the document

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

on the 8th Cohesion Report: Cohesion in Europe towards 2050

{COM(2022) 34 final}

CHAPTER 2. A SMARTER EUROPE – PART 2

Contents

2.4 COMPETITIVENESS OF EU REGIONS

2.4.1 Innovation, digitalisation and smart specialisation

Innovation is an important driver of long-run productivity growth and, as such, is a key factor in supporting the competitiveness of firms. This is especially important for firms in the EU, which increasingly have to compete with firms in developing regions of the world, such as in South East Asia, which benefit from cheaper labour, less labour market regulation, and fast technological catch-up (World Economic Forum, 2019). The capacity to innovate, and to take up innovation produced elsewhere, is of prime importance, especially since, unlike cost-reduction strategies, innovation is, in principle, without bounds, and so is central to sustaining growth over the long-term.

However, concern has risen about a growing research and innovation divide, linked to geographical concentration, both within Member States and across the EU, of the most innovative firms and research centres. While concentration can result in positive externalities of research and innovation, the core areas are very often located in more developed regions[1], so widening geographic disparities.[2] This research and innovation divide may be further fuelled by the ongoing process of digitalisation.

Measuring innovation is widely recognised as challenging (OECD and Eurostat, 2018).[3] The most commonly used indicator, the number of patent applications, gives only an approximate measure of the real innovation activity because it captures only innovations registered at the European Patent Office. These relate mainly to technological innovation in industry, while many if not most innovations in services, which are often intangible, remain unpatented.[4] Nevertheless, though limited, patents provide a useful means of comparing performance of technological innovation across regions.

Over the period 2016-2017, 122 patent applications per million inhabitants were registered at the European Patent Office (Map 2-7). These show a distinct spatial pattern, regions with most applications being located mostly in the north-western Member States and in northern Italy. At the NUTS 3 level, Ludwigshafen in Germany, home to BASF, had the highest number (3 224 per million inhabitants in the period), followed by Erlangen, home to a major Siemens site (2 558) and Zuidoost-Noord-Brabant in the Netherlands (2 529), home to Philips. The degree of concentration suggests a regional innovation divide between the most advanced Member States and regions and the others.

Metropolitan areas tend to offer an environment that is particularly conducive to the development of new ideas, products and processes. A vast literature explains the reasons for this – the presence of a creative and skilled work force, specialised clusters of economic activity,

[1] See (Rodríguez-Pose, 2020) for an analysis of the economic consequences of the research and innovation divide in the EU.

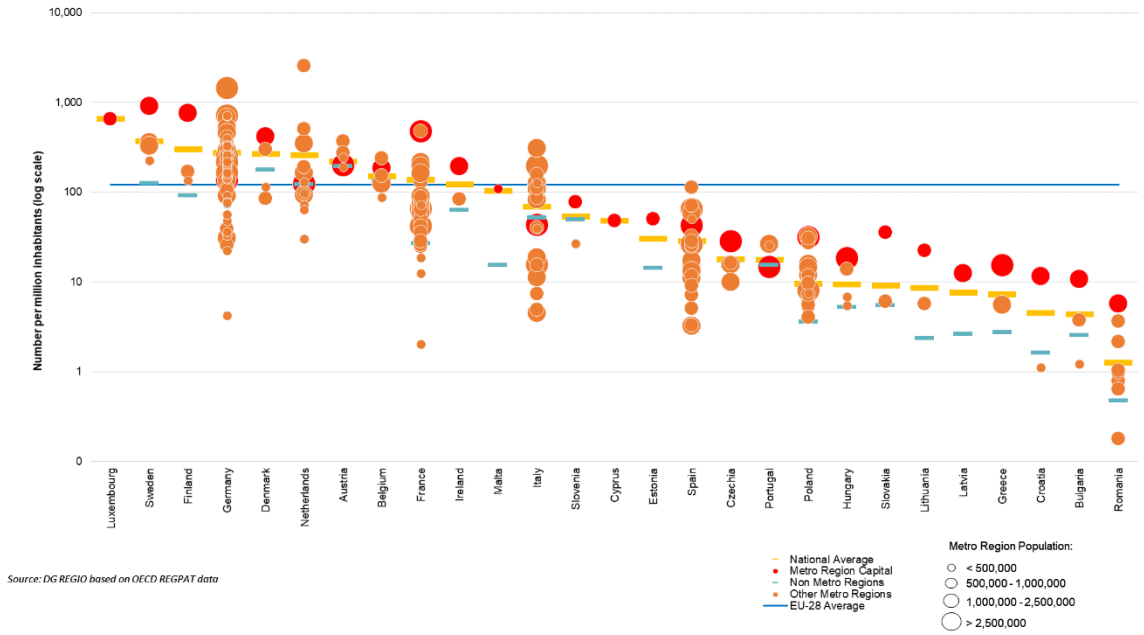
[2] For example, European Commission (2020) concludes that increasing concentration of economic and innovative activities in capitals and metropolitan areas, on the one hand, and declining or peripheral areas on the other lead to negative developments in regions with low capacity to exploit innovation.

[3] This is particularly true in a sub-national context, which highlights the need to work on better territorial innovation data as mentioned for example in the Commission's Communication on a long-term vision for rural areas (COM(2021) 345 final).

[4] This also holds for practices in primary production and organisational and social forms of innovation that can contribute to social capital.

universities and research institutes.[5] There are clear differences in patenting activity between metropolitan (metro) regions (around 167 applications per million inhabitants) and non-metro regions (around 58 per million inhabitants) (Figure 2-10). In quite a few metro regions, however, applications are less than in non-metro regions in the same country, indicating that not all metro regions offer a favourable innovation environment. Still, the distinct spatial pattern and concentration in metropolitan areas of patent applications are further indications of a research and innovation divide in the EU.

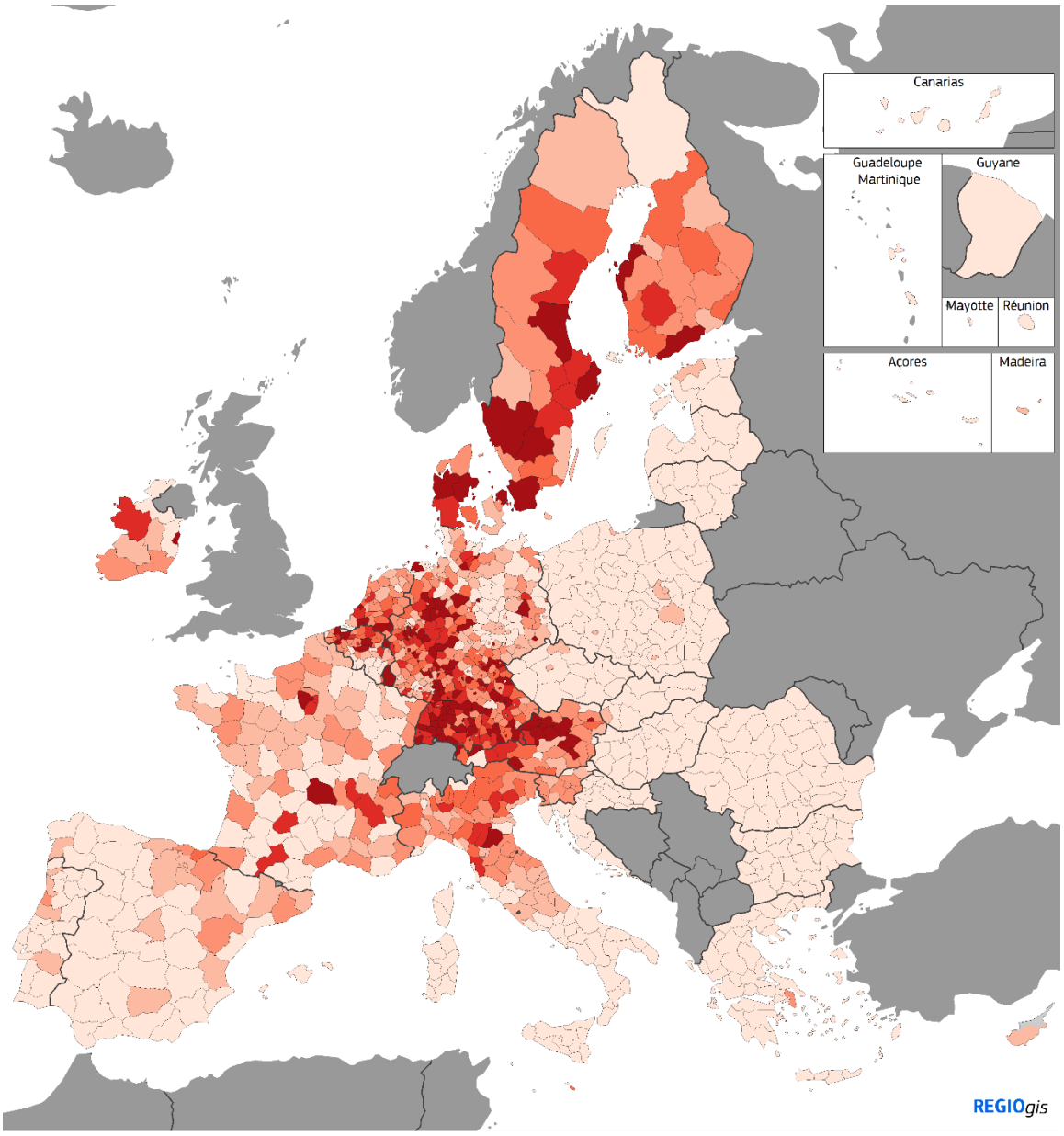
Figure 2-10: Patent applications to the European Patent Office by type of region, 2016-17



Source: OECD REGPAT, DG REGIO calculations

[5] European Union and UN-HABITAT (2016).

Map 2-7: Patent applications to the European Patent Office, average 2016-2017



Patent applications to the European Patent Office (EPO), average 2016-2017

Applications per million inhabitants

- < 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 250
- >=250

EU-27 = 121.7
Sources: DG REGIO based on OECD REGPAT database July 2021 and Eurostat population data (nama_10r_3popgdp)

0 500 Km

Source: Eurostat, REGIO-GIS

Global value chains, foreign direct investment and inequality

Technological change coupled with the intensification of global value chains (GVCs) have spurred the need to place national and regional economic development and innovation policy in an open and interdependent framework. Multinational enterprises (MNEs), by carrying out different forms of investment abroad, are considered key actors behind connectivity and global economic integration of countries and regions worldwide, while also being critical players in international trade flows. Often described as "two sides of the same coin", (Krugman, 2007), trade and investment seem to be intertwined in a more complex manner within GVCs (OECD, 2018 p. 31). In fact, trade flows can be equity led or non-equity led. The former involves networks of foreign affiliates established via foreign direct investment (FDI), which are highly engaged in GVCs (e.g. Altomonte et al., 2012) while non-equity-led trade involves more contractual partners and arm's length external suppliers (Taglioni and Winkler, 2014). As such, trade in GVCs and FDI are complementary phenomena that need be taken simultaneously into account when trying to capture the geographical and functional dimension of global connectivity.

