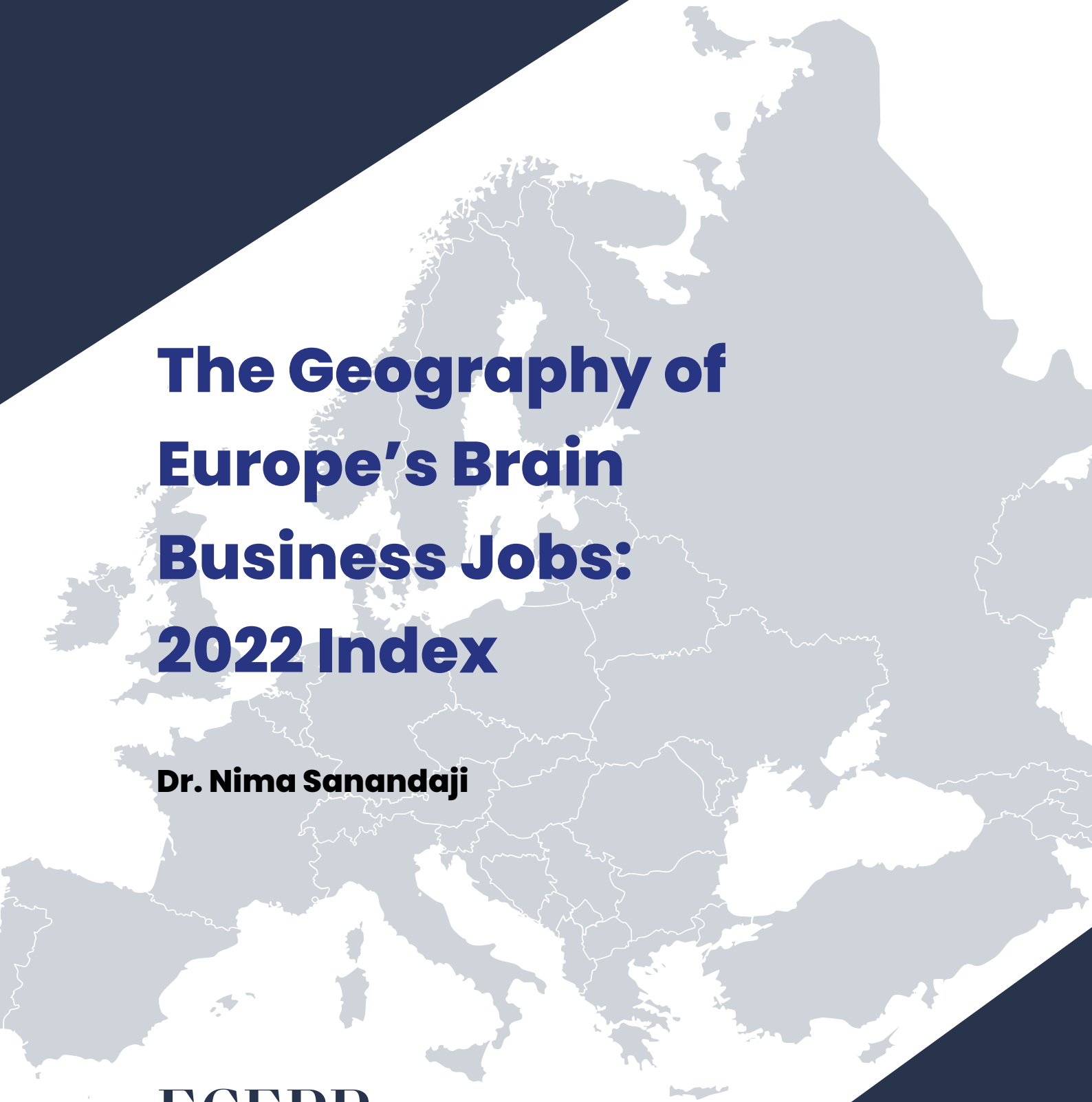

The Geography of Europe's Brain Business Jobs: 2022 Index

Dr. Nima Sanandaji

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NORDIC CAPITAL

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The Geography of Europe's Brain Business Jobs: 2021 Index from the European Institute for Policy Reform and Entrepreneurship (ECEPR), which is produced with the support of Nordic Capital.

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Summary

- In Europe, brain business jobs are growing – and are the keys to low regional unemployment.
- New Nordic and Western European firms in brain business hubs have a significant lead in funding
- Switzerland, Ireland, and Sweden the top knowledge economies of Europe.

The study *The geography of Europe's brain business jobs* measures the share of the working-age population across Europe employed in highly knowledge-intensive enterprises. The data is compiled through an analysis of detailed structural business statistics for European countries and regions. This fifth edition of the index expands the analysis, to also include employment in manufacturing industries, as well as in professional services. Together brain business jobs, manufacturing industries, and professional services are value-driving sectors, creating economic opportunities and exports for regions and countries. By looking at the share of the population employed in high-value-creating sectors in 31 European countries and 267 regions within these countries, this study finds a significant link to regional unemployment.[1] Regions that have a high share of brain business jobs tend to have lower unemployment than those with a lower share of knowledge-intensive jobs. There is an even stronger link between the combined share of employment in high-value-creating sectors (including manufacturing industries and professional services, as well as brain business jobs) and regional unemployment. Several other interesting findings also emerge:

1 Regional analysis includes 29 countries, as data of high quality does not exist yet for Switzerland and Ireland.

- **Steady growth of knowledge-intensive jobs in all greater regions of Europe.** Between 2014 and 2021, the share of the adult population employed in brain business jobs has increased from 4.3 to 5.3 percent in Southern Europe, from 4.4 to 5.9 percent in Eastern Europe, from 7.8 to 8.2 percent in Northern Europe, and 7.4 to 8.4 percent in Western Europe. In 2020 the number of knowledge-intensive jobs decreased, due to the COVID-19 pandemic, but it started to rise again in 2021.

- **Successful new European firms shift focus from customer services to software/AI/digital media.** A study of 150 innovation companies, founded in the top-30 leading European brain business jobs hubs, finds that the most common forms of innovations are business service innovation, digital infrastructure/platform, and software/AI/digital media. Compared with the same study last year, customer service innovation has fallen out of the top three, as software/AI/digital media innovations are now more important for the novel innovation companies of the top-30 leading European brain business hubs. The least common form of innovation remains, like last year, manufacturing technology. Several of the innovative companies are pushing for technological and social change, for example, linked to vaccinations, cancer treatment, and a shift to environmentally sustainable economic production.

- **New Nordic and Western firms in brain business hubs have a significant lead in funding.** The average company in Eastern European brain business hubs, founded since 2016, has attracted 10 million Euros in funding, compared to 74 million in Western Europe. Southern Europe only has two regions on the top-30 list, Madrid and Paris. Paris is however the single largest brain business jobs hub

in Europe (in absolute numbers), with strong funding. The average innovation company in Southern Europe has 118 million Euros in external innovation funding. The leading region continues to be the Nordics, with 167 million in average funding for leading novel innovation companies on average.

- **Switzerland, Ireland, and Sweden the top knowledge economies of Europe.** The concentration of knowledge-intensive jobs is highest in Switzerland, where fully 10.1 percent of the population is employed in brain business jobs. Ireland has the same high share of knowledge-intensive firm employment, followed by Sweden where 9.3 percent of the population is employed in brain business jobs. Ireland climbs to the second position in the brain business jobs index because the statistics for the country reported to Eurostat are now up to date.[2] The country attracts many international firms in knowledge-intensive businesses, mainly from the US.

- **Fostering high-value-creating jobs is an important aspect of reducing regional unemployment.** Already previous years' study of brain business jobs had shown a strong link to regional unemployment. Since this year's study takes a broader view, by looking at high-value-creating sectors (including manufacturing industries and professional services), an even stronger link is now found. Each percentage point higher share of the population of European regions employed in high-value-creating sectors corresponds with 0.22 percent lower regional unemployment.[3] Meaning that in a region where 10 percentage points more of the population (compared to the average European region) is employed in brain business jobs, manufacturing industries, and professional services, the average unemployment is 2.2 percent lower.

2 Data for Ireland reported to Eurostat had shortcomings during previous years. For this year, full data exists for all 31 countries. Regional data of high quality is still not reported for Switzerland and Ireland, and some data is missing for peripheral regions of Greece.
3 Data on jobs for 2021 is matched with latest available regional unemployment data for 2020.

- **4 out of 10 top brain business jobs regions are found in Eastern Europe, 4 in Western, and 2 in Nordics.** As in previous editions of this index, the Slovakian capital region of Bratislava remains the European region with the highest concentration of brain business jobs. Over 22 percent of the working-age population of this region is employed in knowledge-intensive firms. Budapest and Prague rank in second and third positions, followed by Stockholm, Oberbayern, Paris, Copenhagen, the Oxford region (Berkshire, Buckinghamshire, and Oxfordshire), Warsaw, and London. In total four of the regions in the top-10 are found in Eastern Europe, additionally four in Western Europe, and the remaining two in the Nordics. If we instead look at the total number of jobs in high-value-creating sectors (brain business jobs + manufacturing industries + professional services), Bratislava remains on top with fully 61 percent of the population employed in these parts of the economy. Prague is in second place, followed by Paris, Notio Aigaio (in Greece), Oberbayern, Luxembourg, Warsaw, Stuttgart, Budapest, and Mittelfranken.

- **Paris remains only European region with more than one million brain business jobs.** Paris has above 1.2 million brain business jobs and remains the only region in Europe with more than one million employees in knowledge-intensive businesses. In total, the capital regions of Southern Europe (Paris, Madrid, Rome, Lisbon, Athens, Cyprus, and Malta) have above 2.3 million brain business jobs. This can be compared to 1.7 million knowledge-intensive firms' employment in the capital cities of Western Europe (London, Berlin, Amsterdam, Vienna, Brussels, Luxembourg). In total, there

are close to 1.5 million brain business jobs in the capital cities of Eastern European nations (Warsaw, Budapest, Bucharest, Prague, Sofia, Bratislava, Zagreb, Latvia, Ljubljana, Vilnius, and Estonia). The Nordic nations have a strong performance in creating knowledge-intensive jobs, but smaller populations. There are in total circa 700 000 brain business jobs in the Nordic capital regions (Stockholm, Copenhagen, Helsinki, Oslo, and Iceland).

- **Brain business jobs become increasingly distributed over Europe.** There is a strong geographical equalization of brain business jobs, happening in Europe. An analysis of how the concentration of brain business jobs has changed over time (table 1), finds that nine European countries have had an increase of above 33 percent, since 2014. The highest increase is 55 percent in Cyprus followed by 48 percent in Latvia. All nine top climbers are found in the Southern and Eastern European regions. At the same time, countries that previously had a high concentration of brain business jobs, have relatively stagnant development. A significant shift is happening, as brain business jobs grow in parts of Europe which combine ample supply of talent, with a relatively lower cost for employment of talents.

Foreword: Klas Tikkanen

Through the Brain Business Jobs index, we have studied the geography of Europe's knowledge-intensive jobs since 2017. It has been a learning experience, and it is encouraging to see the strong interest that exists for this work, throughout Europe and internationally. Various European governments, regional governments, and universities follow the Brain Business Jobs index. The index features in European media and research, and is used as university course literature even in emerging markets such as India and Mexico.

Knowledge is the foundation for attracting investments and creating value in a long-term sustainable way. As a leading investor in Europe, it is natural for Nordic Capital to support research on how knowledge strengthens good investment conditions.

The index has also lead to some important insights. For example, we see the Eastern European capital regions Bratislava, Prague, Budapest, Warsaw and Bucharest together have almost as many brain business jobs as London—some of these capital regions even have a higher concentration of brain business jobs than London, although smaller total populations.

Eastern European capital regions are becoming an integral part of the European innovation machine. It is increasingly common for innovation companies in places such as Stockholm and London to outsource part of their work to knowledge centres of Eastern Europe, or Southern Europe, to reduce costs. This is an important development, through which European innovation occurs in cooperation between regions.

To be sure, Europe overall still has an entrepreneurial gap compared to the United States, and even to China. This year we launched a sister project to the Brain Business Jobs index, through the Superentrepreneurs index—which measures the rate of leading entrepreneurs per capita in the world. A finding is that Europe is significantly behind the USA when it comes to Superentrepreneurs, and even lags China.[4] McKinsey Global Institute has also brought up how Europe is falling behind both USA and China when it comes to technology and corporate success.[5] However, there is hope for Europe to catch up.

As we have seen in the Brain Business Jobs index, European innovation is increasingly spread out over the continent – and through digital technology and travel, the innovation regions of Europe are increasingly linked together. This is starting to give European innovation companies the combined scale they need in order to compete with the USA and China.

From the beginning of European civilization, to the Renaissance and the Industrial Revolution, it is competition between neighboring states seeking to attract business that has been the winning formula for Europe. Competition and cooperation in Europe are again on the rise, amongst knowledge-intensive companies, which is a sign of rejuvenation for Europe as a leading global centre of new ideas, technologies, and businesses.

4 ECEPR & Nordic Capital (2022).
5 McKinsey Global Institute (2022).

Klas Tikkanen is COO of Nordic Capital. He has helped drive Nordic Capital's transformation the past decade, including the development of its strategy, governance, culture, and operations, and sits on Nordic Capital's top management company board, the investment review committees for Nordic Capital X and Nordic Capital Evolution, portfolio review committee, fair value committee, operations advisory board, and value portfolio committee, as well as chairing the HR and compensation committee and charities boards.

Figure 1. *Share of the workforce in brain business jobs*

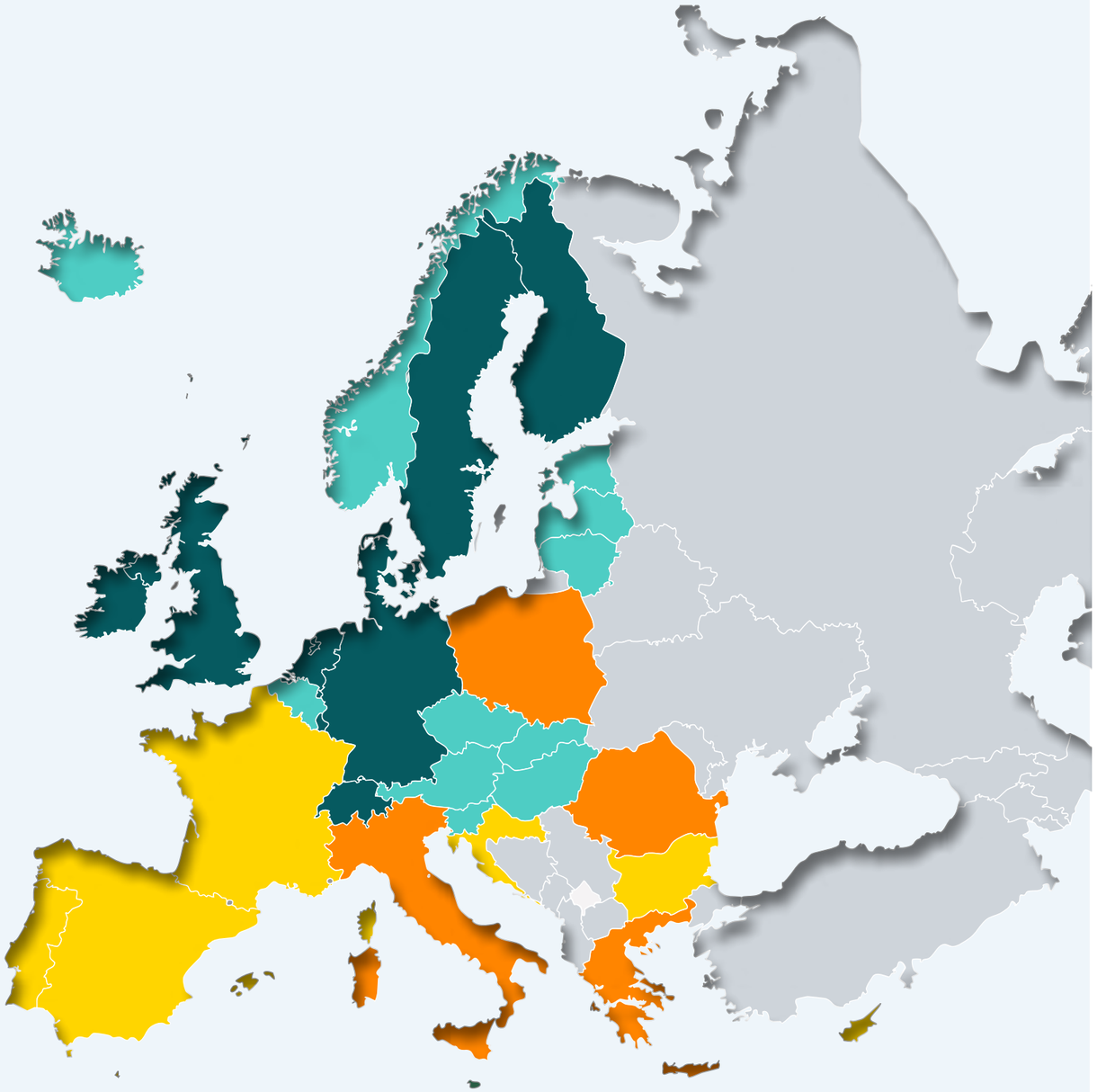


Table 1. *Rate of change in brain business jobs concentration (per capita working-age inhabitants) between 2014 and 2021*

Cyprus	55%
Latvia	48%
Lithuania	42%
Hungary	41%
Poland	39%
Portugal	39%
Estonia	35%
Slovenia	34%
Slovakia	34%
Bulgaria	31%
Malta	30%
Romania	30%
Spain	28%
Croatia	27%
Belgium	25%
Finland	25%
Czechia	22%
Netherlands	15%
Italy	14%
United Kingdom	12%
Luxembourg	8%
Sweden	4%
Norway	3%
France	3%
Austria	2%
Switzerland	0%
Denmark	-1%
Iceland	-4%
Greece	-11%

Source: Own analysis of Eurostat structural business statistics, short-term business statistics, and population data. Note: Ireland had no complete data for previous years, and is therefore excluded in this

Which innovations are driving new business development, in Europe's 30 strongest brain business hubs?

The brain business jobs index includes a mapping of newly founded innovation companies, in the 30 leading brain business jobs hubs of Europe. The source of the data is Crunchbase, a leading international enterprise database, which includes information on firm activity, investments, industry trends, and innovations. For each region, the 5 top-ranking firms on the Crunchbase founded since 2016, have been examined.[6] The result is data on 150 European innovation companies, with a focus on their key innovations and financing. Crunchbase was originally created as a tool for investors to find promising start-up firms to invest in and has since grown to become perhaps the most comprehensive global business database, with a focus on firm innovation. Information on Crunchbase is gathered via four different channels: from the listed companies, through machine learning, from a team of researchers working at the database, and lastly through some half a million active users of the database.

