RESEARCH REPORT

Eurofound

European Commission

Labour market change

European Jobs Monitor 2019: Shifts in the employment structure at regional level

Joint report by the European Commission's Joint Research Centre and Eurofound

European Jobs Monitor 2019: Shifts in the employment structure at regional level

When citing this report, please use the following wording:
Eurofound and European Commission Joint Research Centre (2019), *European Jobs Monitor 2019: Shifts in the employment structure at regional level*, European Jobs Monitor series, Publications Office of the European Union, Luxembourg.

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Eurofound project: European Jobs Monitor (170501)

Luxembourg: Publications Office of the European Union

Print:	ISBN 978-92-897-2017-5	ISSN 2363-0825	doi:10.2806/451383	TJ-AN-19-101-EN-C
PDF:	ISBN 978-92-897-2016-8	ISSN 2363-0833	doi:10.2806/997207	TJ-AN-19-101-EN-N

This report and any associated materials are available online at http://eurofound.link/ef19036

It is part of Eurofound's European Jobs Monitor series. See the full series at http://eurofound.link/efs005

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Country codes

EU28

AT	Austria	**FI**	Finland	**NL**	Netherlands
BE	Belgium	**FR**	France	**PL**	Poland
BG	Bulgaria	**HR**	Croatia	**PT**	Portugal
CY	Cyprus	**HU**	Hungary	**RO**	Romania
CZ	Czechia	**IE**	Ireland	**SE**	Sweden
DE	Germany	**IT**	Italy	**SI**	Slovenia
DK	Denmark	**LT**	Lithuania	**SK**	Slovakia
EE	Estonia	**LU**	Luxembourg	**UK**	United Kingdom
EL	Greece	**LV**	Latvia		
ES	Spain	**MT**	Malta		

Executive summary

Introduction

There is mounting evidence that economic differences between regions within the same EU Member States are growing. Some regions, generally capital city regions and larger metropolitan centres, are faring much better than other regions. These divergences, if unchecked, could undermine social and territorial cohesion. Growing interregional inequality is one factor that is leading to disenchantment with existing political systems, which in turn is weakening the social bonds that ground our democratic systems.

This report analyses shifts in the employment structures of the EU regions. Identifying these shifts in occupational and sectoral employment, and how these vary across regions, can help policymakers to understand how structural change contributes to unbalanced regional growth patterns.

The analysis compares patterns of employment growth and decline in four types of region: capital city, other largely urban, intermediate and largely rural. It covers 130 regions over the period 2002–2017 in 9 of the larger Member States: Belgium, Czechia, France, Germany, Italy, Poland, Spain, Sweden and the United Kingdom. These regions account for nearly four out of five EU workers.

Policy context

Regions have an important place in EU policymaking, notably in cohesion policy. They are the basic territorial units for the application of policies that account for nearly one-third of the overall EU budget. To date, the EU has been successful in its objective of reducing economic disparities between Member States. A combination of catch-up growth and regional policy has contributed to faster growth of GDP per head in central and eastern European Member States over the last 15 years, just as it enabled earlier accession countries such as Ireland, Portugal and Spain to converge economically with the founding Member States of the European Community.

However, in recent years, it has become apparent that the gap in the economic fortunes between regions within many Member States has been growing. Electoral patterns suggest that this is one of the factors fuelling the disenchantment of EU citizens with established political parties and the rapid emergence of populist alternatives adept at drawing electoral advantage from such disenchantment.

Key findings

Population and employment growth have been much stronger in the capital city regions of all nine Member States than in the other types of regions of the same country. In 2002–2017, employment grew by 19% in capital city regions compared to 10–12% elsewhere. This was reflected in a growing share of national economic output. The metropolitan areas of London, Paris and Stockholm accounted for at least 30% of the GDP of their respective countries.

Capital city regions are distinctive in that they have a very high share of employment in the service sector. These regions deindustrialised earlier and faster than other regions, with their early specialisation in services proving fortuitous in the context of the modern shift towards a service-based economy. Nearly 75% of national employment and economic output are now in services, but this share rises to 85% and above in many capital city regions.

In the nine Member States, employment shifts as a whole have been upgrading (more net new employment in well-paid jobs), accompanied by mild polarisation (somewhat greater employment growth in low-paid jobs than in mid-paid jobs). Nonetheless, capital city regions appear to be a significant vector of employment polarisation. They have disproportionately high shares of well-paid, high-skilled employment in knowledge-intensive services, but the shares of low-paid employment have also grown in most of the capital city regions over the period analysed.

Despite growing economic cleavages between capital city regions and other regions, there is evidence that employment structures at regional level are converging towards the average European employment structure. For example, the rapid contraction of the agricultural sector in Poland over recent decades and the corresponding growth of employment in manufacturing and especially services has been an important driver of upward convergence in that Member State. At the same time, regions within the same country are becoming more disparate in their employment structures, whereas differences between Member States are either decreasing or staying the same.

The countries and regions where employment in manufacturing has proven to be the most resilient (Czechia, Poland and some German regions) are those in which mid-paid employment has held up best.

Policy pointers

While the EU has been successful in reducing economic disparities between Member States, social inequality has continued to increase, and more recently, rising inequality between regions within countries has emerged as a public and policy concern.

Public investment, for example in the form of public services employment, plays an important role in supporting more regionally balanced growth, as jobs in education, health and public administration tend to have above-average pay levels and are more evenly spread geographically.

Regional mobility has been regarded as one antidote to unbalanced regional growth, with individuals encouraged to transfer from declining regions to higher-growth regions. However, this risks leaving unfavoured regions even further behind. The need for integration is just as great for regions as for individuals and is even more acute for those regions beset by industrial decline or depopulation.

Given the increasingly digital – and in many cases, location-independent – nature of much work, universal high-quality broadband availability is one obvious example of a policy that may contribute to the dispersal of labour activity. However, good-quality employment – often work that could, in principle, be carried out remotely or virtually – has, in practice, tended to cluster more and not less in large, urban, and often capital city, regions. Connectivity, while helpful, may only be one small part of the answer to the problem of regionally unbalanced growth.

EU regional policy should continue to assist unfavoured regions not to fall further behind regional powerhouses. Infrastructural investments provide the connective tissue strengthening linkages between different regions and region types. Human capital investments (for example, through the European Social Fund and European Globalisation Adjustment Fund) help individuals and companies in such regions to adapt to changing workplace needs. Such policies can mitigate the risks of the overconcentration of economic activity in some areas and territorial disconnection in others.

Introduction

To date, the European Jobs Monitor (EJM) analysis of shifts in employment structures has been carried out at national level and aggregate EU level. In this report, the analysis is extended to cover developments at regional level in nine of the more populous Member States: Belgium, Czechia, France, Germany, Italy, Poland, Spain, Sweden and the United Kingdom. These countries account for nearly four out of five EU workers.

Why do a regional analysis?

There are various motives for wanting to carry out a regional-level analysis. Firstly, regions have an important place in EU policymaking, notably in cohesion policy. They are the basic territorial units for the application of policies that account for nearly a third of the overall EU budget – policies that have been successful in raising living standards in many less developed regions (Rodríguez-Pose and Garcilazo, 2013). Identifying what dimensions of the employment structure help less developed regions to converge towards average output levels can inform cohesion policy.

Secondly, much differentiation in economies, labour markets and employment structures is visible only with a region-based analysis. On average, the most productive region in a developed economy is twice as productive as its least productive (OECD, 2018), which is reflected in large differences in labour market opportunities and, in turn, in employment and population growth. National averages conceal these large differences. They also fail to convey an important message from recent studies of regional inequality in the EU: that the trend towards upward convergence observed at national level across the EU conceals a growing divergence within countries. In other words, some regions are faring much better than other regions in the same Member State.

Thirdly, interregional differences in terms of prosperity and economic dynamism have social and political ramifications, in some cases potentially undermining the social bonds that ground our democracies. In particular, the interests of large, metropolitan capital city areas and the regions outside them appear to be diverging in terms of electoral outcomes, reflecting cleavages in economic dynamism. The strong regional differentiation of the vote in the UK referendum on EU membership is one example (over 60% of London- and Scotland-based citizens voted to remain in the EU, while the overall vote in favour of leaving was 52%). Urban–rural divides in voting patterns have also been observed in national elections in Hungary and Poland, where incumbent conservative nationalist governments were returned to power based on large, regional, non-metropolitan majorities. More recently, the 'gilets jaunes' protests in France can also be interpreted as an expression of the contrast between perceived metropolitan comfort and provincial discontent. In summary, the growing economic importance of larger cities has been accompanied by the growing electoral importance of regions that are being 'left behind' in what Rodríguez-Pose (2018) has called the 'revenge of the places that don't matter'.

Rise of the capital city

These tensions appear to have roots that are highly territorial as well as social. It would be surprising if they were not driven in part by, or at least reflected in, shifts in the employment structure, crucial as this is to income generation and distribution.

The broadest structural shift in employment has been the successive transitions from an agrarian to a manufacturing to a services paradigm of productive activity. The latest phase, which began in the 1970s, coincided with a renewed concentration of resources – human and financial capital – in big cities. In the post-war period, manufacturing tended to disperse production away from capital city regions to mixed urban–rural, intermediate regions. In retrospect, this may have contributed to more balanced regional growth, as the benefits of territorially dispersed production compensated for the secular decline in agriculture in less densely populated areas. Capital city regions deindustrialised fastest and were the first to undergo the 'services transition'. This early specialisation in services proved fortuitous, with nearly three-quarters of employment and output now generated by the service sector. The corollary has been the decline in fortunes in many regions with a strong manufacturing specialisation, and weak population growth or depopulation in many rural, agricultural regions.

What particularities of the growing service sector may be contributing to these spatial divergences? Many service activities rely on face-to-face or in-person provision (notably public services such as health and education but also private services such as accommodation, restaurants and much retail). This, in principle, should be an equalising vector, as services employment needs to be as broadly dispersed as the overall population to meet demand.

However, there are also many professional (mainly private service) activities that benefit considerably from agglomeration effects and therefore tend to cluster in more densely settled urban areas. Most services of this kind are skilled and require higher-level qualifications. These jobs have been referred to as 'symbolic-analytic' (Reich, 1991) and involve the manipulation of information and specialised knowledge. They include most higher-skilled jobs in media and communications, information technology, law, accountancy, and so on.

Earlier predictions that ICT developments would render place of work irrelevant for these types of work have turned out to be wide of the mark. Even though an increasing share of work is performed in front of a computer screen with a network connection (and could, in principle, be carried out anywhere), the importance of proximity to a city when it comes to accessing good-quality employment opportunities has grown, not declined.

This may partially relate to the effects of competition, as well as what Michael Porter (2000) has called the 'location paradox': the more things are mobile, the more decisive location becomes. Outsourcing or offshoring tend to underline that

> *anything that can be efficiently sourced from a distance has essentially been nullified as a competitive advantage in advanced economies [...] the most enduring competitive advantages in a global economy seem to be local.*
>
> (Porter, 2000, p. 32)

As generic inputs to production become more abundant and readily accessible, 'prosperity depends on the productivity with which factors are used and upgraded in a particular location' (Porter, 2000, p. 19). Such improvements particularly benefit from the density of linkages with buyers, suppliers and other institutions – and this is where cities have a clear advantage.
For these reasons, rather than dispersing power and resources, globalisation has tended to reinforce the economic salience of some existing 'global cities' – London, New York, Shanghai and Tokyo – and given privileged places to other regional or national capitals as transaction nodes in the global economy. Knowledge-based service activities tend to cluster in these types of cities.

Commonly cited examples of this are the City of London for financial services, Silicon Valley for information technology and Hollywood for film production. In these knowledge-based sectors, having highly qualified professionals located in close proximity and exchanging ideas augments productivity and innovation. Demand arising from the higher wages of such workers also sustains many lower-paid service jobs.

Moretti (2012) refers to 'thick labour markets', where job opportunities are generated by a variety and volume of firms and employers and a matching variety and volume of qualified workers in close proximity. The advantages of cities in terms of thick labour markets, as well as the cultural amenities they offer as centres of learning and entertainment, have tended to outweigh any disadvantages in terms of cost of living, cost of labour or congestion. And these advantages tend to be self-compounding: the things that attract firms and people to big cities in the first place are boosted, in turn, by further agglomeration (Glaeser, 2008).

Additionally, service outputs may often be the inputs for other service sectors, such as legal services, employment agencies, translation and accounting. Economies of scope have self-reinforcing effects as skilled, specialised individuals tend to gravitate to these same regions or areas, where the opportunities are located. These compounding advantages tend to sharpen regional imbalances. The highest recent increases in relative prosperity in the EU (measured by GDP per head) were all in capital city regions: Bratislava, Bucharest, Dublin, London and Warsaw-Mazowieckie (Eurostat, 2018).

EJM contribution to the evidence

The EJM applies a methodology that is well suited to assess the impact of shifts in the regional employment structure. Using the 'job' – defined as a given occupation within a given sector – as a unit of analysis, it captures both the sectoral and occupational dimensions of change, the former dominated by the shift to services and the latter by a pattern of upgrading. Additionally, the use of the job–wage as a yardstick to assess employment and employment change provides a ready means of measuring the extent to which relatively good-quality – and bad-quality – jobs tend to be concentrated in specific regions.

Two main patterns of employment change have prevailed in Member States in recent decades: upgrading, where new employment is skewed towards higher-paid jobs; and polarisation, where employment grows relatively more in higher-paid and lower-paid jobs compared to mid-paid jobs.

In previous EJM studies at aggregate EU level, the dominant pattern identified has been one of employment upgrading with some measure of polarisation, which tended to be sharper during periods of recession. In this EJM report, the greater variation offered by a regional approach is used to see if the specificities of regional employment structures (for example, shares of knowledge-intensive private services, shares of public services employment, and macroeconomic indicators such as GDP per head and

employment growth) are also useful predictors of the employment-shift patterns observed. They can also indicate the extent to which these shifts are leading to the convergence of employment structures across regions or further specialisation. In order to make the analysis manageable, this study focuses on developments in nine Member States, including the five largest and most populous ones.

Report structure

The report is structured as follows.

Chapter 1 provides contextual detail that informs the job-based analysis in the remainder of the report. It includes a summary of the main findings from recent analyses of regional economic convergence in the EU, as well as descriptive accounts of regional settlement and sectoral specialisation of different regions.

Chapter 2 begins with a methodological note on the jobs-based approach used in this report and then develops a basic classification of regions and presents some initial top-line findings by region type. It also sketches some of the likely sectoral and occupational drivers behind the changes observed. The shift from a national focus – as applied in earlier EJM analyses and in Annex 2 of this report – to a regional focus requires some adaptation of the jobs-based approach in order to synthesise results in a more digestible format.

Chapter 3 contains the main descriptive analysis. It presents a convergence-based analysis using job–wage terciles to compare the regional employment structures in 2002 and 2017 to the weighted average employment structure in the nine chosen Member States.

The time period of the analysis is determined mainly by data availability for the selected countries, although it can be seen as representing one extended business cycle. Of course, an important caveat is that the period was unique in the severity and extensiveness of the recession that occurred mid-path (2008–2010), making even more challenging the task of disentangling the structural and cyclical components of shifts in employment composition.

Chapter 4 closes the report with concluding remarks and policy pointers.

In order not to distract from the regional focus of the main body of this report, the standard EJM presentation of recent labour market trends at national and EU levels (for 2011–2018) using the jobs-based approach is provided in Annex 2. Additional material in the annexes includes:

- a summary of tabular data from the 130 regions covered in the regional analysis
- an examination of the impact of worker mobility and migration on regional employment structures
- a literature review summarising existing relevant analyses using the jobs-based approach
- a summary of the findings of an econometric analysis on the determinants of regional employment shifts
- an application of the Krugman Dissimilarity Index to the regions covered

The main target audience for this report comprises policymakers, as well as researchers and analysts at regional and national levels in the EU with an interest in labour market developments at a subnational level.

1 Context

Trends in regional disparities

From its origins, the European Union has aimed at 'reducing disparities between the levels of development of the various regions and the backwardness of the least favoured regions' (Treaty of Rome, 1957). Yet, although the idea of an EU regional policy can be traced back to the Treaty of Rome, a more genuine 'European' cohesion policy was given impetus by the Single European Act of 1986, which introduced for the first time a specific title covering the concept of economic and social cohesion. Under this title, Article 130c referred to the necessity to 'redress the principal regional imbalances in the Community through participating in the development and structural adjustment of regions whose development is lagging behind'. This constituted the legal basis for the creation of the European Structural Investment Funds, as well as the backbone for EU cohesion policy more generally. The same aim is now enshrined in Article 174 of the Treaty on the Functioning of the European Union (the Lisbon Treaty).

Over the last decades, the EU Member States have converged upward in socioeconomic outcomes. EU membership has led to an improvement in the average standard of living across all Member States and, though at a different pace, the poorer economies (mostly in central and eastern Europe) have caught up with the richer ones (Eurofound, 2017a).[1] However, while income convergence is taking place within the EU as a whole, contrasting trends emerge among regions within countries, in particular those that recently joined the EU (Monfort, 2008; Cuadrado-Roura et al, 2016).

While the central and eastern European countries and regions continued to converge to the EU average in terms of GDP per capita from 2000 until 2015, their regions have performed unevenly (Alcidi et al, 2018). In particular, great disparity has emerged between capital city regions and other regions, with the former adding further to their already advantageous situation through higher income growth rates and the latter recording further deterioration in their relative position. This is the case for Bulgaria, Czechia, Hungary, Poland and Romania, with Sofia, Prague, Budapest, Warsaw and Bucharest performing above national averages. For all these countries, internal disparities were already increasing steadily since the mid-1990s, with the exception of Romania, where local differences increased much more dramatically and more than doubled between 1995 and 2000 (Monfort, 2008).

These contrasting trends at national and regional levels are illustrated in Figure 1, which shows the overall

Figure 1: Theil Index decomposition of variation between and within Member States in GDP per capita in NUTS 2 regions, 2003–2015

Notes: *The Theil Index is a statistical measure often used to measure inequality that allows such measures to be separated into 'within' and 'between' components of inequality. Population-weighted estimates. GDP per capita measured in purchasing power standard (PPS). Data not available for Ireland in 2015.*
Source: *Authors' calculations, based on Eurostat regional accounts*

1 The catch-up process in which poorer countries grow faster than richer ones is defined as beta-convergence. Beta-convergence exists if the relationship between the growth rate of an indicator (for example, GDP per capita) and its initial level is statistically significant and negative. Another way of identifying convergence relies on measures of dispersion (such as the standard deviation or the coefficient of variation) or measures of inequality (like the Theil Index) and refers to a reduction of disparities between countries, or regions, over time (this is the concept of sigma-convergence).

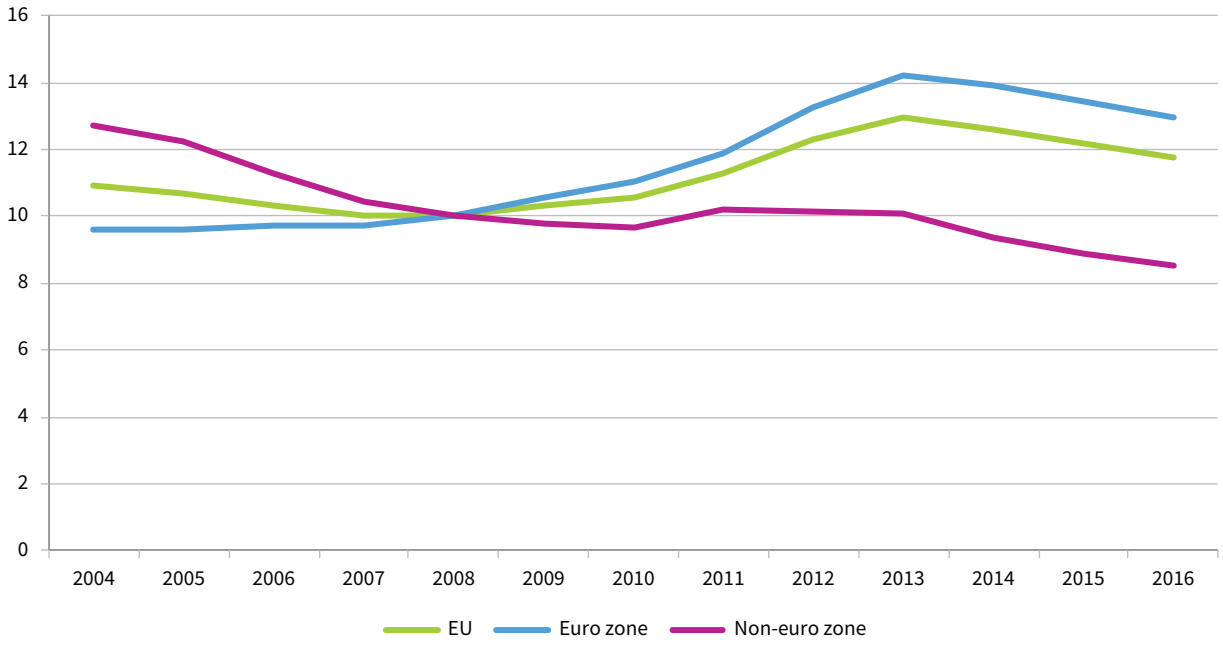
inequality in GDP per capita in the NUTS 2 regions of Europe (green line), and this broken down into variation between and within Member States (the blue and magenta lines, respectively). It shows that up to 2008, EU-wide interregional convergence took place, despite slowing down in the second half of the period. (This pattern was mostly driven by the regions of the pre-2004 Member States, especially the Mediterranean regions.) However, the aggregate decline in regional inequality in GDP per capita was essentially driven by convergence between Member States, while a pattern of increasing inequality is evident between regions within countries, especially in the post-2009 period.

While the economic crisis of 2008–2010 slowed convergence in terms of GDP per head, in the case of the employment rate, 2007 marked a clear inversion in the trend, as depicted in Figure 2. Regional differences in both employment and unemployment rates had narrowed between 2000 and 2007 but widened significantly from 2008 onwards (European Commission, 2013, 2014). More specifically, as Figure 2 shows, the post-2008 increase in regional divergence was driven essentially by dynamics in the euro zone, while regions outside this zone continued to converge more or less consistently towards more similar employment rates. Furthermore, although in 2013 regional disparities in employment rates started to narrow again, three years later they were still higher than pre-crisis levels (notably in the euro zone).

Explaining regional disparities

From a theoretical perspective, various hypotheses have been proposed to explain why some regions attract a disproportionate share of economic activity, which can lead to substantial disparities in economic and labour market performance compared to other regions. Much of the literature has examined the most intuitive explanation: the presence of location-specific productive attributes such as climate or access to ports (natural advantages) (Krugman, 1993; Ellison and Glaeser, 1997). A large body of the literature has also focused on the economic benefit from spatial proximity creating flows of productive knowledge (or knowledge spillovers). Theoretical perspectives offered by Romer (1986), Aghion and Howitt (1998) and Duranton and Puga (2004), for instance, explain the process of regional economic agglomeration through localised accumulation of knowledge, as workers interact with each other, leading to better sharing of ideas, faster innovation or faster adoption of technology. Another strand of the literature, based on trade theories and known as the 'new economic geography', emphasises instead the interaction between trade costs and firm-level scale economies as a source of agglomeration: consumers and producers locate in the same region to exploit plant-level scale economies while minimising trade costs (Krugman, 1991; Head and Mayer, 2004).

Figure 2: Convergence patterns in employment rates among NUTS 2 regions of the EU, euro zone and non-euro zone, 2004–2016



Notes: *Convergence is measured by the coefficient of variation. The main difference between the Theil Index and the coefficient of variation is that the Theil Index uses population-weighted data, while the coefficient of variation is based on unweighted means across all regions.*
Source: *Authors' calculations, based on Eurostat data*

Another plausible hypothesis is based around the idea that benefits arising from skills in a specific location are related to the number of skilled workers there; therefore the processes of economic agglomeration favour already high-skilled regional economies (human capital externalities). Empirically, the high concentration of skilled workers can result in positive social returns in terms of increased productivity at regional level, which reinforces regional imbalances (Moretti, 2004). The presence of high-skilled workers also has spillover effects on non-tradeable low-skilled services that require physical proximity, making the employment opportunities of low-skilled workers increasingly dependent on their proximity to highly skilled workers (consumption spillovers) (Mazzolari and Ragusa, 2013).

According to Sassen (2001), this leads to increasing disparities between global cities, with growing economies driven mainly by the service sector, and less urbanised regions. Recent literature from the United States reveals regional trends of increasing spatial concentration of economic activities, with prosperity unevenly distributed across American metropolitan areas – what Moretti (2012) calls 'the new geography of jobs'. The economic decline of regions in the Rust Belt, the once prosperous industrial heartlands, has been accompanied by the rise of cities such as Seattle, San Francisco and New York, where highly educated workers are concentrating faster and where the knowledge economy is flourishing.

Increasing importance of capital cities

The growing importance of capital city regions in the EU is an analogue of developments in the United States. These regions typically benefit from several economic advantages (in terms, for instance, of income, wealth, productivity, entrepreneurship, innovation and investment), and these advantages appear to have increased in recent decades. According to a recent study, the median share of capital city regions' contribution to the GDP of their respective countries increased by almost 12% (2.8 percentage points) between 2000 and 2016, most notably in central and eastern European countries (OECD, 2018).

The ascendancy of large urban areas (especially capitals) has led some researchers to state that 'cities and urban agglomerations have come to replace large firms and the nation state as the central social and economic organising units of our time' (Florida and Mellander, 2018). And within this group, an even more select subset of 'global cities' has asserted a privileged position as nodes in the global economy. London is one such node, given its pre-eminent position in global finance, while Paris is also often considered to be in the top tier (Globalization and World Cities Research Network, 2018).

This growing importance of capital city regions is likely to contribute to higher levels of income inequality, as city size and inequality are correlated. Research in the United States has pointed out that city size 'accounted for roughly 25–35% of the total increase in economic inequality over and above the effects of skills, human capital, industry composition and other factors' (Florida and Mellander, 2018). Lee et al (2015) demonstrate a strong association in the United Kingdom between regional prosperity and regional inequality, with the geographical 'sorting' of high-skilled workers a key determinant of this association.

Slowdown of urbanisation

According to a recent study by the OECD, metropolitan areas (defined as cities with more than 500,000 inhabitants) have increased their population by 0.75% per year since 2000 and now account for about 60% of national GDP. They are also distinctive in having higher proportions of migrants and higher rates of innovation and business creation (OECD, 2018).

Nonetheless, according to De Beer et al (2014), the rate of urbanisation – the average rate of growth of the size of the urban population – in Europe was highest in the 1950s and 1960s and subsequently decreased. It is currently at just less than half of the peak growth rates seen half a century ago. This is in part due to mature demographics in Europe (lower birth rates) but also to declining rates of transfer from rural to city areas. Dijkstra et al (2013) find that the large European cities may not be concentrating growing proportions of economic activity and populations to the same extent after the turn of the millennium as they did in the 1990s.

When compared to other areas of the world, Europe is characterised by a distinctive polycentric urban settlement, with many mid-sized cities (0.5 million to 2 million inhabitants) and relatively few megacities (more than 10 million inhabitants) (Dijkstra et al, 2013). This can be explained by various factors: the relative maturity of urban settlement and existing high levels of urbanisation in Europe; modern communication technologies facilitating dispersion; and steady but low levels of economic growth and population growth.

Whatever the reasons, this distinctive European urbanisation pattern may be seen from contrasting perspectives. From a negative standpoint, there may be obstacles preventing Europe from achieving optimal city scale, such as planning restrictions or green belts. From a positive perspective, Europe offers an alternative pathway to growth, based on a more distributed urban settlement. This results from a high share of public spending, which tends to distribute economic resources spatially by directing public funding to areas, regions and sectors undergoing major restructuring or transformation (such as agricultural or

post-industrial areas) rather than exposing them to the full rigours of global markets. This mode of development manages to avoid some of the negative consequences of the emergence of megacities, such as congestion, unbalanced regional growth or high costs of living.

With regard to the nine Member States covered in this report, urban settlement patterns vary quite broadly.[2] Germany, Italy, Poland and Spain could be considered countries with polycentric urban settlement, as their capital city regions do not account for a disproportionate share of the national economy, and the weight of several other regions is also relatively important (for example, Lombardia in Italy, Cataluña and País Vasco in Spain, and various regions in western Germany). However, France and Sweden (as well as Czechia, Poland and the United Kingdom to a lesser extent) may be seen as more monocentric, because around 30% of total national economic activity is concentrated in their capital city regions (above 20% in the case of Czechia, Poland and the United Kingdom).

Patterns of regional sectoral concentration

This section describes patterns of regional employment concentration by sector in the nine selected countries, from 2002 to 2017, based on sectoral data available at the NACE two-digit level.[3] The data were extracted from the European Union Labour Force Survey (EU-LFS), provided by Eurostat.

In order to partially overcome the problem of a break in the sectoral classification in 2008 (from NACE Rev. 1 to NACE Rev. 2), a matching method proposed by Perani and Cirillo (2015) has been adopted in this chapter. This approach creates a new classification consisting of the following 16 sectoral categories: agriculture; mining; manufacturing; utilities; construction; retail; accommodation and food; transport, information and communication; financial services; professional private services (comprising professional services, administrative services, business and real estate); public administration; education; health; arts and entertainment and other services; households as employers; and extraterritorial bodies. The classification is consistent over time, allowing us to describe changes in sectoral composition at the regional level in the initial and final year. The only structural break that can be seen clearly is from 2007 to 2008, when the NACE Rev. 2 was introduced, for the transport, information and communication sector (quite heterogeneous on its own).

General trends

Significant differences in the distribution of employment by sector (and its change over time) are already apparent at country level, as illustrated in Table 1. Throughout the entire period analysed, Poland is the country with the highest employment share by far in agriculture, although this has declined by 9.4 percentage points (from 19.6% in 2002 to 10.2% in 2017). This trend is also observed in all the other countries, albeit to a lesser extent (the second highest decline of -2.1 percentage points was registered in Czechia).

With regard to manufacturing, employment shares have dropped in all countries (ranging from -6.5 percentage points in Sweden to -4.5 percentage points in Germany and Italy), with the only exceptions being Czechia and Poland. Indeed, in Poland, manufacturing employment increased slightly from 18.9% to 20.9%, surpassing shares in Germany (19.0%) and Italy (18.2%), while in Czechia, it remained stable at 27.9% (the highest proportion among all countries, both in the initial and final years).

Looking at the employment distribution in the manufacturing sector in more detail, the four subsectors with the highest employment shares across all countries in 2017 were manufacturing of food products (especially in Belgium, France and Spain), fabricated metal products (highest shares in Czechia, Italy and Sweden), motor vehicles and trailers (notably in Czechia and Germany), and machinery and equipment (especially in Germany). The high level of specialisation in the manufacturing sector in Czechia is therefore driven by manufacturing of motor vehicles and trailers and fabricated metal products, which together make up almost one-third of total manufacturing employment. In contrast to Czechia, in Germany, the machinery and equipment manufacturing subsector (alongside motor vehicles and trailers) employs most of the workforce in the sector. The comparatively low employment share of manufacturing of motor vehicles and trailers in Italy (only 4.8%) is noteworthy.

2 The nine countries covered in this report (Belgium, Czechia, Germany, France, Italy, Poland, Spain, Sweden and the United Kingdom) have been selected on the basis of population size in the first instance – larger populations and more regions – but also based on availability of microdata from the EU Labour Force Survey for all regionally relevant variables for the period 2002–2017.

3 NACE is a French acronym (*nomenclature statistique des activités économiques dans la Communauté européenne*) for the industry standard classification used in Europe.

Table 1: Employment share (2017) and change (2002–2017) by sector, nine Member States

	Belgium		Czechia		France		Germany		Italy		Poland		Spain		Sweden		United Kingdom	
	Emp. share (%)	Emp. change (ppt)	Emp. share (%)	Emp. change (ppt)	Emp. share (%)	Emp. change (ppt)	Emp. share (%)	Emp. change (ppt)	Emp. share (%)	Emp. change (ppt)	Emp. share (%)	Emp. change (ppt)	Emp. share (%)	Emp. change (ppt)	Emp. share (%)	Emp. change (ppt)	Emp. share (%)	Emp. change (ppt)
Agriculture	1.2	-0.6	2.8	-2.1	2.6	-1.5	1.3	-1.2	3.8	-1.2	10.2	-9.4	4.4	-0.7	1.8	-0.7	1.2	-0.2
Mining	0.1	-0.1	0.6	-0.7	0.1	-0.1	0.2	-0.2	0.1	-0.2	1.3	-0.7	0.2	-0.2	0.2	0.0	0.4	0.0
Manufacturing	12.4	-5.9	27.9	-0.2	12.6	-5.3	19.0	-4.5	18.2	-4.5	20.9	2.1	12.7	-5.5	10.2	-6.5	9.2	-6.3
Utilities	1.4	0.6	2.1	0.2	1.5	0.6	1.4	0.6	1.5	0.8	2.0	0.2	1.2	0.6	1.0	0.4	1.3	0.6
Construction	6.9	0.3	7.5	-1.4	6.5	0.0	6.8	-0.8	6.2	-1.7	7.5	1.6	6.0	-5.9	6.9	1.3	7.4	0.1
Retail	13.0	-1.3	11.5	-1.6	13.0	-0.1	14.0	0.0	14.3	-1.4	14.2	0.0	15.9	0.7	11.5	-0.8	13.2	-1.8
Accommodation and food	3.2	0.0	3.3	-0.3	3.9	0.6	3.8	0.4	6.3	2.1	2.4	0.5	8.7	1.9	3.5	0.9	5.5	0.9
Transport/Info & comm	8.9	1.2	9.2	1.3	8.5	1.7	8.0	2.5	7.3	1.9	8.5	2.4	8.1	2.0	9.4	2.7	9.0	2.0
Financial services	3.4	-0.4	2.2	0.1	3.3	0.3	3.1	-0.6	2.8	-0.3	2.4	0.0	2.4	0.0	1.9	-0.2	3.8	-0.8
Professional private services	11.7	3.0	8.4	2.9	11.5	1.5	11.3	2.7	11.2	3.4	7.3	2.6	10.9	2.8	15.0	1.5	13.4	2.0
Public administration	8.6	-1.1	6.5	0.2	9.0	-0.2	6.9	-1.1	5.5	-3.2	6.7	0.7	6.9	0.8	6.8	1.2	6.2	-0.5
Education	9.6	1.6	6.6	0.1	7.2	-0.4	6.6	1.1	7.0	-0.3	7.5	1.0	6.7	0.9	11.5	3.4	10.3	2.0
Health	14.9	2.5	7.2	1.0	14.9	4.3	12.9	2.6	8.1	2.0	6.0	-0.6	8.3	2.9	15.2	-3.2	13.2	2.0
Arts/Other services	3.7	-0.5	3.5	-0.2	4.3	-0.1	4.2	-1.4	4.5	0.0	2.9	-0.3	4.5	0.5	5.2	-0.1	5.6	0.3
Households as employers	0.1	-0.2	0.7	0.7	1.1	-1.3	0.5	0.2	3.3	2.5	0.2	0.1	3.4	0.3	0.0	0.0	0.2	-0.2
Extraterritorial bodies	1.1	0.9	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1

Notes: *Emp. = employment; ppt = percentage points.*
Source: *EU-LFS (authors' calculations)*

Employment in the construction sector is much less diverse across countries, with Czechia and Spain having somewhat higher initial values but declining over time, especially the latter (falling 5.9 percentage points, from 11.9% in 2002 to 6% in 2017). The construction sector in Spain experienced a big expansion in the pre-crisis period followed by a strong reversal when the economy entered recession.

Private sector services account for the highest employment share in every country (ranging from around 38% in Czechia and Poland to above 50% in Spain and the United Kingdom). This share has been increasing in every country, particularly in Italy and Spain, but also in the two central and eastern European countries, despite still ranking low. A detailed look at the sectoral distribution of employment shows that most of the job expansion is driven by the professional private services category, comprising professional services, administrative services, business and real estate (from +3.4 percentage points in Italy to +1.5 percentage points in France and Sweden, Table 1). A general increase across all countries was also recorded in the transport, information and communication sector, and notably within that sector in computer programming, consultancy and related activities, which increased in all countries over the period 2008–2017.

Aggregate public services employment[4] also increased, although mainly in the health sector and, to a lesser extent, the education sector. The expansion of healthcare employment was particularly evident in France (from 10.6% to 14.9%), but also in Belgium, Germany, Italy, Spain and the United Kingdom (with increases ranging from 2 to 2.9 percentage points). The notable exception is Sweden, where the employment share in the health sector declined from 18.4% to 15.2%; it remains, however, the country with the highest figure for health employment in 2017. The employment share in public administration decreased for some countries, notably Italy (dropping 3.2 percentage points, from 8.6% to 5.5%) but also Belgium and Germany (-1.1 percentage points). Overall, Czechia and Poland are among the countries that recorded the least variation over time in employment shares in public administration, education and, especially, health.

Comparing employment across sectors

Differences in the distribution of employment across sectors in the selected countries and their dynamics over time are displayed in a more synthetic way in Figure 3 using box plots. The same analysis of the distribution of employment is also performed at regional level, allowing a comparison of results.

In general, what clearly emerges is that differences in the sectoral distribution of employment are considerably more pronounced at regional level than at national level, both at the beginning and at the end of the period considered. This is the case for each sector and in particular for agriculture, where several outliers can be identified at regional level. However, it is worth noting that there has been a decline in extreme values over time, pointing to convergence in regional employment shares.

Manufacturing employment also shows a considerably higher variability at regional level, with maximum and minimum values from around 0% to above 30% of total employment. Indeed, manufacturing tends to be more concentrated territorially because of historical paths of development, specific local endowments of natural resources, access to specialised human capital and benefits from agglomeration effects. For private services, the distribution of regional employment is particularly dispersed in the professional private services sector, as well as for the accommodation and food sector, with many high-value outliers.

Regarding public sector employment, the greatest interquartile range at regional level is recorded for the health sector. This is somewhat surprising considering the nature of the service, which is provided in situ and face to face. However, in countries like Italy, the health system is managed at regional level (even financially). Moreover, these differences could be driven by the age distribution across regions.

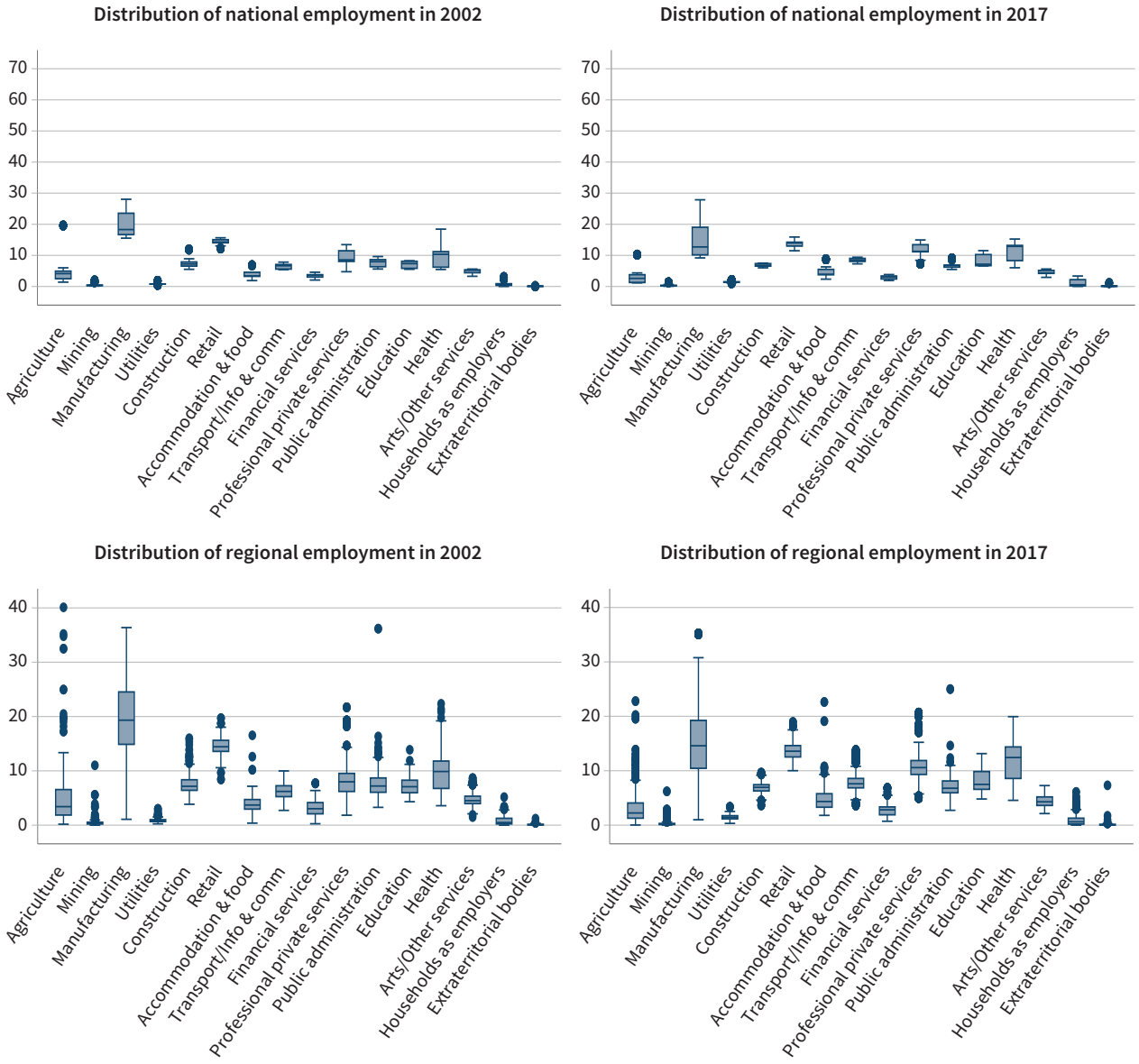
Key broad sectoral shifts

The results presented above point to substantial heterogeneity in industrial structure across European regions. The next step is to further investigate these differences and identify which regions within the selected countries specialise in certain sectors, and how the economic structure has changed over time.[5] In order to do so, this section analyses data specifically for four sectors: agriculture, manufacturing, professional

4 Public services employment is proxied by employment in three predominantly state-funded, one-digit NACE sectors: public administration, defence and compulsory social security; education; and health and social work.