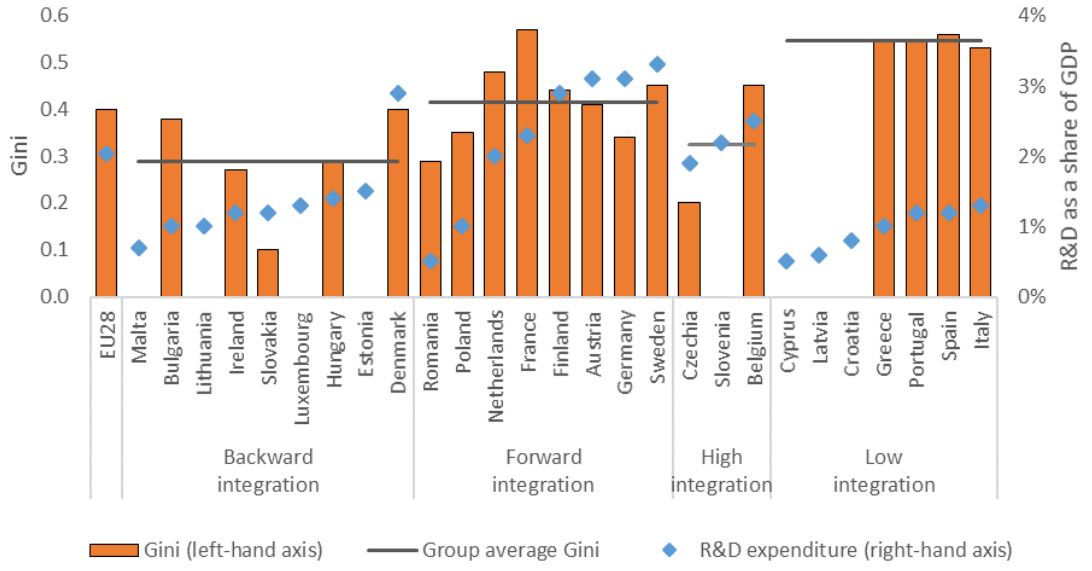
Two measures of GVC participation can be distinguished: (a) Backward Linkages: share of foreign value-added in the total exports of a country; and (b) Forward Linkages: domestic value-added embodied in exports of intermediates that are further re-exported to third countries, expressed as a ratio of gross exports. By looking at the relative position of each country with respect to the EU average, it is possible to identify four broad groups of economies:

1) **High GVC Integration:** Higher Backward – Higher Forward **(H-H)** Linkages
2) **Low GVC Integration:** Lower Backward – Lower Forward **(L-L)** Linkages
3) **Backward GVC Integration:** Higher Backward – Lower Forward **(H-L)** Linkages
4) **Forward GVC Integration:** Lower Backward – Higher Forward (**L-H)** Linkages

The *Forward GVC integration* group comprises the most innovative countries in terms of R&D expenditures (as well as patents), Poland and Romania being exceptions. Within this group there is a relatively high inter-regional dispersion of GDP as measured by the Gini coefficient (Figure 2-11). Conversely, *Low GVC integration* economies show low values of R&D (and patents), but also have big economic disparities. The *High GVC integration* countries show varying economic disparities, while *Backward GVC integration* countries show low shares of R&D expenditure (except Denmark) and lower economic disparities.

Leading industrial regions in Europe follow patterns and hierarchies symmetric to those of capital regions. Higher levels of both inward and outward FDI characterise advanced regions in the *Forward GVC integration* economies such as Bayern, Baden-Württemberg, Hessen, Nordrhein-Westfalen, Niedersachsen and Rheinland-Pfalz (Germany), Zuid-Holland and Noord-Holland (the Netherlands), Sydsverige (Sweden), and Pomorskie and Malopolskie in Poland. Similarly, some key industrial regions in the *Low GVC integration* countries display relatively high levels of both inward and outward FDI: Piemonte (Italy), Cataluña, País Vasco, Galicia and Andalucia (Spain). Flanders (Belgium), in the *High GVC integration* category, follows similar patterns, while industrial eastern EU regions in the *Backward GVC integration* group mostly show internationalisation profiles skewed towards inward FDI.

Figure 2-11: GVC profile, R&D expenditure (% of GDP) and Gini-coefficient by Member State



Source: Eurostat. DG-REGIO elaboration. The GINI coefficient is not provided for countries with only one or two NUTS-2 regions.

A widely used indicator of innovation capacity, rather than performance, is expenditure on R&D relative to GDP, which is a measure of input into the innovation process, or the effort made, rather than of output. As in the case of patents, however, R&D expenditure is likely to underestimate innovation activity, particularly in sectors outside industry where non-technological and non-research-based innovation is common.

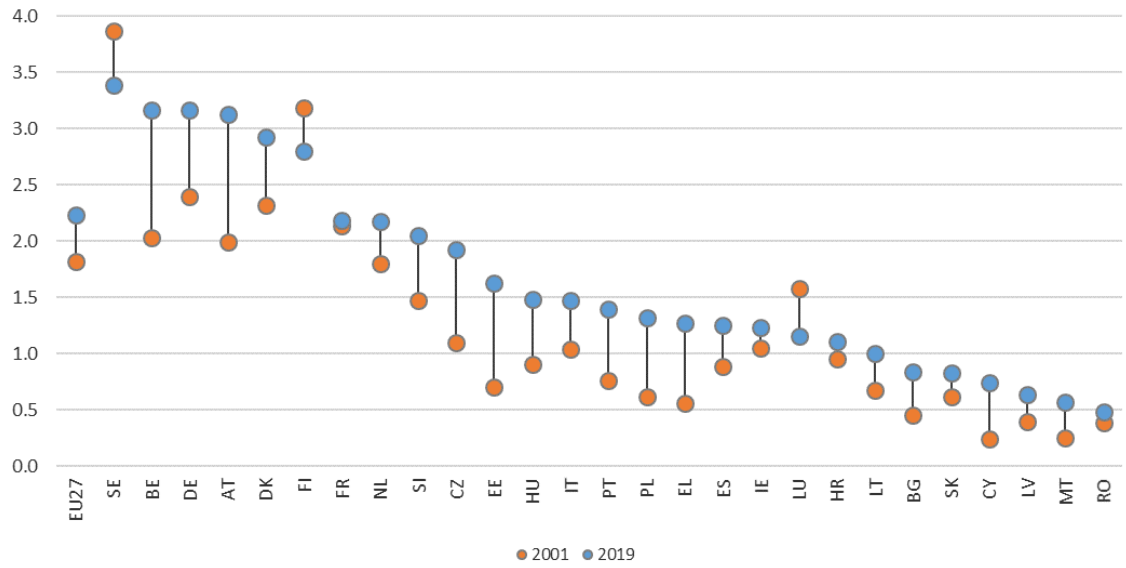
Expenditure on R&D in the EU amounted to 2.2% of GDP in 2019 (Figure 2-11) and increased only marginally over the previous two decades (from 1.8% of GDP in 2001). The expenditure rate increased in all Member States, except for Sweden and Finland, where it had already reached a high level in 2001, and Luxembourg[6]. Despite the overall increase, in most Member States the expenditure rates for the most part remain well below those in other highly developed economies, especially Japan (where expenditure was 3.2% of GDP in 2019) or the US (where it was 3.1%). There is also no evidence of convergence in rates within the EU, countries with comparatively low R&D expenditure in 2001 having the smallest increase in spending over the 2001-2019 period, suggesting a widening research and innovation divide between Member States.

R&D expenditure in the EU is highest in the north-western regions (at an average of 2.7% of GDP in 2019) and lowest in the east (1.3%) and south (1.4%). At the NUTS2 level, spending is highest, at over 7% of GDP, in Braunschweig and Stuttgart in Germany and Brabant Wallon in Belgium (Map 2-8).

[6] The decrease in Luxembourg is linked to the fact that business R&D spending strongly decreased over the past decade. This is possibly related to the potentially large impact of the behaviour of few multinational companies on official business R&D statistics (see OECD 2019).