Information on investments and other changes in the firms listed on Crunchbase is often updated live, or on the day following the investment. While Crunchbase is created mainly as a tool for investors and entrepreneurs, it has also gained considerable academic interest in recent years. For example, Jean-Michel Dalle, Matthijs den Besten, and Carlo Menoni published a study in 2017 for the OECD on the possibility to use Crunchbase for research in economics and management. The authors noted that Crunchbase is attracting interest from researchers in different fields since it contains unique data on the start-up ecosystem.[7] Yuxian Eugene Liang and Soe-Tsyr Daphne Yuan have relied on Crunchbase for studying firm investments, with the motivation that Crunchbase is the largest global database with profiles for the included firms.[8] Ross Brown and Augusto Rocha have used the database in order to study the actions of investors during the uncertainty created by the COVID-19 pandemic.[9]

An example of the 30 regions studied is the Slovakian capital region of Bratislava, the European region with the highest concentration of brain business jobs. In the Bratislava region, the five highest-ranked companies on the Crunchbase database are CloudTalk (which offers remote ready call centre software), InoBat (research and development and production of batteries), altFINS (cloud-based platform allowing investors and traders to track and analyse digital assets across various platforms), FinGo (offers comparisons of mortgages, investments, and insurances) and iERP.ai (provides pre-packaged artificial intelligence algorithms to businesses). The key innovations of four of the companies (except InoBat) concern business services, while altFINS and FinGo also offer innovations relevant for customer services. CloudTalk has innovations in digital meetings/marketplace, digital infrastructure/platform, and software/AI/digital media, while altFINS has innovation in digital infrastructure/platform, and iERP.ai has innovation in software/AI/digital media. InoBat has innovations in manufacturing technology, as well as in the products/procedure/other technology category.

Figure 2 shows the innovation reliance, of the panel of 150 newly founded, and on Crunchbase highly ranked, firms in the 30 leading brain business hubs of Europe. A majority of 66 percent of the firms rely on business service innovations, while 42 percent rely on digital infrastructure/platforms, typically as a means of standardizing a form of service delivery. Software/AI/digital media innovations are utilized by 37 percent of the novel innovation

6 Data gathered between 20th and 30th of December 2021.

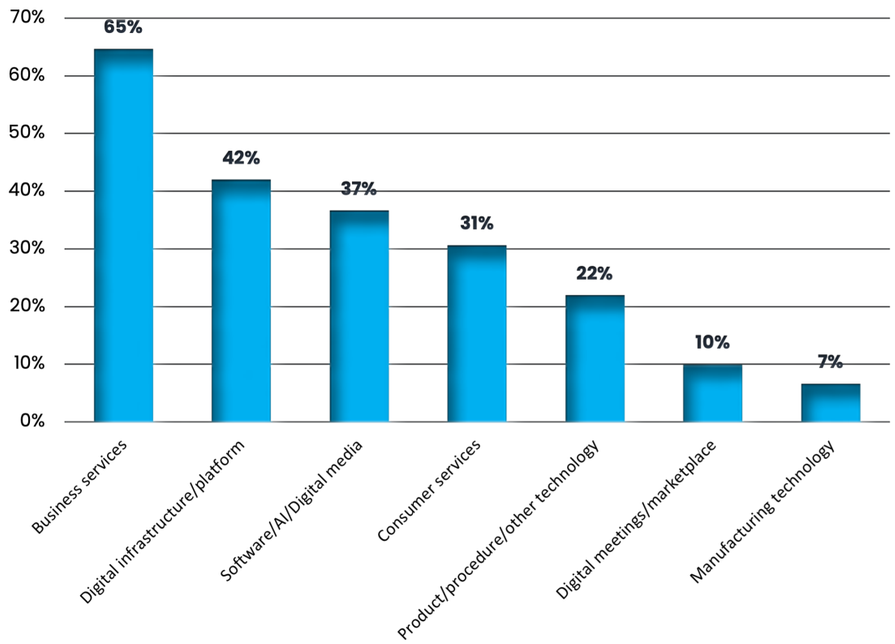
7 Dalle, Den Besten & Menon (2017).

8 Liang & Yuan (2016).

9 Brown & Rocha (2020).

companies, compared with 31 percent which rely on various customer services innovations. Product/procedure/other technology innovations are relevant for 22 of the companies, while 10 percent rely on digital meetings/ marketplace innovations. Lastly, only 7 percent of the companies rely on manufacturing technology innovations.

Figure 2. *Firm innovation reliance, panel of 150 high-ranking businesses founded since 2016 in 30-top brain buiness jobs centres of Europe (firms can rely on a combination of innovations)*



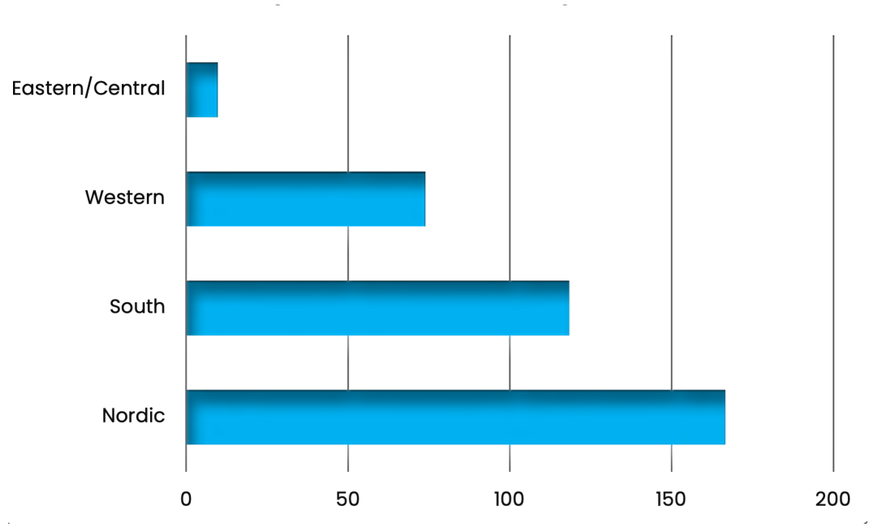
The novel innovation companies of Europe play a key role in solving the challenges facing Europe, and the rest of the world, such as viral infections, global warming, transportation, and cancer. For example, Vaccitech in the Oxford region (Berkshire, Buckinghamshire, and Oxfordshire) is creating novel vaccines that elicit strong responses from helper and cytotoxic T-cells.

Heimdal, a company also found in the Oxford region, is developing profitable direct air carbon capture engineering. Einride in Stockholm is designing and building semi-autonomic electrical trucks, that make transportation more cost-efficient and fuel-efficient. Lava Therapeutics, in the Utrecht region of the Netherlands, is developing a bispecific antibody platform used to engage gamma-delta T cells for the treatment of cancer.

The novel innovation companies of Europe play a key role in solving the challenges facing Europe, and the rest of the world, such as viral infection, global warming, transportation, and combating cancer.

There are, as shown in figure 3, geographical differences in funding for innovative businesses. The average leading innovation company in Eastern Europe founded since 2016 has attracted 10 million Euros in funding (venture capital, own investment of owner, bank loan), compared to 79 million in the average leading innovation firm of Western Europe, and 116 million Euros in the average leading innovation firm of Western Europe. The innovation firms of the Nordic region have on average attracted 167 million Euros in funding.

Figure 3. *Average investments (million Euros) in the panel of 150 high-ranking businesses founded since 2016 in the top 30 brain business jobs centres of Europe*



Leading brain business jobs regions of Europe

The capital regions of Central and Eastern European nations have some of the highest levels of brain business jobs concentration. The Slovakian capital region of Bratislava again emerges as the number one region in Europe in terms of the concentration of brain business jobs. More than 22 percent of the working-age population of the region is employed in knowledge-intensive businesses. The total share of adults working in high-value-creating sectors (brain business jobs, manufacturing industries, and professional services) amounts to 61 percent of the working-age population, again the highest rate in all of Europe. Budapest, Prague, Stockholm, and Oberbayern are the other top-5 regions in terms of brain business jobs concentration (table 2). If we instead rank the regions based on total employment in high-value-creating sectors, Bratislava is still the European number one region followed by Prague, Paris, Notio Aigaio (in Greece), and Oberbayern (table 3).

Table 2. *Regional ranking of brain business jobs*

Rank	Region	Percentage of the adult (20-64 years old) population employed in brain business jobs
1	Bratislava	22.4%
2	Budapest	19.9%
3	Prague	19.9%
4	Stockholm	17.8%
5	Oberbayern	17.6%
6	Paris	16.7%
7	Copenhagen	15.9%
8	Berkshire, Buckinghamshire and Oxfordshire	15.9%
9	Warsaw	15.8%
10	London	15.4%
11	Hamburg	15.3%
12	Utrecht	14.6%
13	Walloon Brabant	14.5%
14	Bucharest	13.8%
15	Darmstadt	13.8%
16	Amsterdam	13.7%
17	Berlin	13.3%
18	Köln	12.9%
19	Oslo	12.8%
20	Helsinki	12.7%

21	Mittelfranken	12.6%
22	Sofia	12.4%
23	Karlsruhe	12.1%
24	Vienna	11.9%
25	Madrid	11.7%
26	Bedfordshire and Hertfordshire	11.7%
27	North Eastern Scotland	11.7%
28	Brussels	11.7%
29	Cheshire	11.6%
30	Vilnius	11.5%
31	Stuttgart	11.2%

32	Lisbon	10.6%
33	Gloucestershire, Wiltshire and Bristol/Bath area	10.0%
34	Flemish Brabant	10.0%
35	Ljubljana	9.8%
36	Surrey, East and West Sussex	9.7%
37	East Anglia	9.3%
38	Bremen	9.3%
39	Düsseldorf	9.3%
40	Hampshire and Isle of Wight	9.0%
41	Antwerp	9.0%
42	Luxembourg	8.9%

43	Noord-Brabant	8.8%
44	Västsverige	8.7%
45	Zuid-Holland	8.5%
46	Herefordshire, Worcestershire and Warwickshire	8.5%
47	Sydsverige	8.2%
48	Braunschweig	8.0%
49	North Yorkshire	7.8%
50	Leipzig	7.7%

Capital regions are marked in blue. Smaller countries such as Iceland and Malta make up single NUTS2 regions and are marked in green. Regional data is not available for Switzerland and Ireland.

Table 3. *Regional Ranking of high-value-creating jobs*

(brain business jobs + manufacturing industry jobs + professional services jobs)

Rank	Region	Percentage of the adult (20-64 years old) population employed in brain business jobs
1	Bratislava	61.0%
2	Prague	58.0%
3	Paris	57.9%
4	Notio Aigaio	55.5%
5	Oberbayern	50.9%
6	Luxembourg	49.9%
7	Warsaw	49.4%
8	Stuttgart	48.6%
9	Budapest	48.5%
10	Mittelfranken	48.3%
11	Vilnius	47.2%
12	Bremen	46.9%
13	Åland	46.7%
14	Hamburg	45.2%

15	Stockholm	43.7%
16	Darmstadt	43.6%
17	North Eastern Scotland	42.2%
18	Karlsruhe	41.8%
19	Jihovýchod	41.6%
20	Cheshire	41.4%
21	Tirol	41.4%
22	Severovýchod	41.2%
23	Ljubljana	40.9%
24	Provincia Autonoma di Bolzano/Bozen	40.9%
25	Iceland	40.7%
26	Highlands and Islands	40.6%
27	Salzburg	40.4%
28	Vorarlberg	40.3%
29	Střední Morava	40.3%
30	Freiburg	40.2%
31	Unterfranken	40.1%
32	Braunschweig	39.9%
33	Sofia	39.7%
34	Köln	39.6%
35	Småland med öarna	39.5%
36	Detmold	39.5%
37	Jihozápad	39.3%
38	Västsverige	39.0%
39	Tübingen	39.0%
40	Bucharest	38.8%
41	Oberösterreich	38.7%
42	Algarve	38.5%
43	Moravskoslezsko	38.4%
44	Copenhagen	38.0%
45	Latvia	37.8%
46	Düsseldorf	37.7%
47	Agder og Rogaland	37.6%
48	Amsterdam	37.5%
49	Estonia	37.5%
50	Schwaben	37.5%

Capital regions are marked in blue. Smaller countries such as Iceland and Malta make up single NUTS2 regions and are marked in green. Regional data is not available for Switzerland and Ireland.

Mapping Europe's brain business jobs

For an investor, a business,s or an employee choosing where to locate, the characteristics of regions and countries matter. Previous studies that have attempted to identify knowledge-intensive industries tend to end up with the following four knowledge-intensive types of business, namely the tech sector, ICT (information and communications technology), advanced services, and creative professions. These broad fields are in the data analysis divided into twelve subfields, as shown below. This comprehensive way of defining brain business jobs includes not only those who work with novel technological solutions but also the creators and advanced service providers who play a key role in modern societies.

Table 4. *Division of brain business jobs*

Tech sector	**High-tech Manufacturing** **Engineering/Architecture** **Research and Development** **Pharmaceutical industry**
ICT	**Telecom** **IT Services** **Computer Programming**
Advanced services	**Head office Management** **Advertising and Market Research**
Creative professions	**Publishing** **Film/TV/Music** **Design and other Creative Work**

The source of the data is structural business statistics, published by the European statistics agency Eurostat. Through this comprehensive database of activity in the business sector, the share of people who work in highly specialized knowledge-intensive workplaces or local units of firms is measured. Thus, employees of local units of larger companies, focused, for example, on high-tech manufacturing, are counted as brain business jobs. A potential shortcoming of this approach is that, for example, administrators working in specialized IT companies are counted as brain business workers, while IT specialists in sectors such as construction are not. For some purposes, for example, determining how many people belong to different professions, might constitute a measurement error. For this report, however, mapping how many people work in advanced knowledge-intensive firms is more interesting since it reflects the size of brain businesses.

Structural business statistics is highly detailed, but since it relies on firms' annual accounts, and firms have different accounting years, the data measures the situation two years previously. Quarterly employment statistics (for Q2 of each year) are added to the analysis to estimate brain business jobs also during 2020 and 2021. The technical source of regional data is SBS data by NUTS 2 regions and NACE Rev. 2. The statistical unit used for regional SBS is generally the local unit, which is an enterprise or part of an enterprise situated in a geographically identified place. Local units are usually classified under NACE according to their main activity. Manufacturing industries (except high-tech manufacturing and pharmaceuticals which are counted as brain business jobs) and professional services (except engineering & architecture, R&D,

telecommunications, IT Services, programming, head office & management, advertising & market research, publishing, film/TV/ music, and design & other creative professions, which are counted as brain business jobs) are also included in the analysis. Together brain business jobs, manufacturing industries jobs, and professional services jobs are referred to as high-value-creating sector jobs. These jobs are important for regional economic activity, bringing in export revenues, and are often also drivers of innovation.

Short-term and long-term business data, as well as population data, all have Eurostat as their source. Following Brexit, quarterly data over changes in labour input are no longer reported by the UK, as the information is now deemed to be confidential. Structural business data is however still published for the UK. To calculate the brain business jobs concentration for the UK, an assumption is made that quarterly changes in labour output follow the average of the other European countries.

National and regional data for 31 countries are included in this study. These countries are the 27 EU member states plus the UK, Switzerland, Norway, and Iceland. Data over the working-age (20-64 years old) population is calculated for the corresponding years in each region and country—again with Eurostat as the source. As shown in figure 4, 6.4 percent of the working-age population of the 31 studied European countries work in brain business jobs. Additionally, 15.3 percent work in manufacturing industries, and 9.6 percent in professional services.

Figure 4. *The high-value-creating jobs sectors of Europe (percent of working age adults)*

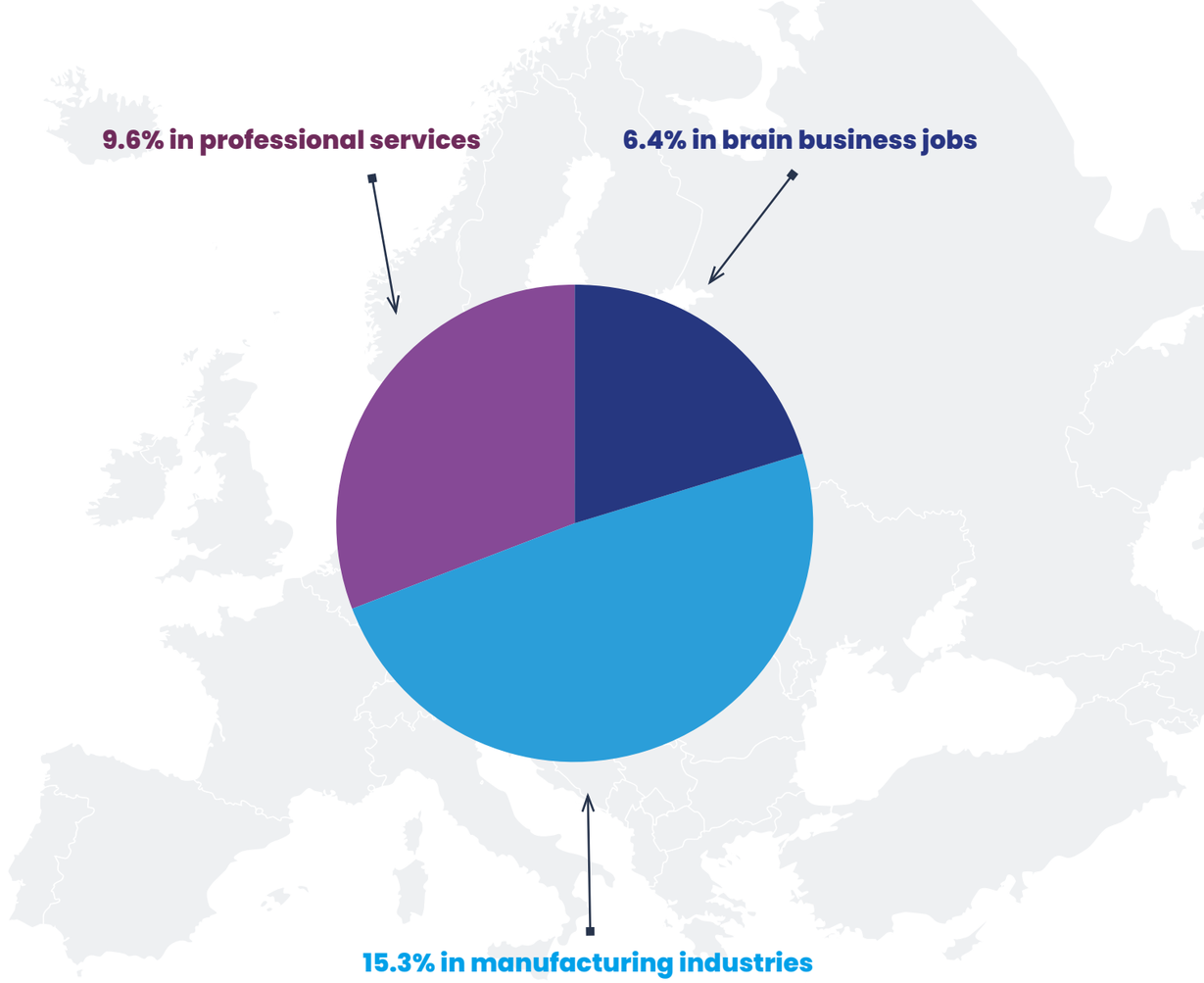


Table 5. *Detailed brain business jobs, manufacturing jobs, and professional services jobs rating for European nations*