5 For the purpose of the analysis at regional level, two small regions with very low employment levels (less than 50,000) were dropped. These are Ceuta/Melilla in Spain and Valle d'Aosta in Italy.

Figure 3: Box plots of employment shares (%) by sector at national and regional levels, nine Member States, 2002 and 2017



Source: *EU-LFS (authors' calculations)*

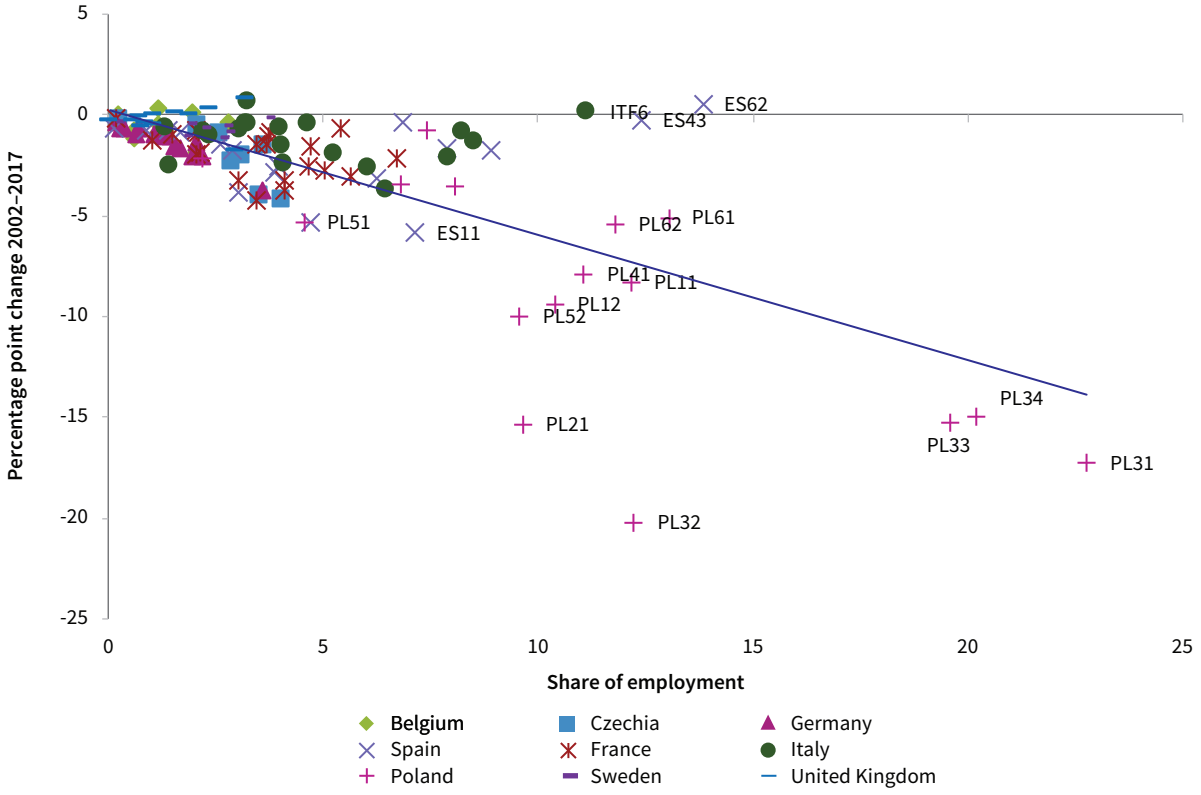
private services and health. For these sectors, interesting developments were already found at national level, so they warrant a more detailed analysis.

Agriculture

Regarding agriculture, as previously mentioned, the most noticeable changes occurred in Polish regions – which were those with the highest employment share at the beginning of the period considered. The dramatic change (see Figure 4) is particularly notable for regions like Podkarpackie, Lubelskie, Małopolskie, Świętokrzyskie and Podlaskie, which all recorded a decrease in employment share close to or higher than 15 percentage points. All of these regions occupy the southeast area of the country, bordering Belarus or Ukraine (in the east) or Slovakia (in the south). Overall, a clear process of convergence towards the European average is taking place.

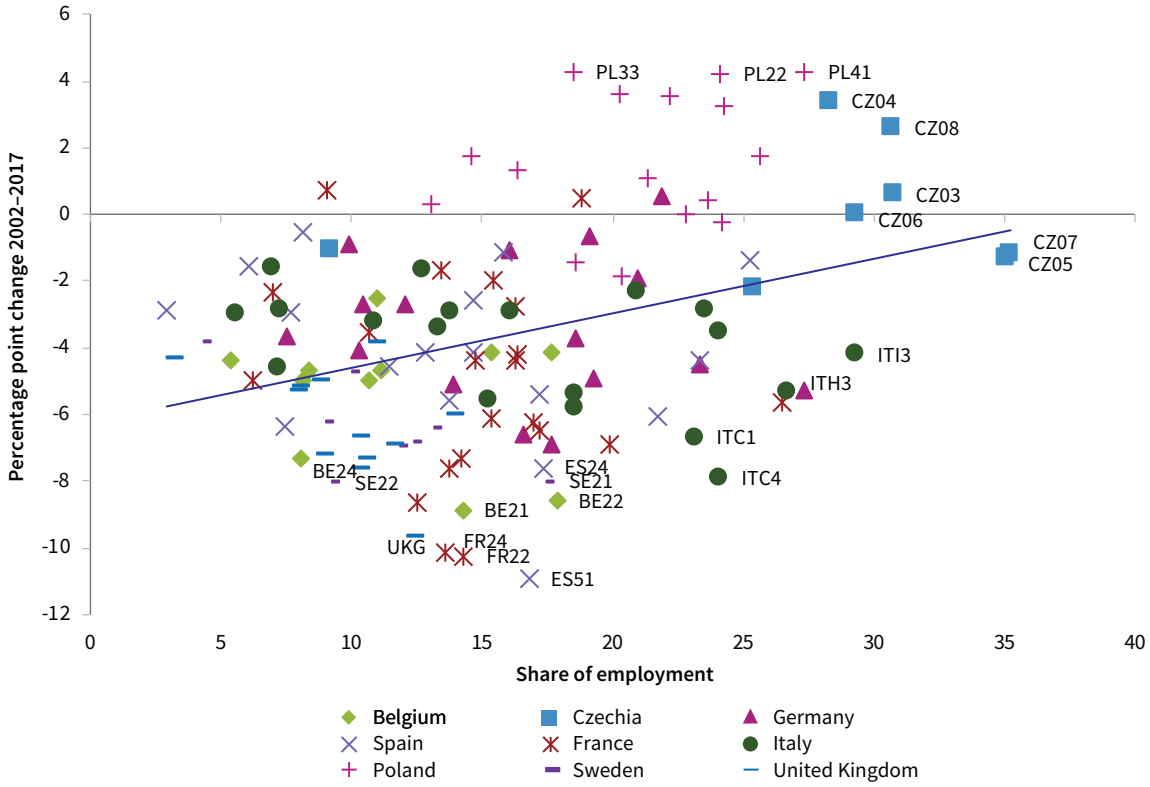
In the majority of all the other regions considered, changes in employment shares were either very modest or around 0. Among the exceptions are some northern Spanish regions: notably Galicia (-5.8 percentage points), La Rioja (-5.3 percentage points), Cantabria (-3.9 percentage points), Castilla y León (-3.2 percentage points), Principado de Asturias (-2.9 percentage points) and Comunidad Foral de Navarra (-2.6 percentage points). This declining trend did not affect Extremadura and Murcia, however, both of which still recorded the two highest shares in agriculture in 2017, around 12.4% and 13.8%, respectively. The Czech regions of Jihozápad (in the southwest) and Jihovýchod (in the southeast) recorded a drop of around 4 percentage points from an initial employment share of around 8%. Similarly, in the French regions of Pays de la Loire, Aquitaine, Limousin and Basse-Normandie, the employment share in agriculture declined by around 3 percentage points. In Italy, the region of Calabria recorded a stable employment share at around 11%, the highest in the country in both 2002 and 2017; other southern regions with high initial shares of around 10%, such as Molise and Basilicata, instead recorded a decline (-3.7 percentage points and -2.1 percentage points, respectively). In Germany, the only region with a higher but declining employment share in agriculture (-4 percentage points) is Mecklenburg-Vorpommern (bordering the Baltic Sea to the north and Poland to the east).

Figure 4: Regional share of employment in agriculture (%, 2017) and change (ppt, 2002–2017), nine Member States



Notes: *Selected regions indicated only. See Table A1 in Annex 1 for NUTS codes.*
Source: *EU-LFS (authors' calculations)*

Figure 5: Regional share of employment in manufacturing (%, 2017) and change (ppt, 2002–2017), nine Member States



Notes: *Selected regions indicated only. See Table A1 in Annex 1 for NUTS codes.*
Source: *EU-LFS (authors' calculations)*

Manufacturing

In terms of regional employment in the manufacturing sector, Figure 5 demonstrates that employment has contracted in most of the regions. Among the regions ranking highest in terms of manufacturing employment in 2017, some experienced a significant drop compared to 2002. These are mostly Italian regions, notably: Marche, with an initial value of 33.5% and a decline of 4.2 percentage points (although it remains the most industrialised region in the country); Veneto, with an initial value of 32% and a decline of 5.3 percentage points; Lombardia, with an initial value of 32% and a decline of 7.9 percentage points; and Emilia-Romagna, with an initial value of 27.6% and a decline of 3.6 percentage points. The German region of Baden-Württemberg (in the southwest) also recorded a notable decline of around 5.3 percentage points (from 32.6% in 2002 to 27.3% in 2017). A very similar pattern can be seen in the French region of Franche-Comté.

Czech regions are among those with the highest employment shares in manufacturing – especially those located in the north and northeast of the country – and their primacy has been consistent over time, with only small variations over the period considered. Severozápad and Moravskoslezsko recorded the greatest expansions – 3.4 and 2.6 percentage points, respectively. The most dynamic regions in terms of increasing manufacturing employment are in Poland: among the 10 regions with the largest expansion, 8 are Polish. It is particularly interesting to note that the region of Świętokrzyskie is both the one with the largest decline in agriculture and the highest increase in manufacturing (from 14.2% to 18.5%, although this is still lower than the national average of 20.9% in 2017), suggesting a shift in the economic structure towards higher industrialisation.

The picture is much more diverse if one looks at the 10 regions experiencing the highest drop in manufacturing employment. At the top of the ranking is the Spanish region of Cataluña, where manufacturing employment dropped from 27.8% to 16.8% over a period of 15 years. A similar decline of around 10 percentage points was recorded in the French regions of Picardie and Centre (and to a lesser extent Nord-Pas-de-Calais), as well as the West Midlands in the United Kingdom. Some Flemish regions of Belgium and southern Swedish regions are also characterised by a significant decline in manufacturing employment (around 8 percentage points).

Professional private services

This category groups together professional services, administration services, business and real estate activities. Employment in these types of private services is on the rise everywhere, with three notable exceptions: Stockholm, Brussels and Île de France. However, even in these cases, the decline is very marginal – around 1 percentage point – and all three regions still occupy the highest places in the national rankings (see Figure 6).

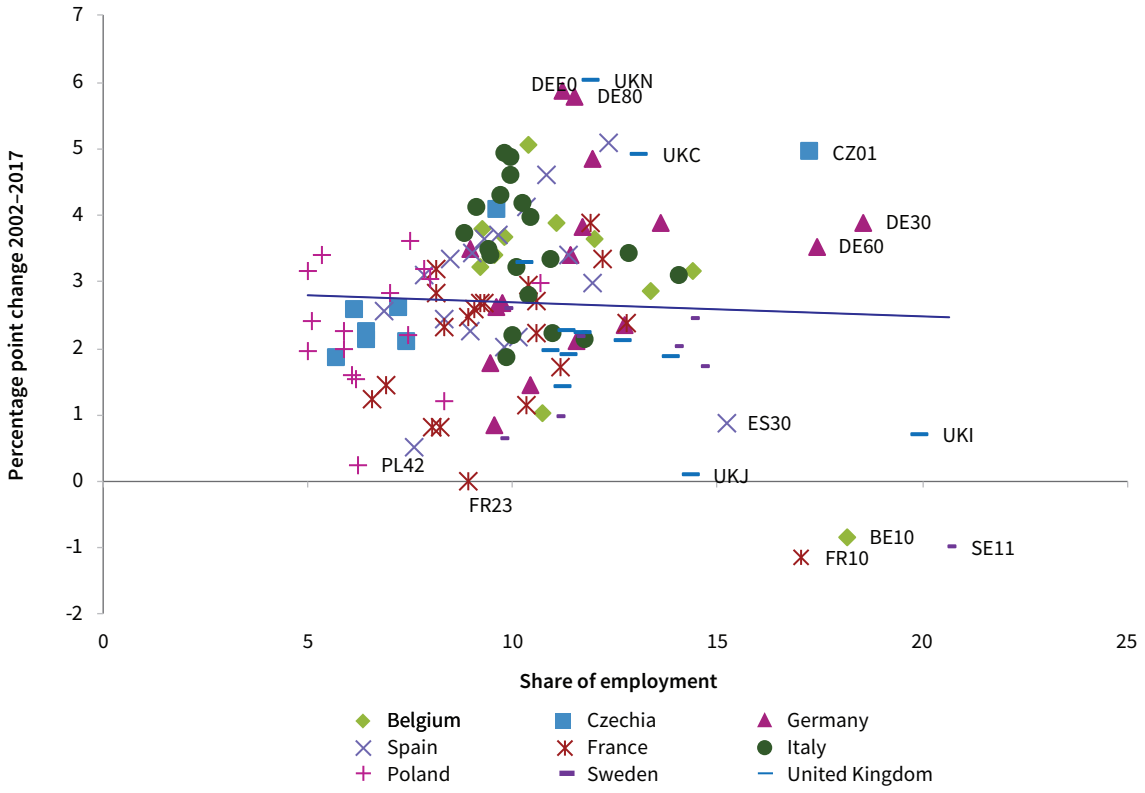
Indeed, it is very much the case that when it comes to private services, and even more specifically those analysed here, capital city regions are in the lead. By looking at the 10 regions with the highest employment share in professional private services in 2017, one can find almost all the capital city regions of the nine selected countries: from Stockholm, with the highest rate (20.7%), to Madrid (15%). Among these capitals, Prague and Berlin recorded the largest employment expansions: +4.9 and +3.9 percentage points, respectively. The only two outliers are Lazio and Mazowieckie; in both cases, the employment share expanded by around 3 percentage points between 2002 and 2017, but in absolute terms, it is lower than the other capitals, especially Mazowieckie (the employment share in 2017 was 14.1% and 10.7% respectively).

The employment expansion in several regions with a very low initial share of professional services is also noteworthy; for instance, Northern Ireland (where the employment share rose from 5.9% in 2002 to 12% in 2017) and many southern Italian regions like Abruzzo, Calabria, Puglia, Sicilia, Campania, Basilicata and Sardegna (where the employment share doubled in some cases, starting from around 5–6%). Altogether, a moderate convergence pattern can be identified, suggesting that regions with the lowest initial employment rate are growing the most.

Health

The health sector expanded in almost every region, by almost 2.8 percentage points on average, between 2002 and 2017, but with great variation across different regions (Figure 7). However, there are also some cases of employment contraction, particularly evident in Polish and Swedish regions. Most of the regions in Poland experienced a marginal decline in employment shares in the health sector, ranging from a minimum of 0.5 percentage points to a maximum of 1.8 percentage points. Ranking regions by the employment share of the health sector in 2017, it becomes evident that the bottom 10 are all Polish – with values ranging between

Figure 6: Regional share of employment in professional private services (%, 2017) and change (ppt, 2002–2017), nine Member States



Notes: *Selected regions indicated only. See Table A1 in Annex 1 for NUTS codes.*
Source: *EU-LFS (authors' calculations)*

4.6% and 6.5%. This was not the case 15 years before, when the lowest values were recorded predominantly in Spain.

Employment in the health sector also contracted in many Swedish regions, both in the north and south of the country. However, in contrast to Poland, these were still among the regions with the highest health sector employment share in 2017 (especially the northern regions, at 18% or more).

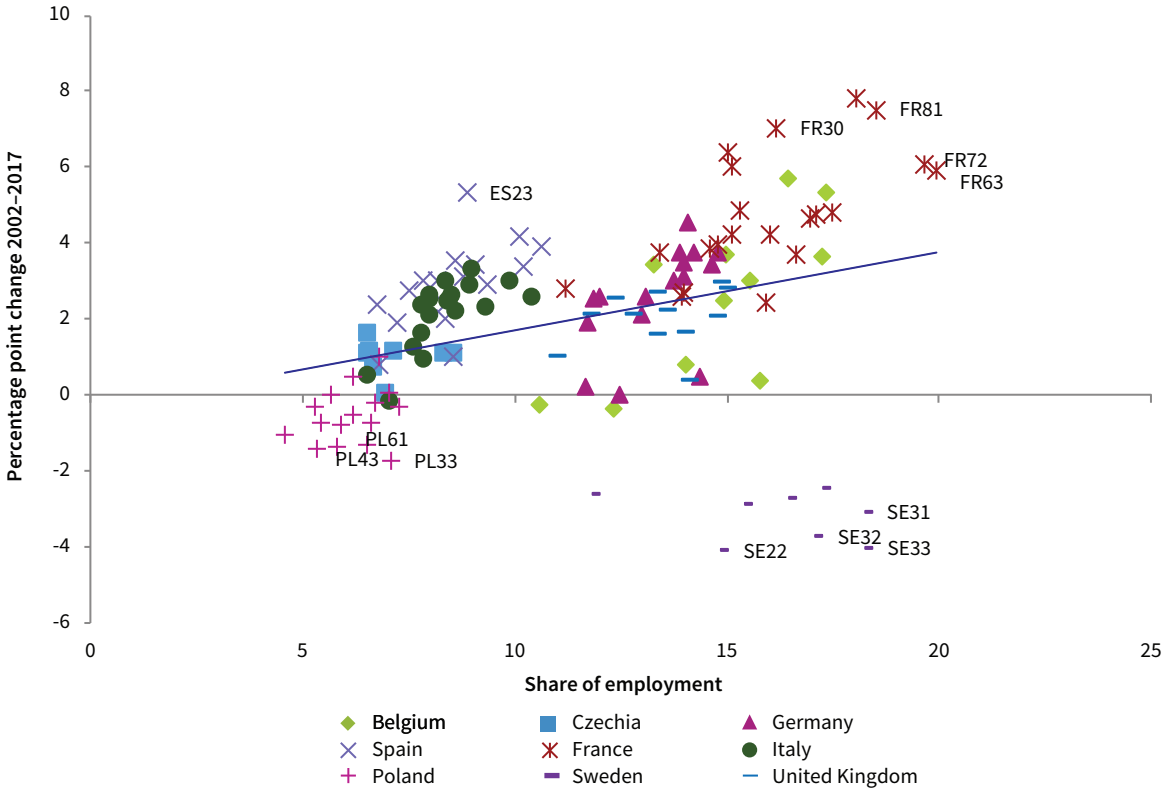
French regions are among those that have experienced the biggest employment expansions in the health sector. Indeed, among the top 10 regions where the employment share increased, 8 are French. These are dispersed around the country, from the north (for example, Nord-Pas-de-Calais and Champagne-Ardenne) to the south (Languedoc-Roussillon), the east (Alsace) and the centre (Auvergne and Centre) but not in the west. This significant employment expansion means that Limousin, Auvergne and Languedoc-Roussillon overtook Swedish regions and, in 2017, were the EU regions with the highest employment shares in the health sector (around 19%).

Relevant research

The well-established literature on shifts in the employment structures of advanced economies tends to focus on developments at country level and, in many cases, is predicated more or less explicitly on the prevalence of patterns of employment polarisation or (less often) employment upgrading at national level (for instance, Autor et al, 2006; Goos and Manning, 2007; Goos et al, 2009; Oesch and Rodríguez-Menés, 2011; Eurofound, 2013, 2014, 2015; Oesch, 2015). Relatively few studies look at recent shifts in employment at regional level in detail. Where this has been done, these studies primarily focus on specific countries, while there is a gap in terms of comparative analysis at EU level.

Most of the analyses focus on structural changes in local labour markets in Germany (for instance, Dauth, 2014; Senftleben-Konig and Wielandt, 2014; Blien and Dauth, 2016) and the United Kingdom (for instance, Kaplanis, 2007; Jones and Green, 2009; Lee et al, 2015). Less evidence is available for other countries, although individual studies do cover Spain (Consoli and Sánchez-Barrioluengo, 2016), the Netherlands (Terzidis et al, 2017) and Italy (Aimone et al,

Figure 7: Regional share of employment in health (%, 2017) and change (ppt, 2002–2017), nine Member States



Notes: *Selected regions indicated only. See Table A1 in Annex 1 for NUTS codes.*
Source: *EU-LFS (authors' calculations)*

forthcoming). A detailed summary of each study is provided in Annex 4, including the methodology used and main findings. The studies highlight that there are noticeable differences in the quality of employment at local level, with polarising patterns of different intensity that warrant further investigation and comparison from a cross-country perspective. The degree of urbanisation can play an important role, with regions that are initially more urbanised more likely to have a polarised employment structure. In particular, changes in employment patterns in capital cities appear to stand out vis-à-vis the rest of the country (notably in the United Kingdom). The results also highlight the role of the public sector in providing good-quality employment, reducing inequalities and mitigating regional differences.

In terms of the forces behind these changes at local level, several studies conclude that there is an association between job polarisation at local level and the concentration of routine jobs, emphasising the role of technological change in polarising the employment structure by displacing routine, mid-paid jobs. At the same time, local demand is also a very important factor contributing to increased employment in low-skilled services, notably generated by the presence of highly skilled workers, which leads to consumption spillovers.

2 Applying the jobs-based approach at regional level

This chapter presents the jobs-based approach applied in the remainder of this report. A classification of regions is developed, loosely based on an existing Eurostat urban–rural typology, in order to describe the main regional developments broadly. This shows how employment has evolved from 2002 to 2017 in four settlement categories: capital city regions, other largely urban regions, intermediate regions and largely rural regions. Thereafter, pointers are offered as to what specific sectoral and occupational developments contribute to the differences observed between region types, in particular to the strong and growing skew of capital city regions in terms of well-paid employment. This is by way of preamble to the more detailed regional application of the jobs-based approach in the next chapter.

Methodology: The jobs-based approach

The key concept of the jobs-based approach is that of a 'job'. A job is defined as a given occupation in a given sector – for example, a salesperson in the retail sector or a doctor in the health sector. This is an intuitively attractive definition and corresponds to what people might consider when describing their job or to how an employer advertises a new job opening.

This definition is useful for both theoretical and empirical reasons. The two concepts of occupation and sector correspond to two fundamental dimensions of the division of labour within and across organisations. The sector classification designates the horizontal distribution of economic activities within a country across organisations generating different products and services. The occupation classification provides an implicit hierarchy of within-organisation roles – senior managers, line managers, professionals, associate professionals, production staff, and so on. Established international classifications of occupation (the International Standard Classification of Occupations, ISCO) and sector (NACE) mean that it is relatively easy to operationalise the jobs-based approach using the standard labour market data sources, such as the EU-LFS. This allows for a highly detailed disaggregation of the workforce in each country based on commonly applied occupational and sectoral classifications to ensure international comparability.

The jobs-based approach requires not only an intuitive, conceptually coherent and empirically practical definition of a job but also some means of evaluating jobs in relation to their quality. The job–wage has been the main proxy of job quality in much jobs-based analysis, originating in the work of Nobel Laureate Joseph Stiglitz in the 1990s (CEA, 1996) and subsequently refined by Erik Olin Wright and Rachel Dwyer (2003) and others. The analysis that follows relies on a wage-based measure to rank jobs.

For the purposes of this report, the jobs-based approach used in earlier EJM analyses has been adapted in order to deal with three issues:

- limitations in the level of sectoral detail available in the EU-LFS microdata (NACE Level 1, identified by a one-digit code, rather than NACE Level 2, identified by a two-digit code), which necessitate a more aggregated approach[6]
- changes in the core ISCO and NACE classifications in 2008 and 2011, which complicate the analysis of shifts in the employment structure over the chosen period of analysis (2002–2017)
- the sheer complexity of trying to cover 130 territorial units rather than 28 Member States

These issues have been addressed by using a tercile-based approach rather than the quintile-based approach used in previous analyses. Such an approach lends itself to a simpler characterisation of employment shifts, notably the canonical patterns of upgrading or polarisation.

In terms of presentation, a new graphical approach has been used to characterise employment shifts in order to compress more regional data into individual scatterplots.

Finally, and more substantively, much of the analysis is based on a different set of comparisons to that used in the country analysis covered in previous EJM reports (and in Annex 2 of this report, covering developments at national level). Instead of covering absolute

6 In EJM reports up to 2017, the level of detail was two-digit for both occupation and sector. Eurostat introduced restrictions in 2018 in the level of detail permitted in its ad hoc extraction requests, upon which EJM analysis has been largely reliant. The current analysis is conducted at a less detailed level as a consequence (one-digit NACE instead of two-digit). Sensitivity analysis, however, confirms that overall results (employment shifts by quintile) are only very modestly affected by this change.

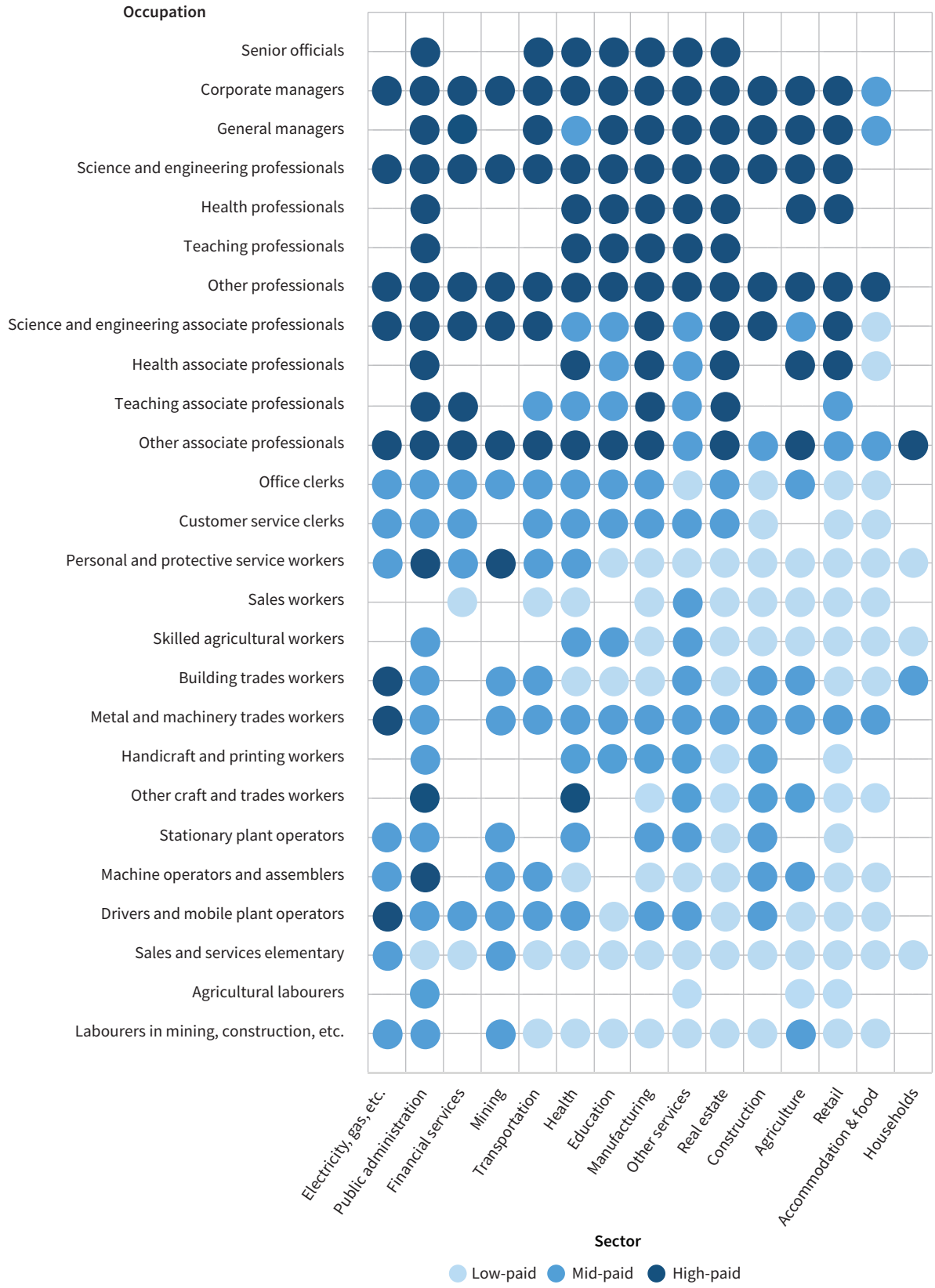
employment shifts by job–wage quantile between a start and an end year in an individual territory, the main comparisons are between the regional shares of employment, using the job–wage terciles of the nine Member States as a baseline. This means that rather than comparing regions with themselves over time (showing net employment change between a start and end period), all regions are compared to a reference European employment structure (based on the nine Member States), first in 2002 and then in 2017. This allows us to characterise a region's employment with reference to the average job–wage structure of all nine countries – accounting for over three-quarters of EU employment – to identify how regions deviate from that average (whether more upgraded, more downgraded, more polarised, and so on) and how those deviations have evolved over time.

The main, simplified steps of the jobs-based approach used in this report are as follows.

1. **A matrix of jobs – comprising occupation-by-sector cells – is created for each region**, using the standard international classifications of occupation (ISCO) and sector (NACE). The level of detail is two-digit for occupation and one-digit for sector. Each job is an occupation in a sector. In total, there are 43 two-digit occupations and 21 one-digit sectors, generating 903 job cells. In practice, many of the theoretical job cells do not contain employment; there are unlikely to be many skilled agricultural workers in financial services, for example. At the country level, the total number of job cells with employment varies between around 300 and just over 700. The number is largely determined by country size and labour force survey sample size (the bigger the workforce, the greater the variety of possible job combinations in which employment is observed using EU-LFS data).
2. **A weighted average EU job–wage ranking is calculated**. This exercise is carried out separately for 2002 and 2017 due to changes in the underlying sector and occupation classifications in 2008 and 2011, respectively. For the 2017 data, the job–wage rankings for each country are based on combining data from the EU-LFS annual data files for 2011–2014 and aggregated data from the Structure of Earnings Survey (SES) for 2010. For the 2002 data, the job–wage rankings derive from a combination of SES and European Community Household Panel data.[7] For both years, an aggregated job ranking is then calculated, based on the employment-weighted average job ranking across the nine Member States.
3. **Jobs are allocated to terciles** based on the EU job–wage ranking. The best-paid jobs are assigned to the third tercile, the lowest-paid to the first tercile. Each tercile of the EU job–wage ranking represents as close as possible to one-third of employment in the starting period for the nine Member States as a whole; in other words, jobs are assigned to terciles based on their employment weights. The job rankings and resulting assignment of jobs to terciles remain fixed in the beginning and end periods (see Figure 8 for job to tercile allocations for the starting period, 2002).
4. **Regional employment structures are compared** to that of the nine Member States in both 2002 and 2017, based on the share of employment by EU job–wage tercile. This analysis makes it possible to see where low-paid, mid-paid and well-paid jobs are more prevalent in individual regions compared to the reference employment structure of the nine Member States. As the comparison is done at two points with a 15-year interval, it is also possible to see how regions' position relative to the average of the nine Member States, and to other regions, has evolved over time.

7 Further background documentation on the data processing involved includes Eurofound (2008), as well as extensive material in the annexes of previous EJM annual reports (see Eurofound, 2013, 2014, 2015, 2017) where the same jobs-based approach was used.

Figure 8: Assignment of jobs to terciles based on nine Member States, 2002



Notes: *Allocation of jobs to terciles in the nine Member States in 2002, based on the average ranking positions of the occupation-by-sector combinations and the shares of employment in the nine Member States as a whole. Job combinations (occupation by sector) with marginal or no employment have been omitted.*
Source: *EU-LFS, SES (authors' calculations)*

Top-level findings

This section describes how employment has evolved from 2002 to 2017 in four identified settlement categories (capital city regions, other largely urban regions, intermediate regions and largely rural regions) before exploring developments in employment at individual regional level in the next chapter. These four categories arise from an adaptation of Eurostat's urban–rural typology, which is necessary in order to apply the EU-LFS employment data to the 130 regions covered in this report – see Box 1 for details.

Box 1: A classification of regions

Estimates of the urbanisation levels of countries are highly dependent on how regions are categorised, and as a result, they vary significantly. The United Nations estimated the urban share of the population in Europe at 73% in 2011. According to the current Eurostat regional typology, 41% of the EU population lived in regions that are 'mainly urban' in the same year. The estimate of the combined urban and capital region shares of the population generated from the nine countries covered in this report lies somewhere in the middle, at around 54%.

The urban–rural typology used by Eurostat is assessed at NUTS 3 level (Eurostat, undated). NUTS 3 regions are characterised by the share of the population living in rural or urban areas. The Eurostat typology comprises three categories: mainly urban, intermediate and mainly rural. A region is categorised as 'mainly urban' if less than 20% of the population live in rural areas, 'intermediate' if 20–50% of the population live in rural areas, and 'mainly rural' if more than 50% of the population live in rural areas. Rural areas are all areas outside urban clusters, which are defined as contiguous grid cells of 1 km^2 with a density of at least 300 inhabitants per km^2 and a minimum population of 5,000. Adjustments are made based on the presence of urban centres within regions – a rural area with an urban centre of more than 200,000 inhabitants becomes intermediate, while an intermediate area with an urban centre of more than 500,000 becomes mainly urban.

Unfortunately, there is no equivalent at NUTS 2 or NUTS 1 level, the level of detail at which EU-LFS data is made available to researchers. Moreover, simply taking the Eurostat approach, based on the rural percentage population shares, and applying it at the more aggregated regional level tends to mechanically raise the percentage of urban and intermediate shares. There are proportionately many fewer NUTS 2 regions than NUTS 3 regions with a majority of inhabitants living in rural areas.

Given that regional policies in the EU are often based on data available at NUTS 2 level, there is an obvious demand for adapting the Eurostat typology to this level of coverage – and the current regional analysis is an example. So, for this report, one useful existing example of such an adaptation (De Beer et al, 2014) has been further adapted to take into account the fact that EU-LFS microdata is available in a combination of NUTS 1 level (Germany and the United Kingdom) and NUTS 2 level (the other seven Member States). The steps taken are described below.

- Regions are categorised based on the share of the population living in urban, rural and intermediate NUTS 3 regions that are part of a larger NUTS 1 or NUTS 2 region.
- The NUTS 1 and 2 regions are labelled according to whichever of the three categories has the highest share of the population. Thus, if a NUTS 1 or NUTS 2 region comprises NUTS 3 regions where the urban regions account for 40% of the population, the intermediate regions account for 35% and the rural regions account for 25%, the region is considered a 'largely urban region'.
- One additional adjustment – useful for the analysis, given the central importance of capital cities – is to distinguish capital city regions as a separate category.

The four-category typology proposed is subject to two important caveats:

- It is improvised for the purposes of this report and strictly unofficial.
- All such typologies are bound by construction to oversimplify and sometimes lead to dubious categorisations of regions due to aggregation issues. This is notably an issue as regards the UK and German regions, as the unit of regional observation in the EU-LFS (NUTS 1 regions) is generally much larger than in the other Member States covered, so these regions are more likely to be misclassified as a result. The German NUTS 1 regions of Bayern and Nordrhein-Westfalen are each more populous than individual countries such as Belgium, Czechia and Sweden.

A full list of regions by region type is included in Annex 1.

In 2017, the population of the nine Member States studied was distributed in the four settlement categories as follows: capital city regions, 12%; other largely urban regions, 42%; intermediate regions, 35%; and largely rural regions, 11%.

Capital city regions have increased their shares of employment in all but one of the nine Member States. Table 2 shows the percentage of employment by region type in 2017 and the percentage point change from 2002 in an accompanying column. Île de France (Paris) is the one exception to the pattern of relatively rapid-growing capital city regions but nonetheless accounts for over one-fifth of national employment, the second highest share among the nine capital regions. The largest shift of employment towards capital city regions occurred in Sweden (+2.2 percentage points), where the Stockholm region now accounts for nearly a quarter of national employment.

The nine countries covered are diverse in their composition of employment by region type: the United Kingdom is overwhelmingly urban; Belgium, Italy, Spain, and Sweden are relatively highly urbanised; France and Poland have a relatively high share of employment in rural areas; and Czechia and Germany have high shares of employment in intermediate, mixed urban and rural regions.

The main compositional change has been one of an incremental shift towards capital city regions. This has occurred at the expense of other largely urban regions in Belgium, Italy and the United Kingdom. In Sweden, intermediate regions have declined fastest. In Czechia, largely urban regions rather than the capital city region have benefited from rural–urban employment flows – although, as detailed regional data in Annex 1 confirm, this relates in particular to growth in the Střední Čechy region, which forms a 'doughnut' around the capital city region. Poland is exceptional in the shift of employment out of largely rural regions, consistent with a late and ongoing decline in agriculture, which accelerated following EU accession. The shifts here have been mainly to intermediate regions. France is notable for the relative stability of employment shares between different types of region between 2002 and 2017.

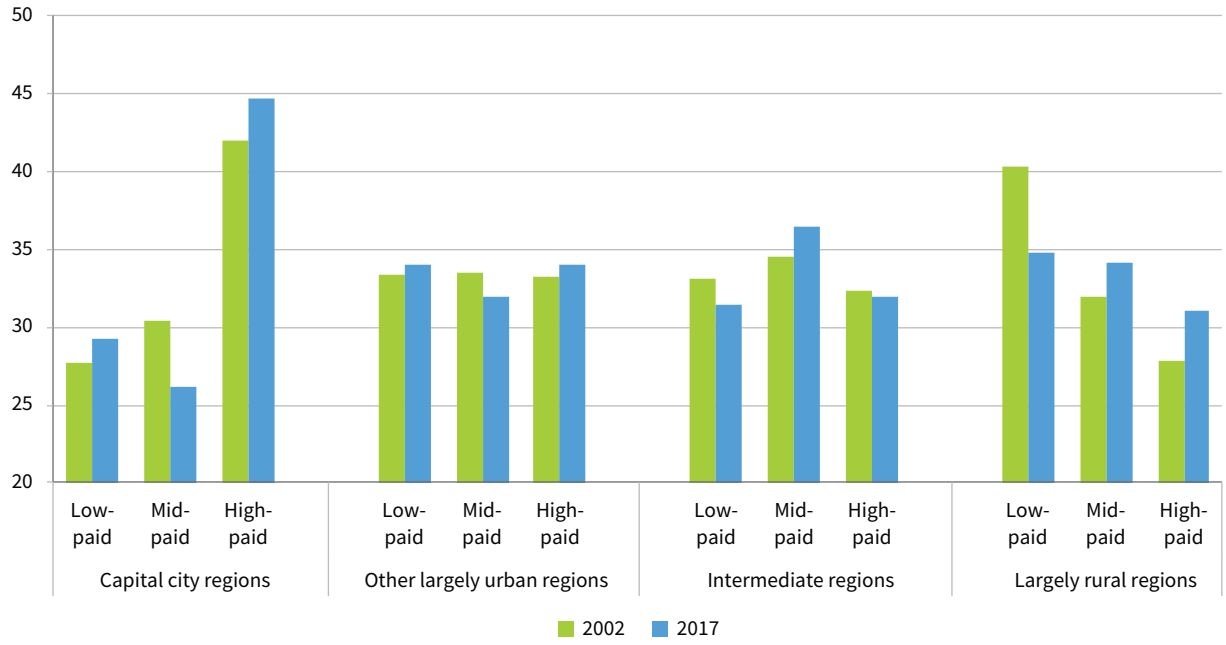
Not only have capital city regions benefited disproportionately from employment growth, but their advantage in terms of aggregate employment quality has also increased over time. As shown in Figure 9, capital city regions have a notable skew towards upper-tercile employment, and this increased from 2002 (41.9%) to 2017 (44.7%). The share of low-paid employment also increased in capital city regions during the same period, albeit from very low levels, so there is some evidence of employment polarisation in these regions. In other largely urban regions, employment is more evenly spread across well-paid, mid-paid and low-paid employment. This is also the case in intermediate regions, but there has been a shift towards mid-paid employment. The largest relative shift in employment has occurred in largely rural regions, where a significant upgrading has taken place arising from the decline in low-paid, mainly agricultural employment and countervailing increases in private services employment. In the period after 2011, largely rural areas also experienced a growing manufacturing share of employment.