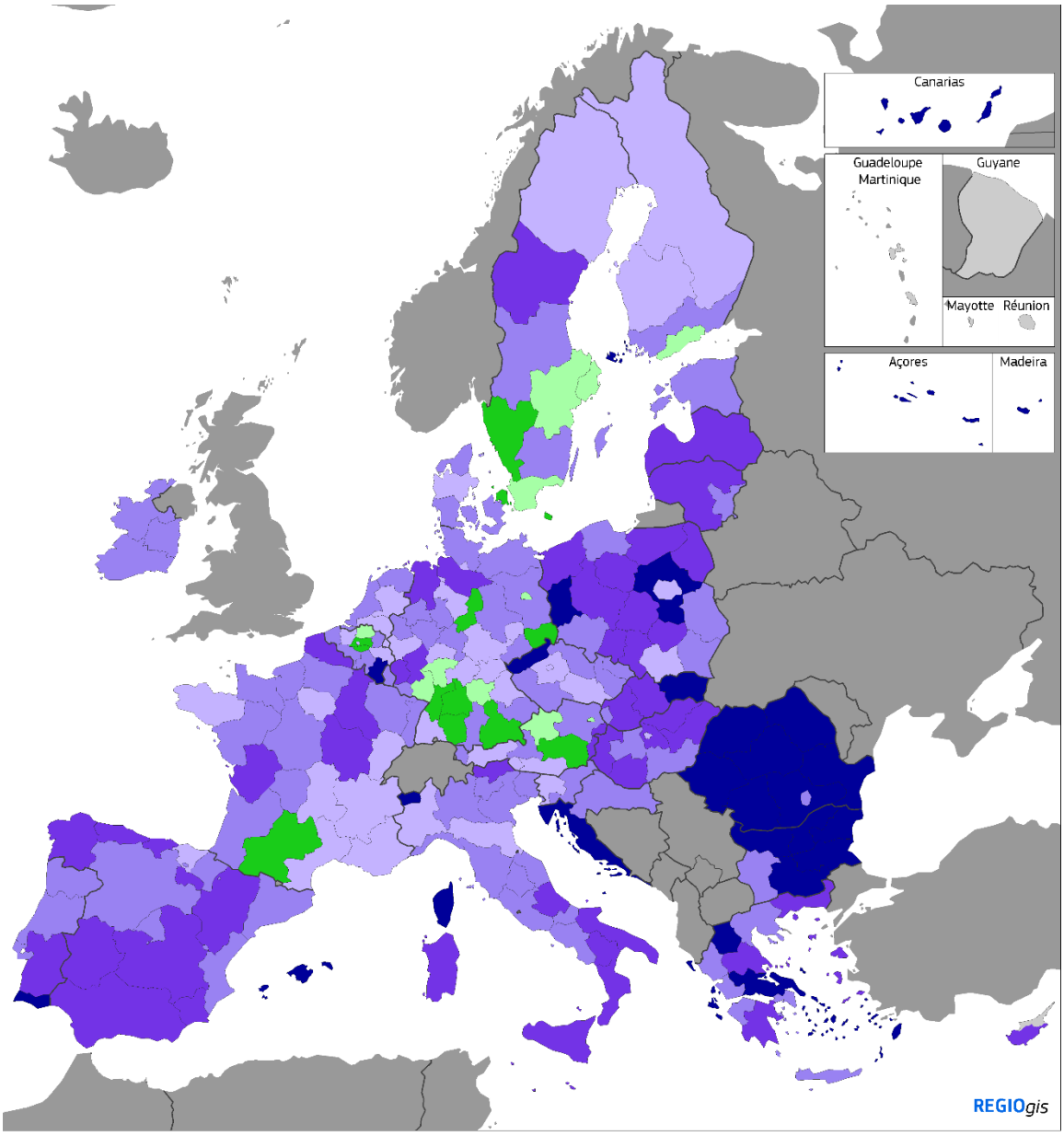
In general, regions with the highest R&D expenditure tend to be the most developed and often include capital cities (Belgium and Germany are notable exceptions) (Figure 2-13). Of the 20 regions with the highest expenditure, 19 are more developed with GDP per head above the EU average, while two third of the 50 regions with the lowest expenditure are less developed with GDP per head below 75% of the average.

Figure 2-12: Total expenditure on R&D as a % of GDP, 2001 and 2019



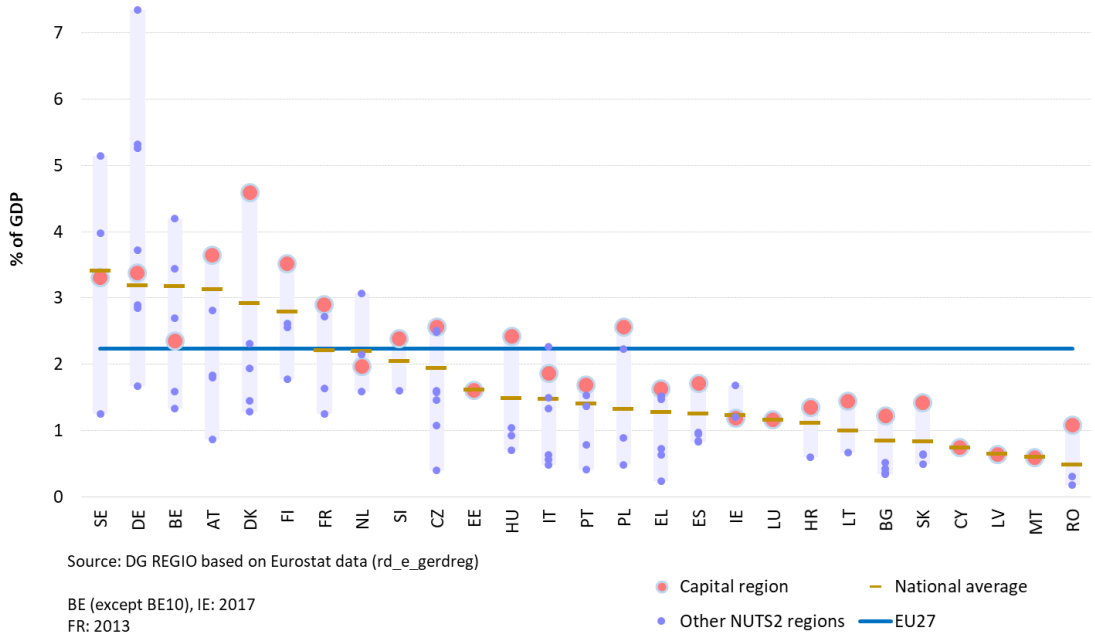
The 2001 figure for LU relates to 1999, for MT and HR to 2002.
Source: Eurostat [rd_e_gerdreg], DG REGIO calculations.

Map 2-8: Total expenditure on R&D as a % of GDP, 2019



Source: Eurostat, REGIO-GIS

Figure 2-13: Total expenditure on R&D as % of GDP, 2019



Note: BE (except BE10) and IE relate to 2017. FR relates to 2013.
Source: Eurostat [rd_e_gerdreg], DG REGIO calculations

In 2019, expenditure on R&D relative to GDP exceeded the Europe 2020 target of 3% only in a small number of NUTS 2 regions, accounting for just 12% of EU population (Table 2-7). These are all more developed regions in the north-west of the EU, except Dresden (Germany) which is a transition region. None of the less developed regions met the 3% target, with expenditure on average over 2 pp below the target.

Table 2-7: Total R&D expenditure and the distance to the Europe 2020 target, EU-27 regions, 2019

	Less developed	Transition	More developed	EU27
R&D expenditure as % of GDP, 2019	1.0	1.4	2.5	2.2
Distance to EU target (% point difference)	2.0	1.6	0.5	0.8
% of population living in regions* that have reached the EU target	0.0	2.9	20.1	11.9

BE (except BE10) and IE relate to 2017. FR relates to 2013.
* Includes only regions for which data are available
Source: Eurostat, DG REGIO calculations

The Regional Innovation Scoreboard

The Regional Innovation Scoreboard (RIS) 2021 highlights the key role innovation plays in regional development.[7] The RIS, an extension of the European Innovation Scoreboard (EIS), assesses the innovation performance of regions on the basis of a subset of the indicators included in the EIS. In 2021, it covers 215 regions in the EU[8], plus 30 regions in Norway, Serbia, Switzerland and the UK.

The most innovative regions in the EU by this measure are Oberbayern (Germany), Hovedstaden (Denmark), Etelä-Suomi (Finland) and Stockholm (Map 2-9). Despite some regional variation within countries, the ranking of regions largely matches that of Member States, suggesting that indicator values at the regional level are affected by national characteristics. Most regional 'innovation leaders' are in countries which are also identified as 'innovation leaders' or as 'strong innovators', and almost all of the regional 'moderate 'and 'modest' innovators are in countries categorised in the same way. However, regional 'pockets of excellence' are evident in some 'moderate innovator' countries, including capital city regions in Czechia, Spain, and Lithuania as well as País Vasco in Spain, while some regions in 'strong innovation' countries lag behind.

Regional Innovation Scoreboard (RIS) methodology

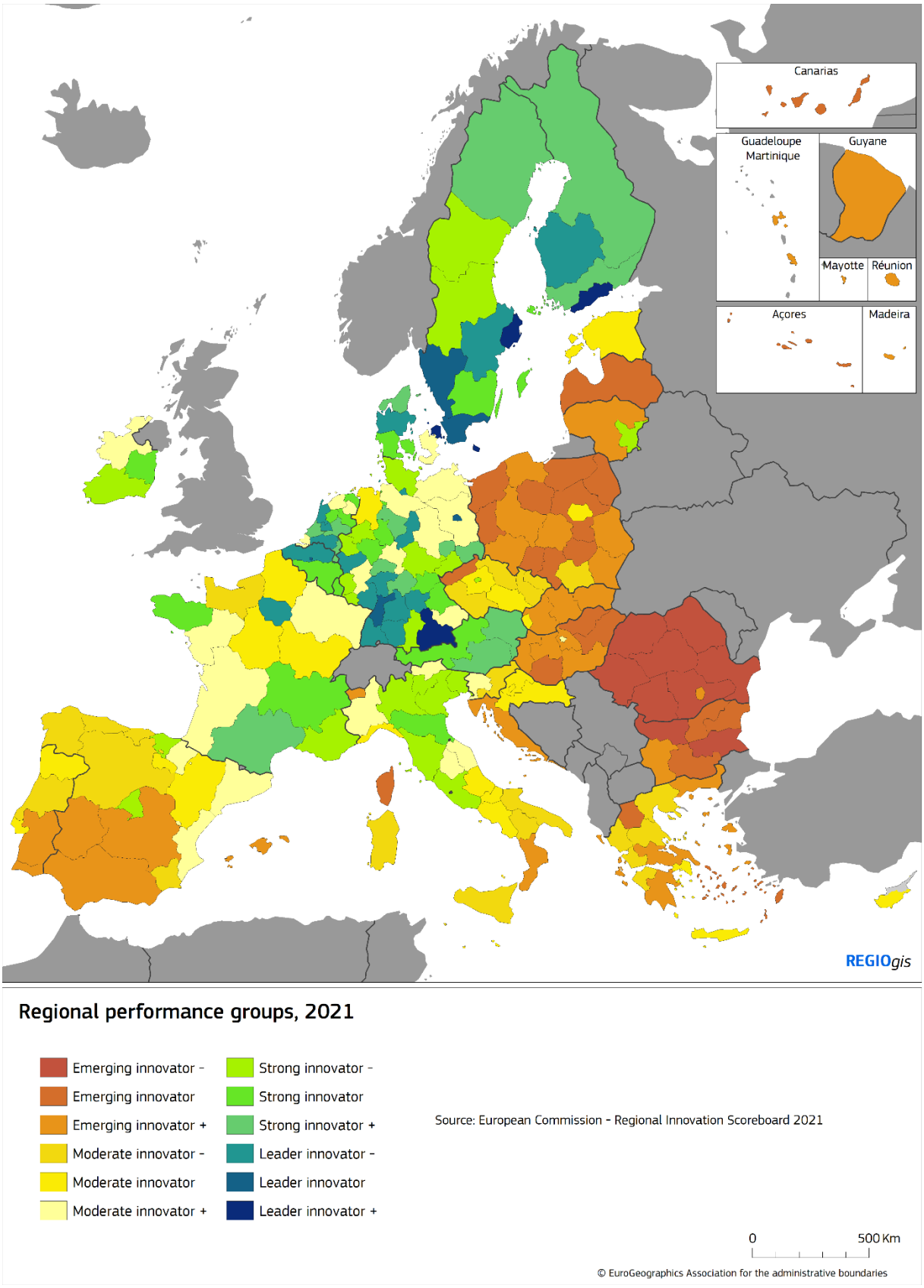
The 2021 edition of the Regional Innovation Scoreboard (RIS) provides a comparative assessment of innovation systems across regions. It is based on data for 21 of the indicators used in the European Innovation Scoreboard. This set of indicators covers higher education, scientific publications, ICT skills, R&D expenditure, business innovation, and patenting. Data come from a variety of sources including Eurostat, SCOPUS (Science-Metrix), the Community Innovation Survey (Eurostat and National Statistical Offices) and the European Union Intellectual Property Office (EUIPO).
Indicator values are normalised by using the min-max procedure, i.e. the difference between the observed score and the maximum score across all regions is calculated and then divided by the range between the minimum and the maximum scores across all regions. The overall RIS score is calculated as the unweighted average of the indicator scores. The RIS then classifies regions into four innovation performance groups based on their overall RIS score relative to the EU average: 'leader innovators (26 EU regions), strong innovators (55 EU regions), moderate innovators (69 EU regions), and emerging innovators (65 EU regions). A more detailed breakdown of these performance groups is obtained by splitting each group into a top third, middle third, and bottom third.