	BBJ per capita total	Tech sector BBJ	ICT sector BBJ	Advanced services BBJ	Creative professions BBJ	Manufacturing industries per capita	Professional services per capita
Switzerland	10.1%	5.4%	2.4%	1.6%	0.7%	16.1%	9.0%
Ireland	10.1%	3.0%	3.6%	2.2%	1.4%	14.2%	13.5%
Sweden	9.3%	2.8%	3.3%	1.7%	1.4%	18.2%	9.3%
Netherlands	9.0%	2.3%	2.7%	2.7%	1.3%	11.8%	10.5%
Luxembourg	8.9%	2.2%	4.6%	1.5%	0.6%	20.6%	20.5%
Denmark	8.9%	3.0%	2.6%	1.6%	1.6%	14.1%	9.6%
Finland	8.6%	3.0%	3.0%	1.3%	1.3%	17.2%	8.3%
United Kingdom	8.1%	2.2%	2.6%	2.2%	1.2%	10.7%	12.2%
Germany	8.1%	3.1%	2.3%	1.6%	1.1%	21.2%	11.1%
Estonia	7.7%	1.8%	3.3%	1.3%	1.2%	20.4%	9.5%
Malta	7.6%	1.6%	2.7%	2.5%	0.8%	10.7%	12.0%
Hungary	7.5%	2.7%	2.2%	1.5%	1.2%	16.9%	8.6%
Iceland	7.5%	2.0%	2.8%	1.0%	1.7%	17.7%	15.5%
Slovenia	7.3%	2.7%	1.9%	1.7%	0.9%	22.9%	8.7%
Belgium	7.1%	1.9%	2.0%	2.5%	0.6%	12.2%	7.5%
Latvia	7.1%	1.5%	3.2%	1.4%	1.0%	18.7%	12.0%
Norway	6.8%	2.4%	2.3%	0.8%	1.3%	17.2%	9.7%
Czechia	6.4%	2.3%	2.0%	1.0%	1.2%	25.4%	8.5%
Austria	6.1%	2.2%	1.7%	1.3%	0.8%	18.4%	10.7%
Lithuania	6.0%	1.5%	2.1%	1.5%	0.9%	20.6%	13.8%
Cyprus	5.9%	1.1%	2.0%	2.0%	0.8%	13.0%	15.8%
Slovakia	5.9%	1.6%	1.9%	1.7%	0.7%	18.8%	6.7%
France	5.6%	1.8%	1.7%	1.1%	1.0%	12.9%	8.1%
Portugal	5.3%	1.4%	1.6%	1.5%	0.8%	17.6%	10.5%
Bulgaria	4.7%	1.0%	2.2%	0.6%	0.8%	16.7%	8.2%
Croatia	4.7%	1.6%	1.6%	0.8%	0.7%	16.5%	9.6%
Spain	4.6%	1.5%	1.4%	0.9%	0.8%	11.3%	9.8%
Italy	4.3%	1.3%	1.5%	0.7%	0.8%	14.2%	8.9%
Poland	4.3%	1.2%	1.6%	1.0%	0.6%	17.8%	6.5%
Romania	3.8%	1.2%	1.5%	0.7%	0.4%	13.5%	5.5%
Greece	3.6%	1.4%	0.9%	0.9%	0.5%	8.7%	12.7%

Brain business jobs, high-value-creating jobs, and unemployment

What is the link between brain business jobs, on a regional level, and unemployment? As shown in figure 4, there is a clear link between brain business jobs and unemployment, on a regional level. In regions with few brain business jobs (less than 5 percent of the working-age population employed in knowledge-intensive firms), there is a clear link that regions with more brain business jobs have significantly lower unemployment levels. However, regions do not necessarily need to rely on knowledge-intensive jobs, as in fact also manufacturing industries jobs, and professional services jobs can bring in export revenues and economic activity. Figure 5 shows the relation between the total number of high-value-creating jobs (brain business jobs + manufacturing industries jobs + professional services jobs).

The link is now even clearer. Each percentage point higher share of the population of European regions employed in high-value-creating sectors corresponds with 0.22 percent lower regional unemployment.[10] This means that a region where 10 percentage points more of the population (compared to the average European region) is employed in brain business jobs, manufacturing industries, and professional services, on average has 2.2 percent lower unemployment. Promoting brain business jobs, manufacturing industries jobs, and professional services jobs in all European regions is a policy priority. This enables job growth, which is vital in a time where structural shifts are happening, with old jobs disappearing and new ones being formed.

10 Data on jobs for 2021 is matched with latest available regional unemployment data for 2020.

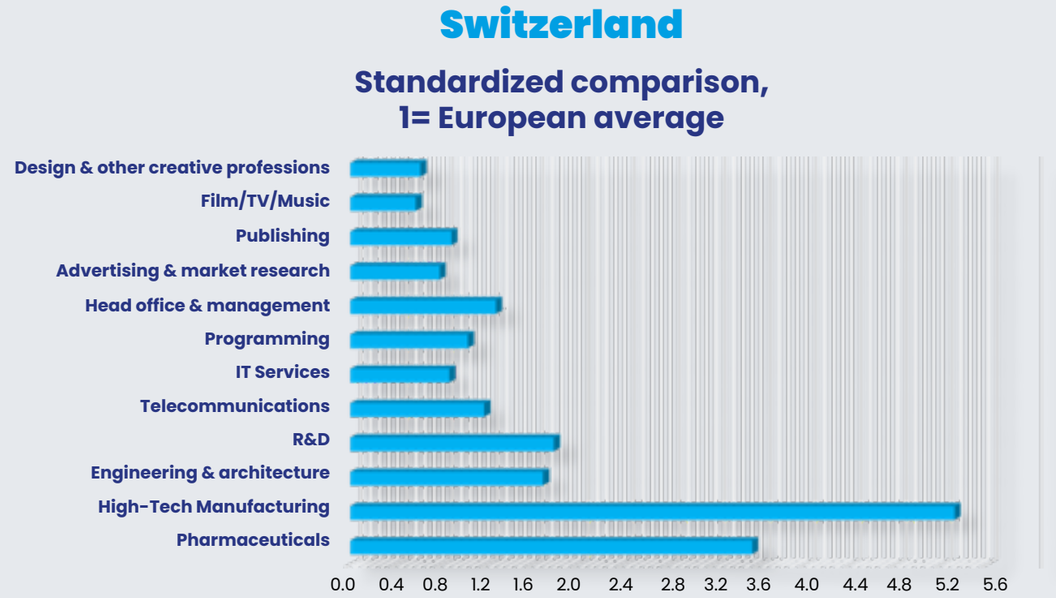
Each percentage point higher share of the population of European regions employed in high-value-creating sectors corresponds with 0.22 percent lower regional unemployment. This means that a region where 10 percentage points more of the population (compared to the average European region) is employed in brain business jobs, manufacturing industries, and professional services, on average has 2.2 percent lower unemployment.

Country Analysis: Switzerland

In 2021, 10.1 percent of the working-age adults of Switzerland were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. This is the highest level in all of Europe, together with Ireland which has the same level. Yet, while the concentration of brain business jobs has grown throughout Europe, the share remains the same in Switzerland in 2021, as it was in 2014. Switzerland thus remains the leading brain business jobs centre of Europe, but if the stagnating development continues countries such as Ireland, Sweden, and the Netherlands may in coming years catch up to and surpass Switzerland.

There is additionally 16 percent of the Swiss adult population employed in manufacturing industries. The country also has 9 percent of its employment in the professional services sector.

Due to limitations in data, the regional number of brain business jobs in Switzerland is not included in this study. While Switzerland does have a commanding lead in brain business jobs compared to the rest of Europe, the country relies heavily on two sectors. These are high-tech manufacturing, where Switzerland has five and a half times as high a concentration of knowledge workers as the European average, and the pharmaceutical industry where Switzerland has three and a half times the concentration of knowledge-intensive workers as the European average. In areas such as design & other creative professions, and advertising & market research, Switzerland lags behind the rest of Europe.



	Brain business jobs per capita	Industries per capita	Professional services per capita
Switzerland	10.1%	16.1%	9.0%

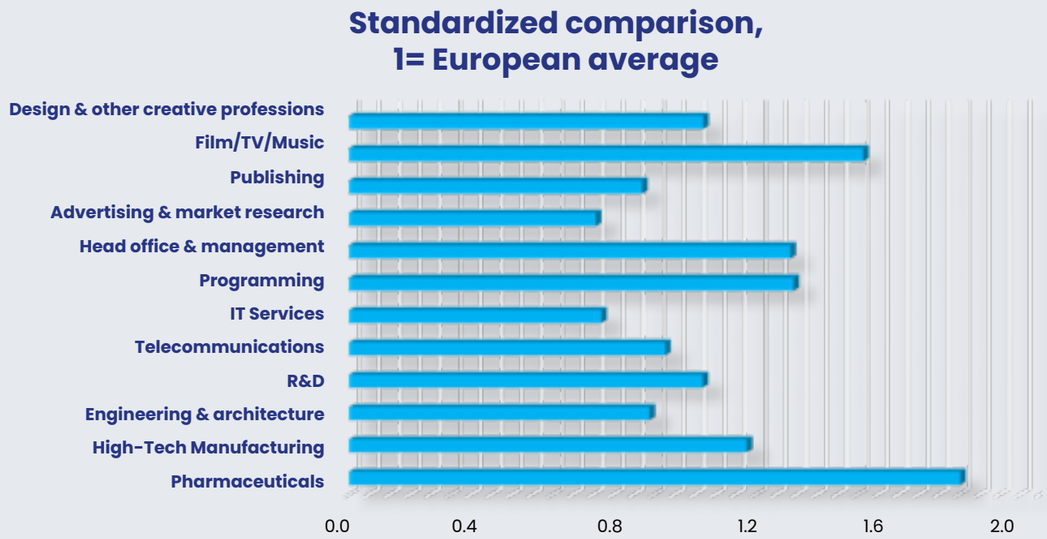
Country Analysis: Ireland

In 2021, 10.1 percent of the working-age adults of Ireland were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. This is the highest level in all of Europe, together with Switzerland which has the same level. For Ireland, there has in previous years been a lack of data, which limits comparison over time. However, the country is a leading knowledge hub of Europe, as both local and international knowledge companies (many from the US) have a significant presence in Ireland.

There is additionally 14 percent of the Irish adult population employed in manufacturing industries. The country also has additionally close to 14 percent of its employment in the professional services sector.

Compared to the rest of Europe, Ireland has several strengths. Ireland has a strong pharmaceutical sector, a strong presence in film/TV/music, and a relatively strong presence of head office & management as well as programming sector jobs. The country does not have any major weaknesses but lags behind the rest of Europe somewhat in IT services as well as advertising & market research.

Ireland



	Brain business jobs per capita	Industries per capita	Professional services per capita
Ireland	10.1%	14.2%	13.5%

Country Analysis: Sweden

In 2021, 9.3 percent of the working-age adults of Sweden were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased slightly over time. In comparison, in 2014, 9.0 percent of the Swedish working age were employed in brain business jobs. The country has the third-highest concentration of knowledge-intensive jobs in Europe, after Switzerland and Ireland.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. The Swedish capital region of Stockholm has fully 44 percent of its population employed in these sectors, and has a relatively low unemployment rate of 7 percent. Småland med öarna, and Västsverige, have circa 40 percent employment in high-value-creating sectors, and the same unemployment figure as Stockholm.

The highest concentration of manufacturing industries jobs in Sweden exists in the Småland med öarna region, and Norra Mellansverige. Västsverige combines a high concentration of manufacturing industry jobs with a high concentration of brain business jobs.

The concentration of professional service jobs is highest in the Stockholm and the Västsverige region, both of these have a high concentration also of brain business jobs. Mellersta Norrland also has a relatively high concentration of professional service jobs, amongst its working-age population. While regions such as Mellersta Norrland and Övre Norrland are sparsely populated, they still have a relatively high concentration of brain business jobs. A unique feature of the Nordic nations is that also less densely populated areas in the north have strengths in the knowledge economy.

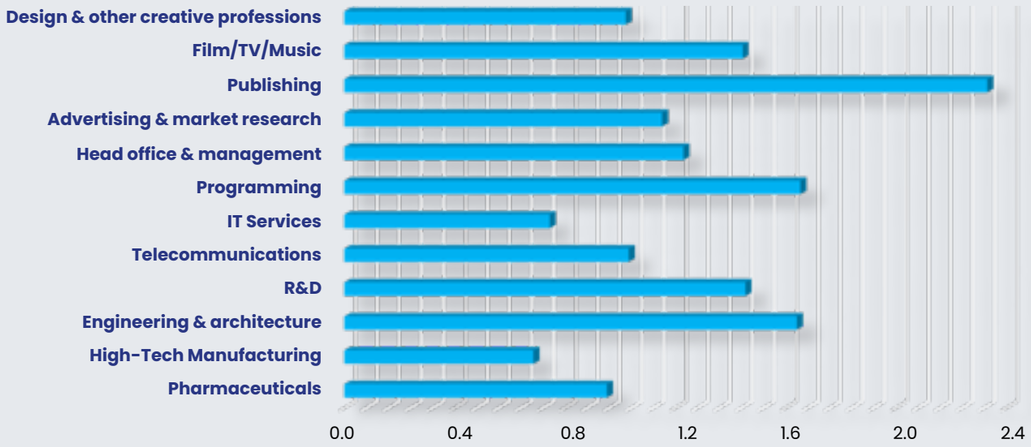
Compared to the rest of Europe, Sweden has strengths in publishing, engineering & architecture, and programming. Sweden has a well-rounded knowledge economy, with strengths in diverse areas. High-tech manufacturing and IT services are exceptions to this general trend, as the concentration of knowledge-intensive jobs is lower than the European average.

Stockholm ranks in 4th place, amongst 267 European regions, in the concentration of brain business jobs. Examples of novel innovation firms, founded since 2016 in the region, include micro-mobility company Voi, Einride which designs and builds semi-autonomic trucks, and Moralis, which provides software to blockchain projects.

While Sweden retains a strong position, in this year's index Ireland (for which reported data was lacking previous years) places above Sweden in brain business jobs concentration. To compete with the brain business jobs leaders Ireland and Switzerland, Sweden needs a reform of business taxation and regulation. Also, the capital regions of Eastern European nations are catching up to Stockholm in brain business jobs concentration. The competitive edge of the Eastern European national capital regions is that they combine good access to talent with lower wage costs. The cost of labour is an important challenge for Sweden to tackle, possibly through a lowering of labour taxes.

Sweden

Standardized comparison, 1= European average



	Brain business jobs per capita	Industries per capita	Professional services per capita
Stockholm	17.8%	13.4%	12.5%
Västsverige	8.7%	21.0%	9.4%
Sydsverige	8.2%	16.2%	8.4%
Östra Mellansverige	6.3%	18.4%	7.0%
Övre Norrland	6.1%	20.9%	8.7%
Mellersta Norrland	6.1%	18.0%	9.2%
Småland med öarna	5.2%	25.6%	8.8%
Norra Mellansverige	4.8%	21.7%	7.9%

Country Analysis: Netherlands

In 2021, 9.0 percent of the working-age adults of the Netherlands were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 7.8 percent of the working-age population were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. Amsterdam, Noord-Brabant, and Utrecht are the three regions with the highest share of the population employed in these sectors, 38 percent in Amsterdam, 35 percent in Noord-Brabant, and 34 percent in Utrecht. These regions all have a low unemployment rate of 3 percent.

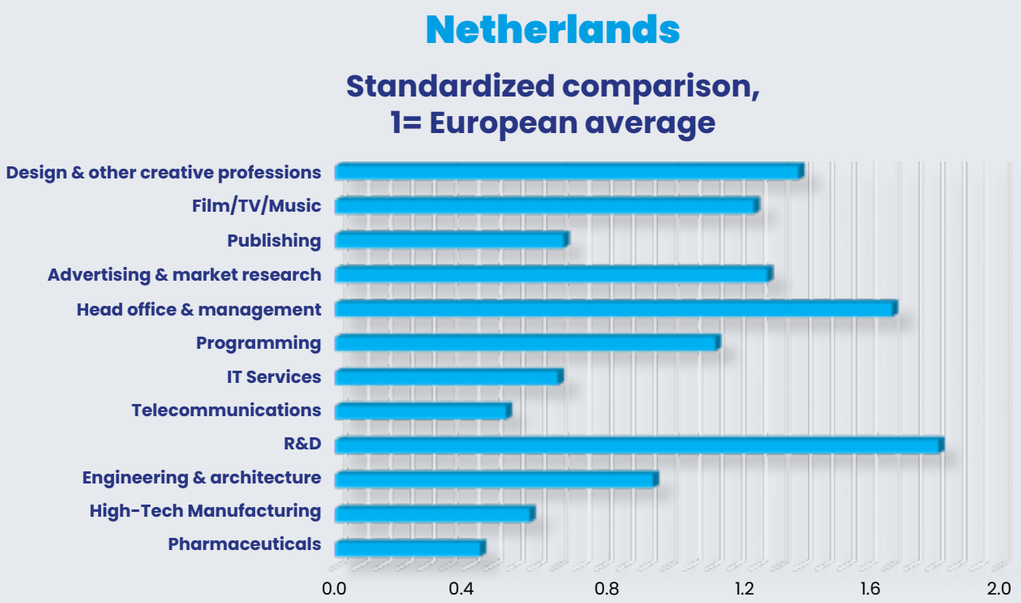
Noord-Brabant, Overijssel, and Zeeland are the three manufacturing industries hubs of the Netherlands, with 15 percent of the population employed in this part of the economy. Noord-Brabant also has a relatively high concentration of brain business jobs, as close to one in ten of the population is employed in knowledge-intensive enterprises. Amsterdam is the main professional service hub of the Netherlands, with 15 percent of the population employed in professional services.

Utrecht ranks in 12th place, amongst 267 European regions, in the concentration of brain business jobs. Examples of novel innovation firms,

founded since 2016 in the region, include Trengo, which offers solutions for companies' digital teamwork, and Lava Therapeutics which develops a bispecific antibody platform, relevant for cancer treatment. Amsterdam ranks in 16th place in Europe, in terms of concentration of brain business jobs. Examples of novel innovation companies in Amsterdam include Accel Club, a platform for e-commerce businesses, and Silverflow, a cloud-based platform for payment providers.

Compared to the rest of Europe, the Netherlands has strengths in research & development, head office & management, and design & other creative professions. The country lags behind the rest of Europe in telecommunications, IT services, and pharmaceuticals.

The challenge for the Netherlands is to compete with Switzerland, Ireland, and Sweden for the position of Europe's leading brain business jobs nation. Competition from growing economies of eastern Europe, with lower wage costs for talents, is also important to tackle.