Table 2: Employment share (2017) and change (2002–2017) by region type and Member State

	Capital city region		Other largely urban region		Intermediate region		Largely rural region	
	Emp. share (%)	Emp. change (ppt)	Emp. share (%)	Emp. change (ppt)	Emp. share (%)	Emp. change (ppt)	Emp. share (%)	Emp. change (ppt)
Belgium	9.8	1.4	46.4	-1.3	41.2	-0.3	2.6	0.2
Czechia	13.1	0.3	12.8	1.3	62.5	-1.3	11.6	-0.3
France	20.7	-0.4	18.5	0.4	27.6	-0.5	33.2	0.5
Germany	4.3	0.3	32.5	0.1	61.4	-0.2	1.8	-0.2
Italy	10.3	1.0	48.0	-1.3	40.4	0.4	1.3	-0.1
Poland	15.1	1.1	11.5	0.3	29.5	1.9	43.9	-3.3
Spain	15.4	0.3	61.9	0.6	22.7	-0.9	0.0	0.0
Sweden	24.5	2.2	36.2	-0.3	30.9	-1.4	8.4	-0.5
UK	14.3	1.6	74.4	-1.7	11.3	0.0	0.0	0.0
Weighted average	12.7	0.7	41.3	-0.3	35.6	-0.1	10.5	-0.2

Notes: *Emp. = employment; ppt = percentage points.*
Source: *EU-LFS (authors' calculations)*

Figure 9: Employment share (%) by job–wage tercile and settlement category, nine Member States, 2002 and 2017



Source: *EU-LFS, SES (authors' calculations)*

In summary, employment growth has been strongest in capital city regions. These are also distinctive in their high levels of higher-paid, higher-skilled private services employment. They have quite different contours to those of the other region types, and these differences have become more accentuated since 2002. There is nonetheless some evidence of modest polarisation in capital city and other largely urban regions, compared to growth in the middle in intermediate regions and upgrading in largely rural regions, albeit one where a skew to less well-paid employment persists.

Sectoral drivers

In order to see which sectors are contributing to changes in the tercile share of employment by region, as observed in Figure 9, the most relevant data are:

- how employment is distributed by sector across the job–wage distribution
- which sectors have contributed most to relative shifts in overall employment composition, both negatively and positively
- which are the sectors and occupations where employment growth has been unevenly distributed by region type

Member State level

Figure 10 addresses the first two elements of the list for the nine Member States. Sectors are ranked left to right by their contribution to the overall percentage point change in employment (right-hand axis). This helps to readily identify those sectors contributing most to compositional shifts, which appear at each end of the figure. The vertical bars describe the employment share by job–wage tercile in the selected Member States in 2017. This shows, for example, that over 80% of employment in agriculture was low-paid, while around 65% of employment in education was high-paid. The decision to use 2008–2017 as the period of coverage is pragmatic; the NACE classification change in 2007–2008 in the EU-LFS complicates a simple presentation of the basic sectoral trend for the entire period 2002–2017.

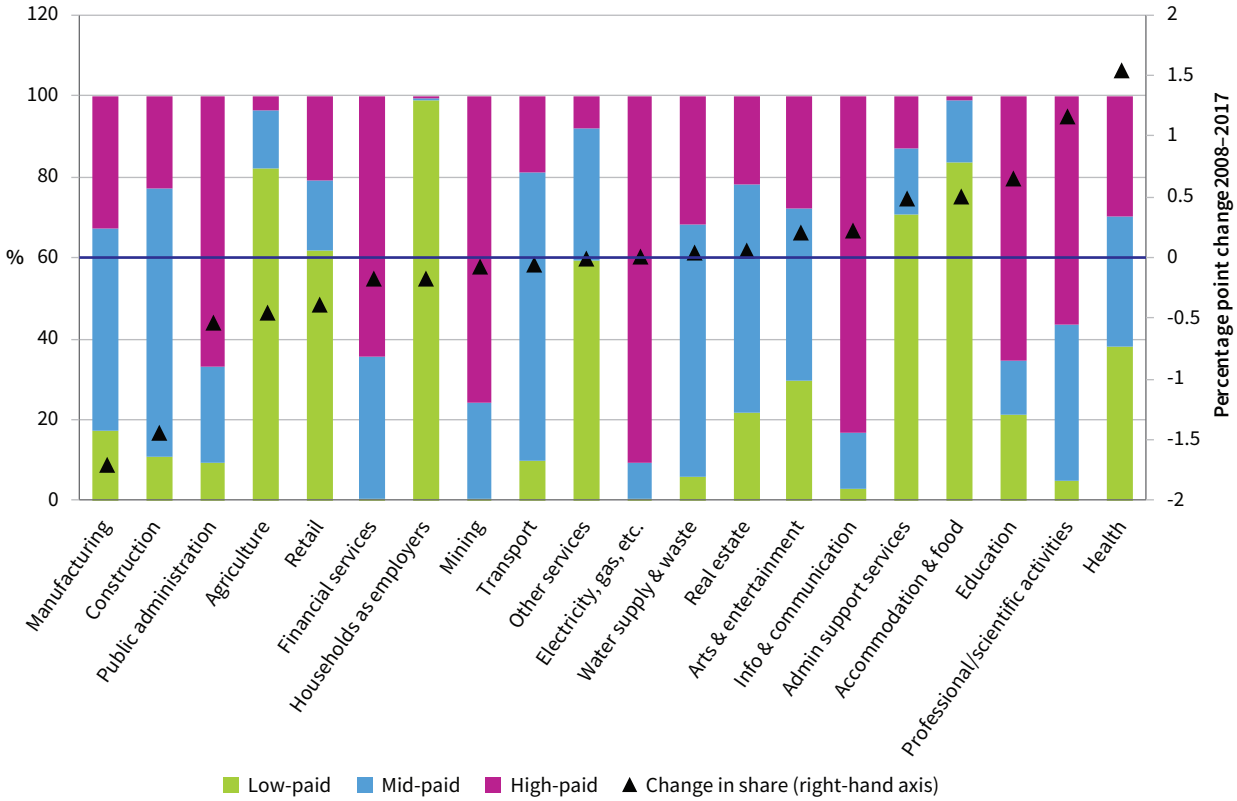
The main structural changes are in any case highlighted adequately in Figure 10 by the declining share of manufacturing and the increasing share of health and professional, scientific and technical services. These shifts were similarly prominent in the earlier 2002–2007 period.[8]

The decline in manufacturing (-1.7 percentage points) and construction (-1.4 percentage points) should, all things being equal, generate polarisation, as employment is concentrated in the mid-paid tercile in these sectors. Also, stronger relative growth in professional, scientific and technical services (+1.2 percentage points) as well as education (+0.7 percentage points), combined with the relative growth in more basic service activities such as accommodation and food and administrative support services (+0.5 percentage points each) should together also contribute to employment polarisation. The former boost employment growth in the top tercile, while the latter boost employment growth in the bottom tercile.

On the other hand, declining employment shares in agriculture (-0.5 percentage points) and retail (-0.4 percentage points) are each upgrading, as they detract from growth in the low-paid tercile. Finally, the declining public administration share (-0.5 percentage points) should be downgrading, as this sector predominantly comprises high-paid employment. The sector in which the employment share grew most – health (+1.5 percentage points) – has a reasonably even distribution of employment across the wage distribution, so this growth should, all things being equal, be neither upgrading nor polarising.

The relative contribution to overall employment shifts of the remaining sectors bunched in the middle in terms of percentage point growth share is somewhat less important, either because the sector itself has less weight in overall employment or because the level of employment has evolved more or less in line with that of total employment across all sectors. For example, the information and communication sector still only

Figure 10: Composition of sectoral employment by job–wage tercile (%, 2017) and shifts in total employment share by sector (ppt, 2008–2017) in nine Member States



Note: *Sectors are sorted by contribution to percentage point change in total employment (low to high).*
Source: *EU-LFS, SES (authors' calculations)*

8 The main sectoral difference between the earlier and later period is that the construction sector experienced growth in 2002–2007, increasing its share of total employment by 0.4 percentage points, before declining after 2008. This can be interpreted as a reversion to mean after the construction bust-to-boom cycle experienced notably by Spain and the United Kingdom, of the countries covered here, during and after the global financial crisis.

accounts for 3% of overall employment, so despite relatively fast growth it contributes only modestly to overall employment shifts, while the retail sector, though declining only modestly in relative terms (from 14.1% to 13.7%), contributes more to overall sectoral compositional shifts.

As a first approximation, based on the relative sectoral composition shifts identified above, overall employment would be expected to have polarised but with a positive upgrading skew.

Regional level

How these broader shifts in the sectoral composition of employment impact at regional level depends in part on how evenly or unevenly sectoral employment is distributed across different region types. Table 3 confirms that agricultural employment is, unsurprisingly, heavily skewed towards largely rural regions, and that it is in these regions that the greatest share of agricultural employment decline has been recorded.

For some more important sectors in terms of aggregate employment share, such as manufacturing and professional, scientific and technical activities, there is also a strong skew by region type. Manufacturing is underrepresented in the employment share of capital city regions, in particular, but also of other largely urban regions. The highest share of manufacturing employment is in intermediate regions, while even largely rural regions have a higher share than largely urban regions. The locus of manufacturing activity has tended to shift away from urban concentrations. In largely rural areas, the manufacturing employment share has eroded much more slowly than in more densely populated regions over the last decade. As industrial activity has increasingly dispersed away from the most densely populated areas, these have been the first to undergo deindustrialisation and, subsequently, the shift to service activity. Likely factors influencing this development are the greater costs, including opportunity cost, of manufacturing in cities due to higher land costs (and in some cases labour costs) as well as reduced transport costs, making location decisions less sensitive to considerations of market proximity.

Two growing service sectors with a preponderance of urban, and especially capital city region, employment are professional, scientific and technical services and information and communication. Both have a concentration of well-paid, top-tercile employment. The share of employment in both sectors in capital city regions is around twice the average. And employment growth has tended to widen the differentials in employment share based on population density.

The employment share of professional, scientific and technical services has, for example, grown by 2.1 percentage points (from 7.9% to 10%) between 2008 and 2017 in capital city regions, but by 1 percentage point or less in other region types. Financial services employment – another well-paid sector – is also concentrated in capital city regions, but in this case, the employment growth trajectory has been modestly negative.

For many other service sectors, such as retail, public administration and education, the distribution of employment by region type is more balanced, reflecting in part that these services often involve person-to-person contact and employment is therefore more likely to be evenly dispersed in line with the overall population.

From Table 3, plausible inferences can be made to partially explain some of the job–wage tercile patterns observed in Figure 9. The strong skew of capital city region employment towards the top tercile is in part attributable to the notably higher share of well-paid employment in financial services, professional, scientific and technical services, and information and communication concentrated in this type of region. Positive agglomeration processes appear most salient in these sectors. There are also advantages for private services firms in co-locating with the sources of civic and commercial power (legislators, social partners and company headquarters) for purposes of influence, lobbying and access to state funding. These also tend to be concentrated in capital city regions. The fact that the capital region positive skew has sharpened is attributable in part to the relatively faster employment growth of these same sectors in that region type.

Capital city regions – and other largely urban regions – have a lower manufacturing share of employment, and this is reflected in relatively low mid-tercile shares in Figure 9. These have also declined in both region types over the period covered, consistent with the sharper falls in manufacturing employment share in cities. Mid-tercile employment shares have held up better in less densely populated areas, in part due to higher shares of manufacturing employment and their more modest rate of decline in these regions.

The counterpart of the strong positive employment skew of capital city regions in Figure 9 is the strong negative employment skew of largely rural regions, albeit one that has moderated significantly in the period 2002–2017. The first and most important contribution to the improvement has been the declining agricultural share of employment, which has contributed to reducing the bottom tercile share by around 5 percentage points. The loss of manufacturing and construction employment – mainly mid-tercile – has

been only marginal on average in largely rural regions, with the result that the declining agricultural share has been compensated for mainly by growth in service sectors (health; professional, scientific and technical services; administrative services; and information and communications) which together have boosted employment shares in the middle and top terciles. The outcome of these shifts is that the employment structures in largely rural regions have upgraded significantly, while still retaining a skew towards lower-paid employment.

Occupational drivers

Up until this point, the descriptive analysis has looked only at the sectoral dimension of change and has ignored the occupational dimension. But there is good reason to expect that occupational shifts – both in general as well as within sectors – play an important role in determining the employment-shift patterns observed in the tercile charts and how they are differentiated across region types. Wage and skills levels tend to correlate more strongly along occupational lines than sectoral lines.

Table 3: Employment share (2017) and change (2008–2017) by region type and sector, nine Member States

	Capital city		Other largely urban		Intermediate		Largely rural		All regions	
	Emp. share (%)	Emp. change (ppt)	Emp. share (%)	Emp. change (ppt)	Emp. share (%)	Emp. change (ppt)	Emp. share (%)	Emp. change (ppt)	Emp. share (%)	Emp. change (ppt)
Agriculture	1.5	-0.3	2.1	0.0	3.1	-0.4	7.8	-2.6	3.0	-0.5
Mining	0.1	-0.1	0.4	-0.1	0.3	0.0	0.3	-0.1	0.3	-0.1
Manufacturing	6.7	-2.4	13.9	-1.9	19.5	-1.6	17.9	-0.3	15.4	-1.7
Utilities	1.2	0.0	1.4	0.1	1.5	0.0	1.7	0.1	1.4	0.1
Construction	5.8	-1.3	6.8	-2.1	7.1	-1.2	7.5	0.1	6.9	-1.4
Retail	12.8	0.0	14.5	-0.5	13.4	-0.4	13.0	-0.5	13.7	-0.4
Transport	5.5	-0.4	5.3	0.0	4.8	-0.1	5.3	0.0	5.2	-0.1
Accommodation and food	5.1	0.5	5.4	0.7	4.5	0.4	3.0	0.4	4.8	0.5
Information and communication	6.5	0.6	2.9	0.1	2.4	0.1	2.0	0.5	3.1	0.2
Financial services	4.8	-0.3	3.0	-0.3	2.6	-0.1	2.6	0.3	3.0	-0.2
Real estate	1.4	0.2	0.9	0.1	0.7	0.0	1.0	0.0	0.9	0.1
Professional/scientific activities	10.0	2.1	6.0	1.0	5.1	1.0	4.1	0.9	6.0	1.2
Administrative support services	5.4	0.1	4.9	0.7	4.1	0.3	3.2	0.6	4.5	0.5
Public administration	7.4	-1.0	6.4	-0.4	6.9	-0.5	7.5	-0.8	6.8	-0.5
Education	8.0	0.9	8.2	0.8	7.1	0.7	7.1	-0.1	7.7	0.7
Health	9.8	1.1	11.8	1.7	11.6	1.5	11.4	1.6	11.4	1.5
Arts and entertainment	2.6	0.0	1.9	0.3	1.5	0.2	1.4	0.3	1.8	0.2
Other services	2.6	0.1	2.7	0.0	2.7	0.0	2.2	0.1	2.6	0.0
Households as employers	1.7	-0.1	1.3	-0.2	1.0	-0.1	0.5	-0.6	1.1	-0.2

Notes: *Emp. = employment; ppt = percentage points.*
Source: *EU-LFS (authors' calculations)*

Based on the specifics of the employment structure in capital city regions, some likely sectoral contributors to the positive skew observed in capitals have been indicated in the previous section. But the skew indicated in Figure 9 is so great that rapid increases in employment in some relatively small, well-paid service sectors are likely to account for only a limited portion of it.

In Table 4, the share of employment in the combined ISCO categories 1–3 (Managers, Professionals and Associate professionals) is used as a proxy measure of higher-skilled white-collar employment. In 2017, capital city regions had a significantly higher share of this employment than other regions (53% compared to 41%). This difference is most pronounced in financial services (+24 percentage points) but is also high in manufacturing (+14 percentage points) and significant in other knowledge-intensive sectors where capital city region employment growth has been relatively greater, such as professional, scientific and technical services (+8 percentage points) and information and communication (+8 percentage points). Possible explanations include the greater likelihood that private company headquarters are located in capital city regions, with a correspondingly higher share of senior management and professional roles.

For predominantly state-funded sectors, these differentials are lower. The occupational breakdown in the public services is more similar in capital city regions and non-capital city regions. This lends some support to the idea that employment in public services tends to have a levelling influence across territories, notably in terms of sustaining good-quality employment outside the larger urban areas (Jones and Green, 2009). In the big cities, especially capital city regions, the dynamics of private services employment have been more important in boosting well-paid employment.

Conclusion

The conclusion to be drawn from the preceding analysis is that the strong positive employment skew observed in Figure 9 in capital city regions has its basis in both the distinctive sectoral and occupational division of labour in the capitals. On the one hand, capital city regions have nearly twice the national share of workers in faster-growing, knowledge-intensive service sectors and much lower shares of employment in structurally declining sectors such as agriculture and manufacturing. On the other hand, they have a greater concentration of higher occupational profiles across most sectors compared to the other region types.

Table 4: Share of white-collar, higher-skilled employment by selected sector, comparing capital city regions and non-capital city regions, nine Member States, 2017

Sector	Capital city region (%)	Non-capital city region (%)	Difference (ppt)
Financial services	83	59	24
Manufacturing	47	33	14
Retail	33	24	9
Information and communication	89	81	8
Professional, scientific and technical activities	86	78	8
Construction	31	25	6
Administrative support services	28	22	6
Public administration	59	54	5
Education	79	77	2
Health	62	60	2
Accommodation and food	20	19	1
Total	**53**	**41**	**12**

Notes: *Similar differentials are observed in 2002; data are omitted to simplify presentation and because sectoral aggregation is different as it uses the earlier NACE Rev 1.1 categorisation; ppt = percentage points.*
Source: *EU-LFS, SES (authors' calculations)*

3 Regional employment polarisation and upgrading: Detailed analysis

Introduction

Describing the patterns of job polarisation and upgrading across European regions is complicated, due to the large number of units of analysis involved and their significant structural differences. Instead of the 20 to 30 countries normally analysed in the EJM, there are approximately 130 regions in the 9 Member States covered by this study. Conducting a visual analysis of the absolute change in employment by quintile in each region, with further decompositions by sector or other variables, is simply not feasible.

In addition to the proliferation of units of analysis, the description of the patterns of job polarisation and upgrading by region is also complicated by the large structural differences between regions, far larger than those that exist between countries. In the EJM, the analysis of structural change in national labour markets normally uses the initial structure as a reference (for instance, see Eurofound, 2017b). In other words, each job is ranked and assigned to one of five equal-sized categories with an equal share of employment (quintiles) in the first year of the period, and then the change in the level of employment in each of those quintiles is analysed. Doing the exact same exercise with regions (looking at change in regional employment relative to the initial structure) leads to an excessive degree of diversity that is very difficult to interpret. The reason for this is that the initial structures of employment in European regions are much more diverse than the initial structures of employment in European countries, and therefore focusing all the analysis on change from an initial regional reference is not particularly informative. Whereas by country it makes sense to abstract from initial differences and focus entirely on change, by region it is necessary to combine the analysis of change with an assessment of the initial (and final) structural differences.

Therefore, describing the patterns of job polarisation and upgrading across European regions requires a more synthetic approach, but also one that ensures comparability by considering both structure and change in regional labour markets.

One obvious possibility would be to use synthetic indices of polarisation and upgrading rather than the quantile approach normally used in the EJM. But the problem with this is that, despite the copious literature on job polarisation and upgrading, there is at present no agreement on how to formalise and operationalise the concepts of job polarisation and upgrading into indices. In particular, there is little agreement on how polarisation can be measured with a single index, while measuring upgrading is far easier because it implies shifts towards higher-paying jobs in the composition of employment (which for instance, can be operationalised as changes in the weighted average percentile of jobs, keeping the percentiles fixed for each job at their initial value). Polarisation, however, is more complicated, because it refers to a complex non-linear pattern of change that is difficult to even define analytically.

Job polarisation involves shifts in the employment structure from the middle to the extremes, and most experts would agree that these shifts must show some symmetry in order to qualify as polarising. Previous attempts at devising a single measure to capture the concept of job polarisation have involved a variety of different and, in some cases inconsistent, approaches. For instance, following the method used by Goos and Manning (2007), some papers measure job polarisation by looking at the signs of the simple and quadratic terms of a coefficient linking the wage percentile of a job and its change in log employment in a regression model. If the quadratic term is negative (and the simple term positive), then there is job polarisation. But a quadratic term linking two variables in an equation only reflects convexity in the regression line: a line showing exponential growth is also convex, but nobody would say it represents a polarising pattern. Other proposals, including some that have been applied to regional analysis at country level (for instance, Jones and Green, 2009) try to construct an index that measures polarisation as deviations from the mean in an initial percentile distribution. This seems like a sounder proposal, but the results of this index often contradict what a simple quantile analysis of structural change would suggest (for instance, assigning much larger values of polarisation to patterns that look like very mild ones). The ambiguity and lack of consensus on what job polarisation really is and how it could be measured synthetically may, paradoxically, be one of the reasons it has been such a popular concept in recent socioeconomic research, precisely because it allows a lot of flexibility in interpretation, perhaps too much. A more solid proposal that would remove at least some of this ambiguity would be a very good contribution to the field but is beyond the scope of this paper.

A second alternative is to continue using the quantile approach that has been useful for the EJM previously but to reduce it to the simplest possible pattern that captures the concepts of job polarisation and upgrading. The simplest possible expression of the quantile approach for our purposes is terciles. Classifying jobs (occupation by sector combinations) into three groups of approximately equal size, ranked from low to high wages, can provide a sufficiently synthetic way to analyse structural employment change by region. Terciles can capture both polarisation (growth of the top and bottom terciles relative to middle) and upgrading (growth in the upper terciles relative to lower), as well as their mirror concepts of middle-biased growth (relative expansion of the middle tercile compared to the other two) and downgrading (relative expansion in lower terciles). When analysing changes in the relative composition of employment, terciles also have the advantage of requiring only two parameters to represent any pattern: if the three terciles must add up to 100%, then a structure of employment can be perfectly described just by representing two of the terciles, such as the bottom and top ones. For instance, if the terciles are initially equal in share (33.3%, 33.3%, 33.3%), and after some years the top and bottom terciles expand by 2 percentage points (35.3%, 29.3%, 35.3%), just by showing the change in the top and bottom terciles (+2 percentage points, +2 percentage points), the change in the middle (-4 percentage points) can be inferred because the three values must add up to 0. In other words, when analysing compositional change, terciles make it possible to characterise any pattern of job polarisation and upgrading with only two parameters.

The main disadvantage of terciles is that they are less precise than quintiles or deciles and therefore can miss some developments at a finer level of granularity. However, since the large number of observations (regions) requires more parsimony, this can be understood as an advantage too: only very clear cases of job polarisation and upgrading are observed, while developments at a more detailed level are abstracted away.

Grouping the jobs into terciles provides the necessary simplification of the analysis. However, how can comparability be ensured, given the large initial structural differences across European regions, as previously discussed? Our solution to this problem is to change the reference structure for analysing change over time: instead of using the initial structure of each region as the yardstick to analyse its change, the overall EU structure of employment – as approximated by the employment data from nine Member States accounting for over three-quarters of EU workers – in each year is used as a consistent point of reference for all European regions. Change is then analysed in terms of convergence towards or divergence from that structure. This is a subtle but significant departure from the way structural change is normally analysed in the EJM.

The regional analysis is constructed as follows. First, an average normalised ranking is calculated for each job in the nine EU countries covered in this study in the first year of analysis. For instance, the job of secretary in the construction industry occupies a slightly different percentile position in each country (it may have a percentile position of 37.3 in Spain, 40.7 in France, and so on). The weighted average of the nine percentile positions for the same job across all countries could, for instance, be 39.5. This average percentile position is then renormalised according to overall EU employment, to allocate all jobs in three equal-sized groups (terciles), ranked from lowest to highest average wage. In the example, the job of secretary in the construction industry would be defined as a mid-paid job, because it would fall in the middle tercile of the EU as a whole.

Then, a simple calculation for each region establishes what is the actual share of employment for each of those terciles: the distance from the share of the nine Member States (which is 33.3% by construction) indicates how a given region differs from the average employment structure for the nine. For instance, if a region's employment comprises 25% low-paid jobs, 30% mid-paid jobs and 45% high-paid jobs, its employment structure is clearly more upgraded than that of the EU (since the same three categories of jobs account for an equal share of 33% in the nine Member States as a whole). If the exact same exercise is carried out at the end of the period of analysis, and the same region's employment turns out to be made up of 35% low-paid jobs, 30% mid-paid jobs and 35% high-paid jobs, it can be concluded that the region is now closer to the average employment structure of the nine Member States. In addition, in relative terms, its structure has downgraded, because over the period, its share of low-paid jobs has expanded by 10% and its share of high-paid jobs has decreased by the same amount, while the share of mid-paid jobs has remained stable.

This approach achieves several things simultaneously. Firstly, it ensures a high degree of comparability: the jobs classified as high-paid, mid-paid or low-paid are exactly the same across all regions, according to their average wage in all nine countries, facilitating comparison of the regions' different employment structures. Secondly, it takes into account the initial (and final) large structural differences across European regions, because the initial (and final) shares of high-paid, mid-paid and low-paid jobs reflect how different each region is from the average EU employment structure. Thirdly, it allows the identification of patterns of job polarisation and upgrading over time, since the difference between the initial and the final structure reflects structural change in a similar way to the standard EJM approach (although as previously mentioned, not entirely

identical). An additional benefit of this approach is that it addresses the issue of convergence and divergence in the employment structures of regions towards the EU average, a subject of great interest on its own.

To sum up, in this section the concepts of job polarisation and upgrading are explored from both a static and a dynamic perspective.

1. **From a static perspective, it analyses whether each region is polarised or upgraded in its employment structure relative to that of the EU**; in other words, whether it has more high-paid, and low-paid jobs relative to mid-paid jobs, or whether it has generally more high-paid jobs than the EU as a whole.
2. **From a dynamic perspective, it analyses whether in the period covered, the employment structure of each region polarised or upgraded relative to that of the EU**; in other words, whether its share of high-paid and low-paid jobs expanded more than its share of mid-paid jobs, or whether high-paid jobs generally expanded more than in the EU as a whole.

Change in the reference employment structure

The problem with using the employment structure of nine selected Member States in each year as the point of reference for the analysis is that this structure changed in the period covered, and that change is not visible in the regional-level analysis. For instance, if a region is identical in its employment structure to the EU as a whole in the years 2002 and 2017 (the beginning and end of the period analysed), then the analysis will show no change in the employment structure of that region, since all change is expressed relative to the average employment structure of the nine Member States.

This problem is easily solved by starting the analysis with a brief description of the overall change in the employment structure of the nine Member States, shown in Figure 11. The first chart uses the quintile representation of absolute change in employment that has frequently been used in previous EJM reports. The main difference is that, in this case, the figures reflect change only in the employment structure of the nine countries rather than the EU as a whole. Furthermore, the level at which jobs are defined is one-digit level for sector and two-digit level for occupation (and this is maintained in the rest of this report). Other than that, the analysis is identical to the one normally used in EJM analyses.

The results obtained are consistent with previous publications despite the different number of countries represented and the different granularity in the definition of jobs. According to this analysis, over the three periods shown (2002–2007, 2008–2010 and 2011–2017), the employment structure of the nine Member States experienced a more or less consistent pattern of slightly polarised upgrading: the mid-paid and mid-low-paid quintiles declined in relative terms (and even in absolute terms during the 2008–2010 crisis period); the top quintiles expanded significantly (or were more resilient in the crisis); and the very bottom quintile expanded marginally (or was more resilient in the crisis).

The second chart in Figure 11 represents the same structural change but using terciles instead of quintiles. This representation is very important because it is consistently used as a reference throughout this report.

Figure 11: Changes in the employment structure, by job–wage quintile and tercile, nine Member States, 2002–2017

Source: *EU-LFS, SES (authors' calculations)*

It is immediately apparent that using terciles rather than quintiles produces a slightly different picture, although one that is consistent in broad terms. In the two periods of employment expansion shown (2002–2007 and 2011–2017), the use of terciles rather than quintiles means that polarisation is not apparent anymore. This is because the marginal polarisation observed when using quintiles is concentrated in the second-lowest quintile, and the higher aggregation evens this out. For those periods, the tercile representation shows mostly upgrading, concentrated in the top tercile with a flat pattern for the two lowest terciles. The period of the crisis (2008–2010) does show a polarising picture even when using terciles, with a sharp decline in mid-paid jobs, a much slighter decline in low-paid jobs (lowest tercile) and almost no absolute change in the number of high-paid jobs (top tercile).

The charts in Figure 11 show that, because terciles are more aggregated than quintiles, some of the nuance in the analysis is lost. The marginal and asymmetric polarisation of the two expansionary periods disappears from the picture, whereas the sharp and unambiguous polarisation of the crisis period is captured well. The tercile approach simplifies the analysis so that only clear and unambiguous cases of upgrading and polarisation will emerge. On the one hand, this is an operational advantage, since with so many units of observation, it would be impossible to attend to all the different possible (and debatable) modalities of job polarisation and upgrading that can emerge from a quintile approach. On the other hand, this can make any conclusions drawn more robust since only clear and unambiguous cases of polarisation and upgrading are identified. For instance, going back to the aggregate quintile picture for the nine Member States as shown in Figure 11, emphasising the extent of the polarisation in the expansionary periods can be misleading because it is rather marginal, whereas upgrading is clear and unquestionable. In the crisis period, on the other hand, polarisation is clear and unquestionable, whereas any upgrading is marginal. Both key patterns are well captured in the tercile picture, in a more focused and straightforward way.

In any case, the tercile chart in Figure 11 is significant because it represents the change in the employment structure of the nine selected Member States that is the reference for most of the regional analysis. If a particular region does not differ much from the EU reference in its structural employment change, then it experienced a similar (slightly polarised upgrading) trend. If a particular region appears as having downgraded relative to the nine Member States, then it expanded its lower terciles more than the EU picture shown above, and so on.

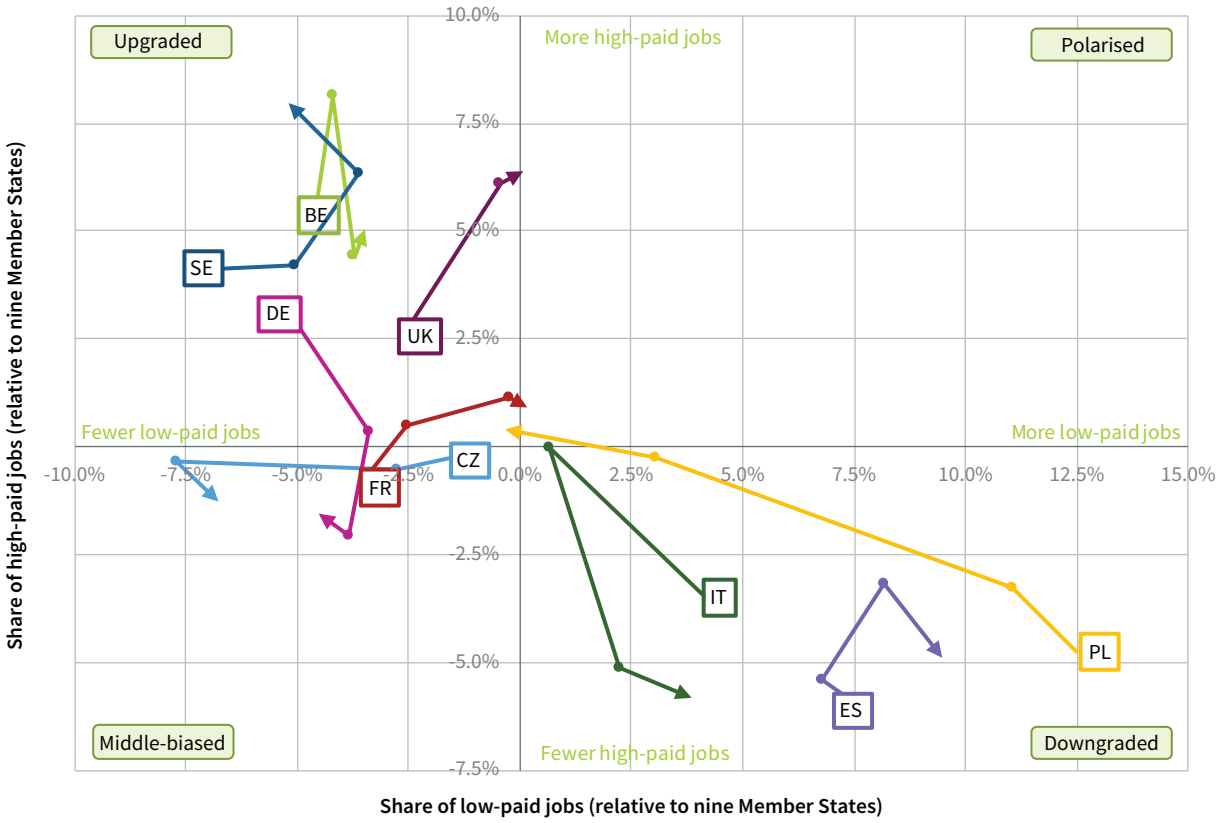
Polarisation and upgrading by country

Although they are well known and have been analysed in detail before, a brief description of the broad patterns of employment polarisation and upgrading for the nine Member States analysed at a regional level provides necessary contextual information to understand the rest of the analysis. This description of the broad country-level developments is also useful to introduce in a simple way the type of analysis that is generalised later for all regions.

Figure 12 shows a static and a dynamic view of job polarisation and upgrading across the nine countries in the period 2002–2017. The horizontal axis represents the difference between the share of low-paid jobs (lowest tercile) in the country and in the nine Member States as a whole (which, by construction, is approximately 33.3%). The vertical axis represents the difference between the share of high-paid jobs (highest tercile) in the country and in the nine Member States as a whole (again, approximately 33.3% by construction). Thus, a country would have the exact same percentage of high-paid and low-paid jobs as the nine Member States if it had a value of 0 in both axes (and also of mid-paid jobs, since the three must add up to 100). The distance from the axes, therefore, represents the distance to the average share of high-paid (vertically) and low-paid jobs (horizontally) in the nine Member States. Each country is represented with a line that starts in 2002 and ends in 2017; the end point of the line represents 2017 and is indicated by an arrow; the other extreme of the line represents 2002 and is indicated by the country initials; and the bends in the line reflect the values for 2007 and 2012.

For instance, Figure 12 shows that in 2002, Poland had around 12.5% more low-paid jobs than the average of the nine selected Member States, and around 5% fewer high-paid jobs. Note that only the proportions of high-paid and low-paid jobs are represented. There is no need to represent the proportion of mid-paid jobs; it can be inferred, since the three differences must add up to 0 (so in this case, Poland had around 7.5% fewer nmid-paid jobs than the average of the nine Member States in 2002). These results imply that in 2002, Poland had a notably downgraded employment structure relative to the EU (many more low-paid jobs and fewer mid-paid and high-paid jobs). However, the line shows how the Polish employment structure changed between 2002 and 2017 relative to the average employment structure of the nine Member States, and it can immediately be seen that the change was quite remarkable. Fifteen years later (in 2017, represented at the end of the line with a dot), the employment

Figure 12: Change in the employment structures of nine European countries compared to the average of all nine, 2002–2017



Note: *Four data points for each country correspond to 2002, 2007, 2012 and 2017. The end point of the line represents 2017 and is indicated by an arrow; the other extreme of the line represents 2002 and is indicated by the country initials; and the bends in the line reflect the values for 2007 and 2012.*
Source: *EU-LFS, SES (authors' calculations)*

structure of Poland had converged entirely with the average of the nine Member States. This means that the share of high-paid, mid-paid and low-paid jobs in Poland in 2017 was almost identical to that of the average of the nine Member States, indicated by the fact that the dot for Poland in 2017 is almost exactly at 0 on both axes. This convergence implies a massive upgrading, with a very significant reduction in the share of low-paid jobs (from +12.5% relative to the average to nearly 0), a significant expansion of high-paid jobs (from -5% to nearly 0) and a significant expansion of mid-paid jobs (from -7.5% to nearly 0).

Patterns of structural change

Whereas vertical and horizontal shifts imply changes in the share of high-paid and low-paid jobs, shifts in the diagonals of each quadrant represent the four main patterns of structural change in the analysis.

- Moving towards the top left quadrant implies growing high-paid and declining low-paid jobs and therefore upgrading.
- Moving towards the top right quadrant implies growing high-paid and low-paid jobs (and thus implicitly declining mid-paid jobs) and therefore polarisation.
- Moving towards the bottom right quadrant implies growing low-paid and declining high-paid jobs and thus downgrading.
- Finally, moving towards the bottom left quadrant means declining high-paid and low-paid jobs (and thus implicitly expanding mid-paid jobs) and therefore a middle-biased pattern (the opposite to polarisation).

Patterns by country

Poland, which experienced the most striking case of upgrading and structural convergence (see Figure 12), has already been described. The main country-level patterns observed in the other eight Member States is summarised as follows.

- As with Poland in 2002 (but not in 2017), Italy and Spain were initially in the bottom right quadrant and therefore characterised by a downgraded employment structure relative to the average of the nine Member States. However, whereas Poland moved from the downgraded quadrant during this period, Italy and Spain remained there, although they experienced diverging developments. Italy upgraded quite significantly between 2002 and 2007, moving very close to the average of the nine

Member States, but afterwards it bent backwards and downgraded even more significantly, meaning the share of high-paid jobs fell and the share of low-paid and mid-paid jobs expanded. Spain, on the other hand, moved in a polarising direction, whereby the share of both high-paid and low-paid jobs expanded relative to the EU average until 2012 and then moved towards downgrading until 2017.

- France started with fewer low-paid jobs than the average in 2012 but converged towards the structure of the nine Member States until 2017, with its relative share of high-paid jobs expanding, but more so its share of low-paid jobs.
- Belgium and Sweden started in a similarly upgraded position relative to the average of the nine Member States. But Sweden's share of high-paid jobs expanded in the period as did its share of low-paid jobs, but to a lesser extent, thus exhibiting polarisation in relative terms. Belgium finished very close to where it started, though with a marginal downgrading trend.
- The United Kingdom started relatively high in the upgraded quadrant but clearly moved towards polarisation, with a significant relative expansion of both high-paid and low-paid jobs.
- Germany started in an upgraded position compared to the average in the nine Member States, but in the period shown, it reduced significantly its relative share of high-paid jobs, moving towards the middle-biased quadrant.
- Czechia, which started close to the origin on both axes (and was therefore similar to the average employment structure of the Member States), moved mostly on a horizontal line. This implies a reduction in low-paid jobs and an increase in mid-paid jobs, thus moving towards the middle-biased quadrant.

These results are very consistent with the findings of the EJM over the years and add useful information on the static differences between countries in the beginning and end of the period, on top of the dynamic representation of change in the national structures of employment. The main insights from Figure 12 are summarised below.

- In 2002, the employment structures in Europe were diverse: Italy, Poland and Spain had relatively downgraded employment structures; Belgium, Germany and Sweden, relatively upgraded; the United Kingdom, relatively upgraded but also polarised; and finally, Czechia and France were similar to the EU average but slightly higher in their share of mid-paid jobs.
- Between 2002 and 2017, the patterns of occupational change across Europe were also diverse. Some countries upgraded quite significantly (especially Poland), some downgraded (Italy and Spain), some polarised (the United Kingdom and, to a lesser extent, France and Sweden), and some experienced a middle-biased trend (Czechia and Germany).
- As a result of these changes, some of the countries changed their position relative to the EU in terms of their employment structure. France and Poland converged very strongly towards the average of the nine Member States. Italy and Spain remained in the downgraded category, while Belgium and Sweden remained in the upgraded one. The United Kingdom moved very close to the purely polarised category, while Czechia and Germany moved to the mirror middle-biased category. Overall, there was as much diversity in the European employment structures in 2017 as 15 years earlier.