For more details, see: https://ec.europa.eu/info/research-and-innovation/statistics/performance-indicators/regional-innovation-scoreboard_en

[7] Regional Innovation Scoreboard 2021, available at: https://ec.europa.eu/info/research-and-innovation/statistics/performance-indicators/regional-innovation-scoreboard_en

[8] All Member States are covered at the NUTS 2 level except for Austria, Belgium and France, which are covered at the NUTS1 level.

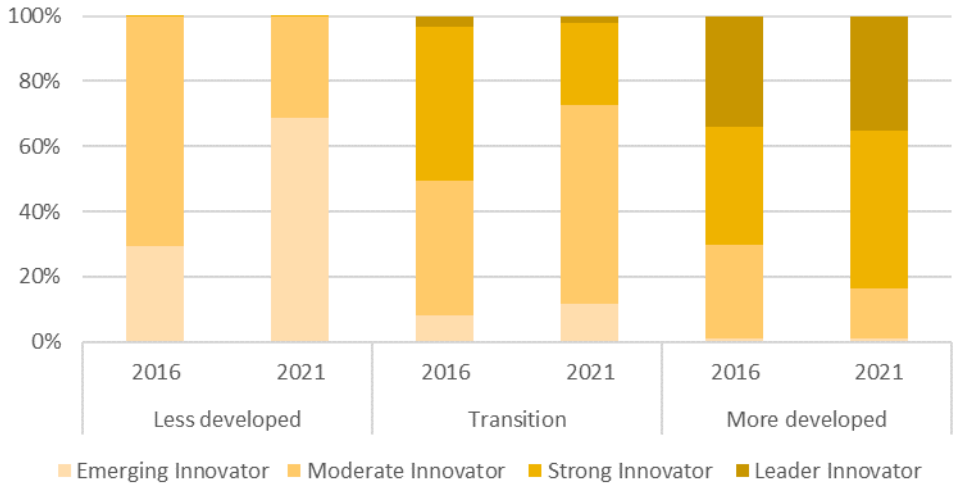
Map 2-9: Regional Innovation Scoreboard, 2021



Source: Regional Innovation Scoreboard 2021, REGIO-GIS

There is a close relationship between the level of development of regions and the innovation score (Figure 2-14). In 2021 about 70% of the population of less developed regions live in an 'emerging innovator' region, which is twice as much as in 2016. This indicates that a large number of less developed regions that used to be moderate innovators have become emerging innovators. Furthermore, none of them live in a 'strong' or a 'leader innovator' region. Accordingly, during the last five years, the less developed regions have fallen further behind in terms of innovation, rather than catching up with the other regions. At the other end of the spectrum, 'leader innovators' are almost exclusively in the group of more developed regions, with only 2% of the population in transition regions living in a region in this category in 2021. The majority of 'strong innovators' are also in the more developed regional group, with 84% of the population of these regions in 2021 living either in a 'strong' or a 'leader innovator' region, up from 70% in 2016.

Figure 2-14: Share of EU population by RIS category and level of development, 2016 and 2021



Note: In cases where the RIS score is only available at NUTS1 level, it is assumed that the same score applies to the latter's constituent NUTS2 regions. Calculations for both years are based on 2021 population data and level of development classification.
Source: Regional Innovation Scoreboard 2021, DG REGIO

In general, the RIS confirms the wide diversity of EU regions in terms of innovation performance, so highlighting the fact that innovation has a strong regional dimension. Because of this, measures supporting innovation, including Cohesion policy programmes, need to take explicit account of the regional or local context when devising the kind of support to provide. As it is inherently place-based, the Smart Specialisation approach helps in this regard.

Smart Specialisation strategies

Smart Specialisation is a place-based approach to the governance of innovation policy that focuses investment in research and innovation on selected areas of activity, identified through a wide and inclusive process to mobilise the local knowledge of relevant stakeholders, including businesses, public bodies, research organisations and civil society.

Conceived in the 2014-2020 programming period, Smart Specialisation strategies are defined by Regulation (EU) 1301/2013 as "*the national or regional innovation strategies which set priorities in order to build competitive advantage by developing and matching research and innovation own strengths to business needs in order to address emerging opportunities and market developments in a coherent manner, while avoiding duplication and fragmentation of efforts."*.

In practical terms, the Smart Specialisation approach concentrates resources into carefully defined "priority areas". These priority areas can be framed in terms of knowledge fields or activities (not only science-based but also social, cultural, and creative ones) or sub-systems within an economic sector or cutting across sectors. They can also correspond to specific market niches, clusters, technologies, or applications of technologies to specific societal and environmental challenges. These priority areas should at the same time be in line with the region's existing assets and be able to take advantage of innovation opportunities.

Smart Specialisation strategies were introduced in 2014-2020 as an *ex ante* condition for all investment priorities under Thematic Objective 1 of the ERDF. A distinct feature is that Member States or regions need to identify priorities for investment through an 'entrepreneurial discovery process', involving key innovation stakeholders, business, and all actual or potential innovation actors that may possess crucial knowledge about new activities to establish in the country or region..

Smart Specialisation was an integral part of Cohesion Policy in the 2014-2020 period. A total of 180 Smart Specialisation strategies were formulated in this period, with ERDF investment of over EUR 40 billion (EUR 68 billion including national co-financing).

A partial transition towards innovative and smart transformation

Although it is still too early to assess the impact of Smart Specialisation on innovation, jobs and productivity, there is already some evidence of how the policy has been implemented on the ground and its effect on policy making.

A recent study (Prognos and CSIL, 2021) shows that in most regions, the prioritisation of investment was based on a broad and inclusive 'entrepreneurial discovery process', which in most cases was specifically set up for formulating the Smart Specialisation strategy. About half of the 180 strategies, as well as about half of the ERDF funding available for these, concerned projects in the Agrofood & Bioeconomy (21%), Health & Life Sciences (15%) or ICT & Industry 4.0 (15%) sectors. Although the extent of prioritisation differs between the regions, there is evidence that the selected priorities closely reflect the scientific and technological profile of regions and public and private sector strengths.

Strategies do not necessarily match the current economic structure as reflected in the sectoral division of employment, but they more often prioritise sectors in transformation, as measured by growth rates of employment. Smart Specialisation eligibility criteria seem to have been generally well applied in selecting projects and the resulting ERDF investments in research and innovation largely match the priority areas selected.

Although challenges remain, new practices in public administration seem to have emerged at national, regional and local level. In particular, recent studies, based on policy-maker perceptions and case-studies (Hegyi et al., 2021; Guzzo and Gianelle, 2021), suggest that the Smart Specialisation experience has improved coordination and strengthened the network of relations between regional and local actors, as well as making the decision-making process and the governance of innovation policy more inclusive. It seems also to have helped reorganise and/or establish coordination bodies, platforms, thematic working groups and clusters. Nevertheless, the effectiveness of coordination between the public and private sectors and within public authorities remains an issue in several regions. More efforts are needed in the future in this regard, along with strengthening the skills and resources to perform policy functions. A clear and, if possible, dedicated structure of governance has proved to be important in this respect.

Expanding digitalisation

Digital technologies have the potential to boost more inclusive and sustainable growth by spurring innovation, generating efficiencies and improving services.[9] The current Commission has put the green and digital transition, the so-called 'twin transition', on top of the political agenda as the two trends that will shape Europe and its future. A goal of the EU is to boost the digital transformation of businesses by encouraging the take-up of three digital technologies[10]: cloud computing services, use of big data and Artificial Intelligence (AI). The objective is that 75% of European enterprises[11] will have taken these up by 2030.

The take-up of Cloud Computing in 2020 was greater than for the other two technologies (Figure 2-15), and the share of enterprises using it was twice as large as in 2014, a rate of increase, which, if it continues, will enable the 2030 target to be achieved. The take-up of big data and AI remains much smaller, which might be a result of these being newer and possibly less generally applicable from a business perspective.

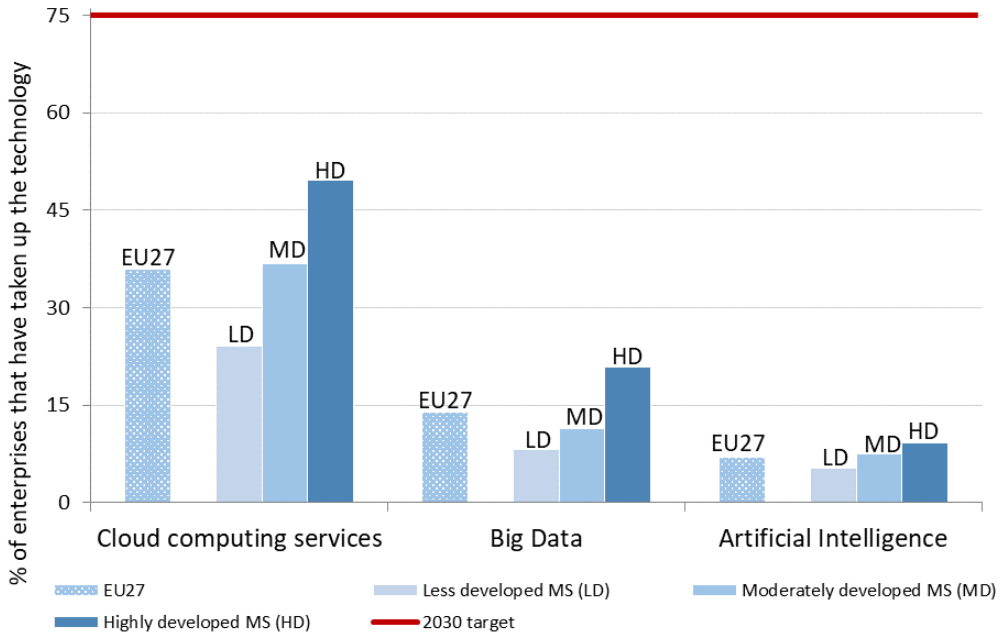
The take-up of digital technologies in the EU masks pronounced differences between Member States. For each of the three technologies, businesses in less developed countries lag behind, the take-up being highest in highly developed Member States.