	Brain business jobs per capita	Industries per capita	Professional services per capita
Utrecht	14.6%	9.3%	10.5%
Amsterdam	13.7%	8.9%	14.9%
Noord-Brabant	8.8%	15.7%	10.2%
Zuid-Holland	8.5%	10.1%	10.3%
Gelderland	7.5%	12.8%	9.3%
Overijssel	6.8%	15.0%	9.9%
Groningen	6.4%	9.7%	7.5%
Flevoland	5.9%	8.9%	7.2%
Limburg (Netherlands)	4.8%	12.6%	10.9%
Friesland	4.8%	13.0%	8.8%
Drenthe	4.1%	11.0%	7.1%
Zeeland	3.7%	14.7%	12.7%

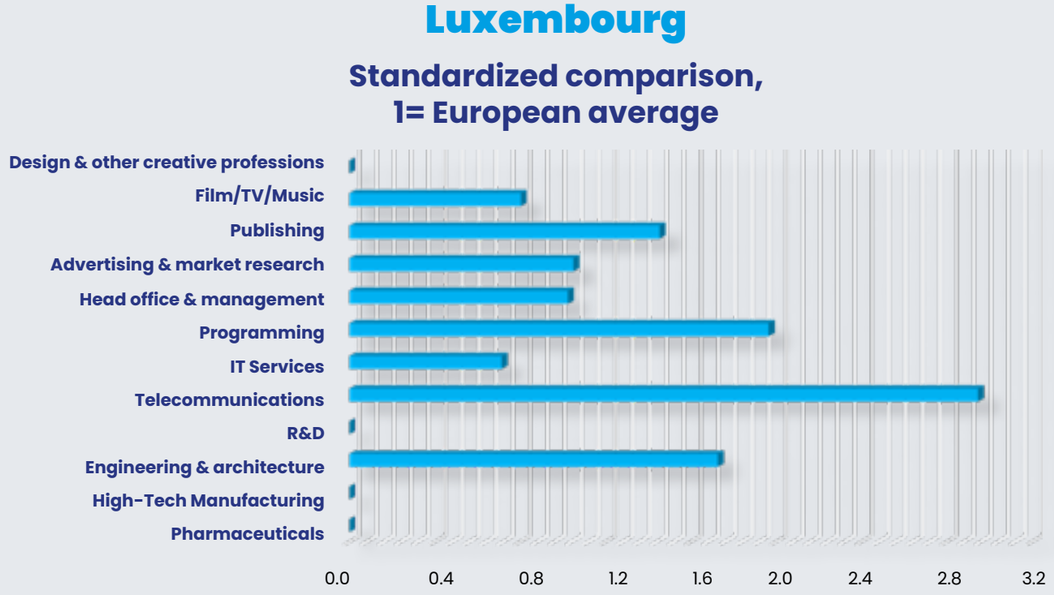
Country Analysis: Luxembourg

In 2021, 8.9 percent of the working-age adults of Luxembourg were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 8.2 percent of the working-age population were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value-creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs). Luxembourg has an unemployment level of 7 percent, relatively high given the advanced state of the economy.

Besides the close to 9 percent of the Luxembourg population employed by knowledge-intensive enterprises, additionally a fifth are employed by manufacturing industries, while another 20 percent work in the professional services sector.

Compared to the rest of Europe, Luxembourg has strengths in telecommunications, as well as programming, and engineering & market research. The small country however lags in areas such as design & other creative professions, research & development, and pharmaceuticals.



	Brain business jobs per capita	Industries per capita	Professional services per capita
Luxembourg	8.9%	20.3%	20.4%

Country Analysis: Denmark

In 2021, 8.9 percent of the working-age adults of Denmark were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has been stagnant over time, contrary to the European trend of growth in knowledge-intensive employment. In comparison, in 2014, 9.0 percent of the working-age population were employed in brain business jobs.

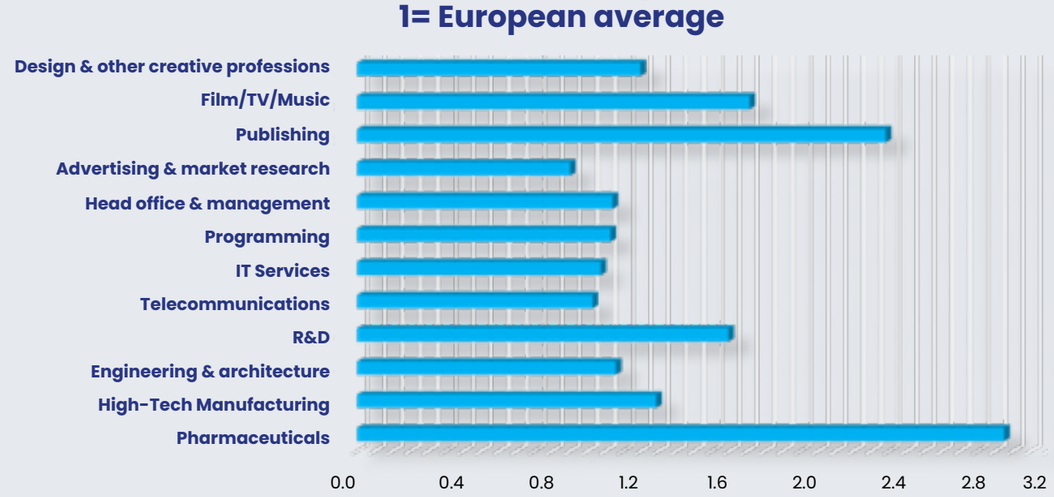
In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. The Danish capital region of Copenhagen has fully 38 percent of its population employed in these sectors, but the unemployment is the same or slightly higher than in the other regions of Denmark.

The highest concentration of manufacturing industry jobs in Denmark exists in the Syddanmark, Nordjylland, and Midtjylland regions. Midtjylland also has a relatively high share of employment in brain business jobs. The concentration of professional service jobs is highest in the Copenhagen region, followed by Syddanmark.

Compared to the rest of Europe, Denmark has strengths in pharmaceuticals, publishing, and film/TV/music. The country is overall strong but lags somewhat in advertising & market research, telecommunications, and IT services.

Copenhagen ranks in 7th place, amongst 267 European regions, in the concentration of brain business jobs. Examples of novel innovation firms, founded since 2016 in the region, include Podimo, an open podcast platform, Dawn Health, offering digital health therapies, and digital contract management platform Contractbook.

The challenge for Denmark is to compete for brain business jobs, in a time where much of the growth is happening in the capital regions of Eastern European countries, which combine talent supply with low costs for employing the talents. Denmark has a strong leading position as a knowledge nation but needs to combine this with policies that reduce firm costs of hiring knowledge workers.



	Brain business jobs per capita	Industries per capita	Professional services per capita
Copenhagen	15.9%	8.6%	13.5%
Midtjylland	7.0%	16.6%	7.1%
Syddanmark	4.5%	17.9%	8.8%
Nordjylland	4.3%	16.9%	7.2%
Sjælland	2.5%	12.4%	6.0%

Country Analysis: Finland

In 2021, 8.6 percent of the working-age adults of Finland were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 6.8 percent of the working-age population were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. The Finnish capital region of Helsinki has fully 36 percent of its population employed in these sectors and has a lower unemployment rate than other parts of Finland.

The highest concentration of manufacturing industries jobs in Finland exists in the Länsi-Suomi region where one-fifth of the population is employed in this part of the economy, followed by Etelä-Suomi. These regions have circa 5 percent employed in brain business jobs, the same as for the rest of Finland except Helsinki where the share is close to 13 percent.

Professional services are particularly strong in Åland. This small region has close to 30 percent of its population employed in professional services, far more than other parts of Finland.

Compared to the rest of Europe, Finland has strengths in publishing, high-tech manufacturing, programming as well as engineering & architecture. The country lags the rest of Europe in pharmaceuticals, and also IT services.

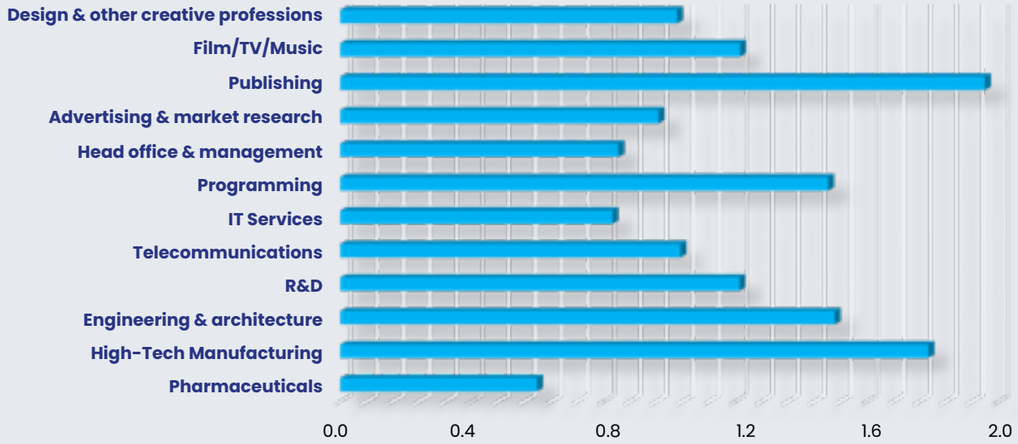
Helsinki ranks in 20th place, amongst 267 European regions, in the concentration of brain business jobs. Examples of novel innovation firms, founded since 2016 in the region, include PVarjo, which develops virtual reality hardware and software, Flowrite, a software creator, and Swappies, an online marketplace for refurbished smartphones.

Much like Denmark, the challenge for Finland is to compete for brain business jobs, in a time where much of the growth is happening in the capital regions of Eastern European countries, which combine talent supply with low costs for employing the talents. Finland has strong performance and might catch up to Denmark and Sweden in brain business jobs concentration in the years to come.

	Brain business jobs per capita	Industries per capita	Professional services per capita
Helsinki	12.7%	13.7%	9.6%
Länsi-Suomi	5.6%	20.2%	6.6%
Åland	5.2%	12.6%	28.9%
Etelä-Suomi	4.9%	18.9%	7.4%
Pohjois- ja Itä-Suomi	4.9%	16.8%	6.9%

Finland

Standardized comparison, 1= European average



Country Analysis: UK

In 2021, 8.1 percent of the working-age adults of the UK were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 7.3 percent of the UK working-age were employed in brain business jobs.

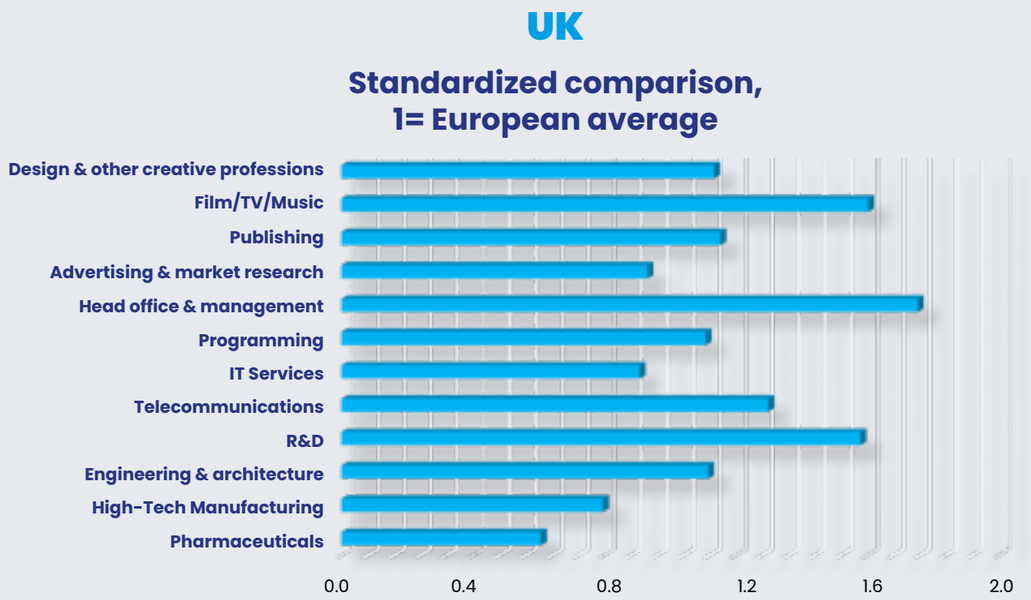
In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. The highest concentration of value creation jobs exists in North Eastern Scotland, where fully 42 percent of the population is employed in these parts of the economy, followed by 41 percent in Cheshire as well as in the Highlands and Islands. These regions also have relatively low unemployment rates.

The two regions in the UK with the strongest presence of manufacturing industries jobs, are Cumbria and North Eastern Scotland. Cumbria has a relatively low share of brain business jobs, while North Eastern Scotland is strong in manufacturing industries as well as knowledge-intensive jobs. The two regions with the strongest concentration of professional service jobs are Highlands and Islands, and North Yorkshire. Highlands and Islands have a relatively low share of brain business jobs, while North Yorkshire combines many professional service jobs with a relatively high share of brain business jobs.

Berkshire, Buckinghamshire, and Oxfordshire rank in 8th place, amongst 267 European regions, in the concentration of brain business jobs. Examples of novel innovation firms, founded since 2016 in the region, include Vaccitech, a vaccine developer, Uncrowd, which measures shopper behavior, and Heimdal which is developing direct air carbon capture technology. London has more brain business jobs in total, but slightly lower concentration, and ranks in 10th place, with novel innovation companies such as Nexo, a regulated financial institution for digital assets, and Celsius Network, a blockchain-based lending platform. Bedfordshire and Hertfordshire, and North Eastern Scotland, are two other UK regions that are amongst the top-30 in Europe with the highest concentration of knowledge-intensive employees.

Compared to the rest of Europe, the UK has several strengths. The main strength is in head offices & management, followed by film/tv/music and R&D. On the other hand, the UK is behind the rest of Europe when it comes to areas such as pharmaceuticals, high-tech manufacturing, and IT services.

The UK has the highest brain business jobs concentration amongst larger European nations. Still, the country faces the challenge of boosting knowledge-intensive sectors, so that it can catch up to leading smaller nations such as Switzerland, Ireland, and Sweden.



	Brain business jobs per capita	Industries per capita	Professional services per capita
Berkshire. Buckinghamshire and Oxfordshire	15.9%	9.6%	11.3%
London	15.4%	5.6%	15.4%
Bedfordshire and Hertfordshire	11.7%	9.9%	12.8%
North Eastern Scotland	11.7%	18.4%	12.2%
Cheshire	11.6%	13.0%	16.9%
Gloucestershire. Wiltshire and Bristol/Bath area	10.0%	11.1%	13.0%
Surrey. East and West Sussex	9.7%	8.0%	11.2%
East Anglia	9.3%	11.4%	11.9%
Hampshire and Isle of Wight	9.0%	10.0%	11.3%
Herefordshire. Worcestershire and Warwickshire	8.5%	16.3%	11.1%
North Yorkshire	7.8%	12.2%	17.0%
West Yorkshire	7.6%	12.1%	12.1%
Leicestershire. Rutland and Northamptonshire	7.4%	13.8%	11.3%
Eastern Scotland	7.1%	8.1%	10.6%
Greater Manchester	7.0%	10.3%	13.1%
East Wales	6.9%	13.3%	12.3%
West Central Scotland	6.8%	9.7%	11.2%
Dorset and Somerset	6.8%	12.9%	13.6%
Essex	6.8%	9.1%	11.2%
Derbyshire and Nottinghamshire	6.3%	13.7%	9.3%
Northumberland and Tyne and Wear	6.1%	11.5%	9.5%
South Yorkshire	5.3%	11.3%	11.1%
Devon	5.3%	10.4%	12.7%
Merseyside	5.3%	8.6%	10.4%

Shropshire and Staffordshire	5.2%	14.6%	10.0%
Kent	5.1%	8.9%	9.9%
West Midlands	5.1%	11.1%	9.6%
Northern Ireland	4.7%	12.1%	8.6%
Highlands and Islands	4.6%	17.0%	18.9%
East Yorkshire and Northern Lincolnshire	4.4%	17.1%	11.5%
Cumbria	4.4%	18.6%	13.2%
Lancashire	4.2%	15.0%	9.2%
Tees Valley and Durham	4.1%	11.1%	7.7%
Southern Scotland	4.1%	11.7%	9.4%
Cornwall and Isles of Scilly	3.9%	9.2%	14.0%
Lincolnshire	3.9%	13.6%	9.7%
West Wales and The Valleys	3.8%	10.4%	8.7%

Country Analysis: Germany

In 2021, 8.1 percent of the working-age adults of Germany were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 6.8 percent of the working-age population were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. The highest concentration of value creation jobs for Germany exists in Oberbayern, Stuttgart, and Mittelfranken. In these regions, half of the population is employed in high-value creation sectors, and all regions also have a relatively low unemployment level.

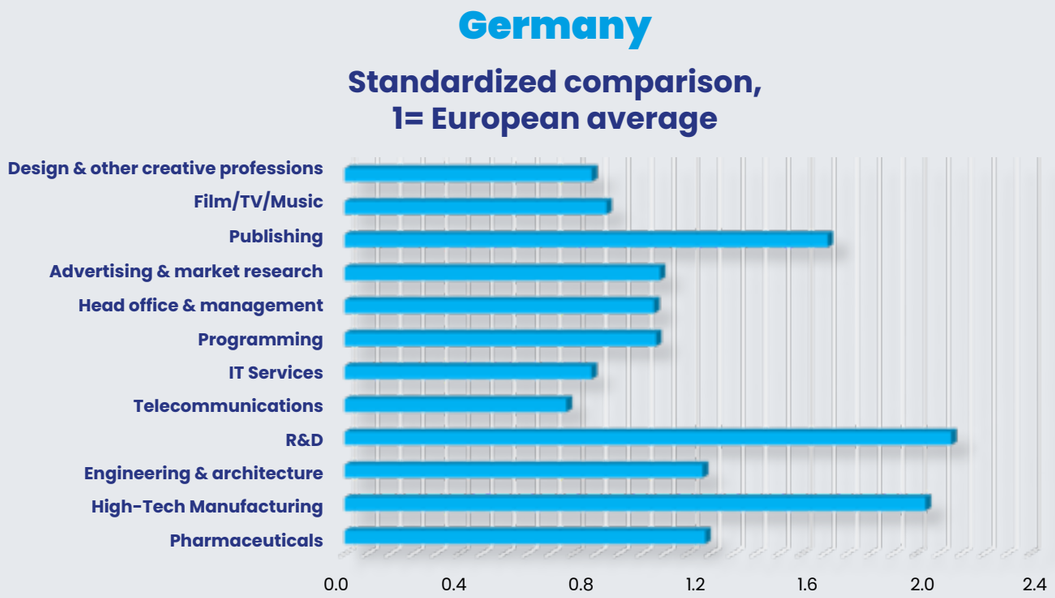
The regions of Germany with the strongest presence of manufacturing industries jobs, are Stuttgart, Unterfranken, and Detmold. More than a quarter of the regional population is employed in manufacturing industries. Many other German regions also have a high share of employment in this part of the economy. Bremen is the professional services hub of Germany, with 21 percent of the population employed in this part of the economy.

Oberbayern 5th place, amongst 267 European regions, in the concentration of brain business jobs. Examples of novel innovation firms, founded since 2016 in the region, include Sono Motors, a mobility and energy service provider, and ATAI Life Sciences, a biotech platform for mental health

disorders. Hamburg ranks in 11th position on the same list, with novel innovation companies such as Taxdoo, an automated financial compliance platform, and Localyze, a software for international team management. Darmstadt ranks in 15th position in Europe, Berlin on 17th, Köln on 18th, Mittelfranken on 21st, and Karlsruhe on 23rd. No part of Europe has as many leading brain business jobs centres as Germany. France for example only has one region, Paris, on the top-30 list.

Compared to the rest of Europe, Germany has strengths in research & development, high-tech manufacturing, and publishing. Germany is not weak in any area but lags behind the rest of Europe in telecommunications and IT services.

Yet Germany still needs to boost knowledge-intensive jobs growth, to catch up to leading countries such as Switzerland and Sweden. Competition from the Central and Eastern European countries, which grow by relying on growing talent supply and lower wages, is increasing.