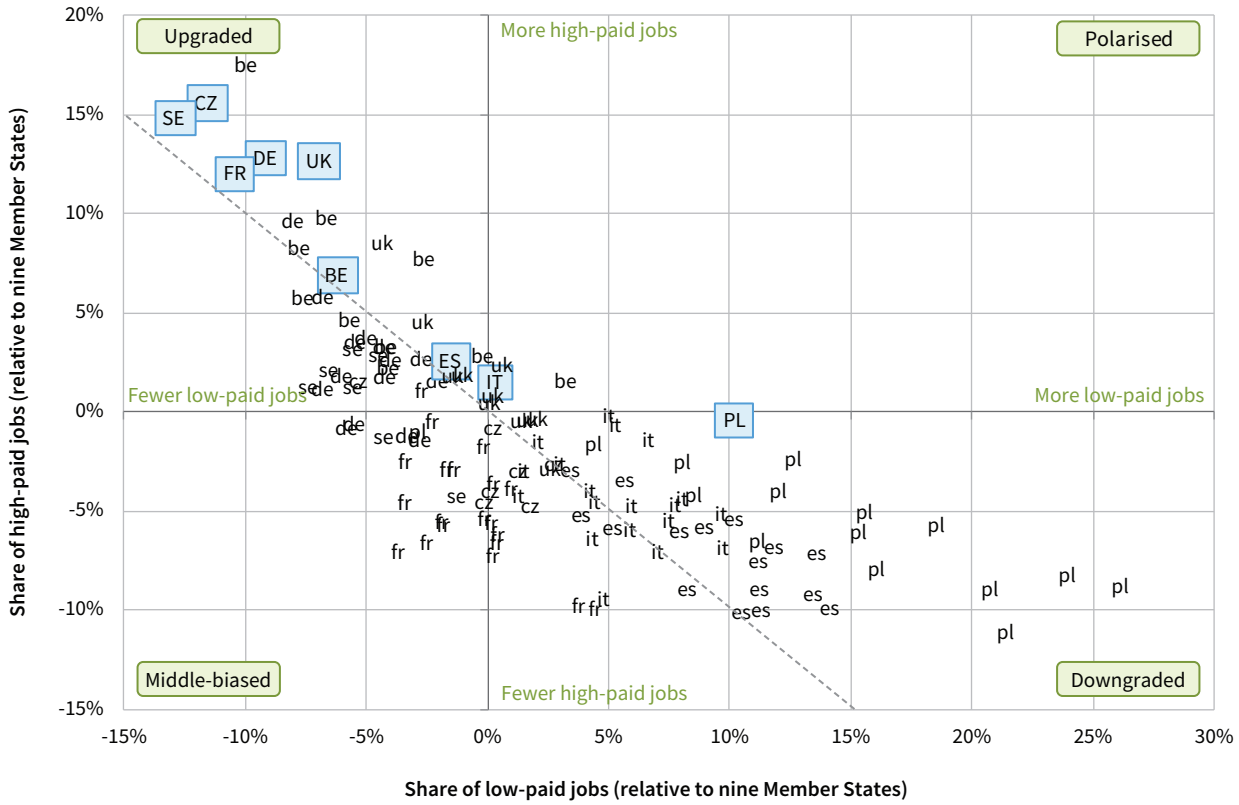
Polarisation and upgrading by region

Now the core findings of this analysis can finally be introduced: the patterns of employment polarisation and upgrading in EU regions between 2002 and 2017 relative to the EU average. The representation is identical to the one shown earlier in Figure 12, except that the dots represent regions rather than countries. Since there are so many regions in the nine European countries covered in the analysis, some simplification is required. This is done in two ways. Firstly, instead of showing a line representing change for a given region (as in Figure 12), the initial (Figure 13) and the final (Figure 14) position of the regions in terms of polarisation or upgrading relative to the average of the nine Member States is indicated. This gives a broad picture of how the regional employment structures changed between 2002 and 2017 but not of how each particular region changed in that period (this is outlined on a country-by-country basis in the next section, 'Analysis of regional developments by country'). Secondly, individual regions are not indicated by their name: each region is represented by the code of its country (BE for Belgium, and so on); however, capital city regions are differentiated by using framed capital letters, while the non-capital city regions are represented in lowercase.

Employment structure, 2002

The relative difference between the employment structure of each region and the EU average in 2002 is represented in Figure 13.

Figure 13: Static relative polarisation and upgrading in regions compared to average in nine Member States, 2002



Note: *Capital city regions denoted by boxed capital country codes, other regions by lowercase country codes.*
Source: *EU-LFS, SES (authors' calculations)*

The findings in Figure 13 can be summarised in three main insights.

Firstly, most of the regional values are concentrated in the upgraded or downgraded quadrants, with some regions in the middle-biased quadrant and just one region clearly located in the polarised quadrant (the Belgian region of Limburg). However, this should not be interpreted as a nearly complete absence of relatively polarised regions. In fact, any region above the dashed diagonal line going from the upper left to the lower right has experienced some degree of polarisation, although combined with an upgraded or downgraded pattern that is dominant. For instance, it can be seen in Figure 13 that, in 2002, the Polish capital city region (Mazowieckie) had around 10% more low-paid jobs than the average in the nine Member States and around the same percentage of high-paid jobs as the nine. This implies (since, again, the deviations from the EU average must add up to 0 for any given region) that Mazowieckie also had around 10% fewer mid-paid jobs than the average in the nine. A pattern of 10% more low-paid jobs, 10% fewer mid-paid jobs and around the same share of high-paid jobs as the average can be interpreted as a downgraded and polarised employment structure. Similarly, several regions display some degree of polarisation, but this tends to be simultaneous with an even more significant pattern of either upgrading or downgrading. Therefore, most of the diversity among European regions in terms of their employment structures in 2002 is associated with either upgrading or downgrading patterns. And while there are many clear cases of polarisation, it is rarely symmetrical and tends to be dominated by either upgrading or downgrading. Interestingly, the rarely discussed pattern of a middle-biased employment structure (one in which jobs in the middle have a larger share of employment) was much more common and clear (symmetrical) in 2002 than the frequently discussed pattern of polarisation.

Secondly, as expected, regions cluster around the country values presented earlier in Figure 12. However, importantly, there is a very significant amount of overlapping between the regional values of different countries, which means that the regional breakdown shown in Figure 13 is very relevant. If all the regions of a given country were around the country average values, and there was little overlapping between them, then it could be concluded that the regional breakdown brings little added value with respect to the country analysis. But the regions of most countries are quite widely spread in Figure 13, and the degree of overlapping between them is quite remarkable. The bottom right quadrant of relatively downgraded employment structures is dominated by Italian, Polish and Spanish

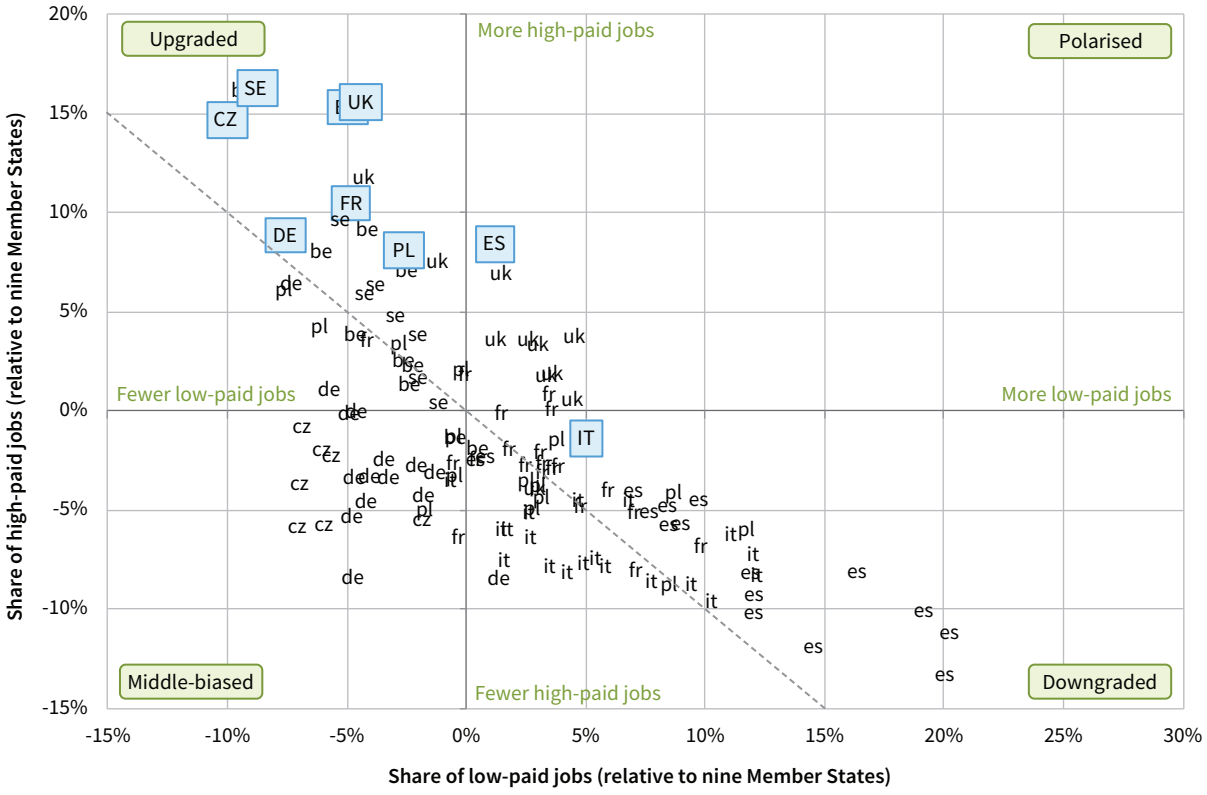
regions, as expected, but there are also several regions from other countries such as Czechia, France and the United Kingdom. It is very interesting to see that there are many French regions in the bottom left quadrant of middle-biased employment structures, together with several Czech, German, Polish and even some Swedish regions. Most of the Belgian regions are in the upgraded quadrant, with the exception of the mildly but symmetrically polarised region of Limburg. Lastly, mixed in the upper left quadrant of upgraded employment structures, are the remaining German, Swedish and UK regions.

Finally, the most striking regional pattern identified in Figure 13 perhaps is the sharp divide between the capital city regions and the rest of the regions in all European countries. Without exception, the capital city regions tend to be located towards the upgrading quadrant compared to the rest of the country, although on their own they may have relatively polarised or even downgraded employment structures. This is the case of Mazowieckie, by far the least upgraded capital city region but still decidedly more upgraded than all the other Polish regions. Comunidad de Madrid and Lazio (the Italian capital city region) also have relatively downgraded structures compared to other European regions, but they are highly upgraded compared to other regions in their respective countries. Although Brussels is one of the most upgraded capital city regions in Europe, it is overshadowed by three other Belgian regions with even more upgraded structures, which is relatively rare. London is also more upgraded than most other UK regions, but it displays a relatively high degree of polarisation too. The French, German and Swedish capital city regions are at the far side of the upgraded quadrant, again quite distant from the rest of their regions. However, perhaps the most striking case is Prague, which has one of the most upgraded employment structures of all the regions represented in Figure 13, contrasting with middle-biased or downgraded structures in most other Czech regions.

Employment structure, 2017

How much did these patterns change over the following 15 years? Figure 14 shows the same regions 15 years later, using the same representation. In this case, the values represent the difference between the share of high-paid and low-paid jobs in each region and the overall employment structure in the nine Member States in 2017.

Figure 14: Static relative polarisation and upgrading in regions compared to average in nine Member States, 2017



Note: *Capital city regions denoted by boxed capital country codes, other regions by lowercase country codes.*
Source: *EU-LFS, SES (authors' calculations)*

As Figures 13 and 14 show, there were many changes between 2002 and 2017. These can be summarised in three key points.

Firstly, although the upgraded–downgraded diagonal axis is still the dominating one, there are many more cases of clearly and symmetrically polarised regional employment structures as well as more cases of clearly and symmetrically middle-biased employment structures than in 2002. In other words, it seems that jobs in the middle of the employment structure are becoming more significant in the diversity of regional labour markets in Europe.

Secondly, there is clearly more overlapping between the regional employment structures of the different countries than in 2002, suggesting that differences by country are becoming less relevant and differences by region more relevant over time. In other words, regions within the same country are becoming more different in their employment structures, whereas European countries themselves are either maintaining their differences or becoming more alike. This is the result of very different trends in terms of regional developments across countries. Most of the Polish regions experienced an impressive upgrading process, meaning that they are no longer dominant in the downgraded quadrant (as they were 15 years earlier). Italy and Spain, in contrast, did not see much improvement at all: in fact, many regions moved even further towards the downgraded quadrant. The French regions appear in all quadrants but are generally very close to the European average. Many Czech and German regions moved towards the middle-biased quadrant (which was dominated by France 15 years earlier), while many UK regions moved towards the polarised quadrant (indeed, UK regions are the most consistently polarised ones). Finally, the Belgian and Swedish regions are generally spread around the upgraded quadrant, as they were 15 years earlier.

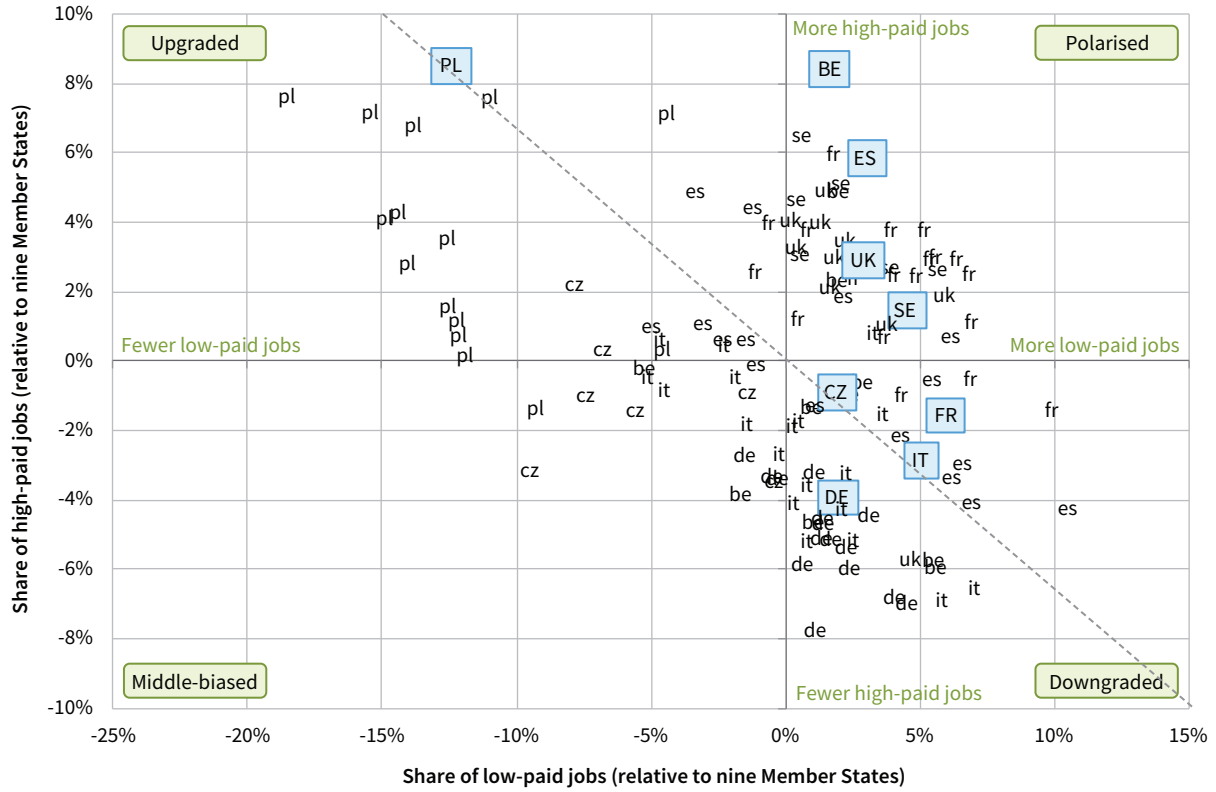
Thirdly, the position of capital city regions also changed in interesting ways. Again, the most impressive shift is observed in the Polish capital city region, Mazowieckie, which moved towards a rather polarised but upgraded structure from a polarised and downgraded structure 15 years earlier. Lazio is quite striking too but for the opposite reasons: from a position very close to the average of the nine Member States, its relative share of low-paid jobs expanded and it moved clearly towards the downgraded quadrant. In contrast, Madrid's share of high-paid jobs expanded mostly and thus its employment structure upgraded, but the relative share of low-paid jobs also expanded and therefore the region experienced some polarisation. London and Brussels also experienced a significant shift towards the polarised quadrant, whereas the capital city regions of Czechia, France, Germany and Sweden remained very high in the upgraded quadrant and very distant from the other regions.

Employment change, 2002–2017

The changes in the relative position of the different regions can be better identified in Figure 15, which simply represents the difference between the 2017 and the 2002 values for the share of high-paid and low-paid jobs. On its own, Figure 15 provides a limited picture because it shows only change and abstracts from the initial differences, which as previously indicated are highly significant and must be taken into account. However, since initial and final positions have already been discussed in detail, it is also useful to focus on change to close this analysis.

In terms of change (as shown in Figure 15), polarisation and downgrading are, perhaps surprisingly, the most common patterns. The polarised quadrant (which in this case must be understood as reflecting the nature of change between 2002 and 2017, not the employment structure of each region compared to the EU at a given point in time) is highly populated in this case (with mostly French and UK regions, as well as some Belgian, Spanish and Swedish regions). It includes four of the capital city regions (Brussels, London, Madrid and Stockholm). In all these regions, the relative shares of both high-paid and low-paid jobs expanded, and thus they experienced some degree of job polarisation. The downgraded quadrant is also highly populated when the focus is exclusively on change; it contains four capitals (Berlin, Paris, Rome and, to a lesser extent, Prague) as well as many regions of Italy and Spain but also of Belgium, France, Germany and the United Kingdom. The purely upgraded quadrant contains Polish regions predominantly, reflecting the impressive occupational upgrading experienced by Poland between 2002 and 2017. The middle-biased quadrant is mostly populated with Czech regions, as well as some German and other country regions.

Figure 15: Dynamic relative polarisation and upgrading in regions compared to average in nine Member States, 2002–2017



Note: *Capital city regions denoted by boxed capital country codes, other regions by lowercase country codes.*
Source: *EU-LFS, SES (authors' calculations)*

The main findings of this analysis can be summarised in three key points.

Firstly, there is a very significant and growing diversity in the employment structures of the different European regions. Employment structures and their change over time are clearly differentiated by regions as much as, or even more than, by country.

Secondly, an axis that goes from downgraded to upgraded employment structures (relative to the EU average) can characterise most of the static differences between European regions, but a secondary axis of polarised to middle-biased employment structures is gaining importance. From a dynamic perspective (in terms of change), the most important patterns observed in the period analysed are polarisation and downgrading (although with many exceptions, including most Polish regions).

Thirdly, capital city regions differ systematically from the other regions of the same countries and generally in very similar ways. With few (but significant) exceptions, capitals tend to have much more occupationally upgraded labour markets.

Analysis of regional developments by country

The previous section provided an overview of regional developments in the nine Member States analysed for this study without identifying any specific region except for the capital region of each country. In this section, regional developments in terms of polarisation and upgrading for each country are presented separately, identifying all regions by name. Although the regional results are presented and discussed by country, the same reference for the definition of the three terciles of jobs (high-paid, mid-paid and low-paid) is used as the reference employment structure against which the regional values are defined.

General developments by Member State

To analyse regional developments at the country level, two different types of representation are used. Firstly, the regions of each country are represented in terms of polarisation and upgrading relative to the average employment structure in the nine Member States analysed, in 2002 and 2017 (see Figure 16, which illustrates developments in Spain). Essentially, this first representation is a close-up view of Figures 13 and 14 for the regions of each country in turn, with the difference that the values for 2002 and 2017 have been

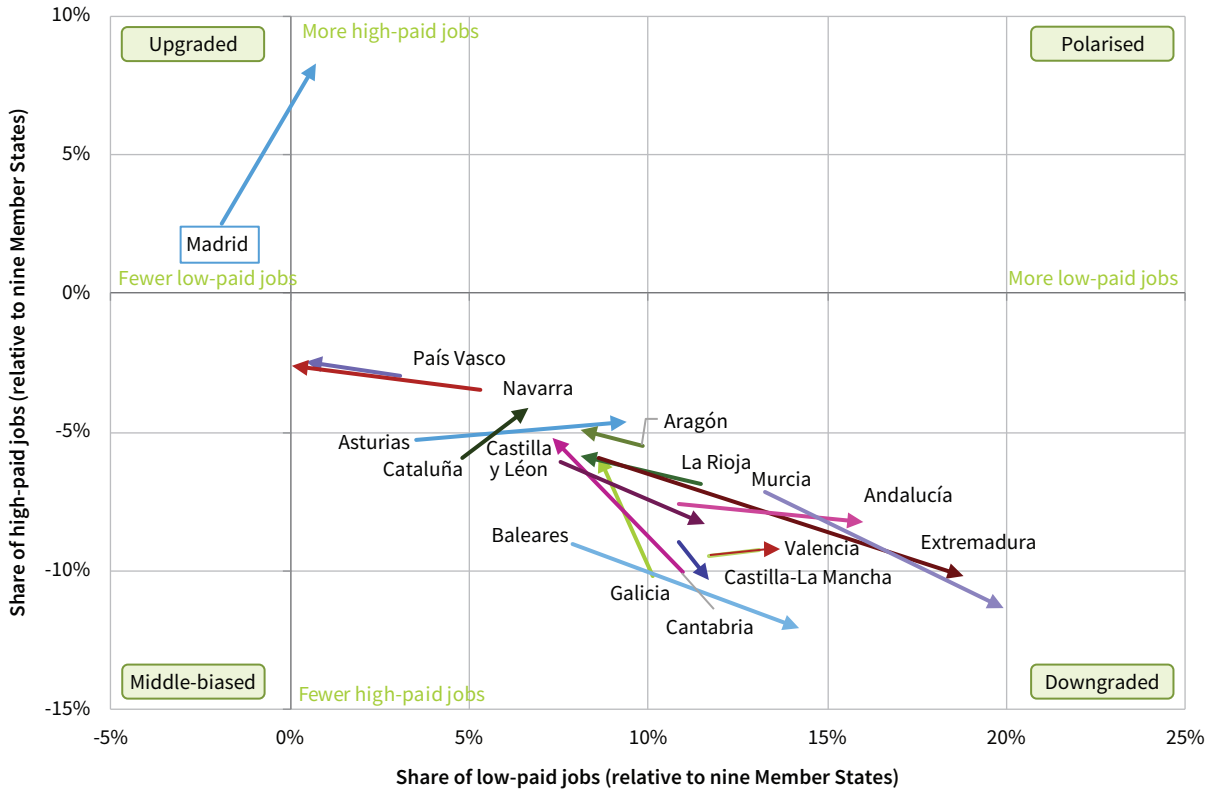
included in a single chart (with a line linking them for each region) and that the regions are identified individually. The vertical and horizontal axes still represent the average share of high-paid and low-paid jobs in the nine Member States (which is 33.3% by construction), and the position of each region is identical to the one discussed earlier in Figures 13 and 14. Each region is represented by a line starting in 2002 and ending in 2017.

Secondly, and as an additional perspective to better understand the regional developments of each country, a simple representation of absolute change in the terciles is added for each region of the same country. The terciles are the same as in previous charts, but in this case, employment change is presented in thousands (of workers) in each region rather than as change in relative shares. This additional perspective is important because the same relative change can have very different implications depending on the absolute developments that are behind it. A region can upgrade its employment structure because of a sharp absolute decline in low-paid and mid-paid jobs – arising from large emigration, for instance. Obviously, that is very different from a region where the employment structure upgrades because of fast economic growth and the creation of many high-paid jobs. Yet, in relative terms, both patterns can look very similar, as an increase in the relative share of high-paid jobs (see Figure 16). It is important, therefore, to complement the relative picture (presented in Figure 16 for Spain) with the absolute developments (presented in Figure 17 for Spain).

Spain

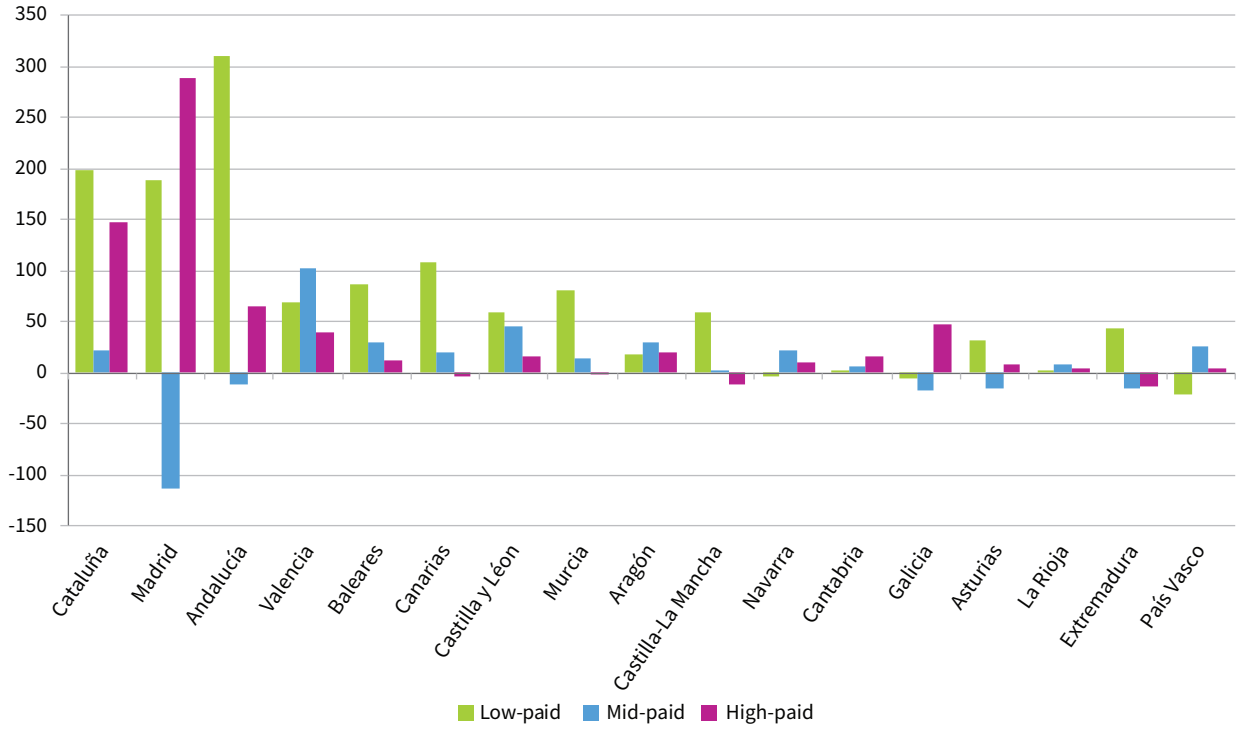
Figure 16, therefore, represents the patterns of regional job polarisation and upgrading in Spain between 2002 and 2017 relative to the nine Member States. As already indicated (although now it is far clearer), only Madrid is outside the downgraded quadrant throughout the period. In other words, all Spanish regions except Madrid have relatively more low-paid jobs than the average of the nine Member States analysed and, to a lesser extent, fewer high-paid jobs (implicitly, also, slightly more mid-paid jobs). Between 2002 and 2017, Madrid's employment structure polarised and upgraded, moving towards the upper right quadrant. A number of regions in the north saw upgrading developments (with the expansion of high-paid jobs and declining shares of low-paid jobs), for instance País Vasco, Navarra, La Rioja and Galicia. By contrast, many of the Mediterranean and southern regions (Andalucía, Extremadura, Murcia and Baleares)

Figure 16: Spain: Changes in the regional employment structure compared to the average in nine Member States, 2002–2017



Source: *EU-LFS, SES (authors' calculations)*

Figure 17: Spain: Absolute change in jobs (thousands), by tercile according to region, compared to the average in nine Member States, 2002–2017



Source: *EU-LFS, SES (authors' calculations)*

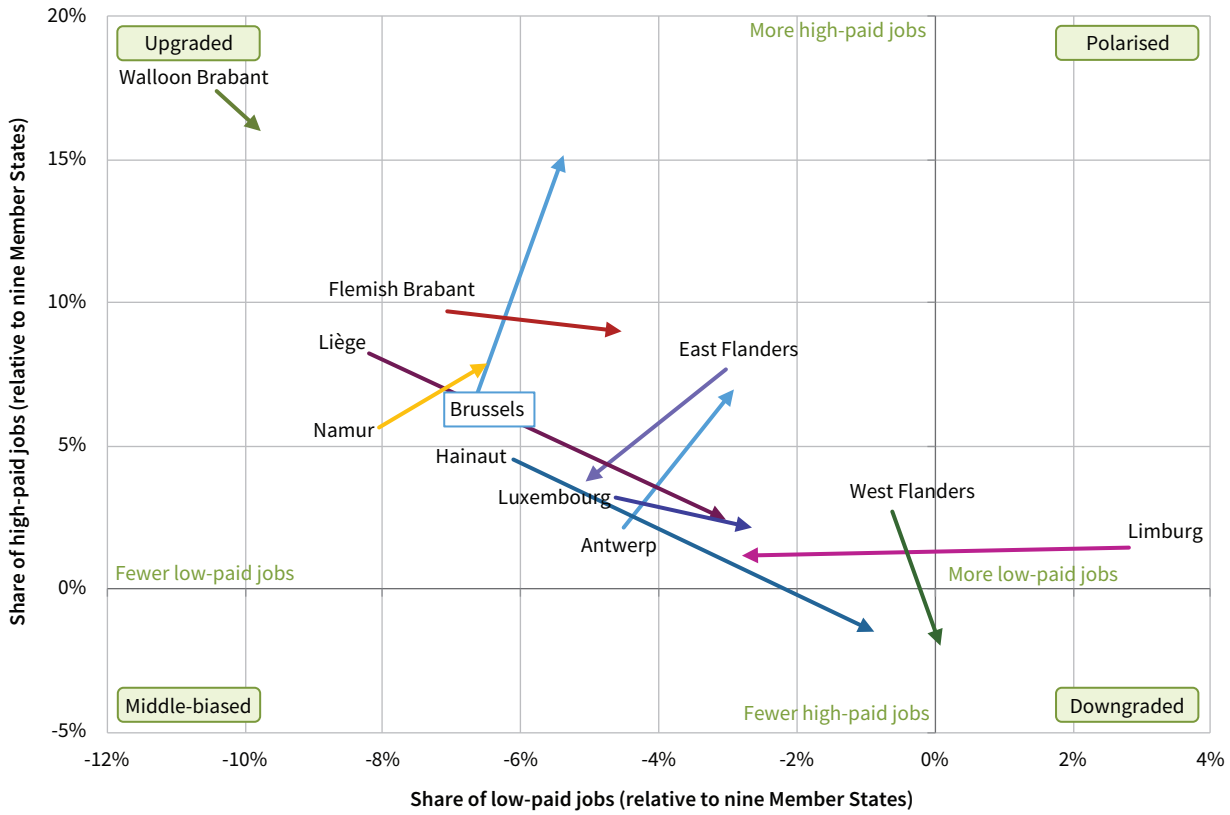
experienced significant expansions in their shares of low-paid jobs, moving further down the downgraded quadrant.

If represented as absolute change, as shown in Figure 17, an important additional dimension to these occupational developments is revealed. The three regions where most of the absolute employment expansion concentrated were Cataluña, Madrid and Andalucía, and each had a different pattern of occupational change. Cataluña and Madrid mostly created high-paid and low-paid jobs, with no change in the absolute number of mid-paid jobs in Cataluña and a significant absolute decline in Madrid. Andalucía, on the other hand, saw a large absolute expansion of low-paid jobs only, with mid-paid jobs declining slightly and high-paid jobs expanding to a small extent. Compared to these three regions, the number of jobs created or destroyed in absolute terms in the other regions is comparatively small. In most cases, however, absolute employment growth tended to be concentrated in the lower tercile, with few exceptions.

Belgium

As indicated earlier, most Belgian regions are spread around the upgraded quadrant (top left) of Figure 18, which means almost all Belgian regions have a higher share of high-paid jobs and a lower share of low-paid jobs than the average of the nine Member States. Patterns in the employment structure over the period 2002–2017 relative to the nine are very diverse across regions. On the one hand, the capital city region of Brussels and the large economic poles of Antwerp and Namur are polarised, although the share of high-paid jobs increased much more in Brussels. On the other hand, a rather downgrading pattern emerged in half of the regions: Hainaut, Liège, Luxembourg, Flemish Brabant and West Flanders. Meanwhile East Flanders and Limburg showed a middle-biased trend (in the latter, due to a strong reduction in the of share of low-paid jobs) and Walloon Brabant upgraded slightly.

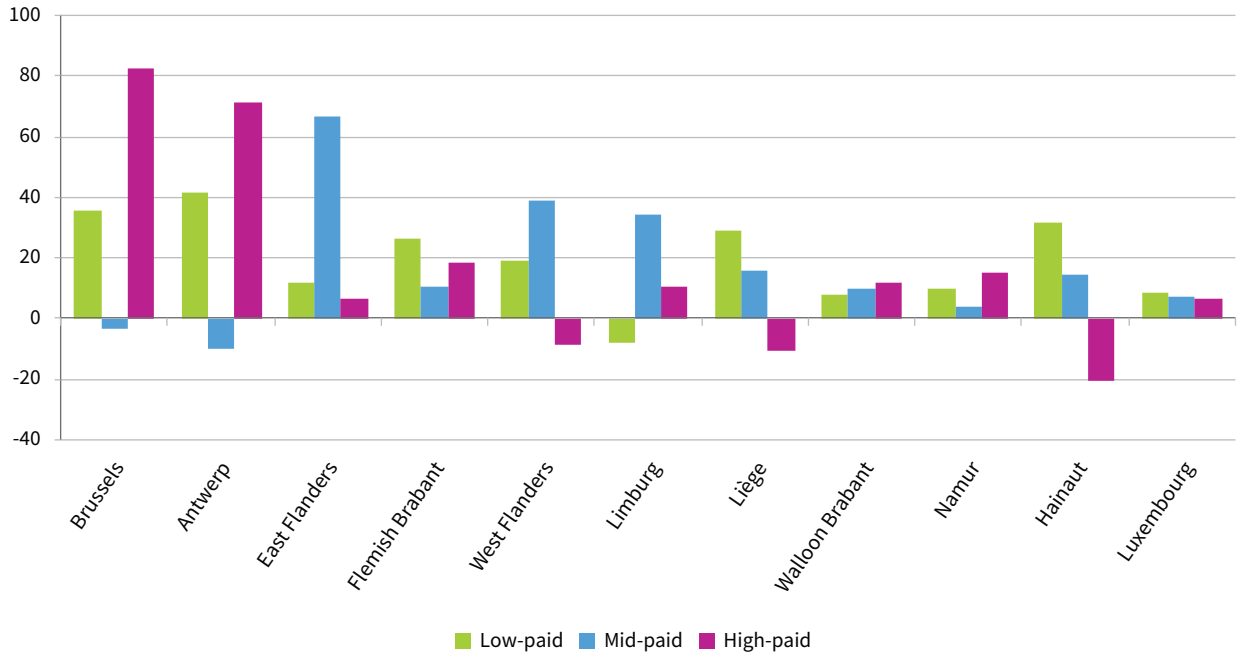
Figure 18: Belgium: Changes in the regional employment structure compared to the average in nine Member States, 2002–2017



Source: *EU-LFS, SES (authors' calculations)*

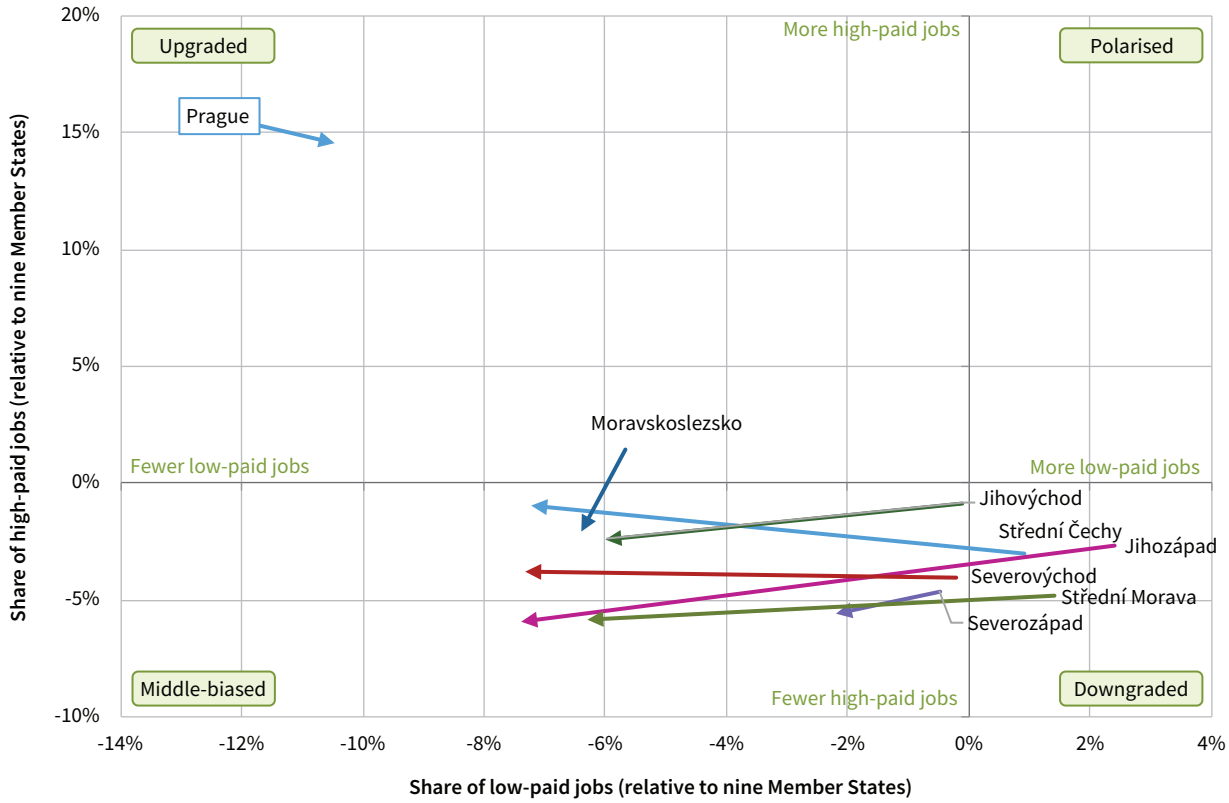
Brussels, Antwerp and, to a lesser extent, East Flanders accounted for most of the expansion in absolute employment levels in the country (Figure 19). While the former two regions demonstrated an upgrading and

Figure 19: Belgium: Absolute change in jobs (thousands), by tercile according to region, compared to average in nine Member States, 2002–2017



Source: *EU-LFS, SES (authors' calculations)*

Figure 20: Czechia: Changes in the regional employment structure compared to the average in nine Member States, 2002–2017



Source: *EU-LFS, SES (authors' calculations)*

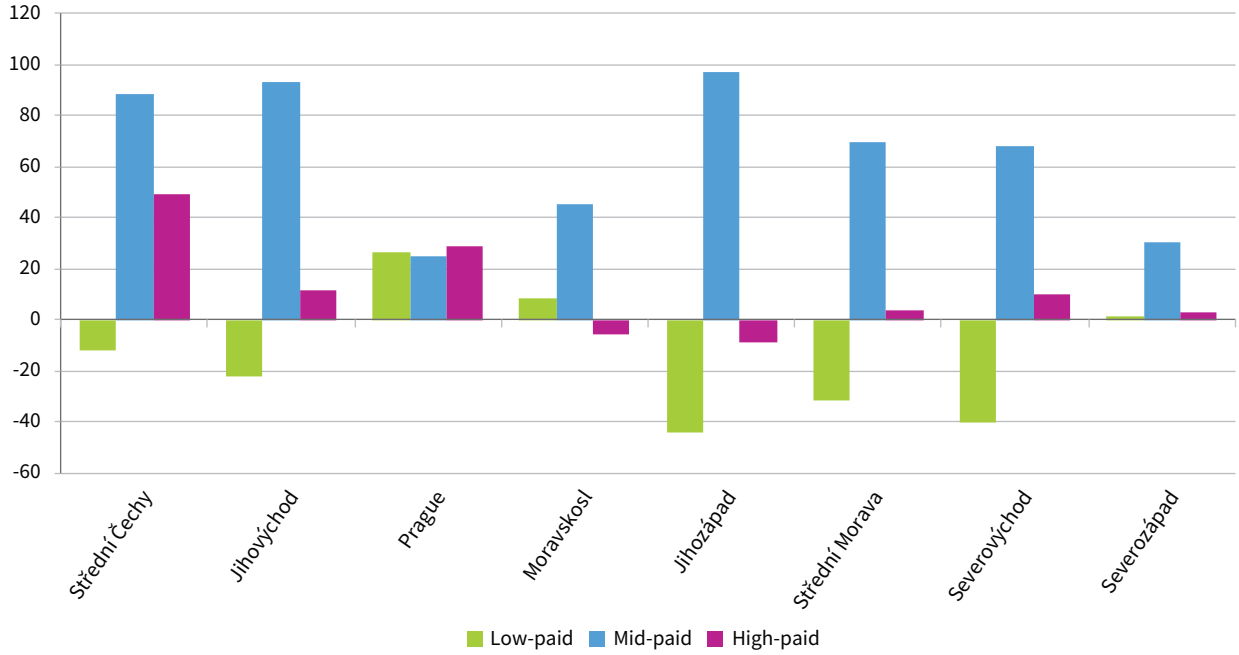
polarising pattern (with large job creation in the top tercile, especially, but also in the bottom), the latter region is a case of middle-biased growth (with much employment expansion in the middle). While employment creation in the other regions was of a lower absolute magnitude, all except Limburg registered employment expansion in the low and middle terciles, while employment in the top tercile declined in three of these nine regions.