[9] OECD (2021) https://www.oecd.org/g20/topics/digitalisation-and-innovation/

[10] European Commission (2021b) EC Communication on the 2030 Digital Compass: the European way for the Digital Decade. COM (2021) 118 final.

[11] All enterprises outside the financial sector with 10 persons or more employed (Eurostat code 10_C10_S951_XK).

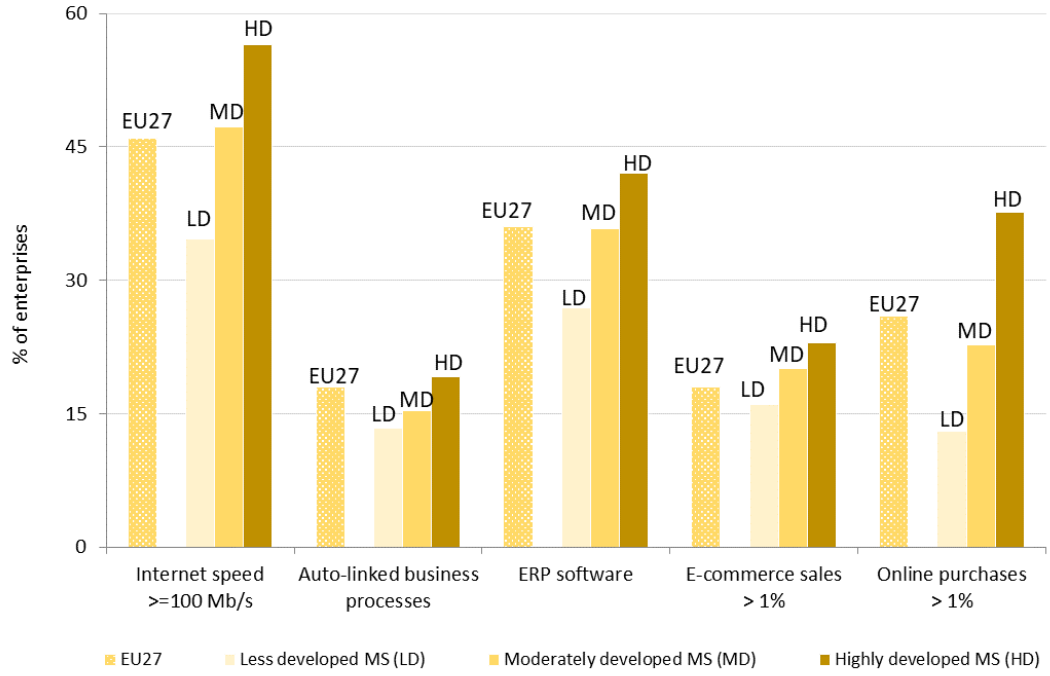
Figure 2-15: EU enterprises take-up of digital technologies by Member State level of development, 2020



All EU enterprises outside the financial sector with 10 or more persons employed are covered (Eurostat code 10_C10_S951_XK).
Source: Eurostat [isoc_eb], DG REGIO calculations

A similar pattern is seen for the take-up of e-commerce and e-business technologies (Figure 2-16). A sufficiently fast internet connection is required for such take-up. On average, some 46% of enterprises in the EU have broadband with a speed at least 100 Mb/s, but the figure is smaller in less developed Member States. Businesses in less developed Member States also lag behind in terms of the take-up of two specific e-business solutions, namely the use of business processes which are automatically linked to those of their suppliers or customers and the use of ERP (Enterprise Resource Planning) software to share information between different functional areas. The same is the case for e-commerce sales and online purchases. Both the share of enterprises with e-commerce sales of at least 1% of turnover and the share with online purchase of at least 1% of the total are smaller in less developed Member States, although the difference with other Member States is larger for the latter share

Figure 2-16: EU enterprise take-up of e-commerce and e-business technologies by Member State level of development, 2020



All EU enterprises outside the financial sector with 10 or more persons employed (Eurostat code 10_C10_S951_XK) are covered.
The full definitions of the five indicators are: (1) the maximum contracted download speed of the fastest fixed line internet connection of at least 100 Mb/s; (2) enterprises with business processes automatically linked to those of their suppliers and/or customers; (3) enterprises with ERP software package to share information between different functional areas; (4) enterprises with e-commerce sales of at least 1% turnover; (5) enterprises purchasing at least 1% of the total online.
Data on ERP software relate to 2019; auto-linked business processes to 2017; online purchases to 2018, except AT, DE, IT, SE, EU27: 2017; EE, HR, SI: 2016; FI, MT: 2015.
Source: Eurostat [isoc_eb, isoc_ec], DG REGIO calculations

These results confirm that digitalisation may further fuel the research and innovation divide, at least between Member States. Given the increasing importance of digital technologies for enterprises to remain competitive, this is a cause for concern from a cohesion perspective. Since technology take-up is an important driver of economic convergence, less developed Member States risk falling further behind rather than catching-up, if their businesses do not innovate by adopting digitalisation. Moderately developed Member States may also see their capacity to compete diminished if they fail to do likewise, so risking falling into, or remaining in, a development trap (as indicated in Section 2.3 above).

Regional cohesion: Corporate divergences and how to address gaps

The pandemic has highlighted gaps among regions and societal groups. Firms across the EU were hit by the COVID-19 shock to different extents, depending on sectoral activities and their ability to adapt to the pandemic situation. The crisis accelerated structural economic and societal change, creating some risks for cohesion as firms are adjusting at different speeds to the emerging recovery phase, marked by a stronger emphasis on digitalisation.

The European Investment Bank's Investment Survey (EIBIS)[12], an annual corporate survey that gathers insights on the investment landscape in the EU, helps shed light on the effects of the COVID-19 crisis on investment and how these link to regional cohesion. For this, firms' responses are grouped depending on their location in less developed, transition, and more developed regions.[13]

EIBIS results show that cuts to investment activity triggered by COVID-19 came on top of lower initial investment activity, particularly in less developed regions. Here, 79% of firms undertake investment, compared to 85% in transition, and 87% in more developed regions.[14] Firms in less developed and transition regions tend to be smaller and fewer to export compared to more developed regions. Firms' investment activities in less developed and transition regions tend to be tilted towards tangibles; a lower share of firms targets investment towards research and development compared to peers in more developed regions, where more active innovators (firms that heavily invest in R&D) are located (Figure 2-17).

Firms in less developed and transition regions operate in a more challenging environment and report obstacles to investment more often; they find considerably more often that their investment is hindered by uncertainty, energy costs, and access to transport infrastructure and finance.

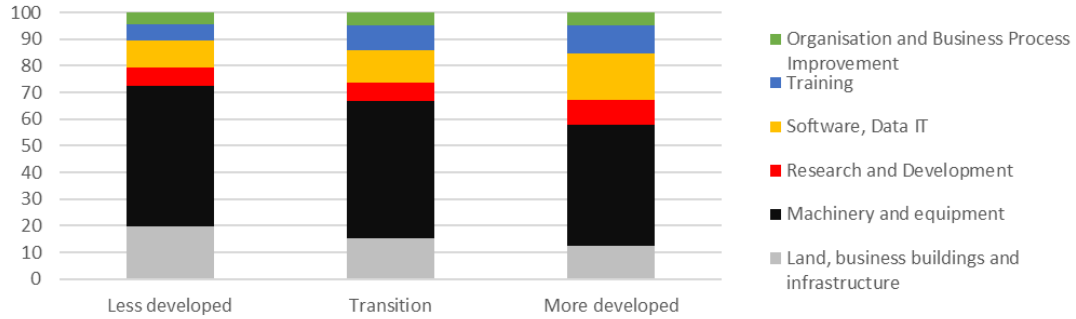
A more challenging investment environment together with structural differences pre-dating the pandemic can hamper adjustment to the emerging recovery phase. Fewer firms in less developed and transition have reacted to the pandemic by becoming more digital, while many in more developed regions are pulling ahead.

Policy measures have helped to limit the immediate adverse impact of the pandemic on jobs. However, a higher share of firms expect the COVID-19 outbreak to lead to a decrease in employment in the longer term (19% in less developed and 14% in transition regions compared to 12% in more developed ones). Structural shifts towards a greener and more digital economy and innovation will be important to maintain competitiveness and support economic catch up also in less prosperous regions, to maintain and nurture quality employment opportunities in the longer-term. EIBIS analysis shows that the pandemic has negatively impacted on human capital formation, with fewer adults participating in training and schools being closed across the EU. What is more, school closures are likely to have accentuated regional disparities as less wealthy Member States closed schools for longer. This underscores the need to invest in human capital as

[12] Available at this link: https://www.eib.org/en/publications-research/economics/surveys-data/eibis/index.htm.
[13] For further information on the methodology see: Delanote and Wruuck (2021), *Regional Cohesion in Europe 2020-2021: Insights from the EIB Investment Survey*, European Investment Bank, Luxembourg; available at this link: https://www.eib.org/attachments/publications/eibis_2020_regional_cohesion_en.pdf.
[14] Based on EIBIS 2020, available at this link: https://www.eib.org/en/publications/econ-eibis-2020-eu.

part of recovery strategies to mitigate risks of rising territorial and social divergences, looking ahead.