	Brain business jobs per capita	Industries per capita	Professional services per capita
Oberbayern	17,6%	17,6%	15,7%
Hamburg	15,3%	11,4%	18,4%
Darmstadt	13,8%	12,6%	17,2%
Berlin	13,3%	2,5%	11,3%
Köln	12,9%	12,8%	13,9%
Mittelfranken	12,6%	24,0%	11,7%
Karlsruhe	12,1%	19,2%	10,5%
Stuttgart	11,2%	26,4%	11,1%
Bremen	9,3%	16,6%	21,0%
Düsseldorf	9,3%	14,5%	14,0%
Braunschweig	8,0%	20,6%	11,2%
Leipzig	7,7%	15,6%	12,6%
Rheinhessen-Pfalz	6,7%	14,4%	10,0%
Hannover	6,6%	14,4%	11,8%
Freiburg	6,6%	24,3%	9,3%

Tübingen	6,2%	24,8%	8,0%
Unterfranken	5,7%	25,2%	9,2%
Schleswig-Holstein	5,7%	12,7%	11,2%
Dresden	5,6%	20,1%	8,5%
Chemnitz	5,5%	21,5%	5,9%
Thüringen	5,5%	20,9%	6,4%
Koblenz	5,4%	4,7%	9,3%
Saarland	5,1%	20,3%	8,7%
Oberpfalz	5,0%	24,0%	7,4%
Detmold	5,0%	25,1%	9,4%
Schwaben	4,9%	23,2%	9,3%
Arnsberg	4,6%	19,1%	11,5%
Oberfranken	4,6%	23,7%	7,5%
Münster	4,4%	15,6%	8,9%
Niederbayern	4,3%	24,9%	7,6%
Kassel	4,3%	20,7%	12,5%
Weser-Ems	4,1%	21,5%	10,8%
Gießen	3,9%	19,0%	6,3%

Brandenburg	3,8%	13,0%	8,0%
Trier	3,7%	4,9%	10,6%
Sachsen-Anhalt	3,4%	17,9%	7,5%
Mecklenburg-Vorpommern	3,3%	12,7%	10,1%
Lüneburg	2,4%	14,0%	7,7%

Country Analysis: Estonia

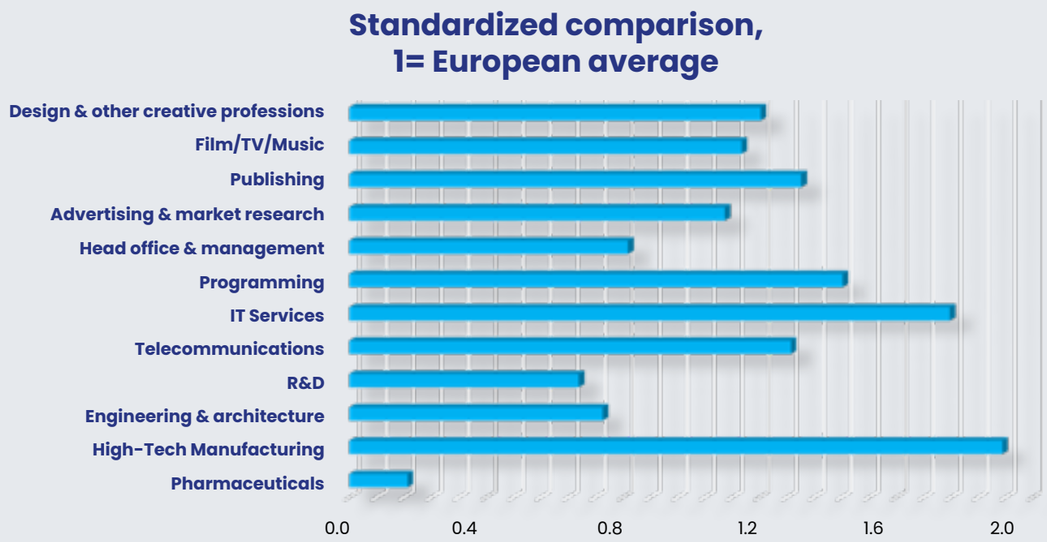
In 2021, 7.7 percent of the working-age adults of Estonia were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 5.7 percent of the working-age population were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. Estonia has a relatively average unemployment level of 7 percent, and 37 percent of its population is employed in these parts of the economy.

Besides the close to 8 percent of the Estonian population employed by knowledge-intensive enterprises, additionally, 20 percent are employed by manufacturing industries, while nearly 10 percent work in the professional services sector.

Compared to the rest of Europe, Estonia has strengths in high-tech manufacturing, IT services, and programming. It lags behind the rest of Europe in pharmaceuticals, research & development, as well as in engineering & architecture.

Estonia



	Brain business jobs per capita	Industries per capita	Professional services per capita
Estonia	7.7%	20.4%	9.5%

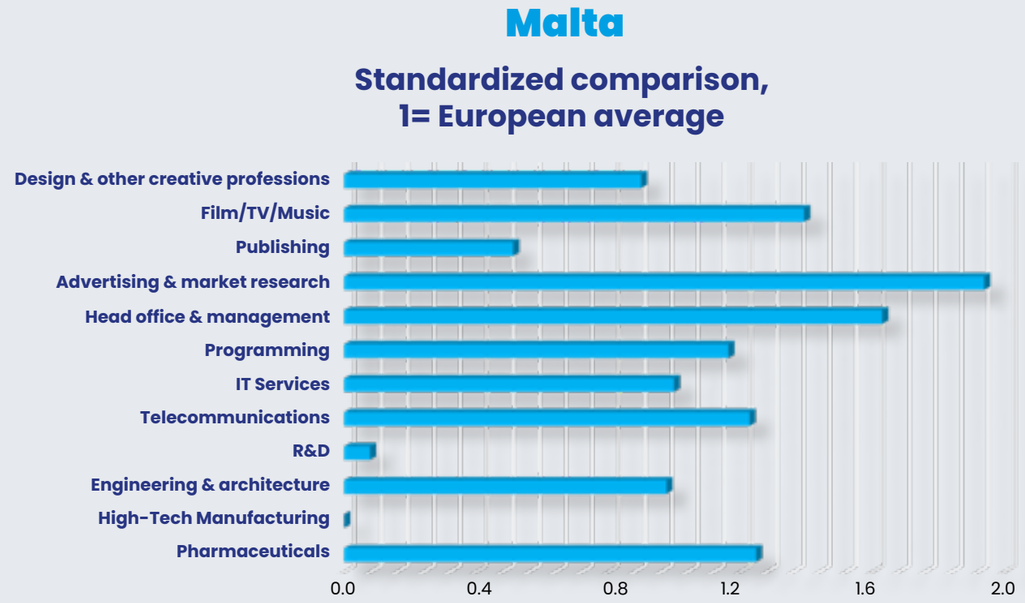
Country Analysis: Malta

In 2021, 7.6 percent of the working-age adults of Malta were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 5.8 percent of the working-age population were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. Malta has a relatively low unemployment level of 4 percent, and 30 percent of its population is employed in these parts of the economy.

Besides the close to 8 percent of the Maltese population employed by knowledge-intensive enterprises, additionally close to 11 percent are employed by manufacturing industries, while 12 percent work in the professional services sector.

Compared to the rest of Europe, Malta has several strengths. The main strength is in advertising and market research, as well as head offices and management. Malta however lags in areas such as high-tech manufacturing and research & development.



	Brain business jobs per capita	Industries per capita	Professional services per capita
Malta	7.6%	10.7%	12.0%

Country Analysis: Hungary

In 2021, 7.5 percent of the working-age adults of Hungary were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 5.3 percent of the working-age population were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. In Hungary, the capital city of Budapest has fully 49 percent of its population employed in this part of the economy. The capital region also has a low unemployment rate of 3 percent.

Közép-Dunántúl and Nyugat-Dunántúl are the manufacturing industries hubs of Hungary, with over a fifth of the population employed in this part of the economy. Budapest is the professional services hub, with close to 16 percent employed in this part of the economy.

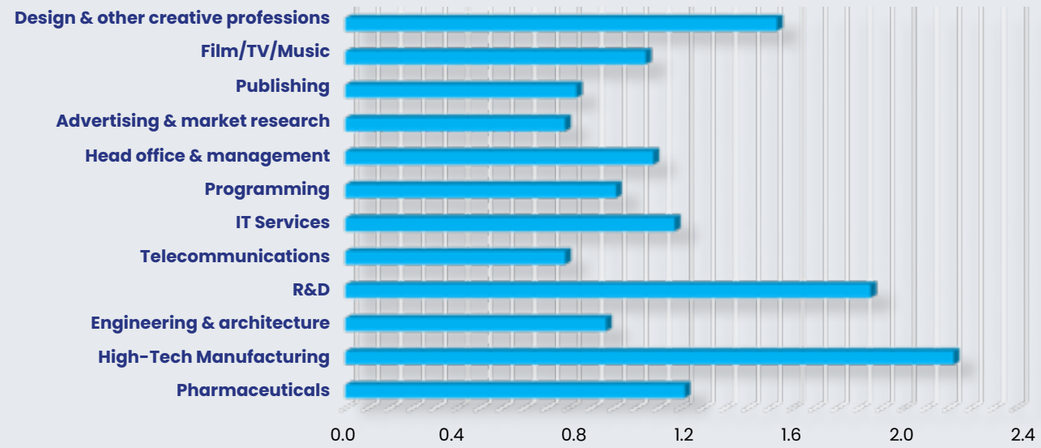
Budapest ranks in 2nd place, amongst 267 European regions, in the concentration of brain business jobs. Only Bratislava has a higher concentration. Examples of novel innovation firms, founded since 2016 in the region, include Craft, a software company, SignAll, providing automated translation, and Banzai Cloud, which offers cloud-native software for enterprises.

Compared to the rest of Europe Hungary has strength in high-tech manufacturing, research & development, as well as in design & other creative professions. It lags behind the rest of Europe in telecommunications, publishing, and advertising & market research.

While Hungary overall has impressive performance in terms of knowledge-intensive jobs, growth of such jobs outside of the capital region is needed to boost the performance of the country as a whole and to lower regional unemployment levels.

Hungary

Standardized comparison, 1= European average



	Brain business jobs per capita	Industries per capita	Professional services per capita
Budapest	19.9%	13.2%	15.5%
Pest	5.9%	15.5%	7.3%
Közép-Dunántúl	5.0%	24.4%	6.8%
Nyugat-Dunántúl	4.5%	22.1%	8.7%
Dél-Dunántúl	4.1%	15.7%	6.3%
Észak-Magyarország	3.9%	16.3%	6.1%
Észak-Alföld	3.8%	14.8%	5.5%
Dél-Alföld	3.7%	18.2%	6.7%

Country Analysis: Iceland

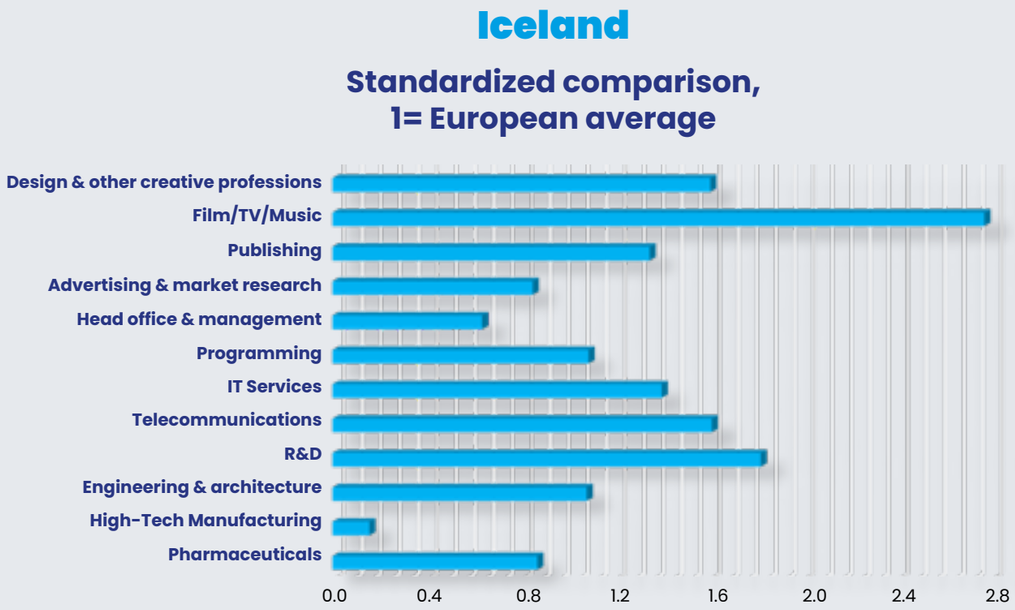
In 2021, 7.5 percent of the working-age adults of Iceland were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has fallen over time, contrary to the European trend of increased occupancy in knowledge-intensive jobs. In comparison, in 2014, 7.8 percent of the working-age population were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. Iceland has a relatively low unemployment level of 5 percent, and close to 41 percent of its population is employed in these parts of the economy.

Besides the close to 8 percent of the Icelandic population employed by knowledge-intensive enterprises, additionally close to 18 percent are employed by manufacturing industries, while close to 16 percent work in the professional services sector.

Compared to the rest of Europe, Iceland has several strengths. The main strength is in film/TV/music, design & other creative professions, as well as research & development. Iceland lags behind the rest of Europe in high-tech manufacturing, head office & management, and pharmaceuticals.

Iceland



	Brain business jobs per capita	Industries per capita	Professional services per capita
Iceland	7.5%	17.7%	15.5%

Country Analysis: Slovenia

In 2021, 7.3 percent of the working-age adults of Slovenia were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 5.4 percent of the Slovenian working-age were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment.

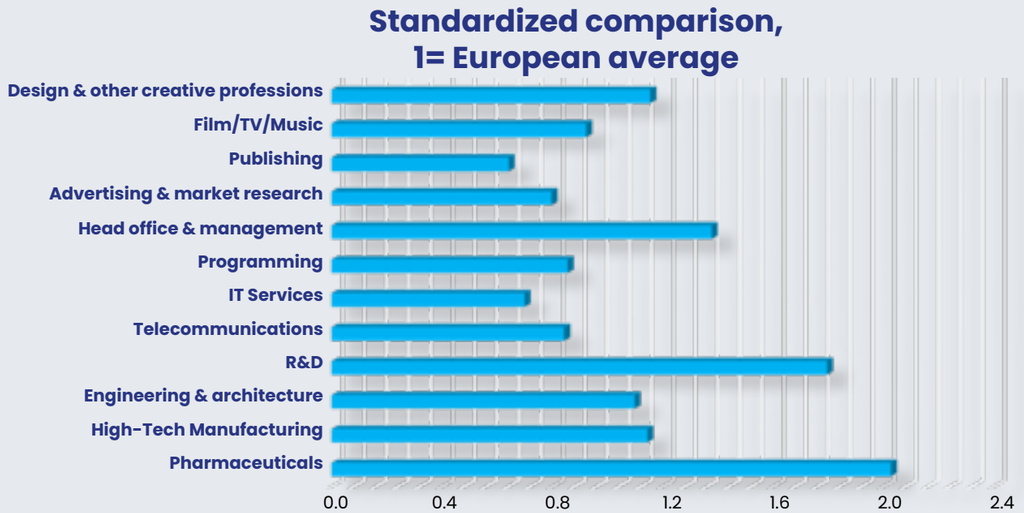
The Ljubljana region, which has nearly 41 percent of the working-age population employed in these parts of the economy, has 4 percent unemployment. The Vzhodna Slovenija, where the share working in high-value creation sectors is 35 percent, has a higher unemployment level, close to 6 percent.

Both regions of Slovenia are strong hubs of manufacturing, with one quarter of the working-age population of Vzhodna Slovenija, and a fifth of working-age adults in Ljubljana employed in manufacturing industries. Ljubljana has a higher concentration of professional service employment.

Compared to the rest of Europe, Slovenia has strengths in pharmaceuticals, research & development, and head office & management. It lags in areas such as IT services and publishing.

Brain business jobs are flocking to the capital city regions of eastern Europe, which combine a good supply of talent, with lower wages and lower taxes. A challenge for eastern European countries is to foster the growth of knowledge-intensive jobs also outside of the capital regions.

Slovenia



	Brain business jobs per capita	Industries per capita	Professional services per capita
Ljubljana	9.8%	20.6%	10.5%
Vzhodna Slovenija	3.9%	24.7%	6.8%

Country Analysis: Belgium

In 2021, 7.1 percent of the working-age adults of Belgium were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 5.7 percent of the working-age population were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. In Austria, West Flanders and Antwerp are the two regions with more than 30 percent of adults employed in this part of the economy, and both regions have low unemployment levels.

West Flanders is the manufacturing industries hub of Belgium, with close to a fifth of the population employed in this part of the economy. Also, East Flanders and Limburg are strong manufacturing regions.

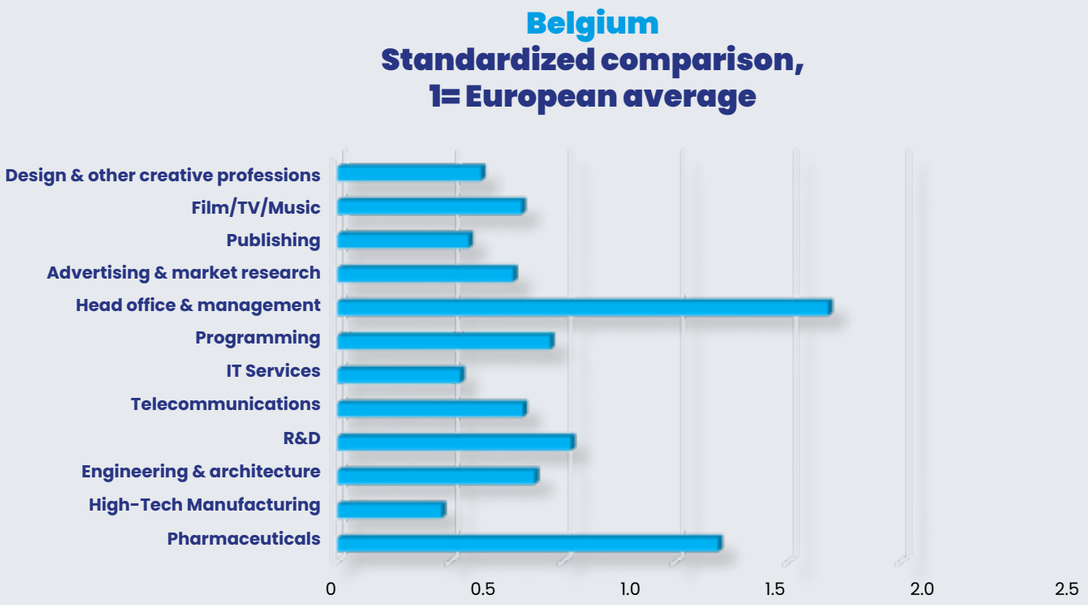
Brussels, Antwerp, and Flemish Brabant are the professional service hubs, with 8 percent of their populations employed in this part of the economy.

Walloon Brabant ranks in 13th place, amongst 267 European regions, in the concentration of brain business jobs. Examples of novel innovation firms, founded since 2016 in the region, include Aerospacelab, which provides intelligence from satellite data, and Gabi SmartCare, which offers outpatient predictive monitoring tools. Brussels ranks in 28th place. Examples of novel

innovation firms, founded since 2016 in Brussels, include Qover, a digital insurance solutions provider, and Cowboy, which manufactures and designs electric bikes for urban riders.