Czechia

Czech regions are spread around the middle-biased quadrant (Figure 20), which means they are characterised by having a larger share of mid-paid jobs than the average in the nine Member States. The capital city region of Prague is an exception as it is clearly in the upgraded quadrant. The most common trend over the period was one of middle-biased employment shifts, since the shares of high-paid and low-paid jobs in most regions fell compared to the average in the nine selected Member States, although the reduction in low-paid jobs was generally more important (except in Moravskoslezsko). The only exceptions to this middle-biased pattern are Střední Čechy, where a mild upgrading pattern emerged, and Prague, with a modest downgrading pattern (while remaining strongly upgraded).

The middle-biased pattern is clearly reflected in Figure 21, depicting absolute changes in employment by job terciles. The net employment creation is relatively scattered across the regions, with a key feature being the disproportionate employment expansion in the middle tercile in almost all regions, even when job reductions occur in the bottom or top job terciles. The only exception is the capital city region of Prague, where the job expansion is similar across all job terciles.

Figure 21: Czechia: Absolute change in jobs (thousands), by tercile according to region, compared to the average in nine Member States, 2002–2017

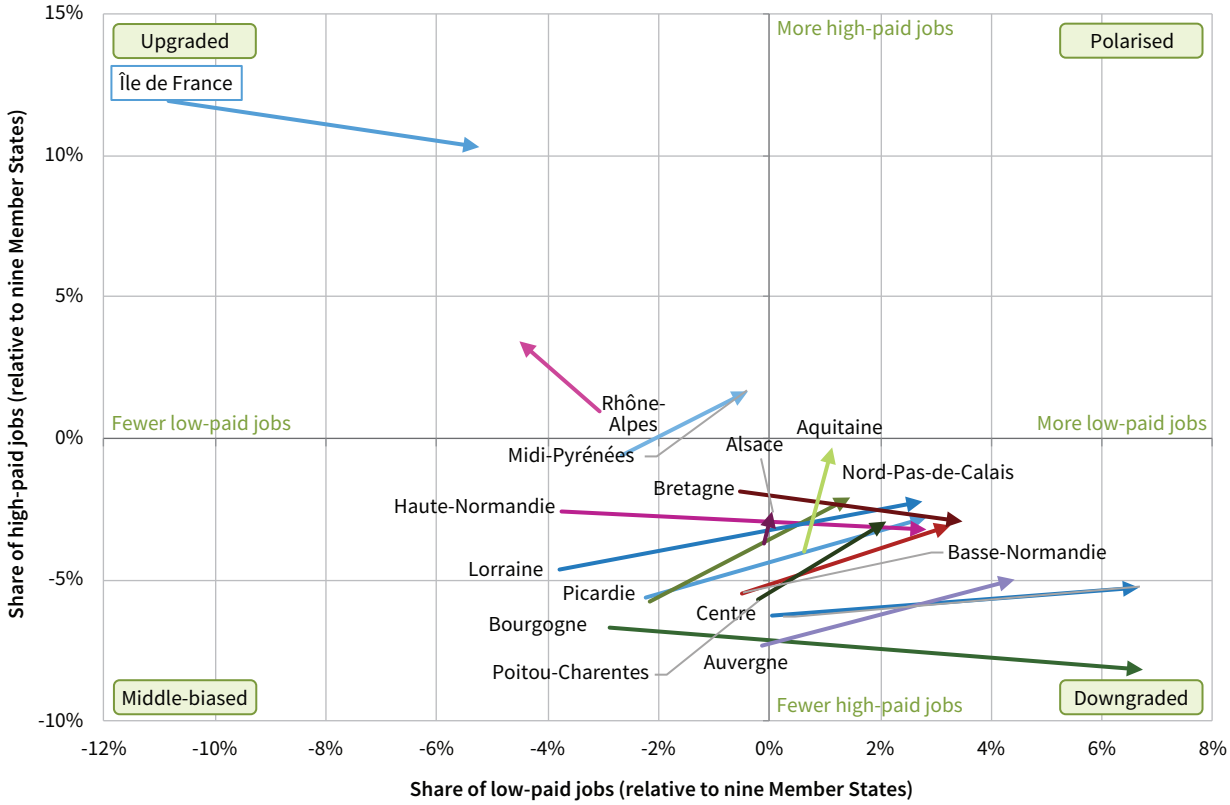


Source: *EU-LFS, SES (authors' calculations)*

France

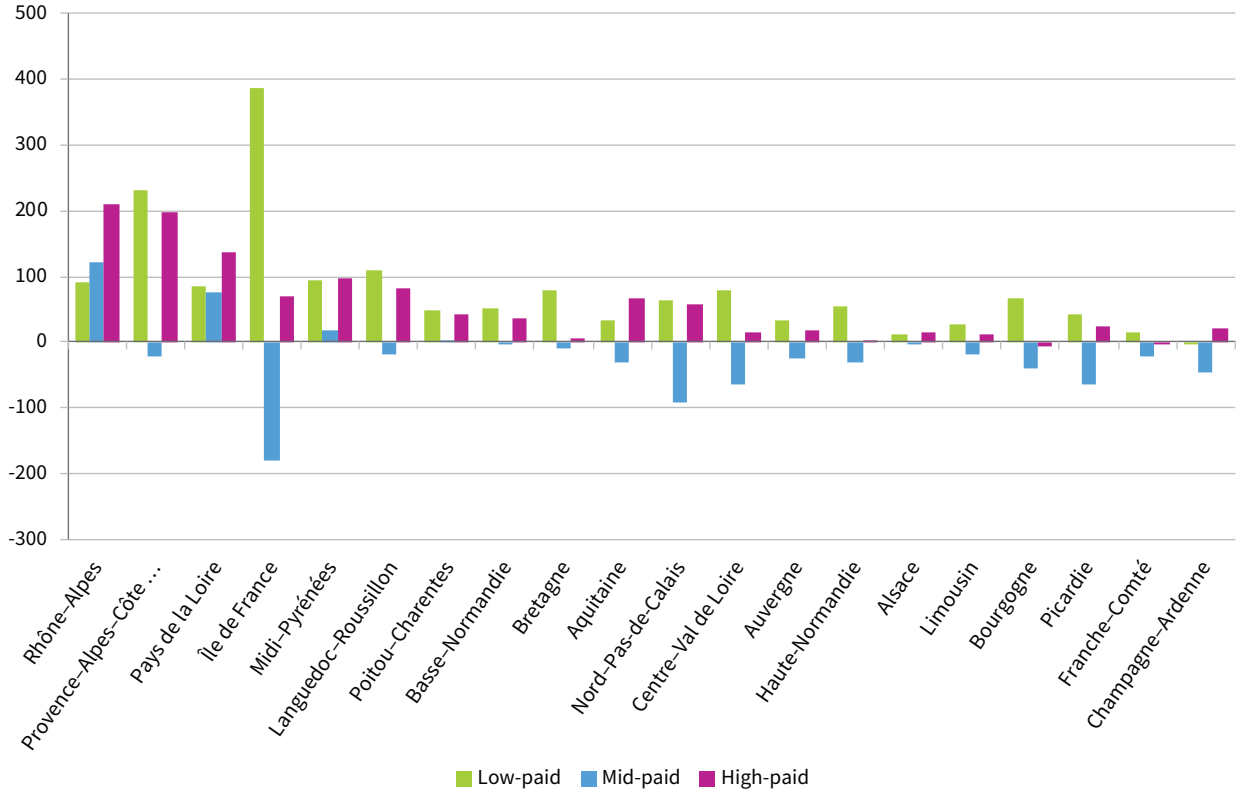
As shown in Figure 22, most French regions are characterised by upgrading and polarising dynamics, although they are generally close to the EU average. Only three regions, Île de France, Rhône-Alpes and Midi-Pyrénées, belong to the upgraded quadrant.

Figure 22: France: Change in the regional employment structure compared to the average in nine Member States, 2002–2017



Source: *EU-LFS, SES (authors' calculations)*

Figure 23: France: Absolute change in jobs (thousands), by tercile according to region, compared to average in nine Member States, 2002–2017



Source: *EU-LFS, SES (authors' calculations)*

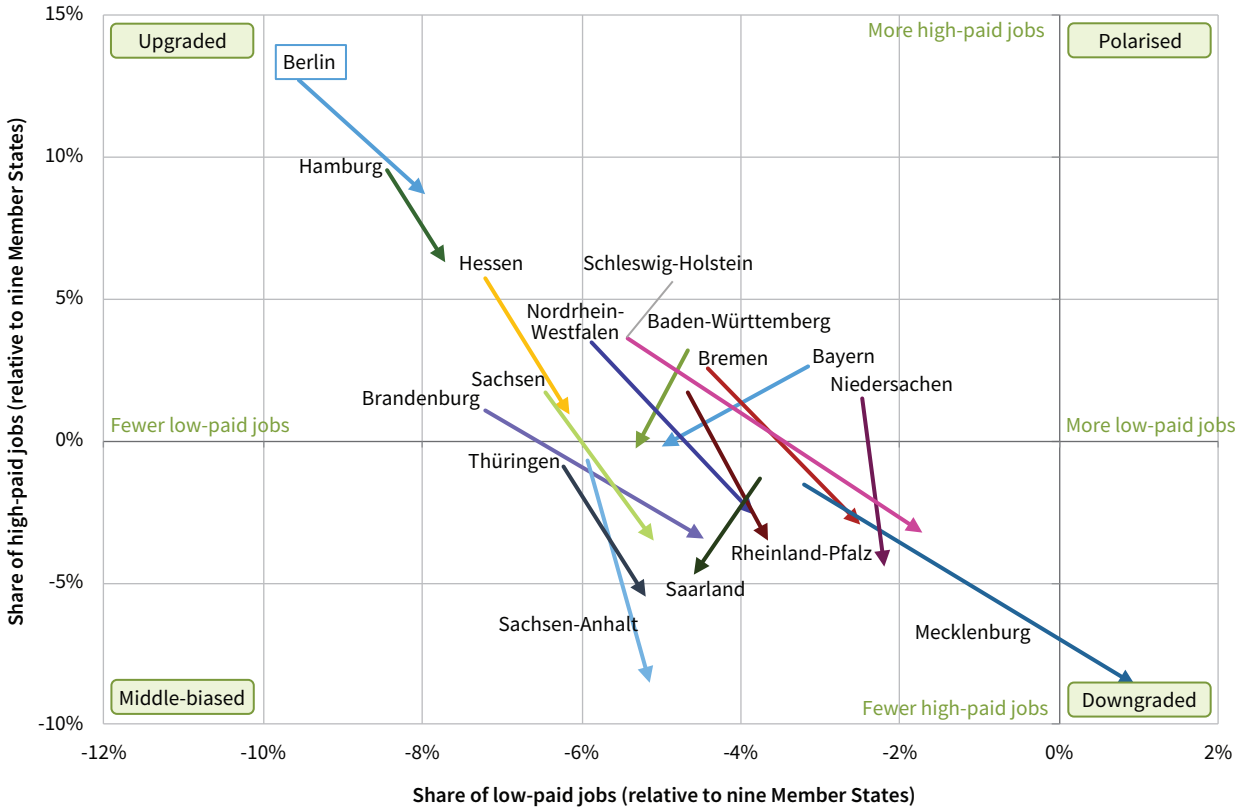
The capital city region, Île de France, experienced a very significant expansion in the share of low-paid jobs between 2002 and 2017, although it remains above the average of the nine Member States in its share of high-paid jobs.

Turning to changes in absolute terms, illustrated in Figure 23, one can see that there was a significant expansion of employment between 2002 and 2017, largely driven by the growth of low-paid jobs in Île de France (387,000) and Provence-Alpes-Côte D'Azur (231,000). The region with the highest absolute expansion and at the same time the biggest increase in high-paid jobs was Rhône-Alpes, which also had the highest, and an almost unique, increase in mid-paid jobs.

Germany

German regions are spread around the upgraded and middle-biased quadrants (Figure 24). This means they are mainly characterised by having a lower share of low-paid jobs than the average in the nine Member States, while the shares of high-paid and mid-paid jobs are mixed. The capital city region of Berlin has a much larger share of high-paid jobs, but other regions have a lower share. Between 2002 and 2017, almost all regions experienced a downgrading pattern compared to the average in the nine Member States – that is, a growing share of low-paid jobs and, typically more strongly, a declining share of high-paid jobs. Baden-Württemberg, Bayern and Saarland were the only regions that escaped this trend and experienced a middle-biased pattern, characterised by declining shares of both low-paid and high-paid jobs.

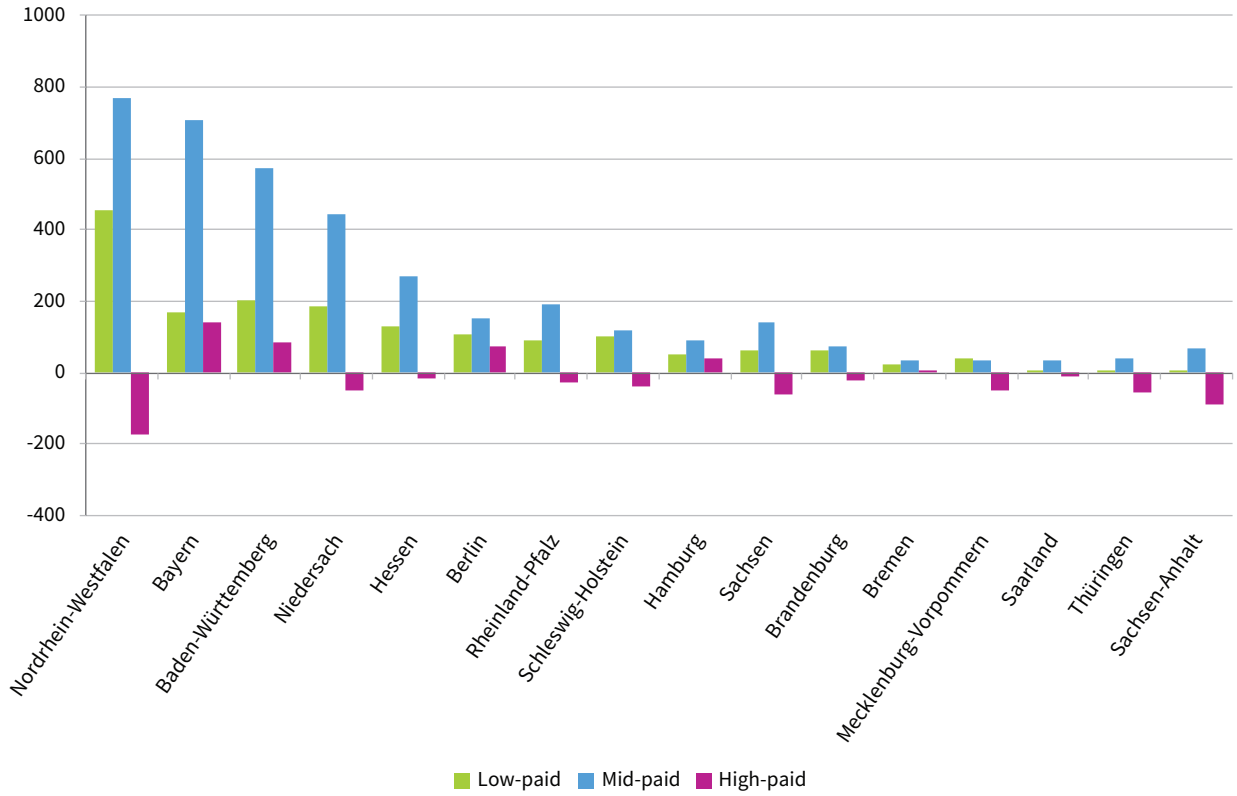
Figure 24: Germany: Changes in the regional employment structure compared to the average in nine Member States, 2002–2017



Source: *EU-LFS, SES (authors' calculations)*

Nordrhein-Westfalen, Bayern, Baden-Württemberg and Niedersachsen are the four regions in which much of the net employment creation was concentrated (Figure 25). All of them saw strong job creation in the middle tercile, much more modest job creation in the bottom tercile and even less in the top tercile; jobs in the top tercile were actually destroyed in Nordrhein-Westfalen and Niedersachsen. Employment creation in the other regions was of a lower absolute magnitude, but in most cases, the job creation in the middle tercile stands out. There was job destruction in the top tercile across many regions, which is consistent with the downgrading pattern described above, where the reduction in the share of high-paid jobs was relatively more important.

Figure 25: Germany: Absolute change in jobs (thousands), by tercile according to region, compared to the average in nine Member States, 2002–2017



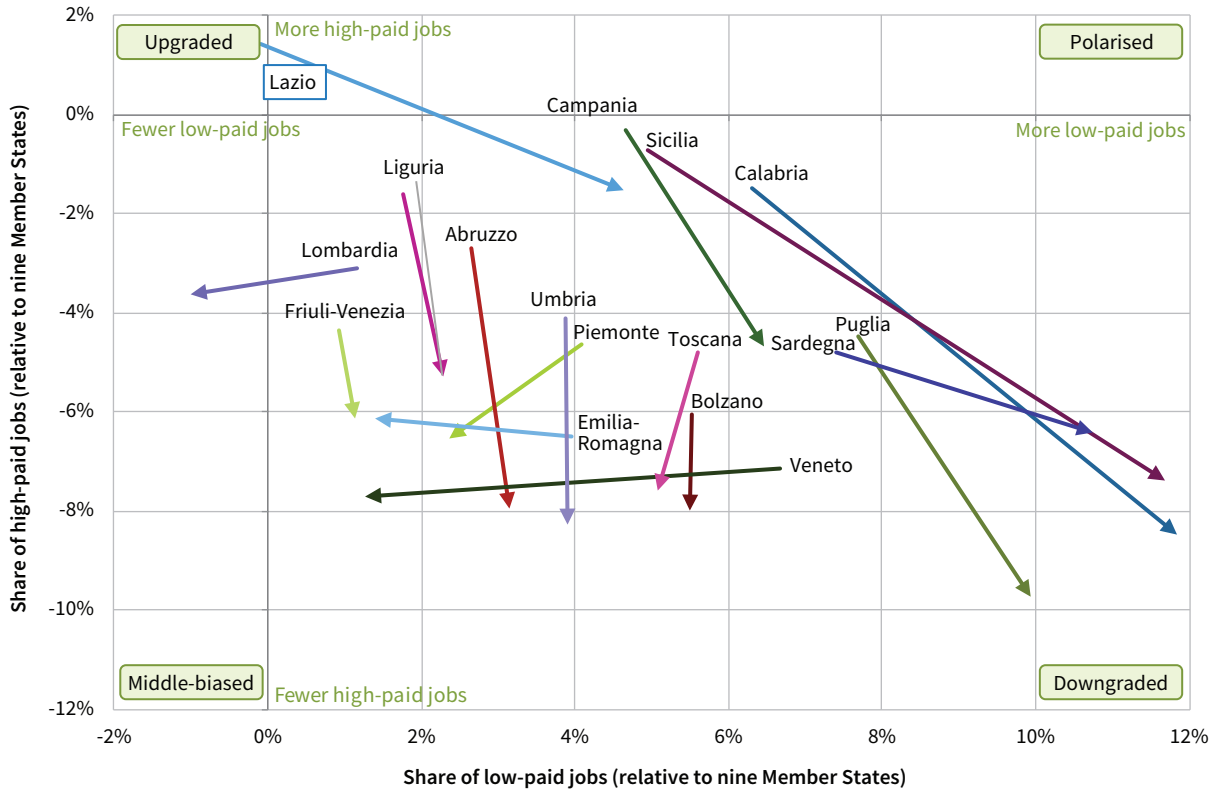
Source: *EU-LFS, SES (authors' calculations)*

Italy

As for Italian regions, as already indicated, a clear pattern of downgrading emerges between 2002 and 2017 (Figure 26). Compared to the average of the nine Member States, all regions but Lombardia are characterised by a higher share of low-paid jobs and a lower share of high-paid jobs. The shape of these dynamics nonetheless differs across regions. Puglia, Calabria, Sicilia and Campania (four major southern regions) experienced a significant increase in the share of low-paid jobs, which shifted them further towards the bottom right of the downgraded quadrant, meaning also that the share of high-paid jobs decreased.

Emilia-Romagna, Liguria and Toscana, while downgrading, did not move too much in terms of polarisation. Changes in the employment structure in Lazio, the Italian capital city region, involved a relevant expansion of low-paid jobs together with an expansion of high-paid ones, albeit to a lesser extent. As with the rest of the country, Lazio experienced a significant downgrading relative to the EU employment structure, with its relative share of low-paid jobs expanding quite significantly and its share of high-paid jobs diminishing slightly relative to the EU average.

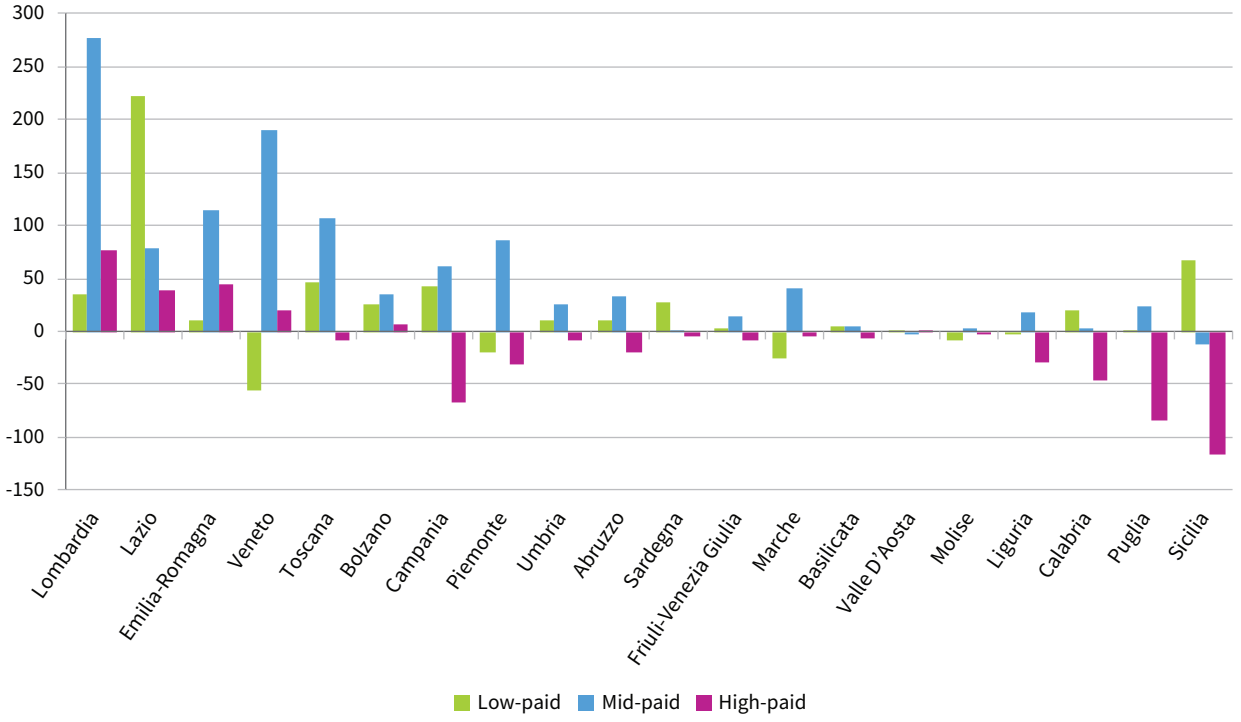
Figure 26: Italy: Changes in the regional employment structure compared to the average in nine Member States, 2002–2017



Source: *EU-LFS, SES (authors' calculations)*

Looking at the absolute change, between 2002 and 2017 Italian regions experienced different patterns within the overall downgrading pattern (Figure 27). Employment expansion was mainly concentrated in Lombardia and Lazio. In Lombardia, this process was characterised by middle-biased growth, with a gain of more than 200,000 mid-paid jobs. Lazio is characterised by a significant expansion of low-paid jobs, probably related to the expansion of tourism-related activities. These are followed by Emilia-Romagna and Veneto, two traditionally manufacturing regions, where changes in absolute terms involved almost only mid-paid jobs. At the opposite end, in southern regions such as Sicilia, Puglia and Calabria, a net destruction of high-paid jobs is the most obvious characteristic.

Figure 27: Italy: Absolute change in jobs (thousands), by tercile according to region, compared to the average in nine Member States, 2002–2017



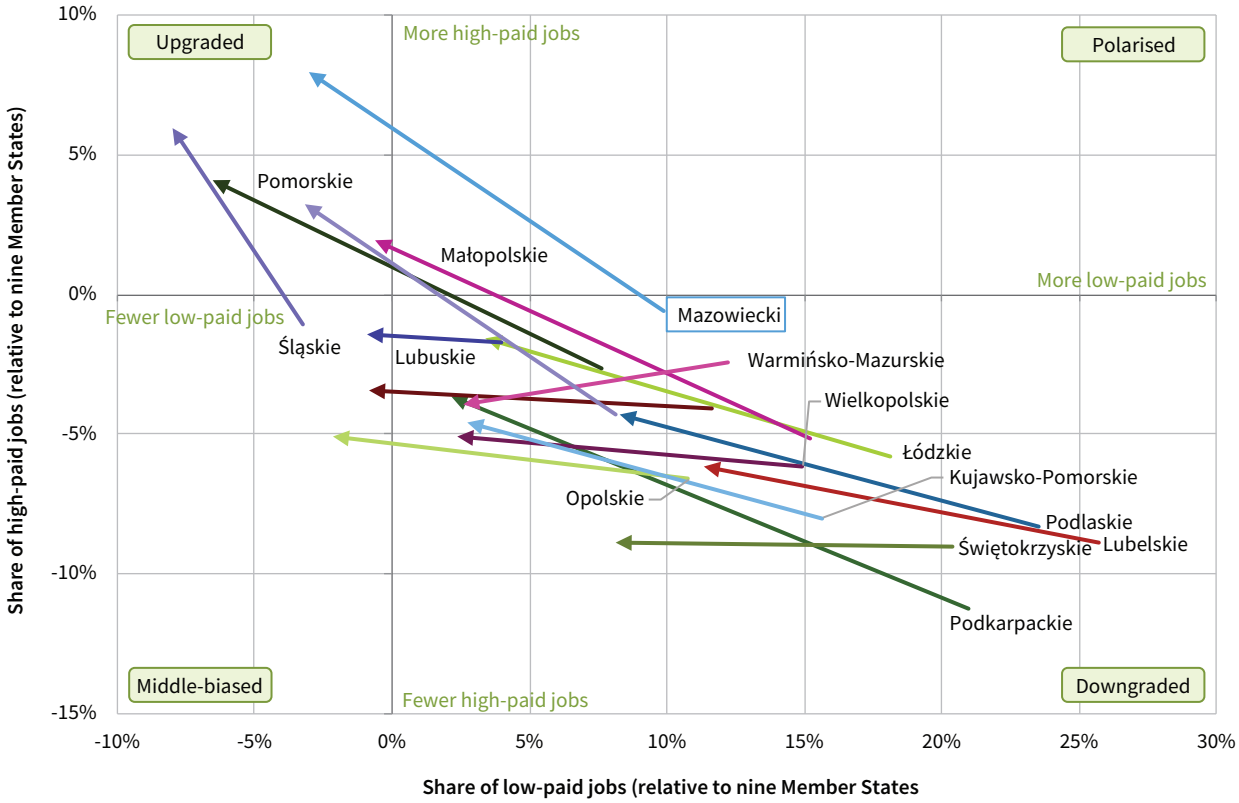
Source: *EU-LFS, SES (authors' calculations)*

Poland

In Poland, all the regions with the exception of Śląskie were in the downgraded quadrant in 2002 (Figure 28), meaning that the share of low-paid jobs was higher than the average of the nine Member States and the share of high-paid jobs lower. The situation changed significantly over the following 15 years, with most regions improving their relative position compared to the average and moving out of the downgraded quadrant. This is the case of the capital region Mazowieckie, Dolnośląskie, Pomorskie and, to a lesser extent, Małopolskie, where a clear process of upgrading took place. This upgrading took the form of notably higher shares of well-paid employment in the two most densely populated, urbanised regions: Mazowieckie and Śląskie (Upper Silesia). These were also the only two Polish regions to record average annual employment growth rates exceeding 2%. In the remaining regions, upgrading was more likely to take the form of a relative reduction of low-paid employment compared to the average, in many cases linked to declines in the agricultural sector.

On the other hand, three other regions – Opolskie, Lubuskie and Zachodniopomorskie – recorded middle-biased developments, having a lower share of both high-paid and low-paid jobs relative to the average in 2017. Śląskie was the only region with a middle-biased employment structure at the beginning of the period, but it then upgraded considerably. As for the remainder of the regions, which were still in the downgraded quadrant in 2017, their relative situation also improved, with a reduction of low-paid jobs and of the negative gap in terms of high-paid jobs (with the exception of Świętokrzyskie, where the share of high-paid jobs remained constant).

Figure 28: Poland: Changes in the regional employment structure compared to average in nine Member States, 2002–2017

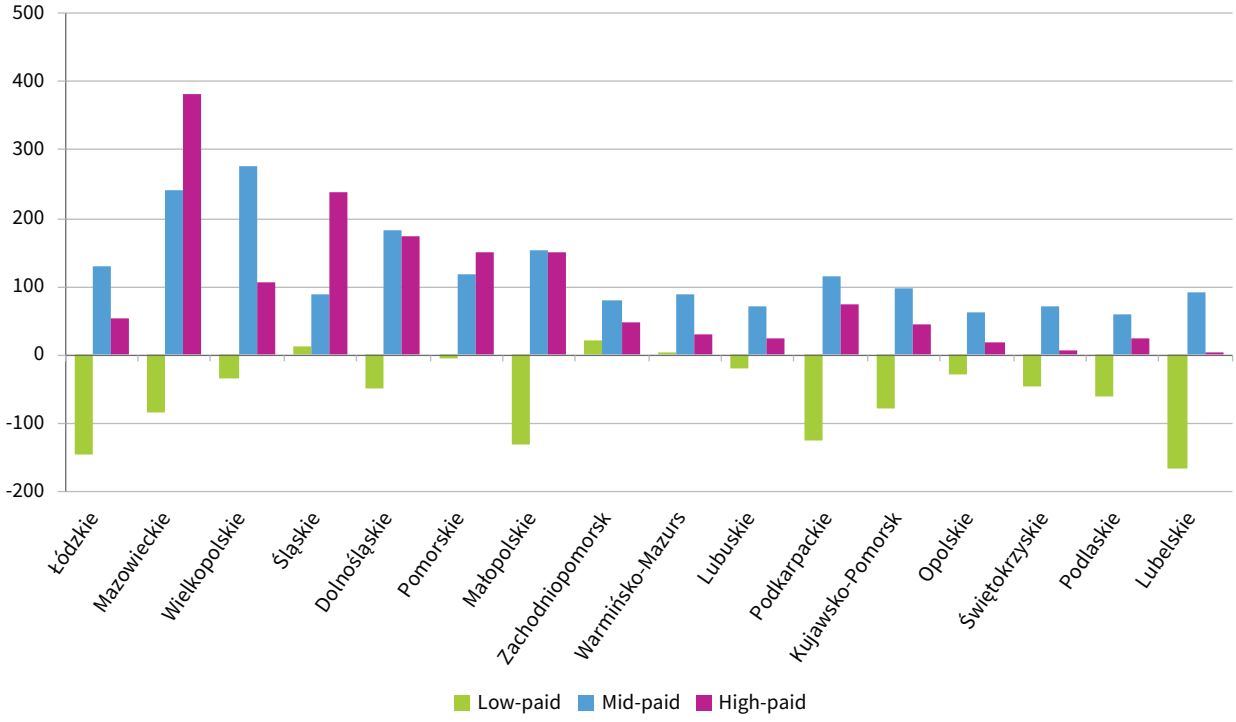


Source: *EU-LFS, SES (authors' calculations)*

In absolute terms, all regions in Poland recorded overall employment expansion in 2002–2017 (Figure 29), with the notable exception of Lubelskie, where job destruction was concentrated in the lowest tercile, mainly due to a marked decline of employment in agriculture. Similarly, significant job destruction of more than 100,000 jobs occurred in the lowest tercile for Łódzkie, Małopolskie and Podkarpackie. Overall, a decline in low-paid jobs was recorded in all but three regions.

The capital city region, Mazowieckie, experienced the highest employment expansion, which was highly skewed towards high-paid and mid-paid jobs. A total gain of more than 300,000 jobs was also observed in Wielkopolskie, Śląskie and Dolnośląskie but with different patterns: strong middle-biased growth in Wielkopolskie, upgrading in terms of the top tercile in Śląskie, and an equal expansion of mid-paid and high-paid jobs in Dolnośląskie.

Figure 29: Poland: Absolute change in jobs (thousands), by tercile according to region, compared to average in nine Member States, 2002–2017

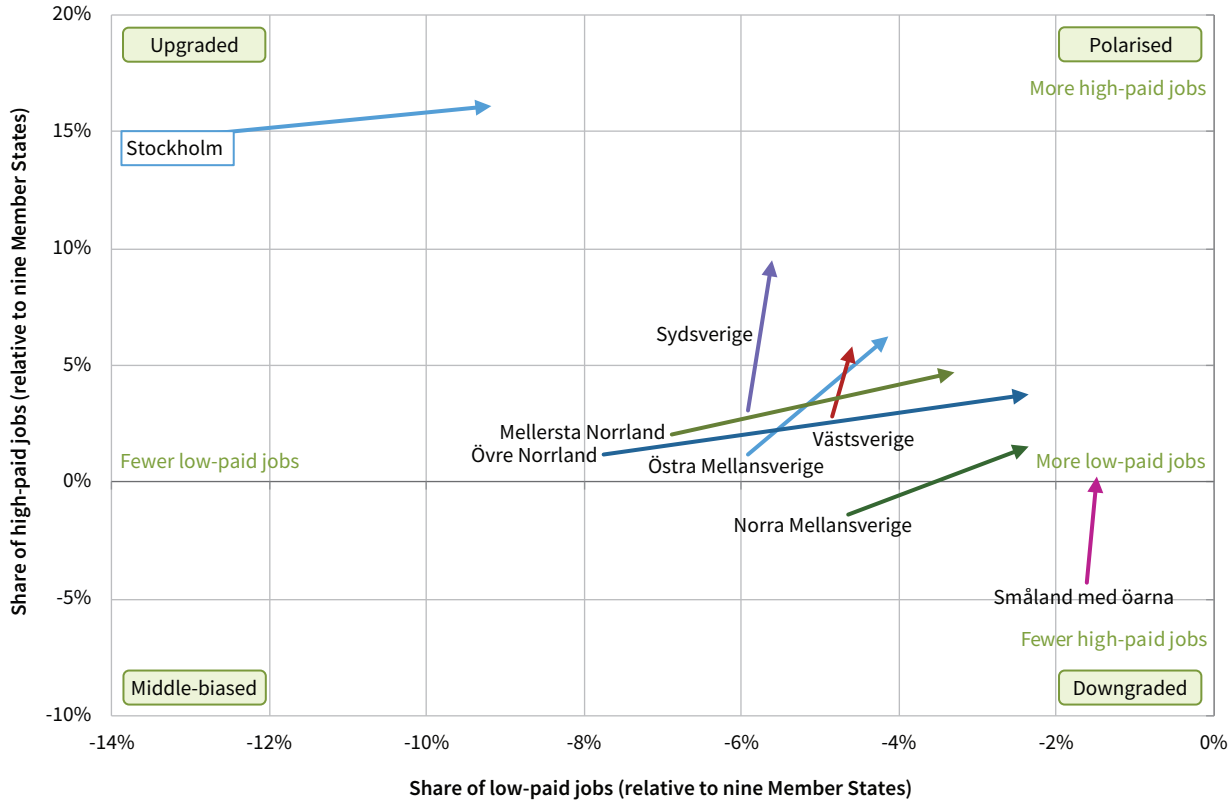


Source: *EU-LFS, SES (authors' calculations)*

Sweden

Swedish regions cluster in the upgrading quadrant, with all having a higher share of high-paid jobs and a lower share of low-paid jobs in 2017 compared to the average of the nine Member States (Figure 30). Norra Mellansverige and Småland med öarna, two less densely populated regions, shifted from having a slightly lower share of high-paid jobs in 2002 (compared to the average) to a slightly higher share in 2017. The capital city region of Stockholm is highly distinctive in having a much more upgraded employment profile vis-à-vis the remaining Swedish regions, with higher shares of high-paid jobs and lower shares of low-paid jobs. As Figure 30 indicates, employment in many Swedish regions polarised significantly compared to the nine Member States. There was a relative growth of low-paid jobs across the board, which was most conspicuous in Stockholm and the northernmost regions (Övre Norrland and Mellersta Norrland); however, this was accompanied by relative growth in high-paid jobs as well.

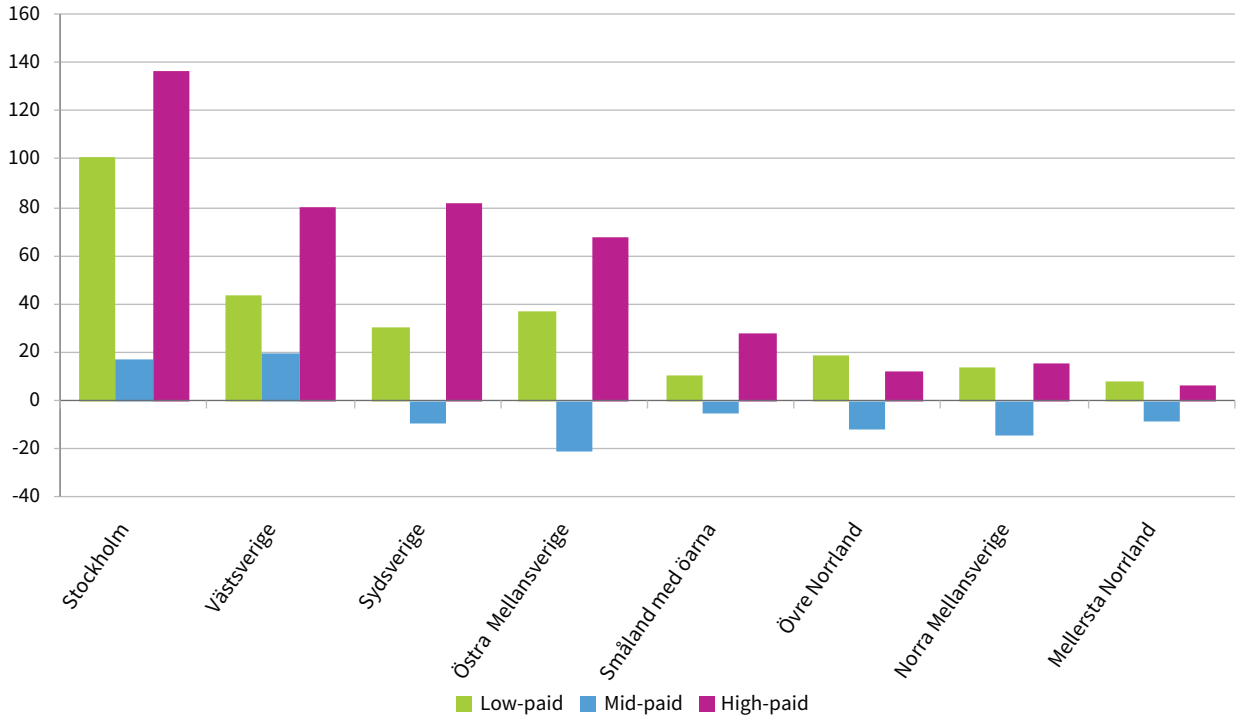
Figure 30: Sweden: Changes in the regional employment structure compared to the average in nine Member States, 2002–2017



Source: *EU-LFS, SES (authors' calculations)*

This relative polarisation is evident in Figure 31, where absolute change in employment between 2002 and 2017 was weakest in the middle tercile across all Swedish regions. The capital region of Stockholm accounted for the largest job gains, which totalled a quarter of a million net new jobs. Alongside other more populous regions – Vast Sverige, Sydsverige and Östra Mellansverige (the hinterland surrounding the capital) – net employment gains were skewed towards high-paid jobs.