Figure 2-17: Composition of investments (in %), by level of development



The results cover all firms who have invested in the last financial year (excluding "don't know" and refused responses). The results concern replies to the survey question: "In the last financial year, how much did your business invest in each of the following with the intention of maintaining or increasing your company's future earnings?"
Source: EIBIS 2021

2.4.2 Firm dynamics in EU regions

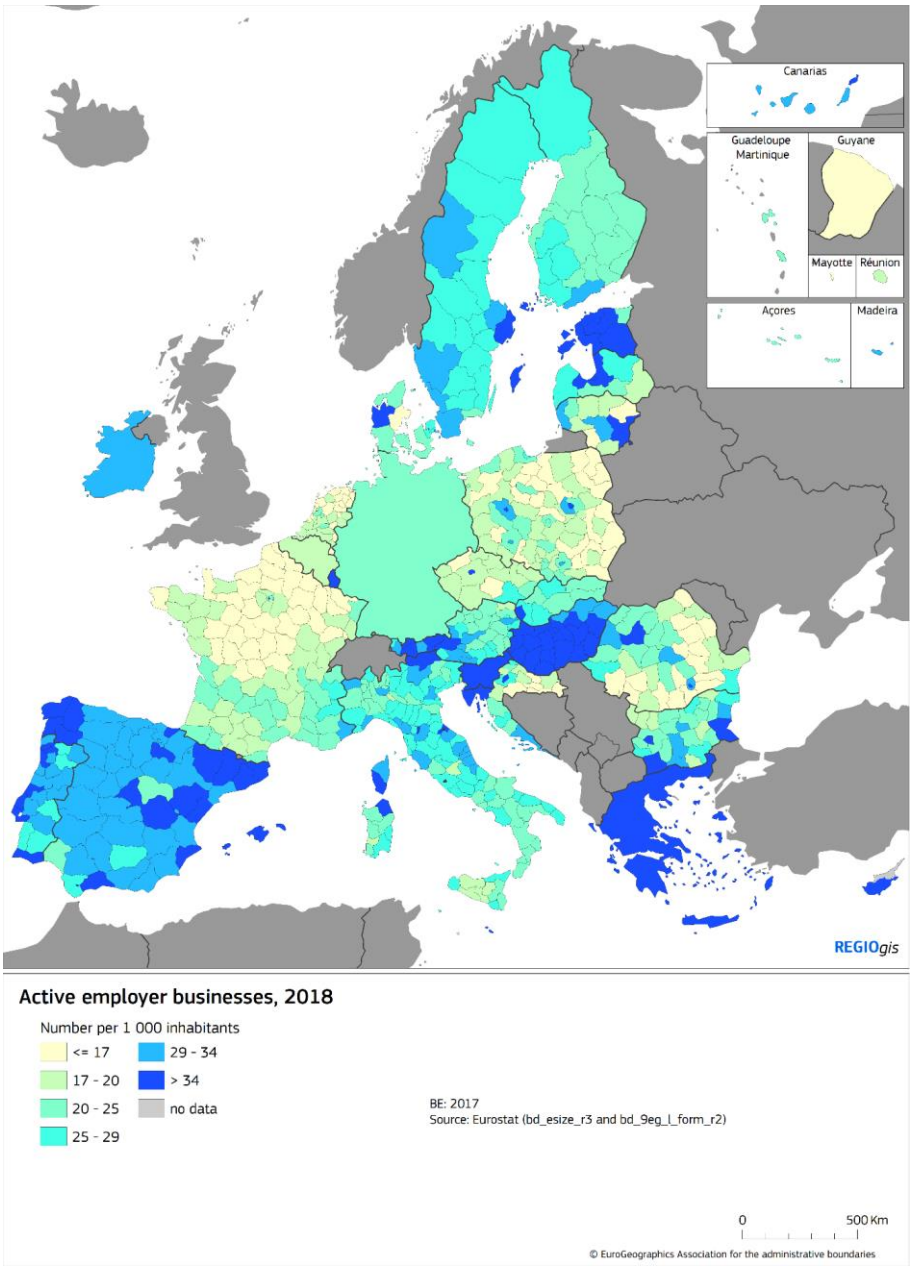
In 2018, the number of firms[15] with at least one employee – termed 'employer firms' here – was largest relative to population in Greece, Cyprus, Luxembourg, Slovenia (for which only national data are available) and most parts of Hungary and Estonia (Map 2-10). This may reflect a relative absence of large firms. Although the number of firms varies greatly between regions within Member States, the national context appears to be an important factor. In most countries, the number of firms relative to population is highest in the capital metro regions, except for France, Italy, Austria, and Spain. This is in part because many firms, especially large ones, have their headquarters there. The headquarter function also contributes to the higher number of employees per firm in the capital metro region[16]. In general, non-metro regions tend to have fewer employer firms per inhabitant than metro regions.

Firms may locate in more urbanised areas to benefit from agglomeration economies, from 'matching', 'sharing' and 'learning' (Duranton and Puga, 2020). Cities tend to have larger labour markets, allowing better matching between labour demand and supply, and enable better sharing of inputs and infrastructure, while the fact that people work and live in close proximity facilitates learning from each other.

[15] All firms in the business economy, as defined by NACE Rev.2, are covered, except insurance activities of holding companies (sector K642).

[16] Some caution is needed in interpreting this result. Some large enterprises may be composed of multiple local units, located in different regions, but with their employment registered in the head office often located in the capital city. This may inflate the number of employees counted as working there.

Map 2-10: Active employer businesses per 1000 inhabitants, 2018



Business demography Statistics

Employer Business Demography Statistics at regional level show where firms (with at least one employee) are located in the EU and their dynamics in terms of births, deaths and growth. This section examines indicators of the number of firms relative to population, employees per firm, firm birth rates (firms created relative to population), firm death rates (closures relative to population), and the proportion of 'high growth' firms (defined here as firms with at least 10 persons employed growing by over 10% a year over a three-year period).

For more details see: http://ec.europa.eu/eurostat/statistics-explained/index.php/Structural_business_statistics_at_regional_level

New enterprise creation is one of the main drivers of economic development and employment creation. New firms can help to open new sectors and higher value-added markets, so contributing to the structural transformation of an economy (Dent et al., 2016). They may also help to increase competitiveness by pushing incumbent enterprises to become more efficient.

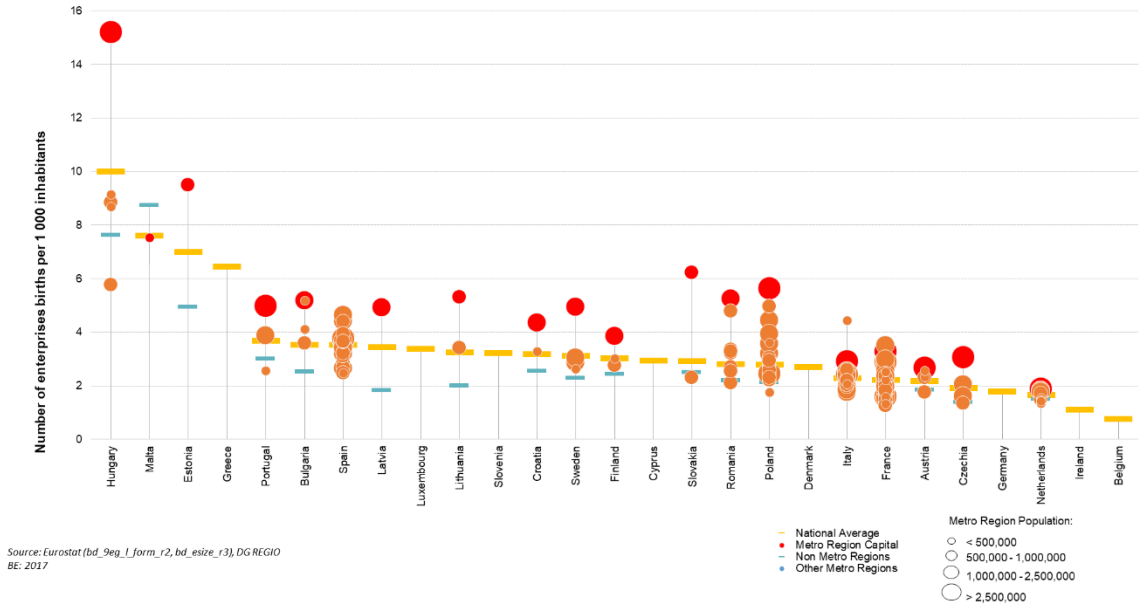
In 2018, the number of newly-created employer firms relative to population tended to be higher in capital metro regions in both more developed and less developed Member States, with birth rates in Budapest and Tallinn being particularly high (Figure 2-18). Paris, Rome and Madrid are exceptions, birth rates being lower than in other metro regions in the countries concerned. In many sectors, firms operating in metro regions tend to face more competition because of the larger market and so a greater risk of being forced out of business if they are uncompetitive (Melitz and Ottaviano, 2008; Combes et al., 2012). High death rates, therefore, often go with high birth rates, as in Budapest and Tallinn, though death rates tend to be lower than birth rates, particularly in metro regions[17].

High growth enterprises[18] play an important role in the economic growth of cities and regions through their contribution to productivity and innovation (Acs et al., 2008). In 2018, capital metro regions typically had the highest number of high growth firms per head. The only exceptions were Lisbon, Amsterdam, Rome, Paris and Vienna, but even there the number was still above the country average (Figure 2-19). In all Member States, the number was higher in metro regions than non-metro regions.

[17] This may reflect the fact that firms can cease operating without being formally closed down.

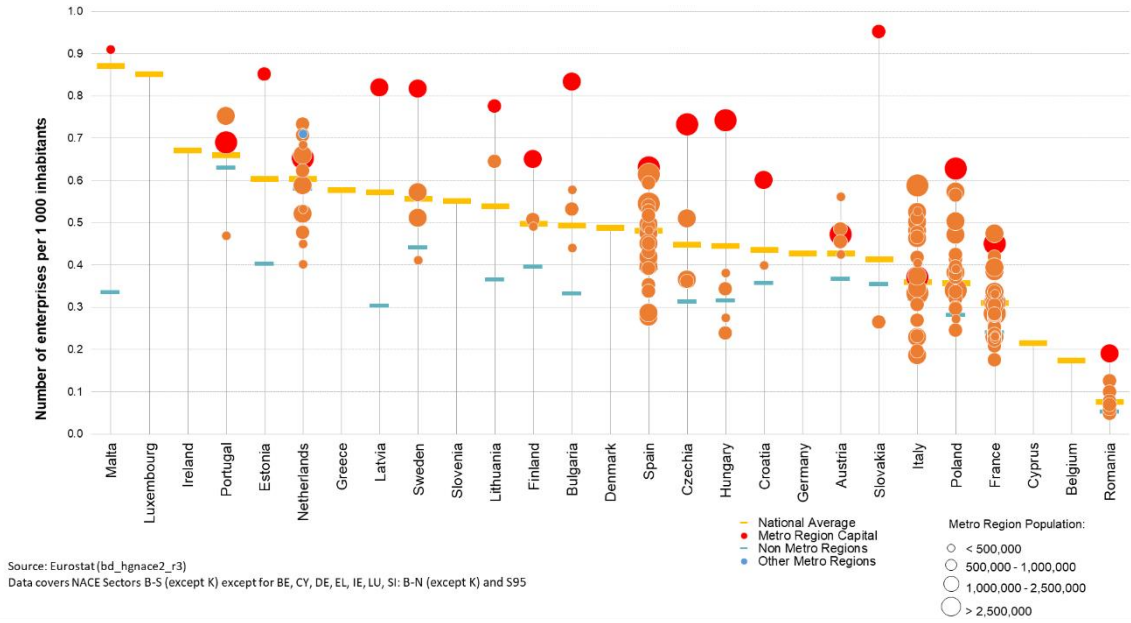
[18] High-growth enterprises are those which had at least 10 persons employed at the beginning of the period and where employment increased by over 10% a year over the subsequent three years.