Compared to the rest of Europe Belgium has strengths in head office & management, as well as in pharmaceuticals. It lags behind Europe in high-tech manufacturing and IT services.

The challenge for Belgium is to stimulate knowledge-intensive businesses and utilize the benefit of having the EU capital region. The cost of employment for talents is a hinder for employment of knowledge-workers, linked to the high levels of taxation. The capital regions of Eastern European nations are experiencing significant growth in brain business jobs, by combining access to talent with competitive wages. Belgium needs to foster increased cooperation with the growing brain business hubs in Eastern Europe and implement reforms that boost the competitiveness of Belgian knowledge-intensive firms.



	Brain business jobs per capita	Industries per capita	Professional services per capita
Walloon Brabant	14.5%	8.2%	6.0%
Brussels	11.7%	6.6%	8.0%
Flemish Brabant	10.0%	8.3%	8.5%
Antwerp	9.0%	14.0%	8.0%
East Flanders	6.4%	15.2%	6.1%
West Flanders	5.6%	18.8%	7.1%
Limburg (Belgium)	4.9%	14.8%	6.2%
Liège	3.4%	11.3%	5.1%
Namur	3.4%	8.1%	4.1%
Hainaut	2.5%	9.6%	4.5%
Luxembourg (Belgium)	1.2%	9.3%	4.6%

Country Analysis: Latvia

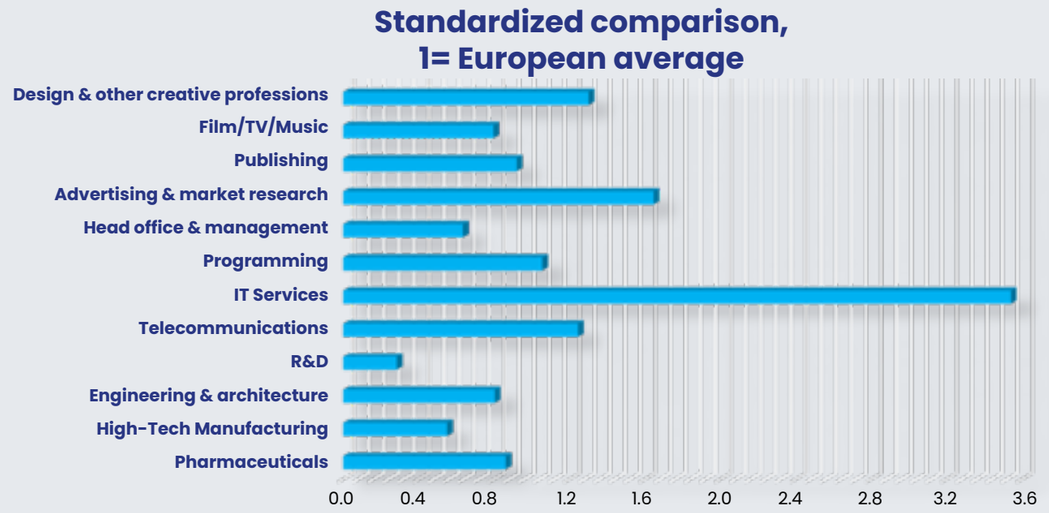
In 2021, 7.1 percent of the working-age adults of Latvia were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time – quite significantly. In comparison, in 2014, 4.8 percent of the working-age population were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. In Latvia, 36 percent of the population works in these sectors. The unemployment rate is 8 percent, similar to the other Baltic neighbours.

The small Baltic country is also an important hub for manufacturing industries, with close to 19 percent of the population employed in this part of the economy. Additionally, 12 percent work in professional services.

Compared to the rest of Europe, Latvia is particularly strong in IT services. Other strengths include advertising & market research, and design & other creative professions. The country lags the rest of Europe in research & development, head office & management, and high-tech manufacturing. Latvia and the other Baltic nations are rising European stars in terms of knowledge-intensive jobs growth and can take advantage of trade with each other as well as the innovative Nordic region.

Latvia



	Brain business jobs per capita	Industries per capita	Professional services per capita
Latvia	7.1%	18.7%	12%

Country Analysis: Norway

In 2021, 6.8 percent of the working-age adults of Norway were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time, although relatively slowly. In comparison, in 2014, 6.5 percent of the Norwegian working-age were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. In Norway however, the Oslo capital region which has 37 percent of adults employed in these sectors, has unemployment of 5 percent. While low in European comparison, this is in fact higher than in other Norwegian regions.

Agder og Rogaland is the manufacturing industries hub of Norway, with close to a quarter of the population employed in this part of the economy. In Vestlandet, a fifth of the population is employed in manufacturing industries. Both regions also have a relatively high concentration of brain business jobs, with 5 percent employed in knowledge-intensive enterprises.

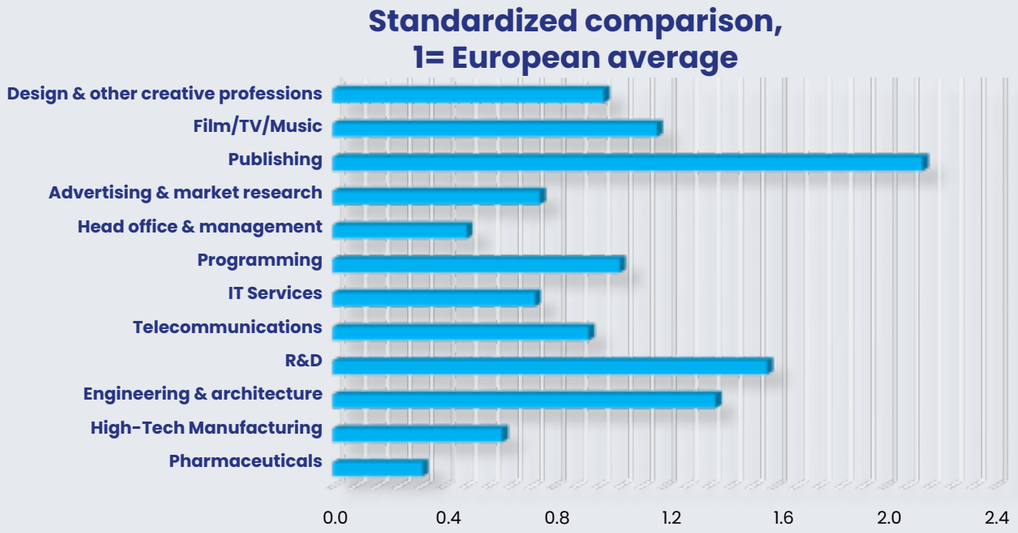
Oslo is the main professional service hub of Norway, with close to 13 percent of the population employed in professional services. In Nord-Norge, the share is 11 percent, the second-highest in the country. Nord-Norge has less than 3 percent employed in brain business jobs, lower than other parts of the country.

Additionally, Oslo ranks in 19th place, amongst 267 European regions, in the concentration of brain business jobs. Examples of novel innovation firms, founded since 2016 in the region, include Dune Analytics, which develops software for analysis of cryptocurrency, Otovo, a marketplace for residential solar energy installation, and Adevinta, a digital marketplace that provides online classifieds services.

Compared to the rest of Europe, Norway has strengths in publishing, as well as research & development. In areas such as head office & management, and pharmaceuticals, Norway however lags the rest of Europe.

A challenge for Norway is to promote knowledge-intensive job growth, in the capital but also in the other regions. The country has had relatively slow growth of brain business jobs, despite being a strong knowledge nation. Brain business jobs in Europe tend to grow in countries and regions which combine lower costs for labour, with a high supply of talent. Lowering the cost of labour, through tax reforms, can strengthen Norway in the competition for knowledge-intensive jobs. Lowering the high cost of living is also needed, to make Norway more competitive in attracting talents.

Norway



	Brain business jobs per capita	Industries per capita	Professional services per capita
Oslo	12.8%	11.4%	12.5%
Trøndelag	6.3%	15.4%	8.8%
Agder og Rogaland	5.1%	23.4%	9.0%
Vestlandet	4.6%	19.9%	9.1%
Sør-Østlandet	4.1%	16.9%	7.5%
Hedmark og Oppland	3.1%	16.6%	8.2%
Nord-Norge	2.9%	16.1%	11.3%

Country Analysis: Czechia

In 2021, 6.4 percent of the working-age adults of Czechia were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 5.3 percent of the working-age population were employed in brain business jobs.

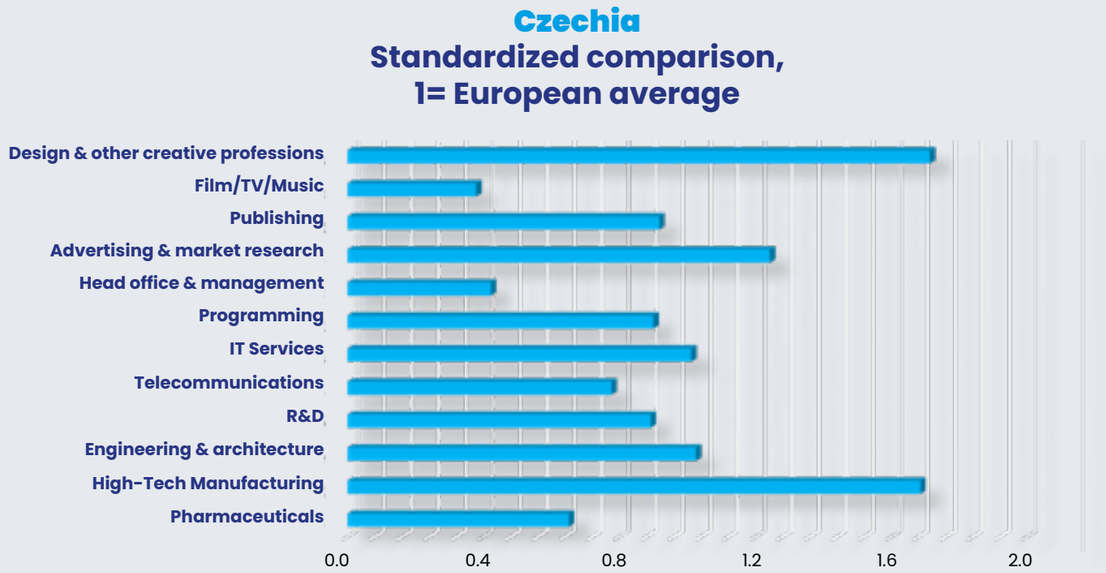
In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. In Prague, the capital region of Czechia, fully 58 percent of the population are employed in these parts of the economy, the second-highest rate in all of Europe besides Bratislava, in Slovakia. Prague also has a low unemployment rate of 2 percent.

Severovýchod and Strední Morava are the manufacturing industries hubs of Czechia, with circa 30 percent of the employed in this part of the economy. Prague is the main professional service hub of Czechia, with 19 percent of the population employed in professional services.

Additionally, Prague ranks in 3rd place, amongst 267 European regions, in the concentration of brain business jobs. Examples of novel innovation firms, founded since 2016 in the region, include GAMEE, focused on protecting AI systems from manipulation, Time is Ltd., which provides a collaboration platform for businesses, and Supernova, a design systems platform.

Compared to the rest of Europe, Czechia has strengths in design & other creative professions, advertising & market research, and high-tech manufacturing. The country lags in film/TV/music, and in head office & management.

The challenge for Czechia is to keep its impressive growth trajectory and to continue to develop Prague as a brain business hub, later expanding the success to other parts of the country.



	Brain business jobs per capita	Industries per capita	Professional services per capita
Prague	19.9%	19.2%	18.9%
Jihovýchod	6.9%	27.4%	7.3%
Severovýchod	4.8%	29.9%	6.5%
Moravskoslezsko	4.7%	27.0%	6.8%
Střední Morava	4.2%	29.5%	6.5%
Střední Cechy	4.1%	23.1%	7.7%
Jihozápad	3.9%	27.8%	7.7%
Severozápad	2.5%	23.9%	6.3%

Country Analysis: Austria

In 2021, 6.4 percent of the working-age adults of Austria were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. While brain business jobs have grown in most of Europe, development in Austria has been stagnant. In comparison, in 2014, 6.0 percent of the working-age population were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. In Tirol, Salzburg, and Vorarlberg, 40 percent of the population are employed in these parts of the economy, and unemployment levels are low. Vienna has 32 percent employment in high-value creation sectors, and a higher unemployment rate than average for Austria.

Oberösterreich and Vorarlbergare the manufacturing industries hubs of Austria, with a quarter of the population employed in this part of the economy. Tirol and Salzburg are the main professional service hub of Austria, with 17 percent of the population employed in professional services.

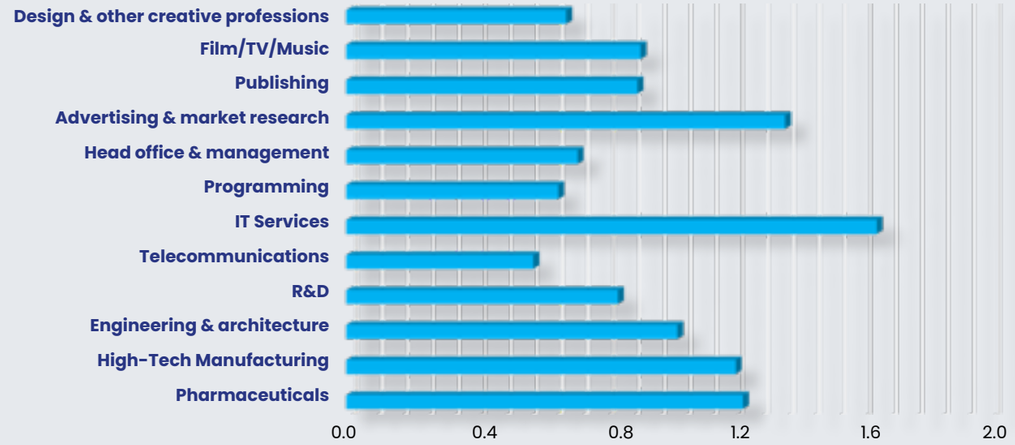
Vienna ranks in 24th place, amongst 267 European regions, in the concentration of brain business jobs. Examples of novel innovation firms, founded since 2016 in the region, include GoStudent, a digital school, Refurbished, a marketplace for refurbished electronics, and Mostly AI, which develops tabular synthetic data.

Compared to the rest of Europe, Austria has strengths in IT services, advertising & market research. Pharmaceuticals and high-tech manufacturing are also strengths. Austria lags behind the rest of Europe in telecommunications and programming.

Geographical proximity to the Central European countries, which are rapidly catching up in brain business jobs concentration, creates an opportunity for knowledge-intensive firms to thrive in Austria. Vienna has a historic tradition as a Central European knowledge hub and is often described as the best city to live in Europe. Yet, growth-oriented reforms are needed for Austria in general and Vienna to reach its potential.

Austria

Standardized comparison, 1= European average



	Brain business jobs per capita	Industries per capita	Professional services per capita
Vienna	11.9%	9.0%	11.5%
Tirol	6.8%	17.4%	17.1%
Steiermark	6.7%	20.2%	9.2%
Salzburg	6.5%	17.3%	16.6%
Kärnten	5.3%	16.2%	10.6%
Oberösterreich	5.2%	25.3%	8.2%
Vorarlberg	4.4%	25.0%	11.0%
Niederösterreich	4.0%	16.8%	9.0%
Burgenland	3.1%	16.0%	8.9%

Country Analysis: Lithuania

In 2021, 6.0 percent of the working-age adults of Lithuania were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 4.3 percent of the working-age population were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. The Lithuanian capital region of Vilnius has an unemployment rate of 7 percent, and fully 47 percent are employed in these parts of the economy. In the Vidurio region, 34 percent are employed in high-value creation sectors and the unemployment is at a higher level, 10 percent.

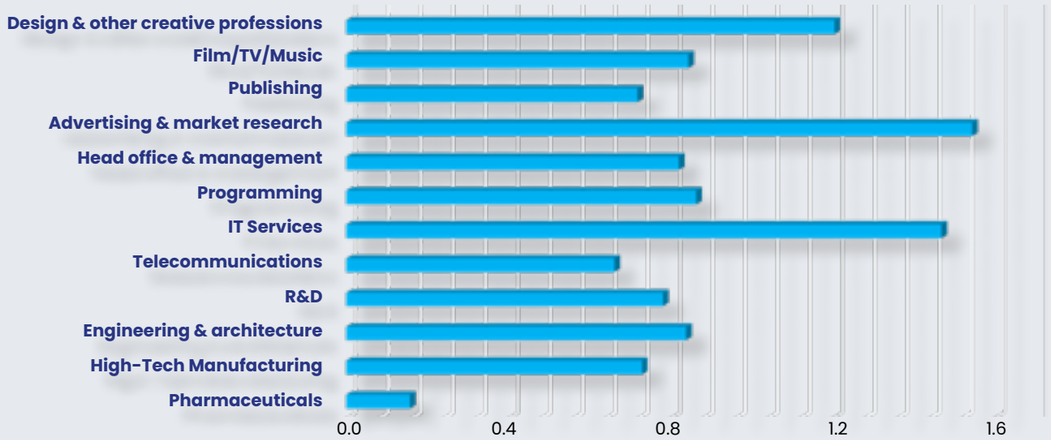
Both Lithuanian regions are strong hubs of manufacturing industries, with around a fifth of the population employed in this part of the economy. Professional services employ more than one in ten in Vidurio, and 17 percent of the population of the Vilnius region.

Compared to the rest of Europe, Lithuania has strengths in advertising & market research, IT services, and design & other creative professions. The country lags behind the rest of Europe in pharmaceuticals and telecommunications.

Lithuania and the other Baltic nations are rising European stars in terms of knowledge-intensive jobs growth and can take advantage of trade with each other as well as the innovative Nordic region.

Lithuania

Standardized comparison, 1= European average



	Brain business jobs per capita	Industries per capita	Professional services per capita
Vilnius	11.5%	18.2%	17.4%
Vidurio	3.2%	20.6%	10.6%

Country Analysis: Cyprus

In 2021, 5.9 percent of the working-age adults of Cyprus were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 3.8 percent of the working-age population were employed in brain business jobs.

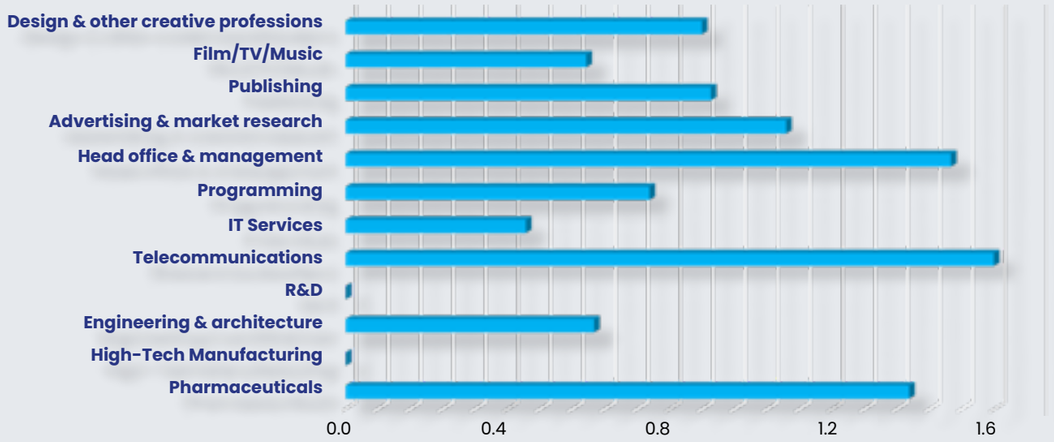
In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. Cyprus has a relatively high unemployment level of 8 percent, and 35 percent of its population is employed in these parts of the economy.