Figure 31: Sweden: Absolute change in jobs (thousands), by tercile according to region, compared to the average in nine Member States, 2002–2017

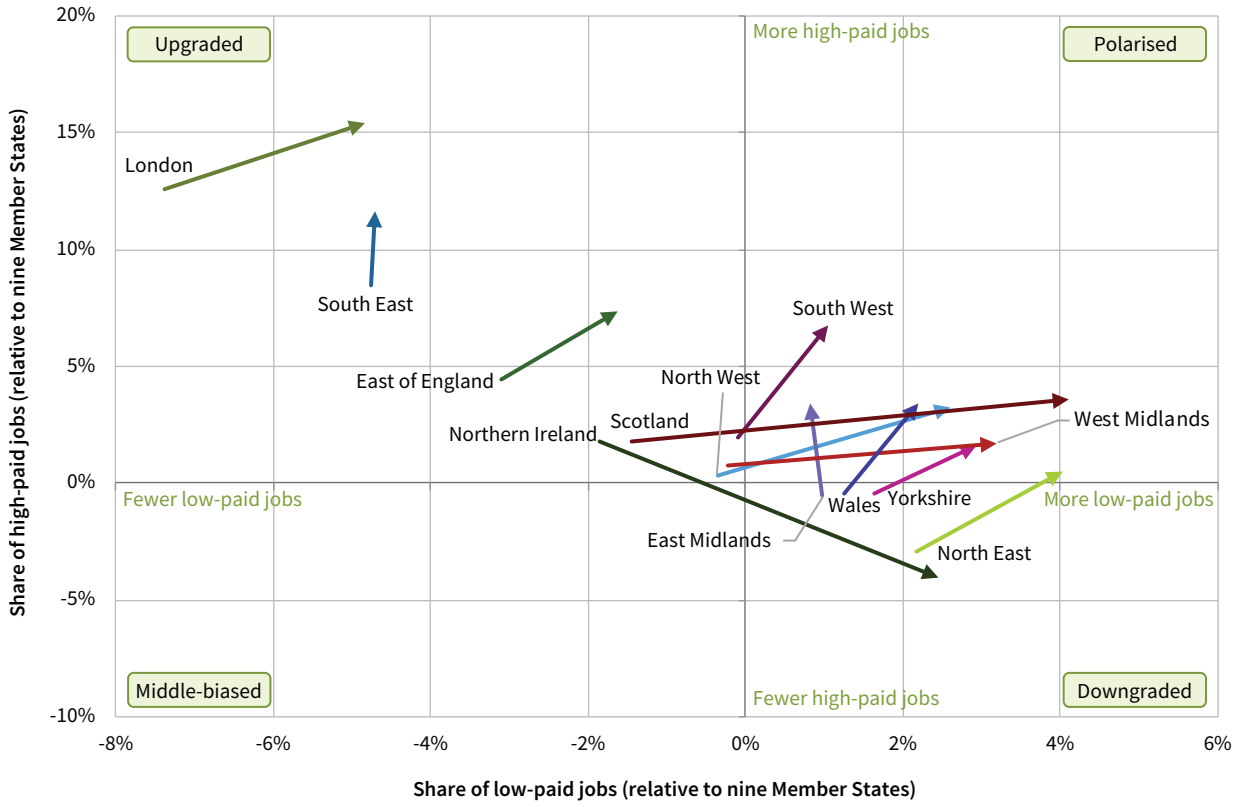


Source: *EU-LFS, SES (authors' calculations)*

United Kingdom

In the United Kingdom, most regions are located in the polarised or upgraded quadrants, with a somewhat higher share of high-paid jobs compared to the nine Member States (Figure 32). London is distinctive in having both a lower share of low-paid jobs and a much higher share of high-paid jobs. It also appears to exercise a strong 'gravitational' effect on surrounding regions, drawing the South East and, to a lesser extent, the East of England into the upper left, upgraded quadrant. This can be inferred, for example, from the comparatively high share of white-collar, high-skilled employment in these satellite regions surrounding the capital (see Annex 2).

Figure 32: United Kingdom: Changes in the regional employment structure compared to the average in nine Member States, 2002–2017

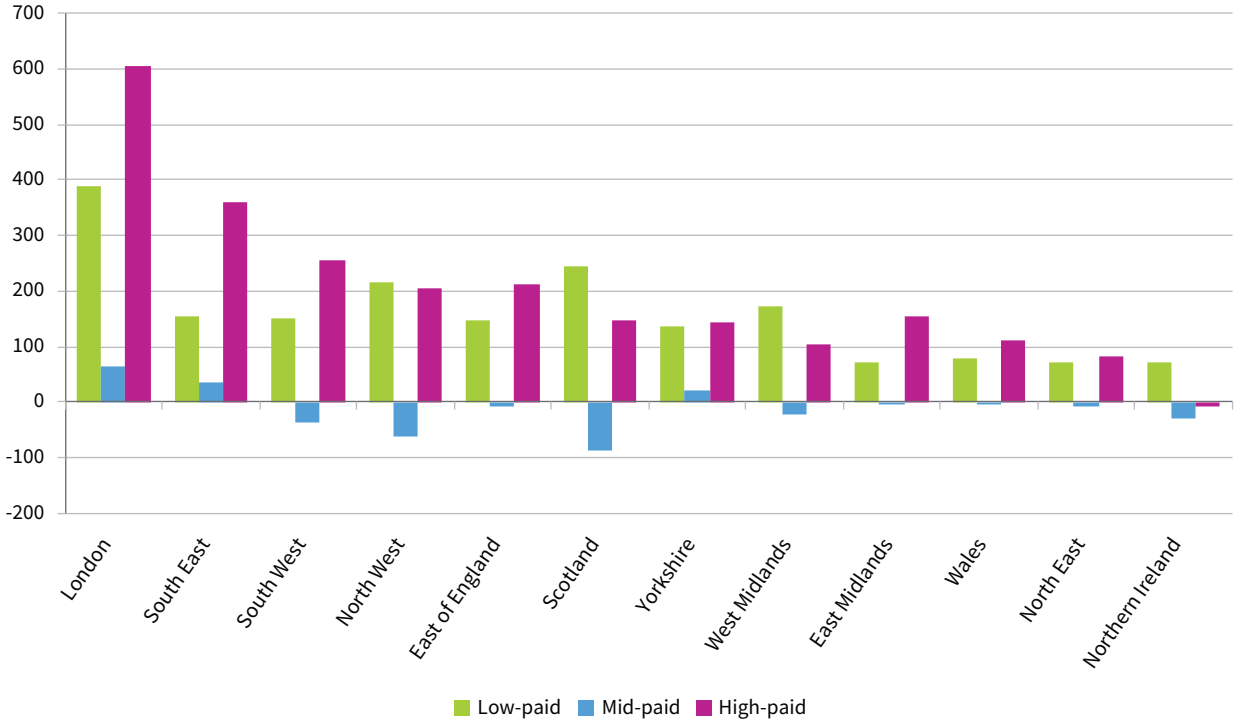


Source: *EU-LFS, SES (authors' calculations)*

Other UK regions tend to have higher shares of low-paid jobs than the capital city region and to cluster in the polarised quadrant. The direction of travel of most UK regions in the period 2002–2017 was one of polarising employment growth, with expansion of low-paid and high-paid jobs and a declining relative importance of mid-paid jobs. The upgrading vector was strongest in the London hinterland regions as well as other English regions (South West, East Midlands and North West), while the expansion of low-paid jobs was most notable in Scotland and Northern Ireland.

The importance of the capital city region is also underlined by its disproportionate contribution to absolute employment growth over the period covered (Figure 33). London alone added one million net new jobs between 2002 and 2017, the largest share being high-paid jobs but with a significant share of low-paid jobs and growth heavily polarised. Similar patterns were observed in the capital hinterland regions (South East and East of England), which were also among the regions contributing most to absolute employment growth. Together, these three regions contributed nearly half of overall national employment growth during the period. With the exception of Northern Ireland, where weak employment growth was skewed towards low-paid jobs, employment in all UK regions tended to polarise compared to the EU reference employment structure. In most cases, this polarisation was skewed upward, while the post-industrial regions of the North West and the West Midlands showed a modest downward skew.

Figure 33: United Kingdom: Absolute change in jobs (thousands), by tercile according to region, compared to the average in nine Member States, 2002–2017



Source: *EU-LFS, SES (authors' calculations)*

An interactive data visualisation of the data in this chapter is available at http://eurofound.link/regionalshifts

4 Conclusions and policy pointers

Conclusions

Employment patterns at national level

The European Jobs Monitor (EJM) has, for more than a decade now, analysed the transformation of employment structures across European countries. Despite confounding factors such as short-term cyclical fluctuations and breaks in the sectoral and occupational classifications, some striking regularities have emerged. The dominant pattern of recent occupational change in Europe, as consistently reflected in the overall EU figures, is one of upgrading with some polarisation, meaning most net employment growth in well-paid jobs, along with somewhat greater employment growth in low-paid jobs than in mid-paid jobs.

But behind this dominant pattern, there has been significant variation in the patterns at national level. Clear and consistent cases of upgrading have typically been observed in northern Europe, while patterns of polarisation are apparent mostly in the large continental European economies and the United Kingdom. A pattern of middle-biased occupational change – where growth is greatest in mid-paid jobs – is clear in some southern European economies before the economic crisis of 2008–2010. Meanwhile, there have been some striking cases of occupational downgrading – with employment growth skewed towards lower-paid jobs – as in Italy after the crisis.

This diversity was consistently observed in periods of economic growth (1995–2007 and 2012 onwards), whereas the economic crisis of 2008–2010 (extending to 2012 in some countries) seemed to generalise a pattern of job polarisation. The factors behind this diversity are complex and manifold: whereas the more or less pervasive and resilient growth of high-paid jobs seems to be linked to technological change and general economic progress, the relatively anaemic growth of mid-paid jobs tends to be associated with secular trends of deindustrialisation and the computerisation of routine cognitive tasks. On the other hand, the much more diverse trends in the evolution of low-paid employment are more likely to be affected by institutional factors such as labour market (de)regulation, minimum wages and industrial relations models.

Findings at regional level

All these findings apply to the changing employment structures at country level. The present report has, for the first time on a comparative European scale, applied a similar approach to the changing employment structures of regions rather than countries. This shift in the unit of analysis is justified by the mounting evidence of growing within-country inequalities in Europe. This is associated with a growing regional diversification in economic opportunities, which is already having disturbing sociopolitical ramifications. The implicit questions this report has tried to answer are these: are the employment structures of European regions growing apart, and is occupational change by region significantly different from the national patterns described above?

- The findings show that there is indeed more diversity in the employment structures of regions than countries, from both a static perspective (as they stood in 2002 and 2017) and a dynamic perspective (as they changed over 2002–2017). The employment structures of different European regions (characterised by their degree of occupational upgrading and polarisation) tend to gravitate around their country averages, but with a very significant amount of overlap between regions of different countries. Moreover, while this overlap tends to increase over time (with some regions, particularly in eastern Europe, converging towards the average European employment structure), the overall diversification of regional employment structures in Europe is growing rather than shrinking. This reflects different underlying factors that could be discussed only superficially in this report. Regions specialise more than countries for obvious reasons of scale, so it is not surprising that their employment structures (which reflect patterns of economic specialisation) are more diverse than those of the countries to which they belong. In addition, some underlying trends such as the growing agglomeration of economic activity in big cities tend to exacerbate within-country regional diversity in employment structures. In sum, regions within countries are becoming more occupationally different, but in similar ways.
- A second important finding is that the broad trends identified in the country-level analysis can also be observed in regional employment shifts but with some important qualifications. From a static perspective, the main axis differentiating European regions is one of upgraded versus downgraded employment structures. In other words, regions tend to differ mostly in the concentration of employment in the upper or lower occupational layers. Regions in northern and continental countries tend to be more upgraded than in southern and eastern Member States, and capital

city regions tend to be more upgraded than the rest of the country. There are also some cases of polarised and middle-biased employment structures. However, from a dynamic perspective, the picture is rather different, because the axis of polarisation–middle-biased occupational change is becoming more important over time. In other words, the diversity of employment structures is becoming wider and qualitatively different: rather than the high-paid jobs concentrating in some regions and the low-paid jobs in others, there is a growing diversity between some regions having a concentration of the high-paid jobs, others having a concentration of the low-paid, while a third group has a more polarised pattern, and a fourth exhibits a more middle-biased pattern.

Comparing national and regional patterns

How do these findings compare with the previous findings of the EJM country-level occupational trends? At country level, upgrading and polarisation have been the dominant patterns of occupational change in recent periods (with a small number of exceptions). However, at regional level the most frequent patterns of employment change are polarisation (in several capital city regions and northern continental regions) and downgrading (also in several capital city regions, as well as in southern European regions). However, as previously mentioned, there was even more diversity at regional level than at country level, and there are also many cases of upgrading (especially in many eastern European regions that have experienced rapid catch-up growth) as well as middle-biased growth (notably in several eastern European regions that expanded their manufacturing base and in some German regions).

A note of caution must be added here on the patterns of employment change observed across regions. To make it possible to compare regions so initially different in their employment structures, the EU employment structure, based on data from nine selected Member States, was used as a yardstick. That is to say, the patterns of upgrading, polarisation and so on, when applied to regions, refer to polarisation and upgrading in a particular region compared to the EU overall pattern of occupational change. As noted already, the overall EU pattern was one of upgrading with some degree of polarisation, and thus the regional results presented tend to significantly underestimate the degree of upgrading as well as the degree of polarisation to a certain extent. In other words, it is important to qualify the previous summary of the main patterns of occupational change across European regions: there were undoubtedly more cases of occupational upgrading than observed and probably a few more cases of polarisation as well. But the importance of this qualification should not be overstated. If occupational upgrading was a more or less pervasive pattern across European regions, its relevance for comparative analysis is relatively limited.

How do these findings compare to those of previous studies of employment change by region, which are available for some European countries, as summarised in the literature review? Although many of the findings of this report corroborate and generalise some of the previous findings of national studies (for example, the growing chasm between capital city regions and the other regions within countries, and the more or less widespread polarisation in many UK regions), this report has arguably found more diversity in patterns of regional employment change than many of the previous studies. This is similar to the EJM itself, which has often found more diversity in the patterns of employment change than other similar studies, which tend to emphasise polarisation as a more or less pervasive trend. In many of the regional analyses of employment change reviewed, job polarisation was identified as the overarching trend. In this report, job polarisation was indeed observed in many regions but certainly not in all of them: other important patterns of change were upgrading, downgrading and even middle-biased occupational trends, the opposite of job polarisation. The latter pattern was observed predominantly in regions where manufacturing employment was most resilient or even growing, while polarisation tends to be linked to deindustrialisation. This diversity in itself suggests a multiplicity of factors behind structural change in European labour markets and invites scepticism regarding any deterministic explanation of polarisation (or any other pattern) being the inescapable consequence of technological change (or any other factor).

Capital cities versus other regions

One important and common finding of previous studies that received qualified support in this report is the apparent link between polarisation and population density. Larger cities tend to have a higher share of high-paid jobs but also more low-paid jobs than mid-paid jobs. The service sectors, which account for as much as 85–90% of employment in some highly urbanised regions, have high concentrations of well-paid services employment at the top of the wage distribution. They also have a concentration of low-paid, less-skilled and often precarious employment in sectors such as retail, accommodation and food services, and personal care – in many cases employment that is dependent on the spending of their higher-earning co-citizens. Over the period 2002–2017, several capital city regions have tended to expand their share of low-paid employment, while remaining distinctively ‘upgraded’ in employment structure compared to other regions.

This growth of capital city regions appears to come partly at the expense of other regions, including other urban regions, in the same country. The growth in the national employment shares of Brussels and London, for example, mirrors a decline in the shares of other largely urban regions in both countries. Economic dynamism appears to be waning in some second cities and other regional urban centres just as it accelerates in capital city regions. Moreover, in many Member States, retrenchment in the public sector – on which regional labour markets have traditionally been more reliant – has sharpened this divide. These developments can feed perceptions that capital city regions are benefiting from globalisation and technological change, the very same forces that are perceived to be undermining the social and economic fabric outside the capitals.

Unbalanced regional growth may not be the only, or the main, force driving these movements. However, it does appear to be an important contributor and – as this report suggests – it is likely to have roots in the emerging geographical division of labour within advanced economies and the unequal distribution of the benefits of the shift towards services.

Policy pointers

The EU has been successful to date in its objective of reducing economic disparities between Member States. A combination of catch-up growth and cohesion policy has contributed to faster growth in GDP per head in central and eastern European Member States over the last 15 years, just as it assisted earlier accession countries, such as Ireland, Portugal and Spain, to converge economically with the founding Member States of the European Community. However, in recent years, the gap in the economic fortunes between regions within many Member States has been growing and that interregional inequality has contributed to the widely documented increase in social inequality. The economic cleavages that have opened up between capital city regions and other regions in the same country have found expression in the ballot box as well as in popular protests. Disenchantment with established political parties – and indeed with the broader civic establishment including the media – has fed the rapid emergence of populist alternatives adept at drawing electoral advantage from disillusion.

Given this context, what lessons or insights can this report provide to policymakers?

- The first point to make is that where there are divergences in intra-country regional economic performance, these remain in the first instance a national responsibility and a concern for national actors.
- The report draws attention to the important role of public investment, notably in the form of public services employment, in supporting more regionally balanced growth. The literature on employment polarisation has tended to emphasise technological vectors of change in labour demand and to disregard, among other things, the important role of the state as a direct or indirect employer, accounting for more than a quarter of employment in some Member States. But jobs in education, health and the public administration tend by their nature to be geographically dispersed rather than concentrated and enjoy above-average pay. They are an important prop to aggregate job quality in regions suffering the impacts of industrial change. The corollary is that such regions suffer disproportionately in times of public spending retrenchment.
- A related point is that public policy matters. The existence of a broad variety of employment-shift patterns – at national and regional levels – gives support to the idea that different labour market policy mixes may mediate the effects of other drivers of change such as technology, globalisation or demographic shifts.
- The report also highlights that industrial change need not be a synonym for decline. Around two million net new manufacturing jobs have been created in the EU since the economic recovery. There has been something of an industrial renaissance in central Europe going back further in time, including in two countries covered in this report, Czechia and Poland. Manufacturing employment itself has tended increasingly to locate outside large urban areas. It too has been an important source of relatively well-paid employment, notably for those with non-tertiary educational qualifications. This suggests that investment in manufacturing may have beneficial, territorially equalising effects and underlines the importance of linking regional and industrial policy.
- Regional mobility has been seen as one antidote to unbalanced regional growth, whereby individuals are encouraged to transfer from declining regions to higher-growth regions. This can be an important safety valve and may be economically efficient. But it can also run the risk of leaving unfavoured regions even further behind. The need for integration is just as great for regions as for individuals, and this need is more acute for those regions beset by industrial decline or depopulation.

- Given the increasingly digital – and in many cases, location-independent – nature of much work, universal high-quality broadband availability is one obvious example of a policy that may contribute to dispersing labour activity. However, as the report highlights, good-quality employment – often work that could, in principle, be carried out remotely or virtually – has, in practice, tended to cluster more and not less in large, urban and often capital city regions. So, connectivity, while helpful, may be just one small part of the answer to the problem of regionally unbalanced growth.
- EU regional policy should continue to assist unfavoured regions not to fall further behind regional powerhouses. Infrastructural and human capital investments (for example, through the European Social Fund and European Globalisation Adjustment Fund) provide the connective tissue strengthening linkages between different regions and region types. Such policies mitigate the risks of overconcentration of economic activity in some areas and territorial disconnection in others. They can also contribute to ensuring that decisions to move from one region to another for work remain primarily a matter of choice, rather than circumstance.

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Table A1: Summary of employment data by region in nine Member States

Code	Region	Urbanisation category	Occupation		Sector						Population (,000s)		Employment (,000s)		Graduate share of employment		Average population growth p.a. 2002–2017 (%)	Average employment growth p.a. 2002–2017 (%)
			White-collar high-skilled (%, 2017)	White-collar high-skilled (%, 2002)	Industry (%, 2017)	Industry (%, 2002)	Services (%, 2017)	Services (%, 2002)	Mainly public services (%, 2017)	Mainly public services (%, 2017)	2017	2002	2017	2002	2017 (%)	2002 (ppt)		
Belgium																		
BE10	Brussels	Capital region	56.9	43.3	5.8	10.2	88.1	85.3	27.1	30.8	*1,199*	978	453	338	55	48	*1.51*	2.27
BE21	Antwerp	Largely urban	47.0	37.7	15.3	24.0	77.2	67.9	29.8	25.4	*1,839*	1,652	776	673	43	33	*0.75*	1.03
BE22	Limburg	Intermediate	41.8	36.7	19.8	27.2	69.8	62.5	30.9	27.3	*870*	799	374	337	36	29	*0.59*	0.74
BE23	East Flanders	Intermediate	46.3	43.8	18.2	20.1	72.8	71.3	30.9	29.2	*1,498*	1,367	661	576	45	34	*0.64*	0.98
BE24	Flemish Brabant	Largely urban	51.8	46.4	8.1	16.3	86.4	76.2	33.0	28.7	*1,131*	1,023	501	446	53	35	*0.70*	0.83
BE25	West Flanders	Intermediate	39.4	39.2	19.5	22.6	68.8	66.9	32.0	26.4	*1,188*	1,132	517	468	39	31	*0.33*	0.70
BE31	Walloon Brabant	Intermediate	57.7	53.5	10.8	13.3	84.2	79.3	32.2	34.3	*400*	355	169	139	62	46	*0.85*	1.41
BE32	Hainaut	Largely urban	39.4	39.1	13.2	16.8	77.9	74.5	35.4	37.0	*1,342*	1,281	475	450	38	30	*0.32*	0.38
BE33	Liège	Largely urban	42.0	43.4	13.7	16.4	77.1	75.7	37.0	34.8	*1,106*	1,024	401	367	40	34	*0.53*	0.62
BE34	Luxembourg	Largely rural	42.8	40.5	9.2	14.2	79.4	71.1	33.2	31.2	*285*	250	120	98	44	34	*0.93*	1.50
BE35	Namur	Intermediate	50.8	40.3	9.7	14.8	81.6	76.2	43.9	37.3	*494*	448	190	161	48	34	*0.68*	1.19
Czechia																		
CZ01	Prague	Capital region	57.2	55.9	11.8	12.1	80.8	77.9	23.6	23.0	*1,281*	1,158	686	608	49	28	*0.71*	0.86
CZ02	Střední Čechy	Largely urban	38.7	30.9	26.6	29.3	63.0	55.0	20.2	18.3	*1,339*	1,124	667	542	23	9	*1.28*	1.53
CZ03	Jihozápad	Largely rural	33.0	33.3	33.5	31.9	53.5	49.8	19.5	17.5	*1,217*	1,174	606	563	20	11	*0.24*	0.51
CZ04	Severozápad	Intermediate	29.9	30.0	31.1	27.9	57.4	54.6	20.7	20.1	*1,118*	1,122	535	501	15	8	*-0.02*	0.45
CZ05	Severovýchod	Intermediate	36.3	31.6	35.3	37.9	53.7	47.7	20.1	16.9	*1,509*	1,483	734	696	22	10	*0.12*	0.36
CZ06	Jihovýchod	Intermediate	36.4	35.2	31.7	30.8	55.7	52.4	20.3	19.1	*1,688*	1,643	826	744	25	14	*0.18*	0.74
CZ07	Střední Morava	Intermediate	32.6	31.8	36.7	37.8	51.9	48.5	19.2	17.3	*1,218*	1,236	586	545	19	11	*-0.10*	0.51
CZ08	Moravskoslezsko	Intermediate	36.6	36.8	33.6	30.1	56.2	53.9	19.4	21.0	*1,210*	1,261	581	534	22	12	*-0.27*	0.59

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			White-collar high-skilled (%, 2017)	White-collar high-skilled (%, 2002)	Industry (%, 2017)	Industry (%, 2002)	Services (%, 2017)	Services (%, 2002)	Mainly public services (%, 2017)	Mainly public services (%, 2017)	2017	2002	2017	2002	2017 (%)	2002 (ppt)		
France																		
FR10	Île de France	Capital region	55.7	50.2	6.3	12.1	86.4	62.4	26.7	25.1	*12,194*	11,186	5,430	5,036	50	38	*0.60*	0.52
FR21	Champagne-Ardenne	Intermediate	37.8	26.5	16.7	22.6	69.3	62.4	31.6	26.8	*1,334*	1,342	504	534	34	19	*-0.04*	-0.37
FR22	Picardie	Largely rural	39.9	32.0	15.5	25.2	73.4	62.9	29.2	26.4	*1,934*	1,874	774	762	31	20	*0.21*	0.11
FR23	Haute-Normandie	Intermediate	40.9	34.3	17.6	24.4	72.5	65.1	34.0	26.7	*1,865*	1,794	711	681	33	24	*0.26*	0.30
FR24	Centre	Largely rural	36.2	29.1	13.8	24.8	77.0	63.3	31.5	26.2	*2,582*	2,473	1,023	989	33	19	*0.29*	0.23
FR25	Basse-Normandie	Largely rural	40.1	32.7	21.1	18.7	64.0	65.9	30.6	28.4	*1,477*	1,438	590	503	30	22	*0.18*	1.16
FR26	Bourgogne	Largely rural	36.4	30.5	16.1	22.0	73.3	65.4	32.5	30.5	*1,637*	1,618	621	600	32	22	*0.08*	0.23
FR30	Nord-Pas-de-Calais	Largely urban	43.9	32.0	14.3	22.3	77.2	67.8	37.9	28.4	*4,087*	4,006	1,486	1,453	39	24	*0.13*	0.15
FR41	Lorraine	Intermediate	40.4	32.0	16.7	22.0	73.0	67.6	34.1	28.7	*2,331*	2,323	911	1,033	35	22	*0.02*	-0.79
FR42	Alsace	Intermediate	41.0	33.4	20.8	27.5	69.6	62.5	25.5	23.3	*1,889*	1,768	800	768	35	25	*0.46*	0.27
FR43	Franche-Comté	Intermediate	39.9	30.3	28.1	32.7	62.6	56.7	30.7	27.1	*1,180*	1,131	497	504	32	22	*0.29*	-0.10
FR51	Pays de la Loire	Largely rural	42.2	31.0	17.0	24.4	70.6	61.5	29.9	25.5	*3,766*	3,315	1,562	1,258	39	23	*0.91*	1.61
FR52	Bretagne	Largely rural	39.8	34.6	15.5	19.7	71.0	66.9	32.8	30.3	*3,223*	2,982	1,345	1,266	38	26	*0.76*	0.41
FR53	Poitou-Charentes	Largely rural	40.1	31.9	18.0	19.9	70.0	66.0	27.6	27.3	*1,811*	1,674	723	628	34	20	*0.55*	1.01
FR61	Aquitaine	Largely urban	43.6	33.4	11.9	15.0	75.2	70.2	34.5	27.2	*3,422*	2,993	1,325	1,247	40	23	*0.96*	0.42
FR62	Midi-Pyrénées	Largely rural	48.0	37.5	14.8	18.5	72.5	69.8	30.7	28.4	*3,046*	2,642	1,276	1,057	44	29	*1.02*	1.38
FR63	Limousin	Largely rural	39.2	27.9	13.2	15.8	72.4	68.5	34.0	30.5	*736*	719	299	277	32	19	*0.16*	0.53
FR71	Rhône-Alpes	Intermediate	48.8	39.7	16.5	22.3	73.8	67.4	30.1	26.8	*6,622*	5,796	2,820	2,379	44	30	*0.95*	1.23
FR72	Auvergne	Largely rural	34.2	30.5	17.0	21.4	69.7	63.8	37.8	31.3	*1,365*	1,320	523	489	28	22	*0.23*	0.47
FR81	Languedoc-Roussillon	Intermediate	45.0	35.6	7.8	9.0	79.7	74.7	35.6	31.3	*2,816*	2,389	1,021	839	39	25	*1.19*	1.45
FR82/83	Provence-Alpes-Côte …	Largely urban	46.1	34.0	7.8	9.8	82.7	78.8	34.7	31.9	*5,382*	4,904	2,059	1,637	40	24	*0.65*	1.72
Germany																		
DE10	Baden-Württemberg	Intermediate	45.6	40.8	28.3	32.9	64.5	58.4	24.2	21.9	*10,952*	10,601	5,982	5,118	31	24	*0.22*	1.13
DE20	Bayern	Intermediate	45.5	40.1	24.3	28.0	66.9	61.9	24.1	21.5	*12,931*	12,330	7,079	6,067	31	21	*0.32*	1.11

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			White-collar high-skilled (%, 2017)	White-collar high-skilled (%, 2002)	Industry (%, 2017)	Industry (%, 2002)	Services (%, 2017)	Services (%, 2002)	Mainly public services (%, 2017)	Mainly public services (%, 2017)	2017	2002	2017	2002	2017 (%)	2002 (ppt)		
Germany																		
DE30	Berlin	Capital region	57.1	51.3	8.5	12.8	86.0	80.1	28.7	30.4	*3,575*	3,388	1,810	1,478	43	33	*0.37*	1.50
DE40	Brandenburg	Intermediate	44.0	39.4	12.5	14.7	75.7	67.4	31.0	25.6	*2,495*	2,593	1,246	1,126	29	29	*-0.25*	0.71
DE50	Bremen	Largely urban	45.2	40.3	14.9	19.9	79.4	73.7	26.1	24.8	*679*	660	331	270	29	19	*0.19*	1.50
DE60	Hamburg	Largely urban	54.5	49.8	11.8	15.2	83.2	78.6	23.8	22.2	*1,810*	1,726	985	804	37	24	*0.32*	1.50
DE70	Hessen	Largely urban	47.7	43.5	17.8	23.8	75.6	68.2	25.8	22.4	*6,213*	6,078	3,223	2,838	33	24	*0.15*	0.90
DE80	Mecklenburg-Vorpom …	Largely rural	37.4	36.5	11.5	12.0	75.7	66.9	30.1	27.8	*1,611*	1,760	765	736	27	27	*-0.56*	0.26
DE90	Niedersachsen	Intermediate	41.7	38.9	20.1	23.2	70.5	65.8	26.8	25.3	*746*	7,956	3,999	3,423	25	20	*-0.01*	1.12
DEA0	Nordrhein-Westfalen	Largely urban	44.7	41.3	19.2	25.3	73.6	66.1	27.2	24.4	*17,890*	18,052	8,711	7,658	27	21	*-0.06*	0.92
DEB0	Rheinland-Pfalz	Intermediate	43.6	39.3	20.3	24.7	70.9	65.3	27.6	25.0	*4,066*	4,049	2,078	1,826	27	22	*0.03*	0.92
DEC0	Saarland	Largely urban	42.3	37.7	22.6	23.3	69.7	66.0	28.5	24.2	*997*	1,066	474	446	24	18	*-0.43*	0.42
DED0	Sachsen	Intermediate	43.5	39.8	20.9	20.4	68.5	65.1	27.1	25.7	*4,082*	4,384	1,991	1,844	30	31	*-0.46*	0.53
DEE0	Sachsen-Anhalt	Intermediate	39.6	38.0	18.2	17.9	69.4	65.1	27.5	26.3	*2,236*	2,581	1,030	1,051	24	27	*-0.89*	-0.13
DEF0	Schleswig-Holstein	Intermediate	43.9	42.3	13.7	15.3	76.8	73.0	30.2	27.2	*2,882*	2,804	1,445	1,259	24	21	*0.19*	0.99
DEG0	Thüringen	Intermediate	40.4	37.1	23.8	21.9	65.7	62.1	27.8	25.8	*2,158*	2,411	1,057	1,065	28	28	*-0.70*	-0.05
Italy																		
ITC1	Piemonte	Largely urban	36.4	30.6	24.5	30.6	66.2	59.5	18.0	17.8	*4,393*	4,212	1,819	1,785	20	12	*0.29*	0.13
ITC2	Valle D'Aosta/Vallée …	Intermediate	32.7	25.3	11.6	14.8	76.6	69.1	28.2	24.2	*127*	119	55	55	20	8	*0.45*	0.02
ITC3	Liguria	Largely urban	37.8	33.7	12.6	15.3	78.3	73.5	22.2	23.2	*1,565*	1,570	603	615	22	15	*-0.02*	-0.13
ITC4	Lombardia	Largely urban	40.6	32.8	25.6	32.9	67.0	57.5	16.9	16.0	*10,019*	9,033	4,399	4,011	23	13	*0.73*	0.65
ITF1	Abruzzo	Intermediate	34.4	31.4	23.5	23.6	64.0	62.8	19.4	27.8	*1,322*	1,262	491	467	21	14	*0.32*	0.33
ITF2	Molise	Largely rural	37.0	28.3	16.5	21.5	68.6	59.7	26.5	26.7	*310*	320	105	112	24	12	*-0.21*	-0.40
ITF3	Campania	Largely urban	34.2	32.8	14.2	15.1	74.6	68.9	23.5	29.8	*5,839*	5,699	1,674	1,636	22	13	*0.16*	0.15
ITF4	Puglia	Largely urban	30.3	28.9	15.1	17.4	69.2	62.8	22.8	27.0	*4,064*	4,020	1,198	1,258	19	13	*0.07*	-0.32
ITF5	Basilicata	Largely rural	32.0	26.9	18.6	20.1	64.8	57.9	25.2	27.8	*570*	597	188	184	20	11	*-0.30*	0.15

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			White-collar high-skilled (%, 2017)	White-collar high-skilled (%, 2002)	Industry (%, 2017)	Industry (%, 2002)	Services (%, 2017)	Services (%, 2002)	Mainly public services (%, 2017)	Mainly public services (%, 2017)	2017	2002	2017	2002	2017 (%)	2002 (ppt)		
Italy																		
ITF6	Calabria	Intermediate	30.8	32.6	8.1	9.8	73.1	67.6	26.1	32.6	*1,965*	2,008	537	561	21	13	*-0.14*	-0.29
ITG1	Sicilia	Largely urban	31.8	33.3	9.2	9.7	76.6	71.1	28.6	33.2	*5,057*	4,967	1,367	1,429	20	15	*0.12*	-0.29
ITG2	Sardegna	Intermediate	32.2	29.1	9.5	13.0	77.2	67.9	27.1	27.2	*1,653*	1,630	562	539	21	11	*0.09*	0.29
ITH1/H2	Bolzano/Trento	Intermediate	36.7	30.4	15.1	17.5	71.5	65.0	24.7	23.7	*1,063*	940	490	422	20	11	*0.87*	1.07
ITH3	Veneto	Intermediate	35.7	29.1	28.0	32.4	62.8	56.7	16.8	16.1	*4,908*	4,529	2,126	1,972	20	11	*0.56*	0.52
ITH4	Friuli-Venezia Giulia	Intermediate	36.2	30.9	24.7	27.0	67.3	63.4	21.7	21.8	*1,218*	1,183	505	496	21	11	*0.20*	0.12
ITH5	Emilia-Romagna	Intermediate	37.6	29.8	25.5	28.3	65.1	59.3	17.3	16.9	*4,449*	4,003	1,973	1,804	23	13	*0.74*	0.62
ITI1	Toscana	Intermediate	34.8	30.5	20.0	25.4	70.3	63.2	18.8	19.4	*3,742*	3,498	1,582	1,437	23	12	*0.47*	0.68
ITI2	Umbria	Intermediate	34.0	31.3	19.8	24.7	69.7	63.0	21.4	22.0	*889*	826	355	327	24	14	*0.51*	0.56
ITI3	Marche	Intermediate	34.4	29.5	30.7	34.2	61.4	54..9	18.8	18.5	*1,538*	1,453	616	607	24	13	*0.39*	0.10
ITI4	Lazio	Capital region	38.7	35.5	8.6	11.1	83.7	77.7	24.3	26.8	*5,898*	5,117	2,378	2,039	29	16	*1.02*	1.11
Poland																		
PL11	Łódzkie	Largely rural	37.0	28.6	25.2	24.5	56.3	48.9	18.8	18.5	*2,472*	2,617	1,22	1,080	32	16	*-0.37*	0.26
PL12	Mazowieckie	Capital region	48.0	35.3	16.3	14.4	66.2	59.5	21.3	19.4	*5,341*	5,122	2,487	1,938	45	20	*0.29*	1.89
PL21	Małopolskie	Largely rural	41.8	30.2	21.6	18.1	57.3	47.9	19.1	18.3	*3,340*	3,230	1,426	1,228	38	17	*0.23*	1.08
PL22	Śląskie	Largely urban	41.8	32.7	26.5	22.9	57.6	55.8	19.5	20.5	*4,511*	4,748	1,886	1,541	34	15	*-0.33*	1.49
PL31	Lubelskie	Largely rural	30.5	25.2	15.0	13.9	54.3	41.2	20.7	17.4	*2,113*	2,202	867	934	31	15	*-0.27*	-0.48
PL32	Podkarpackie	Largely rural	34.1	23.3	26.1	22.1	54.1	39.9	21.8	16.2	*2,085*	2,104	848	781	32	12	*-0.06*	0.57
PL33	Świętokrzyskie	Intermediate	29.4	25.8	20.8	16.4	51.2	41.9	20.0	18.7	*1,238*	1,299	519	486	32	13	*-0.31*	0.45
PL34	Podlaskie	Largely rural	35.4	27.0	17.9	16.1	54.9	44.8	22.2	19.8	*1,157*	1,209	482	458	35	15	*-0.29*	0.36
PL41	Wielkopolskie	Largely rural	33.8	27.9	28.9	25.3	51.6	48.5	15.7	16.9	*3,457*	3,350	1,602	1,252	29	13	*0.21*	1.87
PL42	Zachodniopomorskie	Intermediate	38.6	33.4	21.0	21.8	62.8	61.8	24.6	20.1	*1,681*	1,698	690	540	32	17	*-0.07*	1.86
PL43	Lubuskie	Intermediate	34.4	30.7	25.6	24.6	59.0	58.4	21.8	21.8	*1,005*	1,009	429	351	28	16	*-0.03*	1.47
PL51	Dolnośląskie	Intermediate	42.3	31.8	24.3	21.2	59.9	59.9	19.6	20.9	*2,866*	2,910	1,234	922	35	17	*-0.10*	2.26

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			White-collar high-skilled (%, 2017)	White-collar high-skilled (%, 2002)	Industry (%, 2017)	Industry (%, 2002)	Services (%, 2017)	Services (%, 2002)	Mainly public services (%, 2017)	Mainly public services (%, 2017)	2017	2002	2017	2002	2017 (%)	2002 (ppt)		
Poland																		
PL52	Opolskie	Intermediate	33.3	26.9	27.7	25.9	53.2	46.4	19.7	18.2	*951*	1,066	403	349	29	13	*-0.72*	1.03
PL61	Kujawsko-Pomorskie	Largely rural	33.9	26.5	26.0	25.5	53.8	51.0	19.8	19.1	*2,061*	2,070	862	793	30	12	*-0.03*	0.58
PL62	Warmińsko-Mazurskie	Intermediate	34.4	32.1	23.3	22.7	56.9	54.5	22.8	21.8	*1,411*	1,428	558	427	29	16	*-0.08*	2.04
PL63	Pomorskie	Intermediate	42.2	31.0	22.0	24.0	61.3	58.8	20.9	21.5	*2,286*	2,178	1,008	742	37	17	*0.33*	2.40
Spain																		
ES11	Galicia	Intermediate	31.7	26.7	14.9	19.4	70.7	54.2	22.9	15.5	*2,710*	2,697	1,053	1,028	43	25	*0.03*	0.16
ES12	Principado de Asturias	Intermediate	32.2	31.7	16.3	17.2	73.5	62.0	21.1	17.3	*1,034*	1,063	395	371	49	30	*-0.18*	0.44
ES13	Cantabria	Intermediate	34.5	26.2	14.5	19.9	75.8	59.5	22.8	17.3	*581*	536	237	212	50	29	*0.56*	0.79
ES21	País Vasco	Largely urban	36.6	33.4	23.0	28.2	69.5	60.3	22.6	18.1	*2,167*	2,083	905	894	55	42	*0.27*	0.08
ES22	C. F. de Navarra	Intermediate	34.1	33.0	27.7	27.4	64.4	55.9	23.3	17.7	*640*	557	279	250	51	38	*0.99*	0.77
ES23	La Rioja	Intermediate	32.6	29.5	24.4	27.7	65.8	52.1	22.8	15.6	*313*	278	134	117	43	30	*0.84*	0.99
ES24	Aragón	Largely urban	32.1	31.6	17.5	25.1	70.1	57.6	24.4	17.5	*1,316*	1,210	566	498	44	30	*0.58*	0.91
ES30	Comunidad de Madrid	Capital region	48.5	38.5	8.6	14.4	86.2	75.0	21.6	17.8	*6,477*	5,479	2,907	2,542	54	39	*1.21*	0.96
ES41	Castilla y León	Intermediate	28.6	29.9	16.1	17.6	70.1	59.7	24.5	19.7	*2,436*	2,455	972	921	41	29	*-0.05*	0.37
ES42	Castilla-La Mancha	Intermediate	27.5	25.9	16.3	17.9	68.7	57.4	24.1	19.4	*2,041*	1,763	782	660	34	22	*1.05*	1.23
ES43	Extremadura	Intermediate	25.0	29.4	10.1	9.4	73.3	61.3	30.6	23.5	*1,078*	1,058	365	349	33	23	*0.13*	0.32
ES51	Cataluña	Largely urban	34.7	30.0	18.7	28.3	73.3	58.8	19.3	14.2	*7,441*	6,380	3,275	2,904	45	31	*1.11*	0.85
ES52	Comunidad Valenciana	Largely urban	30.0	26.8	16.4	23.0	73.6	59.2	18.7	14.2	*4,935*	4,192	1,990	1,777	40	25	*1.18*	0.80
ES53	Illes Balears	Largely urban	26.5	27.7	6.3	8.6	82.8	73.7	19.2	16.1	*1,151*	845	538	408	36	22	*2.41*	2.12
ES61	Andalucía	Largely urban	29.7	27.5	9.0	11.2	76.4	64.0	24.5	20.1	*8,409*	7,391	2,949	2,585	38	25	*0.92*	0.94
ES62	Región de Murcia	Largely urban	25.1	27.4	12.3	16.2	67.5	58.1	18.7	17.9	*1,473*	1,207	581	489	34	28	*1.47*	1.26
ES63/64	Ceuta/Melilla	Intermediate	33.5	33.7	1.8	2.9	94.9	92.2	47.7	48.0	*170*	137	55	45	38	28	*1.61*	1.45
ES70	Canarias	Largely urban	26.7	24.5	4.9	6.5	87.0	73.8	19.9	18.8	*2,155*	1,704	841	716	34	27	*1.76*	1.17

Code	Region	Urbanisation category	Occupation		Sector						Population (,000s)		Employment (,000s)		Graduate share of employment		Average population growth p.a. 2002–2017 (%)	Average employment growth p.a. 2002–2017 (%)
			White-collar high-skilled (%, 2017)	White-collar high-skilled (%, 2002)	Industry (%, 2017)	Industry (%, 2002)	Services (%, 2017)	Services (%, 2002)	Mainly public services (%, 2017)	Mainly public services (%, 2017)	2017	2002	2017	2002	2017 (%)	2002 (ppt)		
Sweden																		
SE11	Stockholm	Capital region	62.6	54.7	5.0	8.5	88.7	85.5	29.3	28.0	*2,269*	1,839	1,228	979	50	33	*1.56*	1.78
SE12	Östra Mellansverige	Largely urban	50.3	39.6	13.0	19.7	77.2	70.9	36.0	33.1	*1,664*	1,497	802	716	38	24	*0.74*	0.81
SE21	Småland med öarna	Largely rural	43.1	33.8	18.3	26.1	71.2	64.9	34.2	32.5	*848*	797	423	389	33	20	*0.43*	0.58
SE22	Sydsverige	Intermediate	54.4	41.7	10.4	17.8	80.5	73.3	34.4	32.6	*1,483*	1,287	713	608	44	26	*1.02*	1.16
SE23	Västsverige	Largely urban	49.9	41.1	13.4	19.8	76.8	72.5	31.9	31.2	*1,992*	1,778	1,016	870	39	25	*0.80*	1.12
SE31	Norra Mellansverige	Intermediate	45.2	36.2	13.8	20.4	74.7	69.4	37.0	35.9	*848*	829	400	383	34	21	*0.15*	0.29
SE32	Mellersta Norrland	Intermediate	47.6	39.1	11.3	15.8	78.1	74.4	36.8	35.5	*374*	374	182	176	33	22	*0.00*	0.23
SE33	Övre Norrland	Intermediate	46.6	38.8	10.5	16.4	75.0	72.8	38.4	39.0	*516*	510	256	237	36	26	*0.08*	0.56
United Kingdom																		
UKC	North East (England)	Largely urban	40.3	32.2	12.8	19.2	78.7	72.1	31.6	30.5	*2,639*	2,540	1,219	1,073	33	23	*0.26*	0.91
UKD	North West (England)	Largely urban	45.3	35.7	11.9	18.6	79.9	73.1	30.6	27.5	*7,215*	6,779	3,391	3,032	37	25	*0.43*	0.79
UKE	Yorkshire/the Humber	Largely urban	44.7	34.4	13.5	19.2	78.0	71.9	30.3	26.4	*5,430*	4,988	2,571	2,266	37	24	*0.59*	0.90
UKF	East Midlands (England)	Largely urban	45.1	34.9	15.9	20.8	74.7	69.2	27.9	24.3	*4,727*	4,206	2,240	2,018	35	23	*0.83*	0.74
UKG	West Midlands (England)	Largely urban	43.3	36.1	13.5	23.0	78.0	68.8	28.9	24.6	*5,806*	5,291	2,706	2,451	34	24	*0.65*	0.69
UKH	East of England	Largely urban	49.1	39.6	10.0	16.9	79.2	73.0	27.4	23.1	*6,151*	5,417	3,037	2,683	36	25	*0.90*	0.88
UKI	London	Capital region	58.4	50.0	4.2	7.9	87.7	86.1	25.8	24.1	*8,868*	7,350	4,598	3,530	57	39	*1.38*	2.02
UKJ	South East (England)	Largely urban	53.0	44.4	10.0	14.2	80.7	76.4	29.1	24.4	*9,057*	8,035	4,607	4,059	43	29	*0.85*	0.90
UKK	South West (England)	Intermediate	49.4	37.5	10.8	14.6	79.5	74.9	30.3	26.4	*5,527*	4,960	2,778	2,407	41	26	*0.76*	1.03
UKL	Wales	Largely urban	45.1	34.5	13.1	18.1	77.1	70.9	32.4	30.2	*3,113*	2,916	1,419	1,228	40	26	*0.45*	1.04
UKM	Scotland	Largely urban	44.8	36.6	9.9	14.3	78.0	75.3	30.0	29.3	*5,400*	5,065	2,657	2,345	46	33	*0.44*	0.89
UKN	Northern Ireland	Intermediate	40.8	35.1	10.7	15.3	69.3	69.3	28.5	34.8	*1,875*	1,693	835	714	39	28	*0.72*	1.13

Note: *NUTS level 1 regions were analysed for Germany and the United Kingdom; NUTS level 2 regions were analysed for the remaining Member States.*
Source: *EU-LFS (authors' calculations)*

Annex 2: Employment shifts at national level, 2011–2018

Labour market context

Employment in the EU has grown continuously for over five years, meaning that there were just over 230 million people in employment in the EU in the second quarter of 2018,[9] an increase of some 15 million workers since the post-crisis trough in 2013.