Figure 2-18: Employer firm birth rates by type of region, 2018



BE: 2017
Source: Eurostat [bd_esize_r3], DG REGIO calculations

Figure 2-19: Number of high growth firms by type of region, 2018



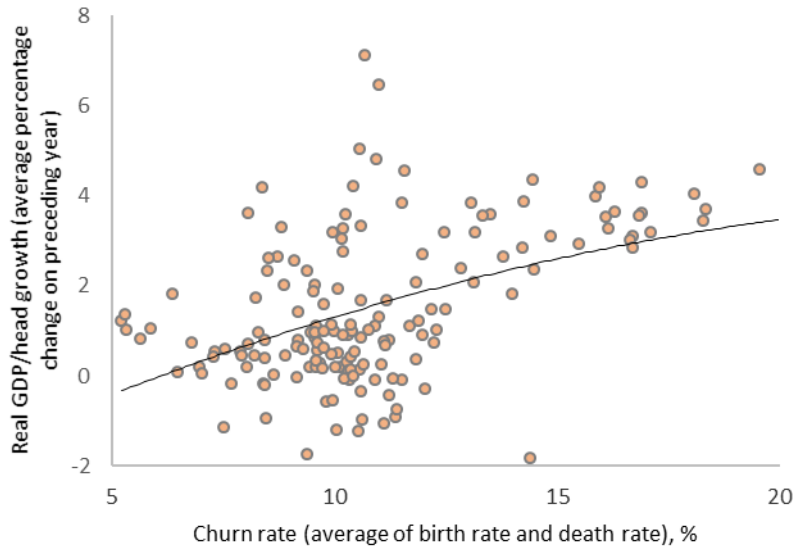
Data covers NACE sectors B-S (except K), apart from BE, CY, DE, EL, IE, LU, and SI, where they cover B-N (except K) and S95.
Source: Eurostat [bd_hgnace2_r3], DG REGIO calculations

Creative destruction and GDP growth in EU regions

The economic concept of creative destruction is described by Schumpeter (1942) as "*the process of industrial mutation that continuously revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one*". As a concept it is studied as a possible driver of economic growth, often in an endogenous growth context (see e.g. Aghion and Howitt, 1992). In the literature on firm and employment dynamics, creative destruction is in many cases measured by the average of the rate of firm creation and the rate of firm destruction, also known as the business churn rate.

There is a significant positive relationship between the churn rate and average annual growth rate of real GDP in EU NUTS2 regions over the 2008-2018 period (Figure 2-20), primarily reflecting the fact that nearly all regions with a churn rates above 12% had above average GDP growth[(i)]. Among regions with lower churn rates the relationship is weaker and, indeed, many of these had high growth.

Figure 2-20: Creative destruction and GDP growth in EU regions, 2008-2018



Note: The precise period covered differs between regions because of data gaps for the churn rate.
Source: Eurostat, DG REGIO calculations

[(i)] The single exception is French Guyana, which could be considered an outlier.

Entrepreneurship is crucial for regional development, but start-ups and 'scale-ups' face particular financing constraints

Start-ups and scale-ups need capital. EU start-ups, however, have more difficulty in obtaining venture capital than their US counterparts. EU scale-ups have even more difficulty to grow and remain independent than US firms. An additional problem is that venture capital is usually concentrated in a few places, often in the capital city.

To boost investment opportunities from venture capital and make funding more accessible to small and innovative enterprises, the Commission in 2016 launched a pan-European Venture Capital Fund-of-Funds under the Start-Up and Scale-Up Initiative (COM(2016)733 final). This complements other financial instruments under the EU programme for the Competitiveness of Enterprises and SMEs (COSME) and Horizon 2020's Innovfin to facilitate SME access to guarantees, loans and equity capital through local financial institutions in the Member States.

To help start-ups and scale-ups, and building on the Single Digital Gateway(1) and existing national and European contact points, the European Commission has set up the Enterprise Europe Network (EEN), which provides 'Scale-up Advisors' in all regions to provide advice to SMEs on relevant national and EU regulations, funding and partnering opportunities and how to participate in cross-border public procurement.

(1) The single digital gateway refers to an initiative to create a single-point of access to the information, administrative procedures and assistance services that individuals and businesses need to become active in another EU country. By the end of 2023 at the latest, users will be able to perform a number of procedures in all EU member states without any physical paperwork, like registering a car or claiming pension benefits.

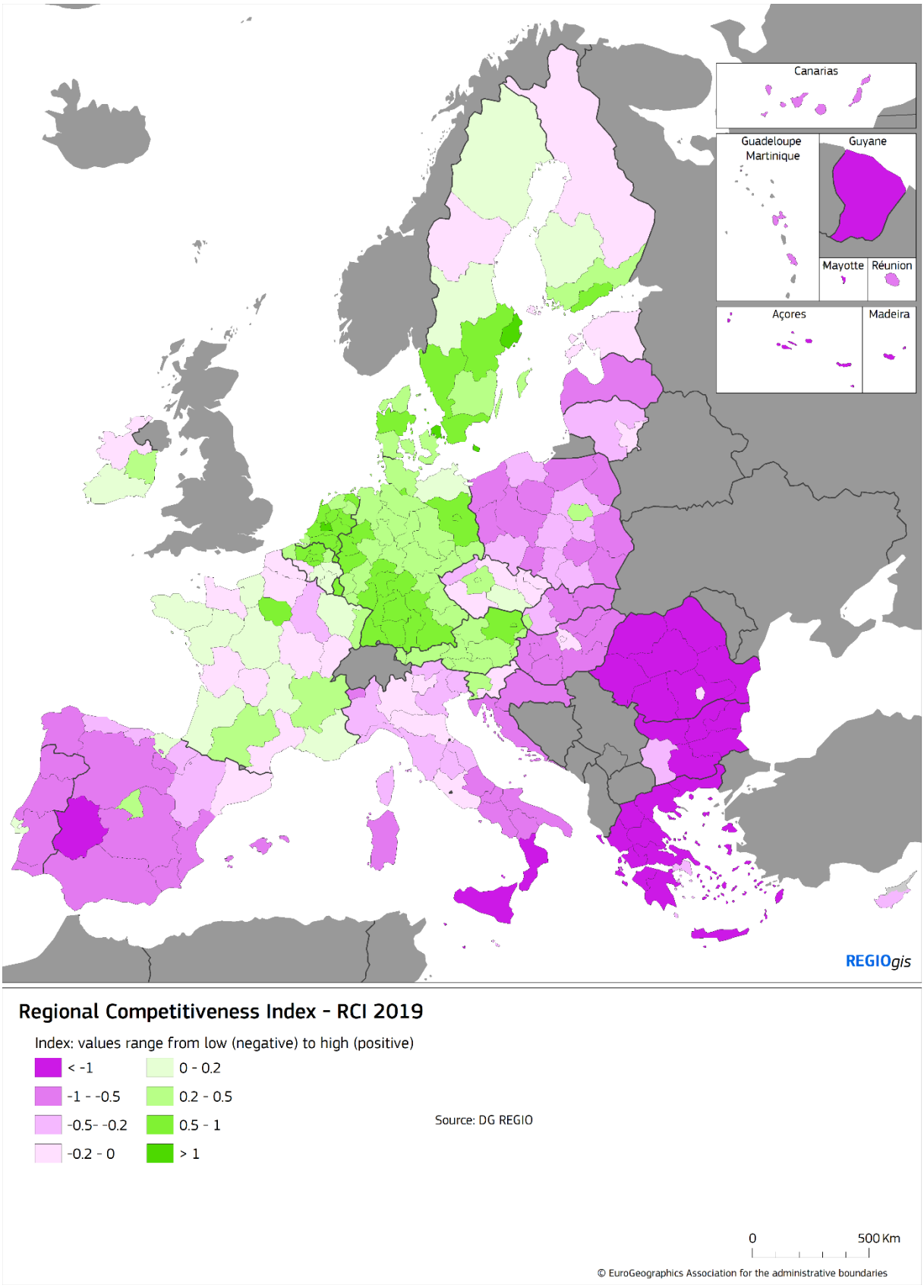
2.4.3 Regional competitiveness in Europe

Regional competitiveness indicates the ability of a region to offer an attractive and sustainable environment for firms and residents to live and work in. Launched in 2010 and updated regularly since, the Regional Competitiveness Index (RCI) is designed to capture the different dimensions of competitiveness for EU NUTS 2 regions[19]. It allows regions to monitor and assess their development over time as compared with other regions[20]. The most recent edition of the RCI was published in 2019. It shows that more than 10 years after the crisis, there is still a clear north-west – south-east divide across the EU (Map 2-11).

[19] See Annoni and Kozovska (2010), Dijkstra, Annoni and Kozovska (2011), Annoni and Dijkstra (2017) and Annoni and Dijkstra (2019)

[20] All RCI editions are built on the same approach as the Global Competitiveness Index of the World Economic Forum.