Besides the close to 6 percent of the Cyprus population employed by knowledge-intensive enterprises, additionally, 13 percent are employed by manufacturing industries, while close to 16 percent work in the professional services sector.

Compared to the rest of Europe, Cyprus has strengths in telecommunications, and head office & management, as well as in pharmaceuticals. The country lacks research & development, and high-tech manufacturing.

Cyprus

Standardized comparison, 1= European average



	Brain business jobs per capita	Industries per capita	Professional services per capita
Cyprus	5.9%	13.0%	15.8%

Country Analysis: Slovakia

In 2021, 5.9 percent of the working-age adults of Slovakia were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 4.4 percent of the Slovakian working-age were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. The capital region of Slovakia, Bratislava, has fully 61 percent of its working-age population employed in these sectors, the highest figure in all of Europe. It also has a low unemployment rate of 3 percent.

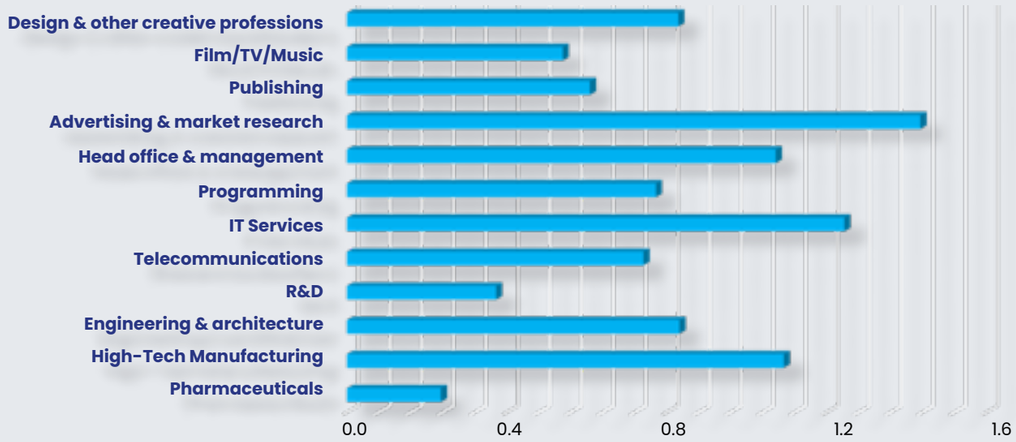
Bratislava has fully 22.4 percent of its working-age population employed in brain business jobs. As in previous editions of the brain business jobs index, this is the highest value of any region in Europe. Examples of novel innovation companies, founded since 2016 in Bratislava, include CloudTalk, a remote ready call centre, InoBat, an R&D and ready call centre software developer, and altFINS. A cloud-based platform for investors.

Bratislava, Západné Slovensko, and Stredné Slovensko, are also strong manufacturing industrial hubs, with a fifth of the population employed in this part of the economy. Compared to the rest of Europe, Slovakia has strengths in advertising & market research, IT services, and high-tech manufacturing. IT lags however in areas such as pharmaceuticals and research & development.

Brain business jobs are flocking to the capital city regions of eastern Europe, which combine a good supply of talent, with lower wages and lower taxes. A challenge for eastern European countries is to foster the growth of knowledge-intensive jobs also outside of the capital regions.

Slovakia

Standardized comparison, 1= European average



	Brain business jobs per capita	Industries per capita	Professional services per capita
Bratislava	22.4%	21.2%	17.4%
Západné Slovensko	4.5%	22.3%	6.0%
Stredné Slovensko	3.8%	19.8%	5.3%
Východné Slovensko	2.9%	16.0%	4.2%

Country Analysis: France

In 2021, 5.6 percent of the working-age adults of France were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has been stagnant over time, contrary to the European trend of growth in knowledge-intensive employment. In comparison, in 2014, 5.5 percent of the working-age population were employed in brain business jobs.

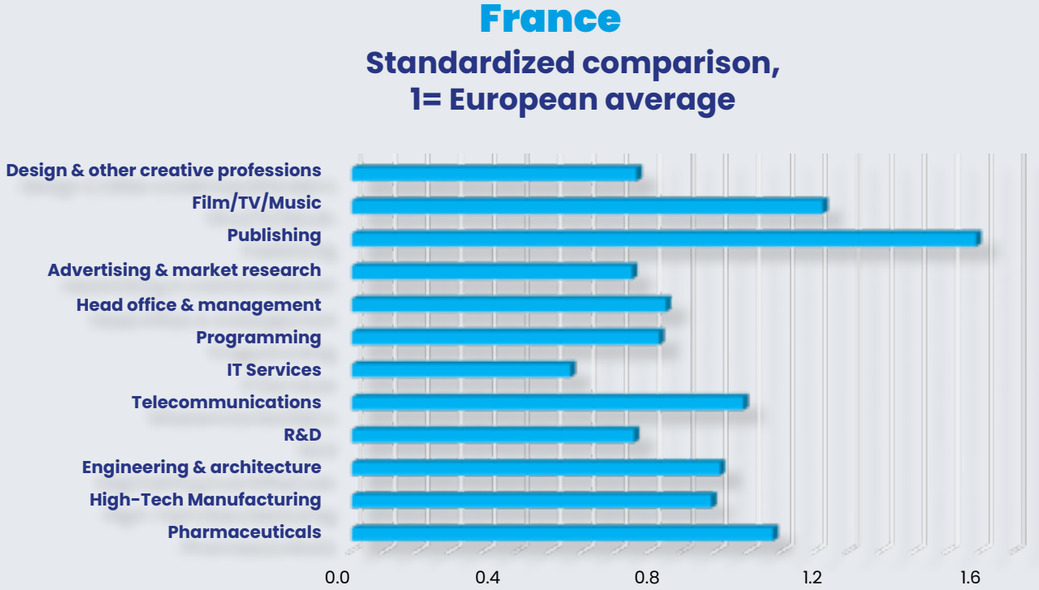
In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. In France, the capital Paris region has fully 58 percent of its population employed in this part of the economy, yet Paris has similar unemployment levels as the rest of France.

Paris is also the strongest hub of manufacturing industries in France, with close to 23 percent of the population employed in this sector, besides the close to 17 percent employed in brain business jobs. Additionally, Paris is also the main professional services hub of France, with 18 percent of the population employed here. France stands out as a highly centralized country, with so much of high-value creation sectors employment focused to the capital city region.

Paris has more than one million brain business jobs, the highest number in total for Europe. In concentration of brain business jobs, the region ranks in 6th place, amongst 267 European regions. Examples of novel innovation firms, founded since 2016 in the region, include Sorare, a global fantasy football game developer, Leocare, an insurer that offers multi-equipment

contracts, and Ankorstore, an online business to business marketplace.

Compared to the rest of Europe, France has strengths in publishing, film/TV/music. Also, telecommunications and pharmaceuticals are relative strengths. France lags other parts of Europe in IT services and research & development.



	Brain business jobs per capita	Industries per capita	Professional services per capita
Paris	16.7%	22.8%	18.4%
Rhône-Alpes	5.2%	12.7%	5.8%
Provence-Alpes-Côte d'Azur	4.0%	9.3%	7.0%
Midi-Pyrénées	3.3%	11.7%	4.8%
Aquitaine	3.1%	9.6%	5.4%
Alsace	2.8%	12.9%	6.7%
Bretagne	2.8%	11.1%	6.4%
Pays de la Loire	2.8%	14.3%	5.3%
Langue-doc-Roussillon	2.7%	7.1%	5.0%
Nord-Pas de Calais	2.2%	8.3%	4.6%
Corse	2.1%	11.2%	8.8%
Auvergne	1.9%	11.9%	4.8%
Centre - Val de Loire	1.8%	8.9%	3.8%
Basse-Normandie	1.8%	12.6%	5.2%
Haute-Normandie	1.7%	8.2%	4.2%
Bourgogne	1.7%	10.0%	4.5%
Limousin	1.6%	9.8%	4.2%
Picardie	1.6%	8.1%	3.5%
Champagne-Ardenne	1.5%	12.2%	4.3%
Poitou-Charentes	1.5%	9.8%	4.2%
Lorraine	1.4%	8.0%	4.3%
Franche-Comté	1.3%	12.0%	3.5%

Country Analysis: Portugal

In 2021, 5.3 percent of the working-age adults of Portugal were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 3.8 percent of the Portuguese working-age were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. In Portugal, the three regions with the highest share of employment in high-value creation sectors are Algarve (38 percent of the population) followed by Lisbon and Norte (36 percent each). These regions however do not have lower unemployment than the rest of Portugal.

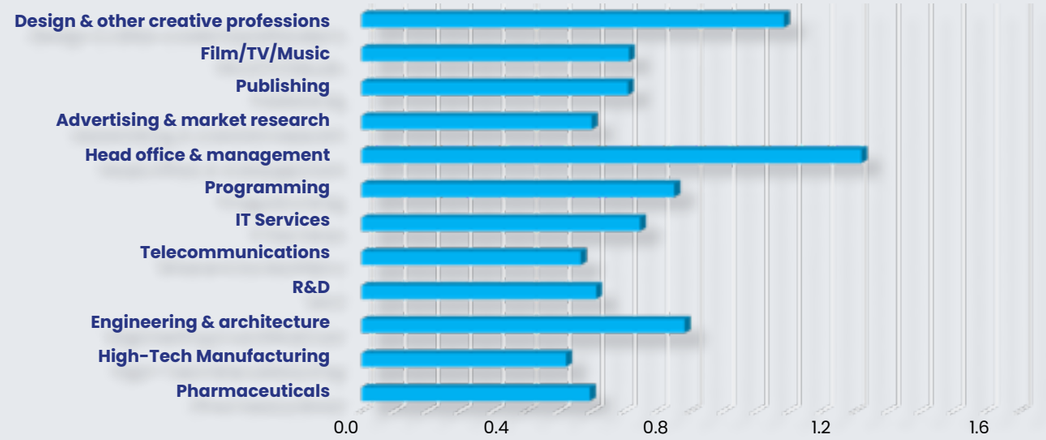
The Norte and Centro regions are the strongest hubs of manufacturing industries in Portugal, with above one fifth of the population employed in this part of the economy. These two regions also have a somewhat higher concentration of brain business jobs than the rest of the country, with exception of the capital region.

The professional services hub of Portugal is the Algarve region, where one quarter of the population is employed in professional services. In Algarve, 3 percent of the population is employed in brain business jobs. Lisbon also has a relatively strong professional service sector.

Compared to the rest of Europe, Portugal has strengths in head office & management, as well as design & other creative professions. In areas such as high-tech manufacturing, telecommunications, and pharmaceuticals, however, Portugal lags behind the rest of Europe.

Portugal's challenge is to foster talent supply, by upgrading the educational system, and encouraging growth, particularly in IT services and programming, in a time where much of business growth is driven by digitalization. The opportunity also exists for the country to strengthen tech sector knowledge jobs, such as high-tech manufacturing and pharmaceuticals. Portugal is growing strong and can, like Malta, develop into a southern European knowledge hub.

Portugal
Standardized comparison, 1= European average



	Brain business jobs per capita	Industries per capita	Professional services per capita
Lisbon	10.6%	10.5%	15.0%
Norte	4.1%	23.4%	8.1%
Centro (Portugal)	3.2%	20.4%	8.5%
Algarve	3.0%	10.6%	24.8%
Região Autónoma da Madeira	2.6%	9.3%	14.1%
Alentejo	2.4%	13.4%	8.4%
Região Autónoma dos Açores	2.0%	9.5%	9.4%

Country Analysis: Bulgaria

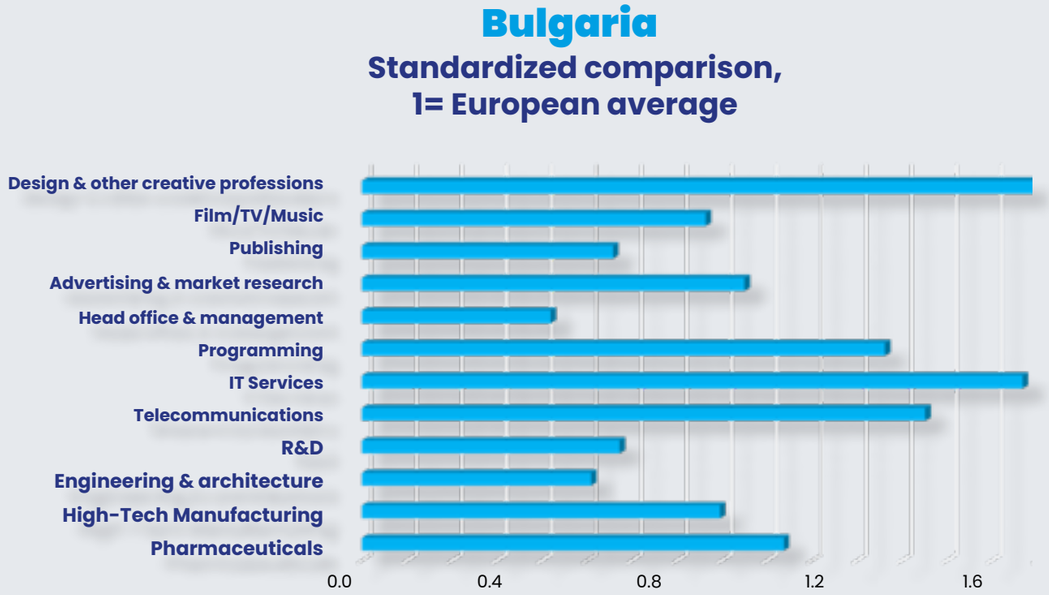
In 2021, 4.7 percent of the working-age adults of Bulgaria were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 3.6 percent of the working-age population were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. In the Bulgarian capital region of Sofia, fully 40 percent of the population is employed in these sectors, and the unemployment rate is only 4 percent.

The highest concentration of manufacturing industries jobs is found in Yuzhen tsentralen and in Severen tsentralen where one-fifth of the population is employed in this part of the economy. The concentration of professional service jobs is highest in the Sofia region, where above 11 percent work in this segment of the economy.

Sofia ranks in 22nd place, amongst 267 European regions, in the concentration of brain business jobs. Examples of novel innovation firms, founded since 2016 in the region in, include Ambire, a wallet developer, Credefi, which connects crypto lenders with small business borrowers, and Nasekomo, which produces animal feed from organic waste using bioconverting insects.

Compared to the rest of Europe, Bulgaria has strengths in design & other creative professions, as well as in IT services. Telecommunications is also a relative strength. The country lags behind the rest of Europe in head office & management, engineering & architecture, as well as research & development.



	Brain business jobs per capita	Industries per capita	Professional services per capita
Sofia	12.4%	15.9%	11.4%
Severoiztochen	2.4%	13.9%	8.5%
Yuzhen tsentralen	2.2%	20.0%	6.9%
Severen tsentralen	1.8%	19.3%	6.8%
Yugoiztochen	1.5%	18.7%	8.4%
Severozapaden	1.1%	15.3%	5.0%

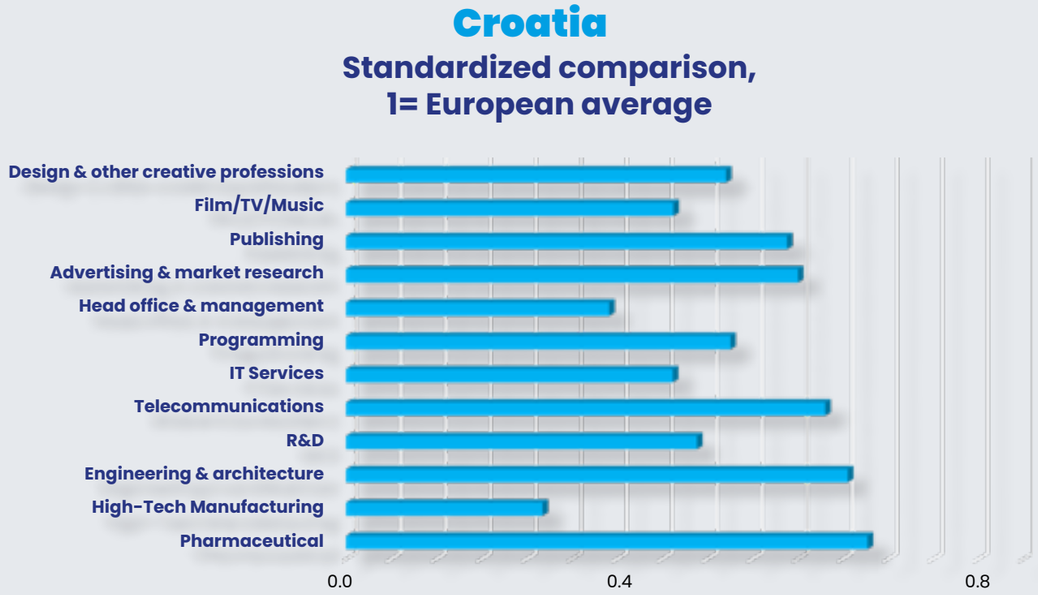
Country Analysis: Croatia

In 2021, 4.7 percent of the working-age adults of Croatia were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 3.7 percent of the working-age population were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. In the Croatian capital region of Zagreb, 28 percent of the population are employed in these sectors, compared to 29 percent in the Jadranska Hrvatska region. Both regions have similar unemployment levels of 7 percent.

The highest concentration of manufacturing industry jobs is found in Zagreb, where above 16 percent of adults work in this part of the economy. The concentration of professional service jobs is highest in the Jadranska Hrvatska region, where above 13 percent work in this segment of the economy.

Compared to the rest of Europe, Croatia has a well-rounded knowledge-intensive industry sector, with strengths in pharmaceuticals as well as engineering & architecture. The country lags Europe in high-tech manufacturing, as well as head office & management.



	Brain business jobs per capita	Industries per capita	Professional services per capita
Zagreb	4.8%	16.4%	6.6%
Jadranska Hrvatska	3.1%	12.8%	13.4%

Country Analysis: Spain

In 2021, 4.6 percent of the working-age adults of Spain were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 3.6 percent of the Spanish working-age were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. In the capital Madrid region, fully 33 percent are employed in these parts of the economy. In País Vasco the same share is 34 percent, and in Comunidad Foral de Navarra 35 percent. These regions also have lower unemployment rates than the average for Spain.

The Madrid capital region, where close to 12 percent of the population are employed in brain business jobs, has 12 percent unemployment, the same as Cataluna which has the second-highest concentration of brain business jobs (6 percent of working-age population). In comparison, Spanish regions with a lower concentration of brain business jobs have unemployment levels close to or above 20 percent.

The highest concentration of manufacturing industries jobs in Spain exists in Comunidad Foral de Navarra and País Vasco, two regions that also have a relatively high concentration of brain business jobs. La Rioja also has a relatively strong concentration of manufacturing industries jobs, but not many brain business jobs.

The concentration of professional service jobs is highest in the Illes Balears and Canaries Islands regions, both of which have relatively few brain business jobs. Madrid, which has a high concentration of knowledge-intensive jobs, however also has a strong professional services sector.