There are more people in employment in the EU now than ever before, reflecting improved economic circumstances as well as the longer-term trends of increased labour market participation, notably of female and older workers. The recent boost to employment levels is reflected in higher levels of labour market participation, higher employment rates and declining unemployment rates.

Demographic factors, however, no longer offer the boost to employment levels that they once did. The working-age population has been contracting since 2010 and is forecast to shrink by some 6–7 million overall between 2010 and 2020, compared to an increase of approximately 10 million in the preceding decade, 2000–2010. The declining working-age population is a particular concern in the central and eastern European countries, where the effects of low birth rates are compounded by emigration. Year-on-year declines were greater than 1% in Bulgaria, Croatia, Latvia and Romania and more than 2% in Lithuania (Eurostat, 2019).

National labour markets within the EU have recovered from the economic crisis at very different paces, but the huge divergences that arose in the immediate post-crisis period are shrinking. Unemployment is at low enough levels in some countries (such as Austria, Czechia and Germany) that labour shortages rather than unemployment is the principal labour market policy concern. Unemployment remains very high in the countries worst affected by the crisis (Greece and Spain) but has improved by nearly 10 percentage points relative to its most recent peaks.

In this annex, the manifestations of these top-level changes in terms of the employment structure are described. The jobs-based approach is then used to add further detail on how shifts in employment (by country, sector, gender, working time, contractual status and so on) are shared across the wage, or job quality, distribution. The main focus is the period Q2 2011–Q2 2018, with the analysis based on the most recent EU-LFS data available at the time of writing.

Broad occupational and sectoral change

Table A2 provides a broad outline of how employment in the EU has changed in terms of occupation and sector. The data in this table are at a much more aggregated level (four occupational groups and five sector categories) than the jobs-based analysis earlier in the report but serve well as a first approximation.

The main vectors of change in employment continue to be the shift towards services – which now account for 73% of EU employment – and occupational upgrading.

Table A2: Change in employment composition (percentage points), by broad sector and occupation, EU, 2011–2018

	Agriculture/ Extractive	Manufacturing/ Utilities	Construction	Primarily private services	Primarily public services	Total occupation
White-collar high-skilled	0.00	0.19	0.02	1.60	0.58	**2.40**
White-collar low-skilled	-0.01	-0.09	-0.04	-0.25	-0.11	**-0.51**
Blue-collar high-skilled	-0.80	-0.39	-0.40	-0.02	-0.03	**-1.65**
Blue-collar low-skilled	-0.14	-0.06	-0.22	0.24	-0.06	**-0.24**
Total sector	**-0.95**	**-0.35**	**-0.64**	**1.57**	**0.37**	**0.00**

Source: *EU-LFS (authors' calculations)*

9 Note that official estimates of EU employment using national accounts data are generally higher by 2–3% than those from the EU-LFS used in this report. The main reason for the difference is that the EU-LFS is a household survey and identifies resident population in employment (national concept), whereas national accounts estimate those working in resident production units (domestic concept) using a variety of sources (including the EU-LFS) and are adjusted for consistency. The differences relate mainly to cross-border workers.

The most significant positive occupational shift has been in white-collar high-skilled employment (especially professionals and associate professionals, with an increase in the share of overall employment of 2.41 percentage points). There have been relative declines in each of the other occupational categories, the sharpest being in blue-collar high-skilled jobs. This category includes much skilled agricultural employment as well as traditional, mainly male, blue-collar jobs in manufacturing and construction.

Employment growth has been heavily concentrated in service sectors. There have been declines of growing magnitude in the manufacturing, construction and agriculture/extractive sectors respectively. The manufacturing and agriculture shares of employment have been structurally declining over a long period. The decline in construction reflects the very delayed recovery of employment in this typically cyclical sector in the aftermath of the Great Recession; employment levels, if not shares, have recovered more quickly in manufacturing than in construction.

Within services, the shift has been primarily to private service sectors, though the predominantly public service sectors (health, education and public administration) account also for a notable share of employment growth in the higher-level occupations. There has been a decline in the share of white-collar low-skilled employment (mainly clerical and secretarial) in both public and private services. And blue-collar occupations have contributed only modestly to growth in services employment.

Finally, there is evidence across the sectors of occupational upgrading; white-collar high-skilled employment has fared relatively better than blue-collar employment in each of the five broad sectors. In part, this reflects changing patterns of labour demand, which have been skewed towards services and higher-skills profiles, but also reflects changes on the supply side.

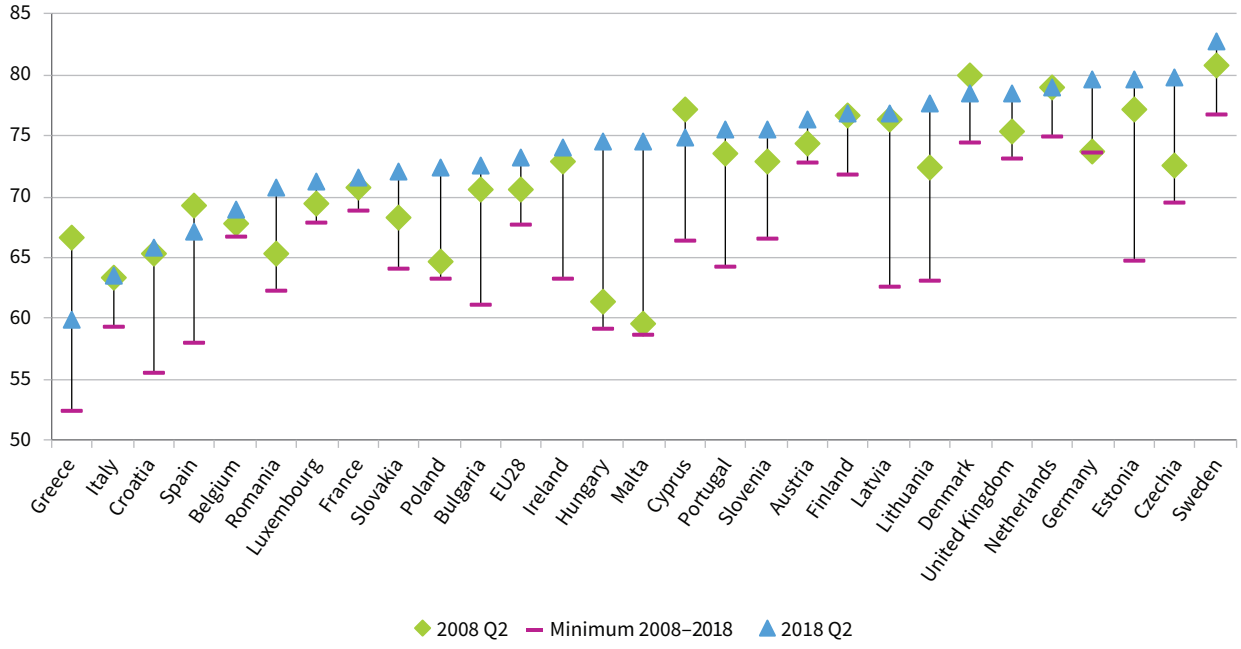
The workforce continues to change across a number of other dimensions as well, notably:

- a skills upgrading of the workforce as older workers retire and are replaced by younger cohorts with higher average levels of qualification
- an increasing share of older workers due to declining levels of youth participation in the labour market and later retirement
- an increasing incidence of part-time work
- a declining gender employment gap

Employment change in Member States

The crisis and post-crisis period has been experienced very differently across Member State labour markets, though with some degree of reconvergence as the recovery has become more generalised in recent years. Two Member States, Germany and the United Kingdom, have contributed disproportionately to overall net employment growth (of 2.8 million and 3 million, respectively) between 2011 and 2018. Only two other Member States, France and Poland, have increased employment by at least 1 million in the same period.

Figure A1: Employment rates (%), EU, Q2 2008–Q2 2018



Note: *Population aged 20–64 years.*
Source: *EU-LFS (Eurostat website)*

Thirteen Member States had surpassed the Europe 2020 target of a 75% employment rate by mid-2018, while another four (Cyprus, Hungary, Ireland, and Malta) were within 1 percentage point of doing so.

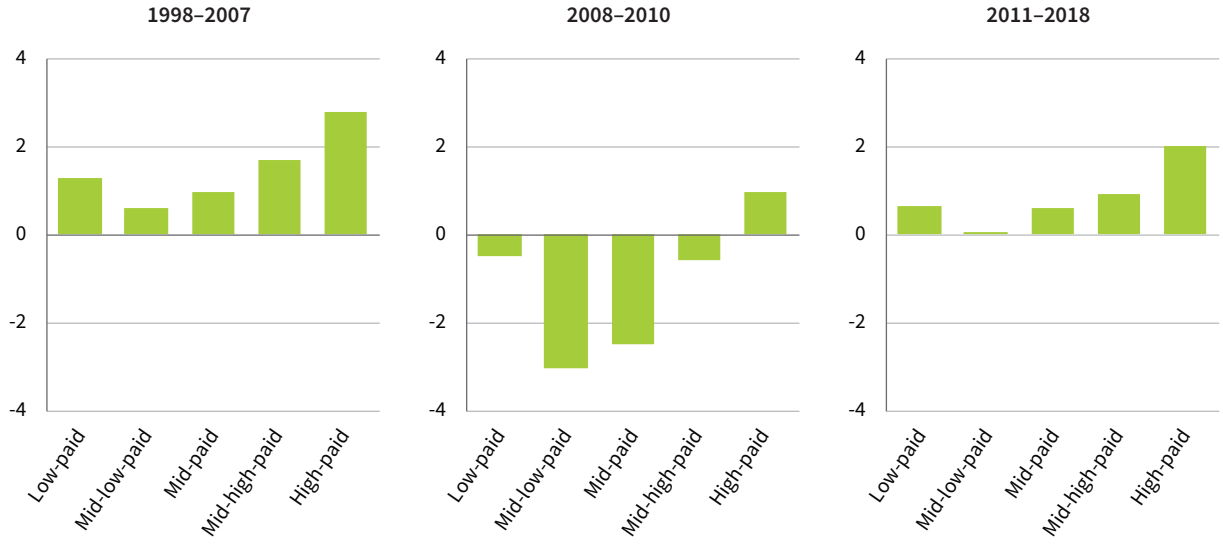
The most recent period of employment growth since 2013 has seen some sustained recovery in most of the Member States whose labour markets suffered most during the crisis period. As Figure A1 shows, employment rates have risen substantially from the minima, even if for some countries, notably Greece and Spain, these are just the first steps towards the normalisation of labour markets.

Recent employment shifts in the EU

This section uses the jobs-based approach to describe employment developments by job–wage quintile, primarily during the period Q2 2011–Q2 2018. In order to put in context more recent developments, however, it is useful to observe how shifts in the EU employment structure have been distributed based on earlier EJM analyses covering data back to the late 1990s.

The distribution of employment change has been relatively consistent between quintiles over the three charts covering 20 years (Figure A2). One key characteristic has been the relative outperformance of the top quintile. Well-paid jobs have added employment even during the peak crisis period (2008–2010) and contribute disproportionately in all periods to overall employment growth. A secondary recurring pattern across the three periods is the relative weakness of employment growth in the mid-low-paid quintile, though the resulting pattern of employment polarisation was clearest during the recessionary period and has been less obvious during periods of employment expansion. In summary, the dominant shift has been one of employment upgrading.

Figure A2: Employment change (% per annum) by job–wage quintile, EU, 1998–2018



Notes: *Different EU country aggregates and periodisations are used due to data availability, as follows: for 1998–2007, 23 Member States (no data for Cyprus, Malta, Poland or Romania); for 2008–2010, 27 Member States (no data for Croatia); for 2011–2018, 27 Member States (data for Luxembourg omitted).*
For all periods from 2008 onwards, figures are based on data from the second quarter of each year. The most recent chart, 2011–2018, is based on an adaptation of the jobs-based approach (see footnote no. 6 in Chapter 2), using a tailor-made EU-LFS data extraction carried out in January 2019. For this reason, it may differ slightly from previously reported EJM figures, due to data revisions in the underlying EU-LFS data.
Source: *EU-LFS, SES (author's calculations)*

Drivers of employment change

Until recently, the debate about shifts in the employment structure in developed economies was largely focused on the two main patterns of change – upgrading and polarisation – observed in Figure A2. Each pattern has its own supporting narrative – 'skill-biased technological change' (SBTC) in the case of upgrading and 'routine-biased technological change' (RBTC) in the case of polarisation.

Upgrading shifts should lead to a linear improvement in employment structure, with the greatest employment growth in high-paid (or high-skilled) jobs and the weakest growth in low-paid (or low-skilled) jobs, with intermediate growth rates in the middle. With polarisation, the main difference is that the relative positions of the middle and bottom of the job distribution are swapped: employment growth is weakest in the middle and relatively stronger at both ends of the job–wage distribution, leading to a 'shrinking' or 'hollowed' middle.

In both accounts, the principal driver of employment change is technology, and its principal effect is to increase the demand for skilled labour in developed economies at the expense of less-skilled labour. Higher skill levels endow their possessors with the capacities to utilise and master new technologies. This should enhance their individual productivity. But while technology tends to act as a complement to those with higher skills, it is more likely to substitute those with lower-level skills whose job tasks are more easily replaceable by machines.

The main explanation of the differences in the two accounts (SBTC and RBTC) relates to where in the wage distribution – at the bottom or in the middle – those jobs that are most susceptible to technological displacement lie. Exponents of RBTC claim that the most vulnerable jobs are routine jobs with a high share of tasks than can easily be codified (for example, routine clerical and manufacturing or production jobs). These happen to predominate in the middle of the wage distribution in developed economies (Autor et al, 2006). Less routine jobs – such as personal services jobs at the bottom of the wage distribution (for example, hairdressers or restaurant workers) and knowledge-intensive professional services jobs at the top (for example, lawyers or medical doctors) – are less easy to automate and therefore less vulnerable to replacement.

However, the world of work and employment is impacted by factors other than new technology. Previous EJM reports have drawn attention to factors contributing to the shifts observed in developed-economy employment structures (see Eurofound, 2017b). These include: the role of the state as an employer; institutional vectors such as labour market regulation, taxation and social welfare policy; worker representation; macroeconomic considerations including regional specialisation; inequality; the business cycle; and, importantly, labour supply factors such as migration, feminisation and educational upgrading. Each of these factors is likely to have a bearing on the changing shape of employment in advanced market economies and – at the least – to mediate the changes that originate in technological progress. As previously argued, these drivers or contextual factors vary significantly between countries and across time, even among a subset of relatively homogeneous, developed western European Member States (Eurofound, 2015). For these reasons, even if aggregate EU employment displays some consistency in its shifts over time, it is not unreasonable to expect significant variation between countries. As the next section indicates, this was found to be the case for the period 2011–2018, as well as being documented in earlier EJM analyses going back to the mid-1990s.

Variety of patterns across Member States

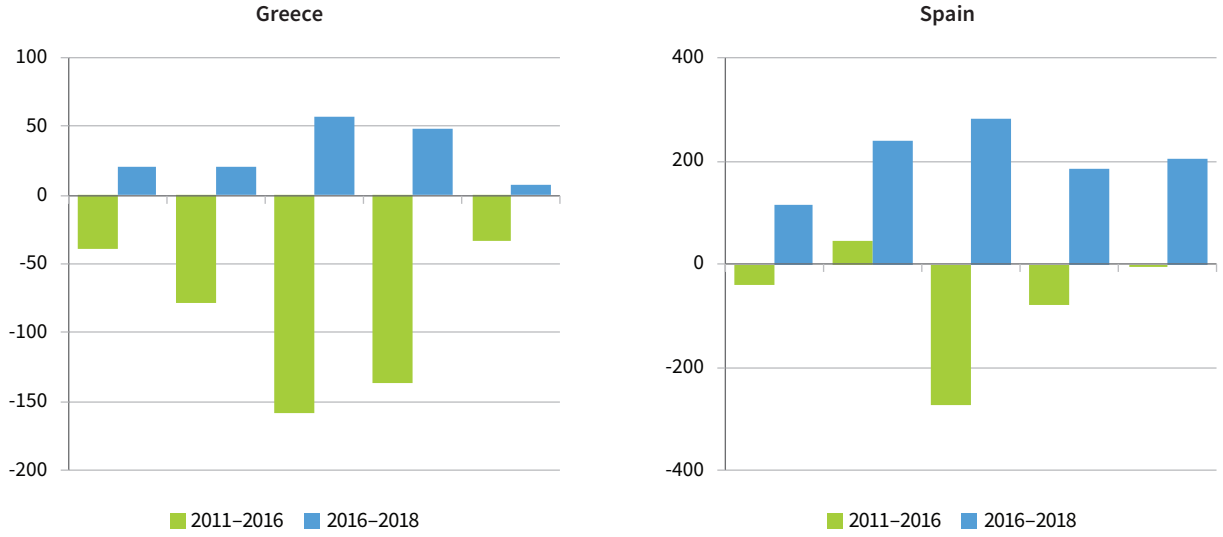
The employment recovery is now well established, with 15 million net new jobs created across the EU since 2011. Recent net new employment has been shared more broadly across the wage distribution, though with a customary skew towards higher-paid jobs. Employment growth has tended to spread down the wage distribution during the recovery, consistent with a consumption-led recovery raising demand in particular for lower-level, non-tradeable services. But, structurally, labour demand remains skewed to higher-paid and higher-skilled jobs.

There is clearly no dominant or pervasive pattern of employment shift over the period covered, as might be expected given the divergent labour market performances of Member States over much of the same period (Figure A3). The aggregate EU pattern is one of upgrading with some polarisation.

Figure A3: Employment change by job–wage quintile, in thousands, Member States, Q2 2011–Q2 2018

Notes: *Data for Germany cover Q2 2012–Q2 2016; data for the Netherlands and Slovakia cover Q2 2013–Q2 2016 due to data breaks.*
Source: *EU-LFS, SES (authors' calculations)*

Figure A4: Employment shifts by job–wage quintile, in thousands, Greece and Spain, 2011–2018



Source: *EU-LFS (authors' calculations)*

Those more populous Member States with significant positive employment growth in recent years each demonstrate clear upgrading patterns – Germany, Poland and the UK. Over half of top-quintile employment growth in the EU since 2011 occurred in these three Member States – they also account for around half of total net employment growth. Other unambiguously upgrading countries included Austria, Bulgaria, Croatia, Portugal and Sweden.

Employment polarisation is apparent in Denmark, France and Romania as well as in some of the countries where labour markets were most affected by the crisis – Estonia, Greece and Spain. It is interesting, however, that more recent employment growth in Greece and Spain has also tended to occur in mid-paid or mid–low-paid jobs, leading to distinctive 'growth-in-the-middle' employment shifts since 2016 (Figure A4). A small number of Member States display downgrading employment shifts, notably Hungary and Italy.

In many countries, employment shifts do not conform to any obvious pattern, are irregular or are some hybrid of the four patterns already indicated. This is in part due to the short time frame covered. Structural changes generally take longer than seven years to manifest themselves. But a second general conclusion based on Figure A4, supported by previous jobs-based approach analysis carried out over longer time frames (Oesch, 2013; Eurofound, 2015), is that there has been a variety of employment-shift patterns in different countries, while the dominant aggregate pattern has been one of upgrading.

Growing and declining jobs

The quintile charts compress a large amount of data in order to convey the main employment-shift patterns graphically. They do not, however, identify the individual jobs (again, as defined in our application of the jobs-based approach) that contribute to the overall pattern. In practice, a small number of large-employing jobs account for a very large share of employment, and shifts in headcount in these jobs contribute most to the observed patterns of change in the quintile charts. Tables A4, A5 and A6 list in sequence the top 12 jobs in terms of employment in the EU as well as those large-employing jobs (having more than 600,000 people employed in the EU in 2016, n=57) with the fastest rate of growth or contraction in 2011–2018.

The top 12 jobs (Table A3) account for over a third of all employment in the EU (34%), with the two biggest jobs, sales workers in the retail sector and teaching professionals in the education sector, together accounting for more than 1 in 10 jobs in the EU. Employment has grown modestly in these two predominantly female jobs, the former being in the lowest job–wage quintile and the latter being in the highest. Of the other largest-employing jobs, the biggest contractions in headcount were in skilled agricultural workers and construction sector labourers, while the biggest gains were among health sector professionals and associate professionals as well as personal services workers in the accommodation and restaurants sector.

Table A3: Top 12 jobs by employment, including job–wage percentile, EU, 2018

Occupation	Sector	Employment (millions)	Employment change 2011–2018 (%)	Wage percentile
Sales workers	G - Wholesale and retail trade; repair of motor vehicles, etc.	13.5	0.2	15
Teaching professionals	P - Education	10.0	4.5	82
Building and related trades workers, etc	F - Construction	6.6	-6.3	40
Market-oriented skilled agricultural workers	A - Agriculture, forestry and fishing	6.1	-13.5	25
Health professionals	Q - Human health and social work activities	5.5	11.7	90
Personal service workers	I - Accommodation and food service activities	5.4	14.8	9
Personal care workers	Q - Human health and social work activities	5.2	2.9	21
Drivers and mobile plant operators	H - Transportation and storage	5.1	8.5	55
Health associate professionals	Q - Human health and social work activities	4.9	10.1	59
Metal, machinery and related trades workers	C - Manufacturing	4.9	-2.2	57
Stationary plant and machine operators	C - Manufacturing	4.3	1.6	44
Science and engineering associate professionals	C - Manufacturing	3.3	11.7	75

Source: *EU-LFS, SES (authors' calculations)*

The fastest employment growth was recorded mainly in higher-paid professional or associate professional grades (Table A4) in a variety of sectors, such as information and communication, health, education, retail and the broad professional services category (professional, scientific and technical activities).

However, two low-paid service jobs also feature: food preparation assistants in the hospitality sector and cleaners and helpers in the health sector.

Table A4: Top 12 fastest-growing large-employing jobs, including job–wage percentile, EU, 2011–2018

Occupation	Sector	Employment (millions)	Employment change 2011–2018 (%)	Wage percentile
Business and administration professionals	G - Wholesale and retail trade; repair of motor vehicles, etc.	1.0	65.4	87
Legal, social, cultural, etc. professionals	P - Education	1.1	50.2	50
ICT professionals	J - Information and communication	2.3	47.1	94
Business and administration professionals	M - Professional, scientific and technical activities	2.0	40.9	87
Business and administration professionals	C - Manufacturing	1.0	37.6	93
Personal service workers	I - Accommodation and food service activities	1.3	35.8	2
Legal, social and cultural professionals	Q - Human health and social work activities	1.2	32.2	67
Cleaners and helpers	Q - Human health and social work activities	1.4	28.3	4
Legal, social, cultural, etc. professionals	Q - Human health and social work activities	1.2	27.1	36
Business and administration professionals	K - Financial and insurance activities	1.1	25.9	97
General and keyboard clerks	O - Public administration and defence	1.4	24.2	49
Labourers in mining, construction, etc.	G - Wholesale and retail trade; repair of motor vehicles, etc.	1.6	21.1	11

Source: *EU-LFS, SES (authors' calculations)*

Table A5: Top 12 fastest-declining large-employing jobs, including job–wage percentile, EU, 2011–2018

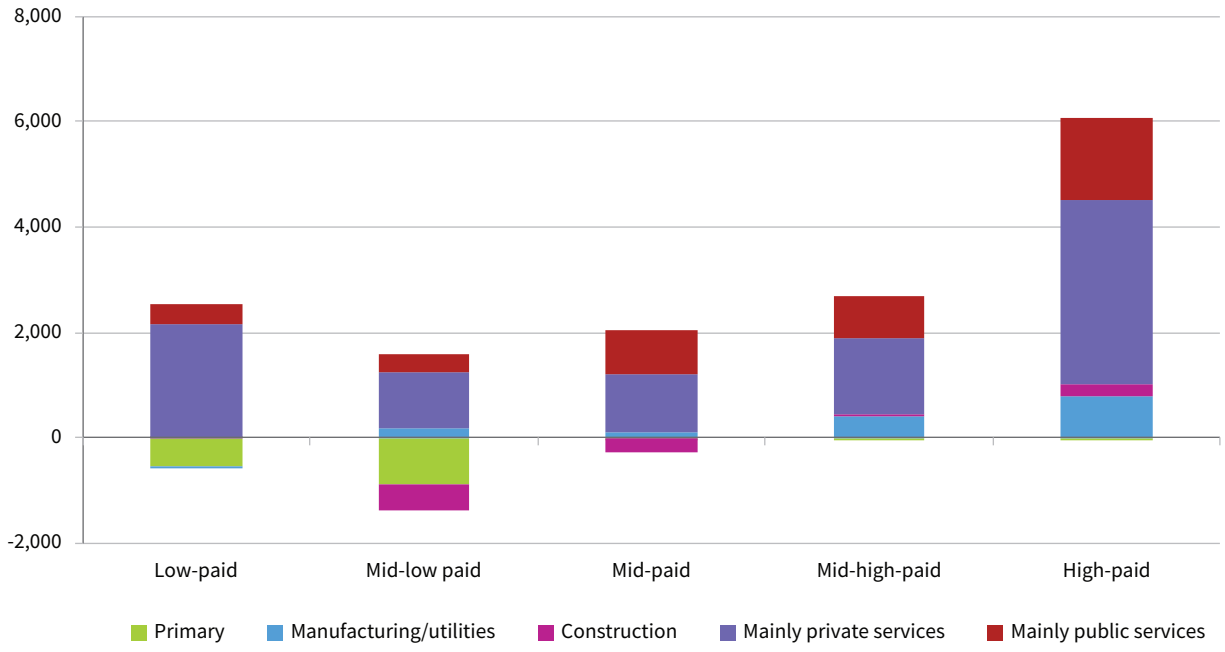
Occupation	Sector	Employment (millions)	Employment change 2011–2018 (%)	Wage percentile
Cleaners and helpers	T - Activities of households as employers	1.4	-23.0	0
Labourers in mining, construction, etc.	F - Construction	1.0	-21.1	28
Market-oriented skilled agricultural workers	A - Agriculture, forestry and fishing	6.1	-13.5	25
Agricultural, forestry and fishery labourers	A - Agriculture, forestry and fishing	1.3	-12.7	4
Hospitality, retail and other services managers	I - Accommodation and food service activities	1.1	-11.7	63
Hospitality, retail and other services managers	G - Wholesale and retail trade; repair of motor vehicles, etc.	1.2	-7.9	84
Building and related trades workers	F - Construction	6.6	-6.3	40
Business and administration associate professionals	C - Manufacturing	1.6	-3.3	77
Numerical and material recording clerks	G - Wholesale and retail trade; repair of motor vehicles, etc.	1.5	-3.3	38
Business and administration associate professionals	G - Wholesale and retail trade; repair of motor vehicles, etc.	2.3	-2.9	69
Metal, machinery and related trades workers	C - Manufacturing	4.9	-2.2	57
Food processing, wood working, etc. workers	C - Manufacturing	3.1	-1.8	27

Source: *EU-LFS, SES (authors' calculations)*

The jobs that are contracting fastest are dispersed across the wage distribution and include construction labourers, clerical jobs in two sectors as well as one of the large-employing jobs, agricultural labourers (Table A5).

As Figure A5 illustrates, a very large share of net new employment since 2011 has been in service sectors, which now account for nearly three out of four jobs in the EU. Private services have accounted for the majority of this growth, but services that are predominantly state-funded (education, health, public administration, and so on) have also made a strong contribution to growth in the top quintiles, where public sector jobs are well represented. Private services employment growth has also been strong in the top quintile but shows some modest evidence of polarisation overall, as nearly all net employment growth in the lowest two quintiles is in lower-level service jobs, such as personal service workers or food preparation assistants in accommodation and food service activities (see Table A5).

Figure A5: Developments by broad sector – the services transition, in thousands, EU, 2011–2018



Source: *EU-LFS, SES (authors' calculations)*

Employment losses by broad sector have been concentrated in the primary sector (agriculture/extractive industries) and construction. In agriculture, these losses have been highly concentrated in a small number of Member States with comparatively large but fast-declining agricultural workforces, for example Croatia, Greece, Poland, Portugal and Romania. The jobs involved are low-paid and in the first and second job-wage quintiles.

The construction sector headcount suffered the steepest relative decline during the global financial crisis and has been much slower to recover than manufacturing. Net employment growth resumed only in 2016, and employment levels remain below those of 2011 and far below those of 2008. This net destruction of employment affected mainly low-paid and mid-low-paid jobs.

Manufacturing, which suffered the steepest employment losses during the recession, has staged a stronger recovery, with net employment growth since 2013 amounting to 2 million new jobs. Interestingly, net new employment has been skewed towards better-paid jobs, with a recomposition of employment towards higher-skilled, professional roles and away from more traditional, blue-collar production jobs. Employment has grown in professional engineering and management roles.

The key trends can be summarised in the following points.

- Net employment growth since 2011 in the EU has tended to be upgrading and skewed towards well-paid jobs, generally requiring higher-level qualifications. In the five years after the post-recession resumption of employment growth in 2013, the EU created nearly 15 million net new jobs.
- There continues to be a variety of patterns of employment shift across Member States. During Q2 2011–Q2 2018, some countries exhibited one of the two main patterns identified in the literature – upgrading and polarisation. For example, Sweden was clearly upgrading while Belgium was clearly polarising. Some countries, such as Hungary and Italy, exhibited downgrading shifts, where relative employment growth was strongest in low-paid jobs.
- Service sectors have contributed to all net employment growth recorded since 2011; the balance of the remaining broad sectors has been slightly negative. Private service sectors have been the main beneficiary, but predominantly state-funded sectors (mainly education and health) have made an increasing contribution in more recent years to top-quintile employment growth, consistent with less-constrained public finances.

Annex 3: Mobility and migration from a regional perspective

In this section, the jobs-based regional analysis is reframed from the perspective of worker mobility, in two dimensions. Firstly, the extent of regional commuter flows is estimated (that is, the incidence of workers who reside in one region but work in another, generally neighbouring, region), and these flows are characterised in terms of job–wage terciles. Secondly, the section describes how non-native employment – as proxied by country of birth – is distributed by region type. This confirms a higher incidence of non-native employment in urban areas, which contributes to the polarisation of employment in capital city regions.

Region of work

In previous EJM analyses, the jobs-based approach has been applied at national and aggregate EU levels only. The main data source, the EU-LFS, is a household survey, and the respondents are resident in the reporting Member State; but they are not necessarily working in the same Member State. In practice, this is a minor problem for the analysis at national level, where the share of cross-border workers is tiny (never more than 2% of the national population and usually much less), and unlikely to affect national estimates in any meaningful way. To be consistent with the methodology of previous EJM analyses, the main analysis in this report has been based on the region of residence of EU-LFS respondents (as captured by the survey variable REGION).

An argument can be made for focusing instead on the region of work (the region where respondents' principal paid job is carried out), regardless of where respondents live. Where there are high levels of intra-country regional commuting, a residence-based approach could give misleading or biased results. This potential concern extends also to cross-border workers commuting between border regions and neighbouring countries. Here, we investigate how relevant this difference is for the analysis, based on the REGIONW (region of work) variable in the EU-LFS, which identifies the regions in which respondents work as opposed to where they reside.[10]

Just over 6% of workers in the nine Member States analysed – around 11 million – indicated that they were not working in the region in which they were resident in 2017 (Table A6). The large majority of these resided in another region in the same Member State (5.1%). The proportion explicitly indicating that they worked in another country is very small (0.3%), but this is likely to be an underestimate. The distribution of the 'not indicated' respondents, which is heavily weighted in border regions in the reporting countries, suggests that a large share of these workers were also working in neighbouring Member States. The share of regional commuting was especially high in Belgium (over 20%) and relatively low in Italy, Poland and Spain (less than 3%).

Table A6: Share of workers who work in the same region as where they reside, a different region or another country, nine Member States, 2017

Country	Same region (%)	Different region (%)	Other country (%)	Not indicated (%)
Belgium	77.8	19.5	0	2.7
Czechia	93.4	5.4	1	0.2
France	93.4	4.8	1.2	0.7
Germany	92.8	5.6	0.1	1.5
Italy	96.9	2.6	0.0	0.6
Poland	96.2	2.5	0.5	0.8
Spain	97.6	2.0	0.1	0.3
Sweden	93.7	5.4	0.0	0.9
United Kingdom	91.8	7.5	0.0	0.7
Total	**93.7**	**5.1**	**0.3**	**0.9**

Note: *Regions at NUTS 2 level except for Germany and the United Kingdom, where it is NUTS 1 level.*
Source: *EU-LFS*

10 REGIONW data are available only more recently in some of the nine Member States covered. For Sweden, data is from 2005; for Poland, from 2004.

Table A7: Share of country's total employment and of non-resident workers in top three regions, 2017

Top three regions by country		Share of national employment (%)	Share of country's non-resident workers (%)
BE10	Brussels	10	36
BE24	Flemish Brabant	9	15
BE21	Antwerp	19	11
CZ01	Prague	13	55
CZ02	Střední Čechy	11	21
CZ06	Jihovýchod	16	8
FR10	Île de France	21	38
FR82/83	Provence-Alpes-Côte d'Azur	8	7
FR71	Rhône-Alpes	11	5
DE60	Hamburg	2	15
DE30	Berlin	4	12
DE70	Hessen	8	11
ITC4	Lombardia	19	24
ITH5	Emilia-Romagna	9	12
ITI4	Lazio	10	12
PL12	Mazowieckie	15	27
PL22	Śląskie	12	14
PL21	Małopolskie	9	9
ES30	Communidad de Madrid	16	39
ES42	Castilla-La Mancha	4	10
ES51	Cataluña	18	8
SE11	Stockholm	25	43
SE12	Östra Mellansverige	15	16
SE23	Västsverige	21	11
UKI	London	14	39
UKJ	South East (England)	13	16
UKH	East of England	9	10

Source: *EU-LFS (authors' calculations)*

As Table A7 illustrates, capital cities in particular absorb commuting workers from surrounding regions. The table lists the top three regions by country in terms of the national share of non-resident workers (those working in the region but not resident there). The highest national shares were reported in the capital city regions in all nine Member States except Italy and Germany – though Berlin and Lazio did appear among the top three regions in each case. The highest shares were recorded in less populous Member States with 'dominating' capital city regions (those accounting for more than 20% of national GDP): Prague and Stockholm. But the larger capital city regions of Île de France, London and Madrid accounted for over one-third of all regional commuters in their respective countries.

In each, the share of the country's non-resident workers is much higher than the capital's share of national employment – by a factor of nearly four in the case of Brussels and Prague. The converse is true in the case of second cities in many of the countries; the regions containing Antwerp, Barcelona, Gothenburg and Lyon each absorb a significantly lower share of regional commuters than their share of national employment would suggest. The gravitational draw of regional commuting flows appears to be highly capital-specific, rather than more broadly metropolitan, in these countries.

In Germany and Italy, it was the regions around the second cities – Hamburg and Milan – that recorded the highest share of non-resident workers. The polycentric urban settlement of Germany in particular but also Italy to a lesser extent leads to relatively low shares of interregional commuters in the top three regions – commuting flows are much more dispersed across regions and less concentrated in individual population centres.