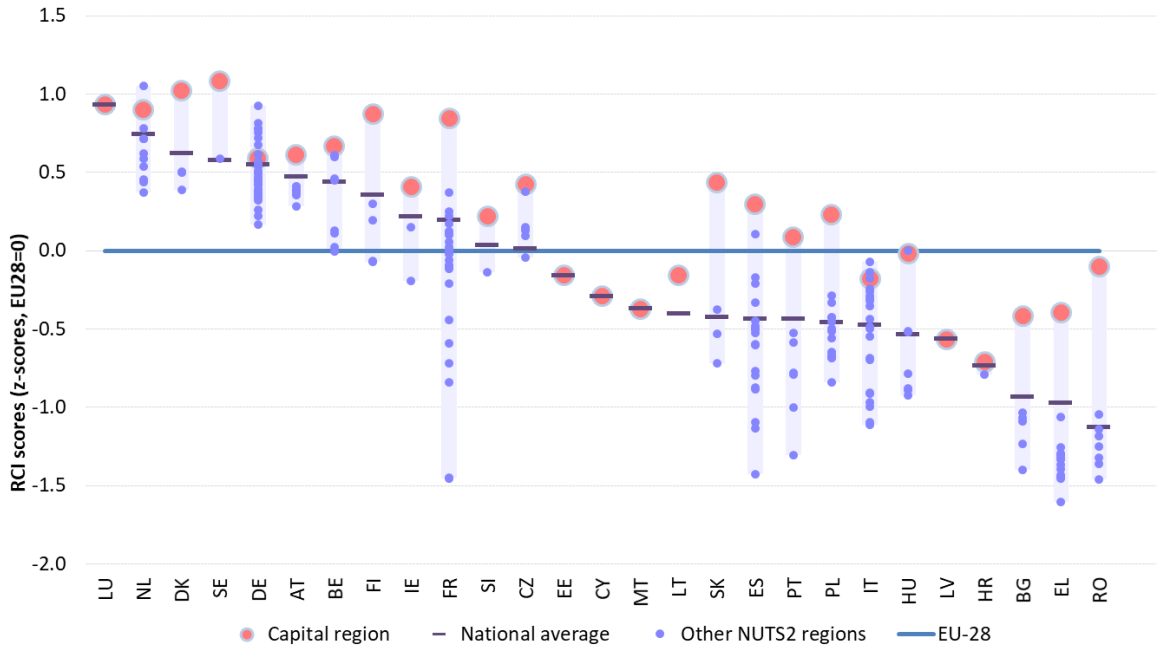
Map 2-11: Regional Competitiveness Index scores, 2019



In line with previous editions, the 2019 RCI shows a polycentric pattern with strong performance of most capital city regions and others with large cities, which benefit from agglomeration economies, better connectivity and high levels of human capital.

Capital city regions tend to be the most competitive, except in the Netherlands (where the capital city region is ranked second), Italy (where Lombardia is the most competitive region) and Germany (Figure 2-21).

Figure 2-21: Distribution of regional RCI 2019 scores by Member State



Source: DG-REGIO

The gap between the capital city region and others is particularly wide in France, Spain, Portugal and many of the Eastern Member States. This can be a reason for concern as it puts pressure on the capital city region while possibly leaving resources under-used in other regions.

In general, higher levels of GDP per head are associated with higher levels of competitiveness. However, this relationship is stronger at lower levels of GDP – among more prosperous regions there is more variation in competitiveness.

The Regional Competitiveness Index (RCI) methodology

The 2019 edition of the RCI index is based on a set of 74 indicators selected from 84 candidate indicators (some indicators used in 2016 have been replaced). Most indicator values available span the period 2015-2017, some are for 2018, while a few go back to 2014.

Data comes from a wide variety of sources, including the Quality of Government Index (University of Gothenburg), Worldwide Governance Indicators (World Bank), Global Competitiveness Index (World Economic Forum), various Eurostat indicators, and the Regional Innovation Scoreboard (DG GROW).

Following the same methodology as previous editions, the indicators are grouped into 11 dimensions of competitiveness capturing aspects that are relevant for productivity and long-term development. In turn, these 11 dimensions are organised into three sub-indices: Basic, Efficiency and Innovation. The Basic group includes five pillars: (1) Institutions, (2) Macroeconomic stability, (3) Infrastructure, (4) Health, and (5) Basic education, which are the key drivers for all economies. As a regional economy develops and its competitiveness increases, a more skilled labour force and a more efficient labour market come into play as part of the Efficiency group, which includes three pillars: (6) Higher education, training and lifelong learning, (7) Labour market efficiency and (8) Market size. At the most advanced stage of development, the Innovation group becomes more important, consisting of three pillars: (9) Technological readiness, (10) Business sophistication, and (11) Innovation. Indicator values are normalised as z-scores, i.e. by calculating the difference between the observed score and the mean score across regions and dividing by the standard deviation.

EU regions are divided into five development stages based on their average 2015-2017 GDP per head (in PPS terms) relative to the EU average. The weights attached to the three sub-indices used to calculate the overall RCI differ between stages of development (Table 2-3).

Table 2-2: Weights of the three RCI sub-indices per development stage

Stage of development	Basic sub-index	Efficiency sub-index	Innovation sub-index
Stage 1: GDP index <50	30.00%	50.00%	15.00%
Stage 2: GDP index 50-75	31.25%	50.00%	18.75%
Stage 3: GDP index 75-90	27.50%	50.00%	22.50%
Stage 4: GDP index 90-110	23.75%	50.00%	26.25%
Stage 5: GDP index >= 110	20.00%	50.00%	30.00%

The GDP index is calculated based on the EU average=100
Source: Annoni et al. (2019)

The 2019 RCI tracks the performance of all NUTS 2 regions in EU Member States. As in previous editions, the regions that are part of the same functional urban area are combined, which is the case for 6 capital functional urban areas, i.e. those of Vienna, Brussels, Prague, Berlin, Budapest and Amsterdam.

For further details on the methodology, see Annoni et al. (2019).

References

Acs Z., Parsons, W., Tracy, S. (2008), High Impact Firms: Gazelles Revisited, Office of Advocacy, U.S. Small Business Administration.

Aghion, P. and Howitt, P. (1992) A Model of growth through Creative Destruction. *Econometrica* 60(2), 323–51.

Altomonte, C., Di Mauro, F., Ottaviano, G., Rungi, A., & Vicard, V. (2012). Global value chains during the great trade collapse: a bullwhip effect? Firms in the international economy: Firm heterogeneity meets international business, 277-308.

Annoni, P., Kozovska, K. (2010), EU Regional Competitiveness Index 2010, EUR 24346, Publications Office of the European Union, Luxembourg.

Dijkstra, L., Annoni P., Kozovska, K. (2011), A new European Regional Competitiveness Index: theory, methods and findings, Working Papers 02/2011, Directorate General for Regional and Urban Policy, European Commission

Annoni, P., Dijkstra, L. (2017) Measuring and monitoring regional competitiveness in the European Union. In Huggins, R. and Thompson P. (Eds.): Handbook of Regions and Competitiveness - Contemporary Theories and Perspectives on Economic Development, Edward Elgar Publishing.

Annoni P. and Dijkstra L. (2019) The EU regional competitiveness index 2019. European Commission. Regional and Urban Policy Papers.

Annoni, P. and Catalina Rubianes, A. (2016) "Tree-based approaches for understanding growth patterns in the European regions", *REGION*, 3(2), 23-45.

Annoni, P., de Dominicis, L., and Khabirpour, N., (2019), Location matters: A spatial econometric analysis of regional resilience in the European Union, *Growth and Change*, 50 (3): 824-55.[1]

Combes, P.P, Duranton, G., Gobillon, L., Puga, D., Roux, S. (2012), The productivity advantages of large cities: distinguishing agglomeration from firm selection, Econometrica 80 (6), 2543-94.

Dijkstra L., Poelman, H. and Rodríguez-Pose, A. (2020), The geography of discontent. *Regional Studies* 54(6), 737-753.

Duranton, G. and Puga, D. (2020). The economics of urban density. *Journal of Economic Perspectives* 34(3), 3-26.

European Commission (2017), Reflection Paper on Harnessing Globalisation. Publications Office of the European Union: Luxembourg.

European Commission (2020) Science, research and innovation performance of the EU: A fair green and digital Europe. Publications Office of the European Union: Luxembourg. European Commission (2021a) EC Communication on a long-term vision for the EU's rural areas – Towards stronger, connected, resilient and prosperous rural areas by 2040. COM (2021) 345 final.

European Commission (2021b) EC Communication on the 2030 Digital Compass: the European way for the Digital Decade. COM (2021) 118 final. European Commission and UN-HABITAT (2016), The State of European Cities 2016. Cities leading the way to a better future, Publications Office of the European Union: Luxembourg.

Guzzo, F., and Gianelle C. (2021), *Assessing Smart Specialisation: Governance*, Publications Office of the European Union, Luxembourg, DOI: 10.2760/48092, JRC123984.

Hegyi, F. B., Guzzo F., Perianez-Forte I., and Gianelle C. (2021), *The Smart Specialisation Policy Experience: Perspective of National and Regional Authorities*, Publications Office of the European Union, Luxembourg, DOI: 10.2760/554632, JRC123918.

Iammarino, S., Rodriguez-Pose, A., Storper, M. (2020), Falling into the Middle-Income Trap? A Study on the Risks for EU Regions to be Caught in a Middle-Income Trap. Luxembourg: Publications Office of the European Union, 2020.

Iammarino, S., Rodriguez-Pose, A., Storper, M. (2017), Why Regional Development Matters for Europe's Economic Future, Working Papers 07/2017, Directorate General for Regional and Urban Policy, European Commission.

Krugman, P. (2007). The 'new' economic geography: Where are we?. In Regional Integration in East Asia (pp. 23-34). Palgrave Macmillan, London.

Lesage, J.O., and Fischer, M. (2008) Spatial Growth Regressions: Model Specification, Estimation and Interpretation, *Spatial Economic Analysis* 3(3), 275-304.

Melitz, M.J., Ottaviano, G.I.P. (2008), 'Market Size, Trade, and Productivity', Review of Economic Studies, 75(1): 295-316.

OECD (2018), Hungary: Trade and Investment Statistical Note

OECD (2019), Luxembourg. OECD economic surveys.

OECD/Eurostat (2018), Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, https://doi.org/10.1787/9789264304604-en.

Pike A., Rodríguez-Pose A., Tomaney J. (2017) Shifting horizons in local and regional development, Regional Studies, 51:1, 46-57.

Prognos and CSIL (2021, forthcoming), Study on Prioritisation in Smart Specialisation Strategies in the EU

Schumpeter, Joseph A. (1942). Capitalism, Socialism and Democracy. New York: Harper & Bros.

Rodríguez-Pose A. (2020). The research and innovation divide in the EU and its economic consequences. European Commission R&I Paper Series. Working Paper 2020/03.

Taglioni, D., and Winkler, D. (2014). Making Global Value Chains Work for Development, Building Global Value Chains 2014. In Annual Meetings side event, The World Bank Group (pp. 1-127).

World Economic Forum (2019), The Global Competitiveness Report 2019.