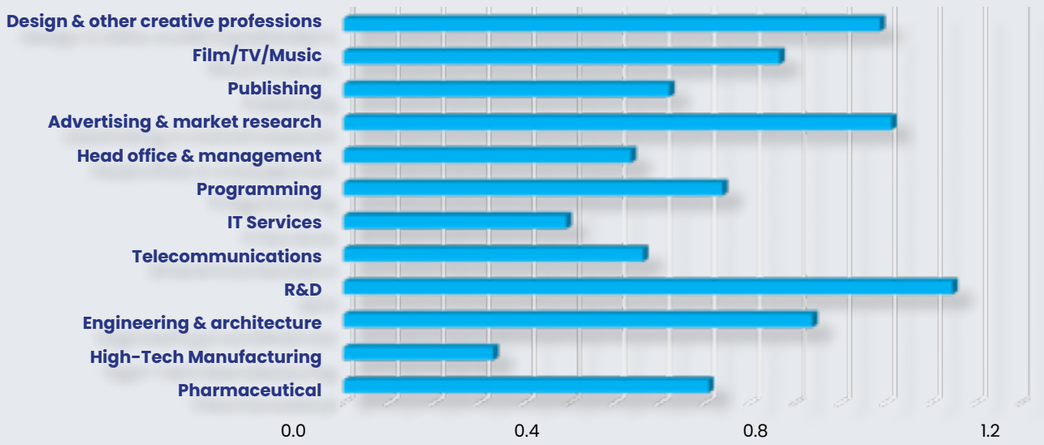
Compared to the rest of Europe, Spain has strengths in advertising & market research, design & other creative professions, and research & development. The country however lags in high-tech manufacturing and IT services.

Madrid ranks in 25th place, amongst 267 European regions, in the concentration of brain business jobs. Examples of novel innovation firms, founded since 2016 in the region, include Playtomic, which operates an online sports court booking platform, Nova, a global talent network company, and Bipi, a car subscription company.

The challenge for Spain is to stimulate the growth of knowledge-intensive firms, improve the level of digitalization and create opportunities for innovative firms to grow also outside of the Madrid region.

Spain

Standardized comparison, 1= European average



	Brain business jobs per capita	Industries per capita	Professional services per capita
Madrid	11.7%	9.2%	11.8%
Cataluña	6.7%	13.7%	11.0%
País Vasco	5.6%	18.8%	9.8%
Comunidad Foral de Navarra	4.5%	21.6%	8.7%
Aragón	3.6%	15.8%	9.8%
Principado de Asturias	3.4%	11.7%	9.0%
Galicia	3.3%	12.7%	9.2%
Comunidad Valenciana	3.1%	12.5%	9.5%
Illes Balears	2.9%	10.0%	16.5%
Castilla y León	2.7%	12.9%	8.7%
Andalucía	2.6%	7.7%	8.4%
Cantabria	2.5%	12.5%	9.2%
La Rioja	2.4%	16.9%	8.0%
Región de Murcia	2.3%	10.9%	8.0%
Canaries Islands	2.3%	6.3%	13.8%
Extremadura	1.9%	7.8%	6.2%
Castilla-la Mancha	1.7%	11.1%	7.6%

Country Analysis: Italy

In 2021, 4.3 percent of the working-age adults of Italy were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 3.8 percent of the working-age population were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. In Italy, the highest share of employment in this part of the economy is found in Provincia Autonoma di Bolzano, (41 percent), followed by Veneto and Emilia-Romagna (37 percent). These regions also have much lower unemployment than the Italian average.

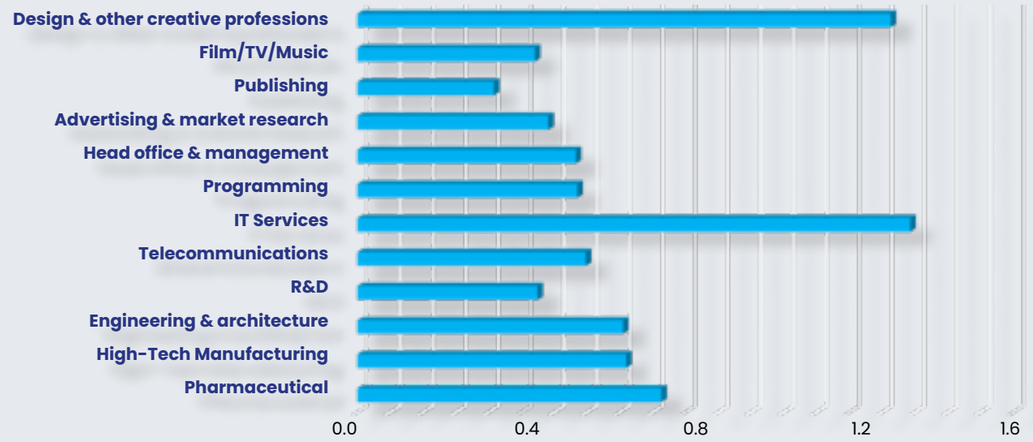
Veneto is the strongest hub of manufacturing industries in Italy, with nearly a quarter of the working-age population employed in this sector. Marche has one-fifth of the adult population employed in manufacturing industries. Both regions have relatively strong performance also in brain business jobs. In Provincia Autonoma di Bolzano nearly 18 percent are employed in professional services, the highest rate in Italy, while the province also has 5 percent employed in brain business jobs.

Compared to the rest of Europe, Italy has strengths in design & other creative professions and IT services. It however lags behind the rest of Europe in publishing, film/TV/music as well as research & development.

The challenge for Italy is to continue growing with knowledge-intensive occupations, improving strengths in areas that are already strong such as IT services and design, and in currently weak areas such as research & development. Another challenge is to promote knowledge-intensive job creation outside of the regions that are already strong, reducing the currently significant geographical differences.

Italy

Standardized comparison, 1= European average



	Brain business jobs per capita	Industries per capita	Professional services per capita
Lombardia	7.4%	18.3%	9.9%
Rome	6.4%	6.9%	10.5%
Piemonte	5.5%	18.0%	8.6%
Emilia-Romagna	5.1%	20.5%	10.9%

Provincia Autonoma di Trento	5.1%	15.9%	12.7%
Toscana	4.8%	17.6%	10.5%
Valle d'Aosta/ Vallée d'Aoste	4.7%	12.9%	15.8%
Veneto	4.6%	22.2%	10.5%
Provincia Autonoma di Bolzano/Bozen	4.5%	18.5%	17.8%
Marche	4.4%	20.7%	8.8%
Liguria	4.2%	10.7%	15.7%
Friuli-Venezia Giulia	4.0%	18.2%	9.7%
Umbria	3.4%	15.4%	8.8%
Abruzzo	3.2%	14.5%	8.2%
Basilicata	2.4%	12.0%	6.9%
Molise	2.3%	10.6%	6.8%
Sardegna	2.2%	6.8%	8.1%
Campania	2.1%	7.7%	7.0%
Puglia	2.1%	9.1%	7.0%
Sicilia	1.8%	5.0%	5.6%
Calabria	1.5%	4.6%	5.5%

Country Analysis: Poland

In 2021, 4.3 percent of the working-age adults of Poland were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 3.1 percent of the Polish working-age were employed in brain business jobs.

In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. This is also clearly seen in Poland. The capital Warsaw region has fully 49 percent of its population employed in high-value creation sectors and has a low unemployment rate. Wielkopolskie has the second-highest rate, 34 percent employed in high-value creation sectors, and also a low unemployment rate.

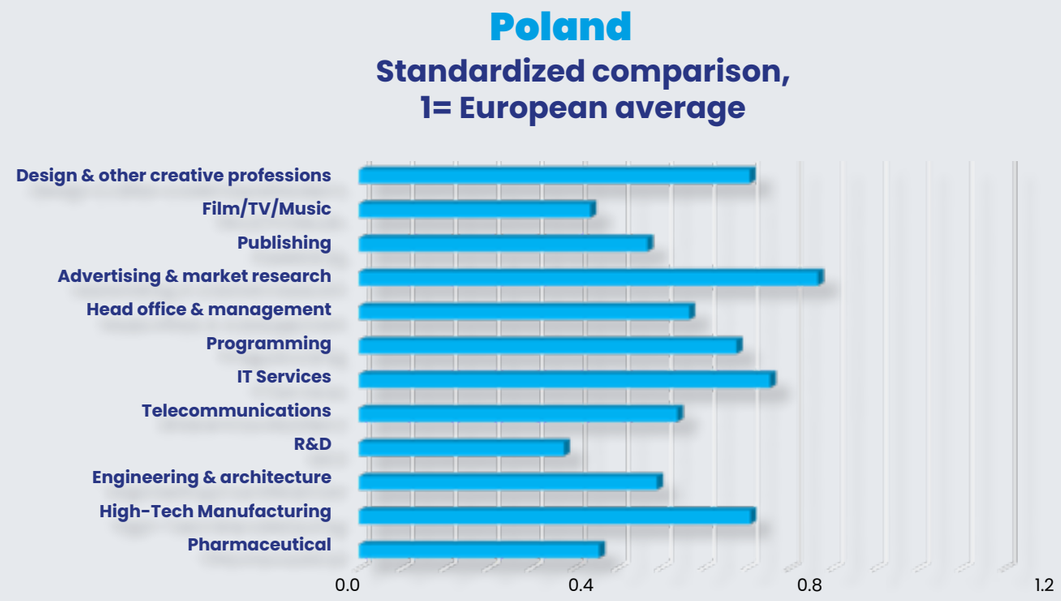
Dolnoslaskie, Wielkopolskie, and Slaskie are the three regions of Poland which are the strongest hub of manufacturing industries. In these regions, a fifth or more of the population is employed in manufacturing industries. The share of brain business jobs is also relatively high, circa 4 percent in Wielkopolskie and Slaskie, and close to 6 percent in Dolnoslaskie are employed in knowledge-intensive firms.

Warsaw is the main professional services hub of Poland, with close to 17 percent of the population employed in this sector. Pomorskie also has a relatively strong professional services sector, and relatively high levels of brain business jobs.

Additionally, Warsaw ranks in 9th place, amongst 267 European regions, in the concentration of brain business jobs. Examples of novel innovation firms, founded since 2016 in the region, include Ramp, which connects blockchain with banks, Higo Sense, which develops telemedical systems for remote diagnostics, and user data service provider Nethone.

Compared to the rest of Europe, Poland has strengths in advertising & market research, as well as design & other creative professions, and IT services. In areas such as research & development, and film/TV/music, however, Poland lags behind the rest of Europe.

The challenge ahead for Poland is to maintain the growth of knowledge-intensive jobs, in the leading capital region as well as the rest of the country. Eastern European nations are rapidly catching up to Western and Northern European nations in Brain Business concentration, relying on a strong supply of talents and lower wage costs for the talents, as well as an otherwise competitive business climate. Poland needs to make further investments in knowledge, through the education system, and improve the business climate for domestic and international firms, to continue its strong growth trajectory in knowledge-intensive jobs.



	Brain business jobs per capita	Industries per capita	Professional services per capita
Warsaw	15.8%	17.1%	16.5%
Malopolskie	6.2%	17.5%	7.1%
Pomorskie	5.7%	18.1%	7.5%
Dolnoslaskie	5.7%	20.0%	6.8%
Wielkopolskie	3.9%	23.0%	7.3%
Slaskie	3.8%	22.6%	6.3%
Lódzkie	3.5%	18.0%	6.1%

Zachodniopomorskie	2.8%	15.1%	7.0%
Kujawsko-Pomorskie	2.8%	17.4%	4.8%
Lubuskie	2.5%	18.1%	6.3%
Podkarpackie	2.4%	17.9%	4.0%
Podlaskie	2.1%	14.3%	4.5%
Lubelskie	2.0%	12.9%	4.4%
Opolskie	1.9%	19.2%	5.1%
Swietokrzyskie	1.7%	15.2%	4.1%
Warminsko-Mazurskie	1.7%	16.2%	4.2%
Mazowiecki regionalny	1.6%	13.7%	4.9%

Country Analysis: Romania

In 2021, 3.8 percent of the working-age adults of Romania were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has increased over time. In comparison, in 2014, 3.0 percent of the Romanian working-age were employed in brain business jobs.

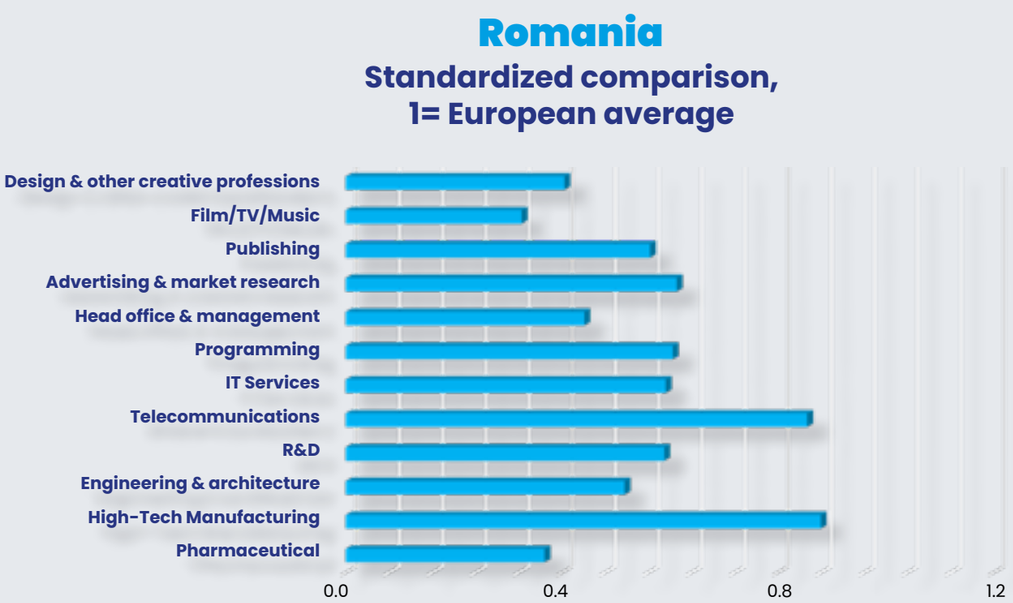
In Europe, there is a general link between a high concentration of high-value creation sectors (brain business jobs, manufacturing industries jobs, and professional services jobs) and employment. In the Romanian capital region of Bucharest, fully 39 percent of the population are employed in high-value creation sectors. Yet, unemployment is the same as the average for the country.

The Centru region is the strongest hub of manufacturing industries in Romania, with nearly a fifth of the working-age population employed in this sector. There are some, but few, brain business jobs in the Centru region. Vest and Nord-Vest, are two regions that have strengths in brain business jobs as well as in manufacturing technology. Ten percent of the working-age population of Bucharest is employed in professional services. In other parts of the country, this group is considerably smaller.

Compared to the rest of Europe, Romania has strengths in telecommunications, and high-tech manufacturing. It however lags in other areas, such as film/TV/music, pharmaceuticals, and head offices & management.

Bucharest ranks in 14th place, amongst 267 European regions, in the concentration of brain business jobs. Examples of novel innovation firms, founded since 2016 in the region in, include Instant Factoring, a fintech start-up, Hyperhuman, with a focus on health & fitness videos, and DRUID, which develops an AI-powered enterprise chatbot platform.

Brain business jobs are flocking to the capital city regions of eastern Europe, which combine a good supply of talent, with lower wages and lower taxes. A challenge for Romania and other eastern European countries is to foster the growth of knowledge-intensive jobs also outside of the capital regions.



	Brain business jobs per capita	Industries per capita	Professional services per capita
Bucharest	13.8%	14.9%	10.1%
Vest	4.3%	16.8%	5.3%
Nord-Vest	4.0%	15.9%	5.8%
Centru	2.7%	19.1%	5.6%
Nord-Est	1.8%	8.8%	3.3%
Sud-Est	1.5%	11.1%	5.1%
Sud - Muntenia	1.4%	12.5%	3.6%
Sud-Vest Oltenia	1.3%	11.4%	3.6%

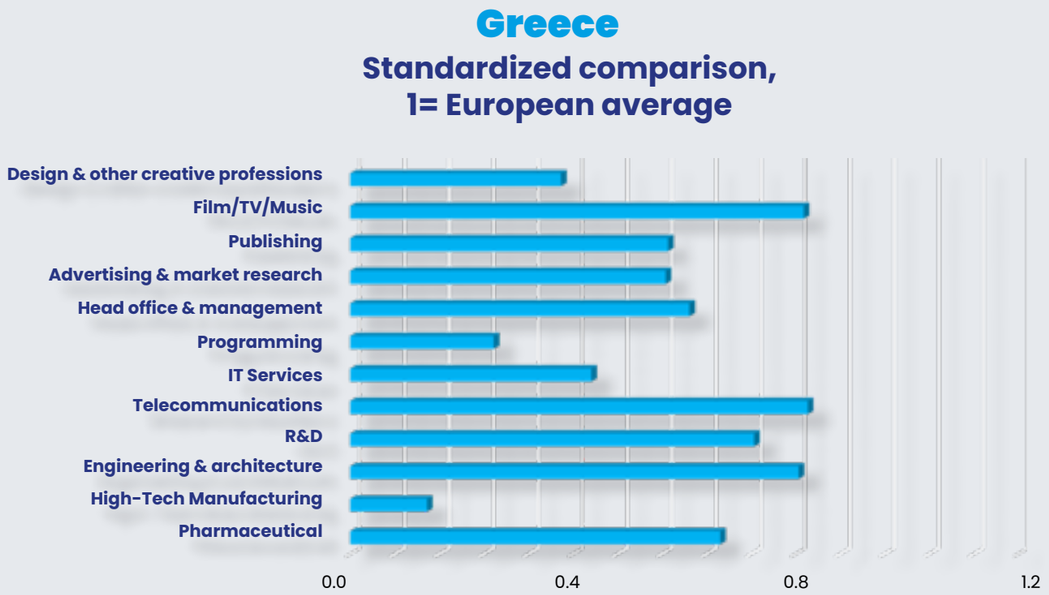
Country Analysis: Greece

In 2021, 3.6 percent of the working-age adults of Greece were employed in brain business jobs, a term for employment in knowledge-intensive firms in tech, information and communications technology, advanced services, and creative professions. The share of employment in these knowledge-intensive jobs has fallen over time, contrary to the European trend of increased occupancy in knowledge-intensive jobs. In comparison, in 2014, 4.1 percent of the working-age population were employed in brain business jobs.

There are additionally close to 9 percent of the Greece adult population, who are employed in manufacturing industries. The country also has close to 13 percent of its employment in the professional services sector. Due to limitations in data, the regional number of brain business jobs in Greece is not included in this study.

Compared to the rest of Europe, Greece has strengths in film/TV/music, telecommunications, as well as engineering & architecture. The country lags the rest of Europe in high-tech manufacturing, programming, as well as design & other creative professions.

Greece can, similarly to Malta and Cyprus, foster strong knowledge-intensive sectors. For this opportunity to be realized, improvements in regulatory and tax systems are needed, as well as a boost in the education sector. Stimulating brain business jobs growth can help Greece maintain its talent supply, and to attract talents from abroad.



	Brain business jobs per capita	Industries per capita	Professional services per capita
Greece	3.6%	8.7%	12.7%

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