A final point from Table A7 is that capital city regions can exert a further pull in terms of regional commuting shares on neighbouring regions. This is the case in the United Kingdom, where the regions surrounding Greater London – and from which many Greater London-bound workers leave to work – themselves absorb a high share of national cross-region commuters. Similar patterns are observed in Střední Čechy, the 'doughnut' region surrounding Prague, and Flemish Brabant, part of the Brussels commuting zone, as well as Castilla-La Mancha near Madrid. These patterns suggest that work-related commuting stretches the effective capital city economic boundaries beyond its NUTS-defined limits in these countries in such a way that surrounding regions themselves are incorporated in a greater capital region commuting zone – with outflows to the capital region itself but also inflows from the capital region proper as well as from other neighbouring regions.

From 2002 to 2017, the pull of the capital city regions in terms of commuting flows has increased in relative terms in all cases except Brussels – where it nonetheless remains very high. The strongest increase has been recorded in Prague (Table A8).

The growing importance of capital city regions in the national employment share presented in this report is boosted by commuting flows from workers resident outside the capital. In all of the nine capital city regions, the net commuting flow (non-residents working in the capital minus those resident in the capital working elsewhere) is positive, especially in Brussels but also strongly in Berlin, London and Prague. In total, these commuting flows add 1.7 million net headcount to the capital city regions.

This raises two questions. The first relates to the characteristics of these commuting workers, for example in terms of occupation and sector. Do they differ from those of the resident working population? The second question, which follows on from the first, is whether and to what extent changing the frame of reference from region of residence to region of work might alter the descriptive findings of the jobs-based approach regarding employment-shift patterns at regional level – upgrading, polarisation, and so on. Clearly, they impact on the quantitative employment shifts as already indicated, notably in capital cities such as Brussels, London and Prague, but will they also change the aggregate qualitative patterns?

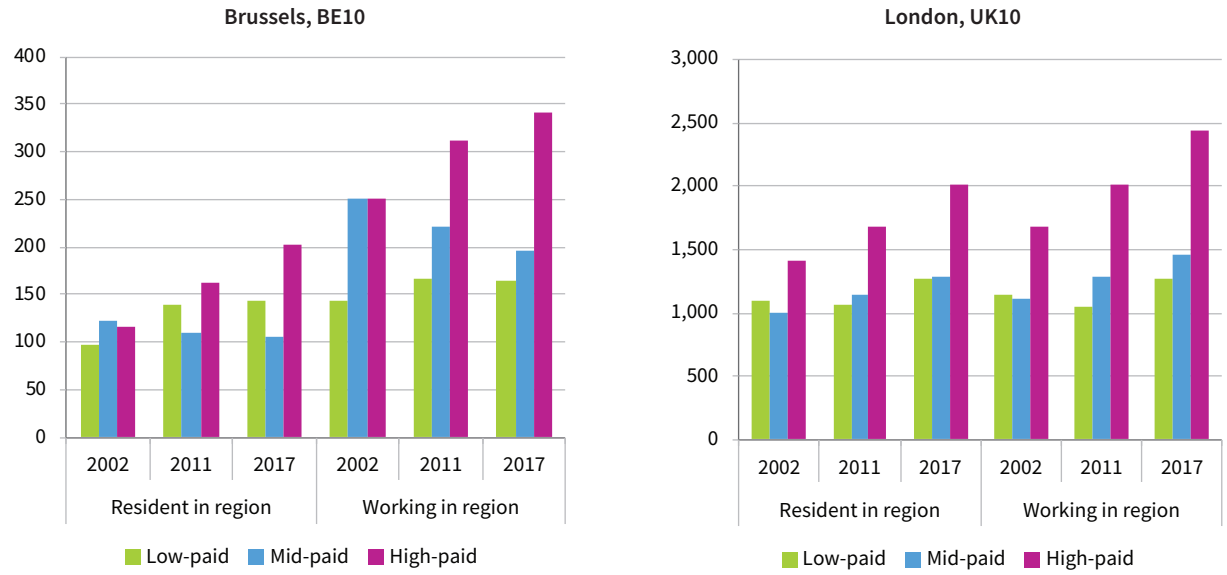
One hypothesis is that commuting workers could be categorised in two distinct groups, broadly speaking those choosing to live outside cities for quality of life reasons (generally those with better-paid jobs) and those obliged to live outside cities for cost of living reasons, especially high housing costs (those with lower-paying jobs). What we infer from the EU-LFS data is that the first hypothesis is better supported by the data than the second. The key difference between resident and commuting workers is that a higher share of commuting workers tends to be in higher occupational groups. The share of high-skilled white-collar workers among those commuting to work is 13 percentage points higher than among workers resident in the same region. Commuting workers are less likely to be blue-collar workers or lower-skilled white-collar workers. A possible explanation is that distance imposes costs and that, as a consequence, relatively well-paid workers have more obvious incentives to commute interregionally. For those on lower pay, the rewards are less likely to justify the additional expense. These differences apply across all

Table A8: Share of non-resident workers in capital city regions and change, 2002–2017, nine Member States

NUTS code	Region	2002 (%)	2017 (%)	Change (ppt)
BE10	Brussels	55.47	46.9	-8.5
CZ01	Prague	14.5	19.5	5.0
DE30	Berlin	11.5	14.0	2.5
ES30	Comunidad de Madrid	2.9	4.9	2.0
FR10	Île de France	7.3	8.3	1.0
ITI4	Lazio	2.9	3.1	0.2
PL12	Mazowieckie	2.4	4.3	1.9
SE11	Stockholm	7.6	9.0	1.4
UKI	London	17.8	18.2	0.4

Source: *EU-LFS (authors' calculations)*

Figure A6: Distribution of employment, in thousands, by national job–wage tercile, Brussels and London, 2002–2017



Source: *EU-LFS (authors' calculations)*

types of region of work (mostly urban, intermediate and mostly rural) and are not especially prominent in capital city regions. Indeed, the biggest differential is observed for those commuting to largely urban – but not capital city – regions (14 percentage points, 54% versus 40%) while it is somewhat lower for those commuting to work in capital city regions (10 percentage points, 62% versus 52%). Moreover, among the nine capital city regions covered, there was considerable variation, with commuters working in Brussels, London, Paris and Rome having a higher occupational profile than resident workers, but little difference in Berlin, Mazowieckie, Prague or Stockholm and, exceptionally, a higher occupational profile of resident workers in Madrid.

Overall, this implies that regions that absorb a lot of commuting workers are, in reality, more upgraded in their employment structures than would be the case if they were characterised solely on the basis of resident workers. Across all of the 130 regions covered in this report, these differences are relatively marginal. Broken down by region type, the main difference is that the already high share of top-tercile employment in capital city regions is increased further by 1.2 percentage points (45.5% versus 44.3%). The principal pattern – the contrast of largely rural areas with a skew towards low-paid employment and capital city regions with a skew towards high-paid employment – remains unaffected.

However, for specific regions, especially those capitals that absorb a high share of relatively high-skilled, high-paid commuters, the differences can be dramatic.

In the Brussels region, where nearly half of workers commute in from other regions, each job–wage tercile grows in absolute terms when region of work is compared to region of residence. By far the majority of this additional headcount is in jobs in the top tercile, followed by those in the middle tercile, with a more modest positive contribution in the low-paid tercile (Figure A6). The skew towards well-paid employment steadily increased from 2002 to 2017. Interestingly, the contribution of commuting to boost employment in the middle tercile has tended to decline since 2002.

In the case of London, a similar pattern of employment growth skewed towards higher-paid jobs is evident. This skew increased over time and commuting flows tended to accentuate the skew. Unlike Brussels, however, commuting flows raise the level of employment in the low and middle terciles only modestly.

In summary, assessing employment shifts based on region of work rather than region of residence does make a difference but mainly for larger metropolitan or capital city regions, especially those with significant commuting inflows. These regions benefit numerically from the daily movement of workers from neighbouring regions. As interregional commuters tend to have a higher-than-average occupational profile, these inflows tend to exacerbate the already existing employment skew towards high-paid jobs in these large urban areas, and this skew appears to have become stronger over time.

Non-native employment

Non-native employment accounts for one in eight workers in the EU, and this share has grown over time. The EU has consistently had a significantly positive net migration balance since the 1980s (Darvas, 2017), while intra-EU mobility has also increased, notably after the expansion of the EU from 15 Member States to 28 during the period 2004–2011. As non-native workers tend to have disadvantages in the labour market – due to a lack of personal networks, lack of relevant language skills, non-recognition of qualifications, discrimination and other reasons – they are more likely to be overqualified than native workers for their given jobs (OECD and European Union, 2015). This translates into a higher share of non-natives on the lower rungs of the occupational ladder. At the same time, international mobility can benefit highly qualified workers by offering them superior work possibilities outside their country of birth. Both types of non-native worker tend to be concentrated in largely urban areas, especially capital city regions, where employment growth has been most resilient and where co-national networks are most likely to exist. In this section, we explore the extent to which non-native workers contribute to employment growth across the job–wage distribution and by region type.

It is important to underline that methodological considerations abound in relation to measuring the non-native working population. The identification of who counts as a mobile or migrant worker is itself non-trivial. Statistically, estimates can vary widely based on inadequate coverage in population sampling frames, high non-response rates and, increasingly, difficulties in capturing phenomena such as short-stay or circular migration. Box A1 describes the basis on which EU-LFS data is used to estimate the non-native employment share.

Box A1: Measurement difficulties

There are two questions in the EU-LFS that capture the native status of workers. Each measures different things and therefore generates different estimates. One relies on country of birth (*countryb*), the other on citizenship (*national*). For the descriptive analysis in this section, we use country of birth as a proxy for workers who are internationally mobile (EU-born but working in another Member State) or migrant (non-EU-born and working in an EU Member State). This conforms to the international standard definition of immigrant (Diez Guardia and Pichelmann, 2006), but it does tend to generate higher estimates for the migrant population than the question about citizenship. The main reason for not using a citizenship-based proxy of mobile or migrant workers is that citizenship is affected by naturalisation processes that absorb proportions of the immigrant population in ways that vary markedly between Member States.

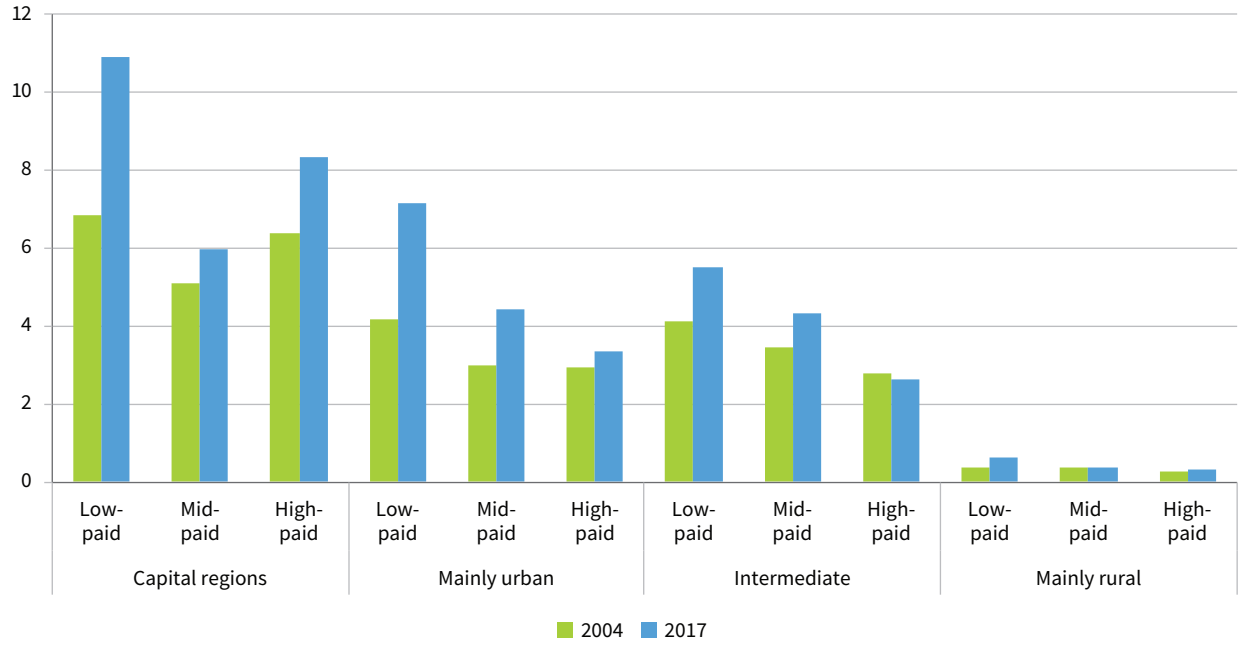
Another note of caution is required regarding indicated estimates of the proportion of non-native workers in the EU workforce, due notably to partial data on the country of birth question from Germany, where all non-native workers were coded as ‘non-response’ until 2016. Our working assumption is that all workers in this category were non-native workers, as the indicative shares are consistent with those from other sources used to generate estimates of the German non-native population share.

The regional distribution of non-native employment is heavily skewed towards urban regions and in particular capital city regions, as Figure A7 confirms. Around one in four workers (24%) in capital city regions in the nine Member States analysed was born outside the Member State concerned in 2017. This compares to around 4% in largely rural regions. Other largely urban and intermediate regions lie in the middle, with between 12% and 14% of jobs held by non-native workers. Cities then, especially larger cities and capitals, tend to be the first port of call for mobile and migrant workers. It is here that they can join existing networks of co-nationals, which facilitate integration and where employment opportunities are likely to be most plentiful and wages higher. They are also the key nodes of high-skilled services work where labour markets are increasingly transnational and transfers of specialised workforce, including intercorporate transfers, more common. As already indicated (see Chapter 2), the share of capital cities in employment in sectors such as financial services, professional, technical and administrative activities, and information and communication is around twice that in non-capital city regions.

Capital city regions are distinctive not only in the quantity of the migrant and mobile working populations, but also in how this has shifted over time and in how it is distributed across the job–wage spectrum. The non-native workforce in capital city regions is more likely to be working in either low-paid or high-paid jobs (bottom and top tercile) than in mid-paid jobs. In each of the other region types, there is a strong skew of non-native employment towards low-paid jobs.

This differentiation has become more acute since 2004. The first thing to observe is that most regions and region types have seen a rise in the share of non-native employment. The share of non-native workers in the lowest-paid jobs has, however, risen faster than in mid-paid and high-paid jobs across all region types, but notably so in capital city and largely urban regions. At the same time, capital city regions have also experienced a stronger non-native growth in higher-paid jobs than the other region types. Consequently, non-native employment in capital city regions was more polarised in 2017 than in 2004, while in each of the other region types it was more skewed towards the bottom tercile and dominated by low-paid employment.

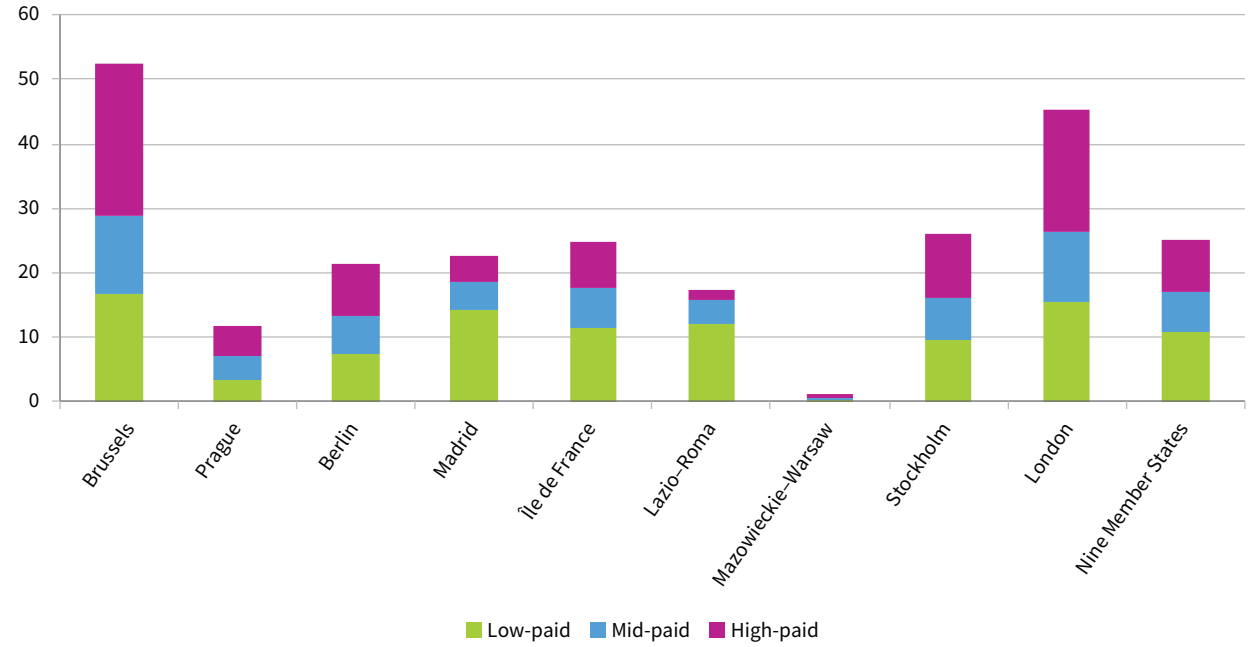
Figure A7: Share of non-native workers (%), by job–wage tercile and region type, nine Member States, 2004 and 2017



Note: *2004 start year selected due to lack of data for Italy and Poland for the countryb variable (respondent's country of birth) prior to 2004.*
Source: *EU-LFS, SES (authors' calculations)*

Individual capital city regions differ markedly in terms of their share of non-native employment, mainly along an east–west axis, with much higher shares observed in long-standing Member States (Figure A8). There is also a strong differentiation in terms of their wage distribution. In the two capital city regions with the highest shares of non-native employment, Brussels – where more than half of resident workers are non-native – and London, non-natives are most likely to be in the top tercile of employment. It is interesting to note on the eve of Brexit that London alone accounts for nearly half of the top-tercile employment of all nine capital city regions considered together (860,000 of 1.82 million), evidence of its long-established status as one of a small number of 'world cities' and one of the main financial services centres worldwide. The probability of non-natives working in well-paid jobs (compared to mid-paid or low-paid) is also somewhat higher in the Berlin, Prague and Stockholm regions while in Madrid, Rome, and, to a lesser extent, Paris, the opposite is the case, with a high share of non-native employment in the low-paid tercile.

Figure A8: Share of non-native employment (%) in capital city regions, by job–wage tercile, 2017



Source: *EU-LFS, SES (authors' calculations)*

Annex 4: Literature review – Regional applications of the jobs-based approach

Germany

Dauth (2014) analyses employment polarisation at the local level in western Germany between 1980 and 2010 using registry data of all German employees subject to social security, provided by the German Federal Employment Agency and the BIBB/IAB Qualification and Career Survey for the task content. The results show a significant level of heterogeneity, with about half of all functional local labour markets (204 in total, defined on the basis of commuting patterns) displaying the U-shaped wage–employment profile characteristic of employment polarisation, while the other cases are either not polarised or even negatively polarised. The study then explores the factors behind these regional differences, first introducing a new measure of the magnitude of job polarisation, which allows a quantitative comparison across labour markets. Rather than relying on the parameter of the quadratic term to demonstrate a U-shaped relationship (Goos and Manning, 2007), which is sensitive to the influence of single observations at the extremes of the distribution, Dauth (2014) considers the t-ratio of the quadratic term a better measure of polarisation, since it accounts for how well the U-shape fits the data.[11] The author finds that employment polarisation occurs almost exclusively in urban areas with a stronger concentration of routine tasks (in particular cognitive tasks, which are easily replaced by computers and are most prevalent in cities). It also occurs to a lesser extent in urban areas where the industry structure is characterised by modern and skill-intensive export-oriented manufacturing (rather than import-competing industries where mostly routine manual tasks are performed).

Senftleben-Konig and Wielandt (2014) analyse the polarisation of employment and wages in Germany between 1979 and 2006. This is the first study that tests the implications of the model proposed by Autor and Dorn (2013) for the German labour market.[12] Data on local employment and wages were obtained from the Sample of Integrated Labour Market Biographies Regional File, provided by the Institute of Employment Research of the Federal Employment Agency, while task intensity is derived from BIBB/IAB. The authors exploit spatial variation in the exposure to technological progress, due to initial differences in the share of routine intensive employment, in order to directly link labour market outcomes to levels of computer adoption. In line with findings for the United States, the local labour markets in Germany that polarised the most were those particularly exposed to computerisation because of a higher share of routine jobs. These markets also experienced an employment shift from mid-skilled routine occupations to lower-skilled personal services (although the effect is gender specific and only true for female employees, while men relocate towards construction). However, and contrary to what Autor and Dorn (2013) find, the reallocation to service occupations is accompanied by significant wage losses, suggesting that technological change contributes to a dispersion of the wage structure. This key difference highlights the importance of demand forces when investigating the impact of technological change on the wage structure and suggests no evidence of increasing demand for personal services in Germany.

Blien and Dauth (2016) also look at structural changes in local labour markets in Germany from 1978 to 2010. Local labour markets consist of 204 regions defined on the basis of commuter flows. They use data from the German Federal Employment Agency, which originate from the compulsory notifications made by employers to the social security system, and the BIBB/IAB Qualification and Career Survey for the task composition of each occupation. The main findings reveal only weak employment polarisation for the overall period, but clear polarisation for the decade of the 2000s. The regression analysis shows a positive association between employment growth at the occupational level (within labour market regions) and the upper two quartiles of the occupation–wage distribution, indicating that they grew faster than average. There is no evidence of a significant association with the lower two quartiles. A negative correlation with routine intensity is found instead, in line with previous literature, which suggests a decline in the demand for routine labour. However, this result is no longer significant when controlled at the occupational qualification level. Surprisingly, the results also reveal that a higher population density is negatively related to employment growth at the occupational level. This goes against the theory and evidence that agglomerated areas show the highest employment growth.

Reinhold (2016) investigates the link between job polarisation and wage inequality in Germany using regional variation to identify this link. Analysing data from social security records from 1975 to 2010, the

11 Inclusion of a quadratic term (squared value of an existing independent variable) in a regression framework helps to establish whether the relationship between the said independent variable and an outcome variable is non-linear. As employment polarisation is an example of a non-linear relationship between wage and employment growth for a given set of jobs or occupations, many studies use such an approach. One potential problem of such an approach is that it identifies non-linearity or convexity rather than polarisation per se.

12 Autor and Dorn (2013) investigate the polarisation of employment and wages in the United States and the growth of low-skilled service jobs between 1980 and 2005 in local labour markets (approximated by commuting zones). The study found that the rising employment and wages in low-skilled service occupations accounted for polarisation and the growth of the lower tail of the employment and earnings distributions.

study finds that while technology-driven employment polarisation drives up wage inequality, it only marginally moves the wage structure itself. Indeed, structural wage shifts in regions exhibiting employment polarisation, relative to regions not exhibiting polarisation, are small and limited to wages in the upper part of the distribution. This suggests that lower-tail wage inequality can most likely be explained by other changes not related to technology, such as institutions. Furthermore, when skills are taken into consideration, employment shifts are not correlated to wage growth. The rise in inequality at the top is directly associated with rising skills requirements within occupations. Regional diversity in workforce composition, and not job polarisation itself, explains differentials in wage inequality.

Italy

Aimone et al (forthcoming) apply the jobs-based approach developed by Eurofound to the Italian labour market. Using EU-LFS data for the period 1998–2017, the authors look at employment change by job–wage quintile both at national and (macro) regional levels, given the great diversity in the Italian productive structure across regions. The analysis of employment dynamics at territorial level confirms an economic divide between central and northern Italy, on the one hand, and southern Italy, on the other. In particular, by looking at different subperiods, the authors show that southern Italy experienced a more intense decline in employment during the recession, and that the recovery in the years 2014–2017 was weaker and attributable to growing employment in low-skilled jobs. The sectoral composition seems to be one of the main factors explaining these trends: southern Italy is characterised by a relatively high share of employment in agriculture, public services, and less-technological services and industry.

Netherlands

Terzidis et al (2017) confirm that the Dutch labour market polarised at provincial level between 1999 and 2012, but with a considerable spatial heterogeneity among local labour markets. Firstly, the degree of urbanisation plays an important role, with regions that are initially more urbanised being more likely to have a polarised employment structure. Secondly, by testing the relationship between tasks and structural employment changes at the occupational level, the authors find a negative association between the level of routineness (abstract task intensity) in the occupation and changes in employment share. The data used for the analysis are from the Dutch LFS, merged with administrative data on income and work location.

Spain

Consoli and Sánchez-Barrioluengo (2016) analyse regional polarisation in 50 Spanish provinces for the period 1981–2011, using data from the decennial population census and the Spanish Structure of Salary Survey. The analysis finds that:

- job polarisation is the main employment trend among Spanish regions over the period considered
- the decrease in routine jobs is particularly driven by the diffusion of technology
- the expansion of low-skilled service jobs is stronger in those regions with a higher initial level of routine occupations (for example, clerks and machine operators)

These results are not specific to large metropolitan areas. The study also shows that the presence of high-skilled workers produces a local job creation effect with spillovers into non-tradeable service occupations (which are highly dependent on physical proximity to their customers), although this is small in magnitude. Results are robust to various controls and instrumental variables that account for long-term industry specialisation.

United Kingdom

Kaplanis (2007) examines the spatial patterns of employment polarisation in UK regions between 1991 and 2001 and confirms its regional pervasiveness. The data used for the analysis are from the New Earnings Survey,[13] which samples employees aged between 16 and 64; a robustness check using UK LFS data is also performed. The empirical work in this study extends the analysis of Goos and Manning (2007) to look at changes in the employment structure at the local level (the 11 standard statistical regions of Britain – the NUTS 1 regions excluding Northern Ireland), using pay as a proxy for job quality (10 equally sized job quality categories are created based on median occupational wages). The analysis primarily considers headcounts, but robustness checks using hours worked are also performed. Results show that the pattern of employment polarisation found at country level is also visible at regional level (with the exception of East Anglia). Among all the regions, this pattern is strongest in London, followed by the West Midlands and the South East, and weakest in Wales and the North of England.[14]

13 One disadvantage of this survey is that it does not cover employees whose weekly pay is below the lower threshold for paying National Insurance contributions, which means there is an underrepresentation of low-paid workers. This means many part-time employees are excluded.

14 While in the 1990s London appeared to experience stronger employment polarisation than the rest of Britain, this was not the case in earlier decades. When extending the period of analysis to earlier data between 1975 and 1990, evidence suggests that the London labour market operated differently during the 1970s and 1980s compared to the 1990s. Indeed, while employment polarisation appears to emerge at the national level, the phenomenon is weaker for London.

When performing the same analysis for metropolitan compared to non-metropolitan areas, results do not support the existence of an 'urban' effect, suggesting that London is a special case on its own. When exploring differences in the composition and growth of employment between London and the rest of Britain, results show that in the capital there was stronger employment polarisation among women, which was not recorded in the rest of the country. Furthermore, when looking specifically at the full-time workers subgroup, employment polarisation (both in terms of headcounts and, even more so, hours worked) is observed at national level and, even more so, in London. This somehow challenges, even if only indirectly, the evidence that polarisation is due to increased employment of part-time workers in low-paid jobs.

Jones and Green (2009) examine the regional distribution of employment in the United Kingdom between 1997 and 2007 using a job quality approach proposed by Goos and Manning (2007). The analysis is undertaken using UK LFS data, both for employment and hourly wages at the occupational level, with regions defined by place of work. The main findings reveal evidence of regional differences in the quality of employment, which have also grown over time. While increasing polarisation since 1997 is recorded for most UK regions, with net new job creation being skewed towards higher-skilled occupations, London and the South East (which already have the highest initial proportion of high-quality jobs) have outperformed other regions in this respect. Northern Ireland is the notable exception, with an increase in the proportion of the lowest-quality rather than the highest-quality jobs. A more detailed examination of regional employment trends by industry reveals that the majority of new jobs that were created in London and the South East were in areas such as finance, real estate and business-related activities. Yet, regional differences are actually driven by the occupation structure within sectors, in terms of a high-quality or low-quality bias, rather than an employment bias towards more productive sectors. Finally, the study presents evidence that the public sector (which is quite evenly spread across regions) played an important role in providing high-quality jobs, especially outside London and the South East, hence contributing to a reduction of regional disparities.

Lee et al (2015) investigate the geography of urban inequality in Great Britain. More specifically, the authors examine patterns of wage inequality and employment polarisation in 60 British cities,[15] defined on the basis of 'travel to work areas'. The primary source of data is the Annual Survey of Hours and Earnings (2008, 2009 and 2010) and the Business Register and Employment Survey for statistics on industry composition at city level. While previous studies investigated inequality at regional level in Great Britain, this is not the case for the urban level. The authors use several measures of wage inequality (the Gini coefficient, the 90/10 ratio, the 90/50 ratio and the 50/10 ratio) as well as the measure of employment polarisation developed by Jones and Green (2009), which captures the extent to which jobs are considered low-wage and high-wage occupations relative to those at the median wage level.[16] The results suggest that the most unequal and polarised cities, apart from London which holds the negative record, tend to be in the Greater South East of England (the areas surrounding London), while the most equal tend to be the ex-industrial cities in the North of England or the Midlands.

When assessing the determinants of urban inequalities, the authors find that:

- the higher the concentration of high-skilled and better-paid workers, the higher the wage inequality and employment polarisation
- the greater the population size, the more unequal the city (however, once controlling for the median wages, the coefficient loses significance and halves in magnitude, suggesting that it is the higher wages in large cities that makes them more unequal) but not necessarily the more polarised in the occupational structure
- the proportion of the workforce employed by the public sector is negatively associated with wage inequality, while no significant relationship is found for employment polarisation

15 The study covers cities in England, the Scottish cities of Edinburgh, Glasgow and Aberdeen, and the Welsh cities of Cardiff and Swansea.

16 With respect to the measures of skill bias and employment polarisation, Jones and Green (2009) introduce two new indexes to 1) quantify the extent to which employment is skewed towards the top end of the skills distribution ('job quality bias' – the sum of the distances of normalised job rank from median job rank); 2) measure the degree to which employment is clustered at the top and bottom ends of the distribution (based on the 'distance squared' of normalised job rank from the median).

Annex 5: Determinants of regional employment shifts

Data and empirical strategy

This section presents the key findings from an econometric analysis that aims to investigate the determinants of changes between 2002 and 2017 in the regional employment structures across the nine European countries studied in this report. Using an original dataset based on EU-LFS microdata and developed for this EJM analysis, regional employment structures are described using the jobs-based approach (Wright and Dwyer, 2003; Fernández-Macías, 2012), where each job is ranked and assigned to equal EU-based employment-weighted terciles at the beginning and end of the period. Jobs are classified as low-paid, mid-paid and high-paid according to whether they are assigned to the first, second or third tercile, respectively. Using these EU-based job–wage terciles, employment is assigned for each region according to the share belonging to each of the three groups of jobs.

Change in employment by tercile is then analysed over time. Identifying the baseline structure at the European level makes it possible to cover a long time span, 2002–2017, minimising as far as possible the effects of classification changes that occurred during the period, which would have led to a different classification of jobs and therefore employment in each tercile.

In all regressions, following the relevant literature (see Annex 4), structural employment changes are considered as an outcome of different socioeconomic forces, often interacting with each other. In particular, the contribution of demand and supply factors is analysed as well as institutional and innovation factors in shaping changes, exploiting the high level of heterogeneity across European regions. There are controls not only for the contemporaneous effects of our explanatory variables but also for differences in the regional initial conditions, given the strong path dependence of socioeconomic developments. Because of data availability at regional level (NUTS 2 level for all countries analysed, except Germany and the United Kingdom, for which data are at the NUTS 1 level), the number of actual observations, 125, is lower than the full sample, 130 regions.

Estimates are calculated using ordinary least squares regression (OLS) according to the following equation:

$$T_{ji} = \alpha + \beta D_{it} + \gamma S_{it} + \vartheta Innov_{it} + \delta I_{it} + X'_{it_0} + \varepsilon_{it} \quad (1)$$

where T_{ji}, the outcome of interest, is the absolute employment change in tercile j in region i between 2002 and 2017. More specifically, absolute changes in each tercile are defined as the change in the share of employment with respect to the first year.

In line with the literature (among others, Esping-Anderson, 1999; Gregory et al, 2001; Schettkat and Yocarini, 2006; Madariaga, 2018), D_{it} serves as a partial proxy for the demand side of the economy. In particular, demographic characteristics are used as a proxy for internal demand, measured as relative change in the share of individuals over 60 years old in the population, where the age structure captures the variation in the demand for services and care. This captures the need for sector-specific local production (both private and public, depending on the level of liberalisation of these sectors). The supply side of the economy is represented by S_{it}, which again includes a set of regionally defined variables such as changes in the share of non-native workers in the population to capture variation in the lowest tail of the labour supply (Oesch and Rodríguez-Menés, 2011). From an interpretative point of view, migrants are thought to have a structurally weak position in the labour market, regardless of their potential or actual contribution to labour productivity or production. Similarly, changes in the share of migrants can been seen as a boost to the 'reserve army of labour' (the share of unemployed and underemployed in the regional labour market). In the regression, the relative change in the share of non-native workers during the subperiod 2002–2007 is used as a proxy of migrant worker flows. This shortened period rather than the full time span is used, as intuitively it could take time for non-natives to integrate and participate in the labour market. The second variable is the change in the share of women out of the total population, to capture female labour supply, a driver of the 'care economy' (Dwyer, 2013). A third variable relates to high-skilled labour supply, measured by the change in the share of third-level graduates in the population (Cirillo, 2018).

Not only demand and supply but also technology plays a role in determining changes in the employment structure. However, technology as such does not have an unambiguous effect on employment: the employment impact mostly depends on the innovation strategy adopted. According to Pianta (2001), it is important to distinguish between product and process (cost reduction) innovation, where the former should have a positive impact on employment and its quality, while the opposite occurs under the latter. In the model, innovation strategies are measured using the European Commission's Regional Innovation Scoreboard, where research and development expenditure in the business sector (expressed as a percentage of regional GDP) and the share of exports of

medium and high-tech manufacturing[17] in total exports captures product innovation, while the share of SMEs introducing marketing and organisational innovation[18] captures process innovation.

Additionally, according to the relevant literature (see, among others, Wright and Dwyer, 2003; Oesch and Rodríguez-Menés, 2011; Oesch, 2015; Murphy and Oesch, 2017), structural changes cannot be explained without looking into the social relations of work and the institutional settings mediating them. For this reason, a variable based on the wage-setting system, I_{it}, is included to proxy labour market institutions, as well as the absolute change in the share of involuntary part-time workers (among all part-time workers) as a measure of the balance of power between employers and workers: the higher the indicator, the lower workers' bargaining power (Wright, 2000). Finally, X'_{it_0} controls for sectoral composition of the employment structure. The inclusion of initial conditions is pivotal in capturing structural changes that are historical outcomes (Nolan and Slater, 2010), and therefore subject to strong path dependence. In order to account for this, the share of employment in 2002 is used, aggregating all sectors (at the NACE two-digit level) in a revised version of the Pavitt taxonomy (Pavitt, 1984) built using an ad hoc extraction from the EU-LFS (seven broad sectoral categories). As indicated in the descriptive sections, employment in one or another tercile is often characterised by a high share of workers within specific sectors: for example, regions with a high share of low-paid jobs (compared to the average of the nine Member States analysed) tend to have more jobs in the primary sector as well as the low-knowledge-intensive service sector. At the opposite end of the job distribution, higher shares of employment are observed in the high-tech industrial sector as well as health and knowledge-intensive services. Finally, the middle of the job distribution has a concentration of low-tech manufacturing and construction employment.

This last set of regressors is the only one that differs across the tercile-based regressions. The non-inclusion of all categories in each specification has been done in order to better characterise each tercile in the most parsimonious way.

Results

Overall, the estimation models seem to explain much of the variation across regions and show a high goodness of fit. Looking into the statistical significance of the socioeconomic determinants yields some significant findings (see Table A9).

- As far as labour supply is concerned and with all the controls included in the models, changes in the share of the female population do not significantly affect the employment structure, while the more skilled the population, the lower the increase in the share of low-paid jobs and the higher the absolute change in high-paid jobs.
- A higher presence of non-native employment over time does not seem to directly affect low-paid jobs as the literature sometimes predicts, while it significantly decreases the share of mid-paid jobs. The lack of an effect in the share of non-native workers on the change in the share of low-paid jobs is the result of the controls for labour market institutions and imbalances of labour market power. Without these variables, the effect is more in line with expectations based on the literature.
- The level of involuntary part-time employment has a positive effect on the share of low-paid jobs and a negative effect on the share of mid-paid employment. This is coherent with an interpretation of the employment effects of the balance of power between employers and workers: the higher a firm's power, the higher the possibility of competing on labour costs while specialising in labour-intensive sectors that mainly characterise jobs in the lowest tercile.
- The more centralised the wage-setting system is, the lower the increase in high-paid jobs, while the opposite occurs for mid-paid jobs. Coefficients are statistically significant, suggesting that centralised bargaining power tends to be associated with a more even distribution of employment across the job–wage terciles (or with growth in mid-paid jobs, the opposite to job polarisation).

17 These include: chemicals and chemical products; machinery and equipment; office machinery and computers; electrical machinery and apparatus; radio, television and communication equipment; medical, precision and optical instruments; motor vehicles, trailers and semi-trailers; and other transport equipment.

18 As defined in the EC scoreboard, 'many firms, in particular in the service sectors, innovate through non-technological forms of innovation. Organisational innovation is an example of this. This indicator tries to capture the extent to which SMEs innovate through non-technological innovation.'

- Innovation strategies appear to have a significant impact as structural determinants of employment shift. In particular, the higher the indicator of process innovation in the region, the more growth in low-paid jobs and the lower the growth in the second and third tercile. This is not surprising, as process innovation is often linked to deskilling and increased precariousness of work according to the classical analysis by Braverman (1974). On the other hand, the proxies for product innovation, research and development expenditure and exports of high-tech manufacturing have a positive effect on the increase of the share of well-paid jobs. This suggests that if firms in the region specialise in the production of goods and services with a higher technological content, they tend to hire workers in better-paid occupations. The same applies in the case of research and development activity. In addition, the same variables play a negative role in the increase of low-paid jobs, which together with the previous results are indicative of an upgrading of the employment structure.
- Finally, as could be expected, the initial sectoral composition of employment has strong effects on structural change as measured by the change in employment shares by tercile. In particular, regions that were initially characterised by a high share of employment in the primary sector are those that experienced the highest decrease in the share of low-paid jobs. The higher the initial share of employment in knowledge-intensive services in 2002, the higher the increase in high-paid jobs, a pattern that could be interpreted as the cumulative and expansionary effect of high-tech innovations. Less intuitive is the role played by the share of low-tech industries in employment changes in mid-paid jobs. According to the literature, jobs in those sectors should be those that tend to be more easily displaced over time, making the employment structure more polarised. The lack of such evidence in the case of this study may suggest that other factors included as controls in the model – for example, institutional and political factors – can offset this effect.

Table A9: Determinants of shifts in regional employment in the nine Member States analysed, 2002–2017

	Low-paid jobs	Mid-paid jobs	High-paid jobs
% change in share of female population	-0.338	0.339	0.243
% change in share of tertiary education	-0.0318*	0.00985	0.0255***
% over 60 years old, 2002	-0.00111	0.00265**	-0.000357
% change in non-native workers, 2002–2007	0.00611	-0.0205***	0.00448
Exports medium and high-tech manufacturing	-0.0424	0.0274	-0.0297
Marketing or organisational innovation	0.118**	-0.114***	-0.0844***
R&D expenditure business sector	-0.00239	-0.105***	0.0777***
Involuntary part-time workers, 2017	0.0944***	-0.0900***	0.0113
Wage-setting coordination, 2014	0.000392	0.0102***	-0.0152***
Primary sector	-0.320***		
Construction	0.105		
Low-knowledge-intensive services	0.0170		
Low-tech industries		0.390***	
Public administration		0.0404	
Education		-0.362	
High-tech industries			0.0773
Knowledge-intensive services			0.183**
Health			0.360***
Constant	0.00378	-0.0283	-0.0157
Observations	125	125	125
R-squared	0.638	0.529	0.539

Note: *Note: *p = 01; ** p = 05; ***p = 001.*
Source: *EU-LFS, SES (authors' calculations)*

Annex 6: An application of the Krugman Dissimilarity Index

The Krugman Dissimilarity Index (Krugman, 1991, p. 75f, 1993, p. 250f) is a simple transformation of the coefficient of regional specialisation, a measure for the dissimilarity of the industrial structure of two regions, which has a long history in regional studies.

The Krugman Index for region A compared with B is calculated as follows:

$$KI_{AB} = \sum_i |(X_{irA}/X_{rA}) - (X_{irB}/X_{rB})|$$

where employment in industry *i* in region A is X_{irA}, employment in the same industry in region B is X_{irB}, total employment in all industries in region A is X_{rA} and total employment in all industries in region B is X_{rB}.

In this case, by construction the Krugman Index will always lie between the values of 0 (indicating that the two distributions are the same, hence the regions have identical industrial structures) and 2 (where the two distributions have nothing in common, reflecting strong sectoral specialisation). Because the index is higher the more dissimilar the two distributions are, the measure is sometimes said to be an 'index of dissimilarity'.

In the case of more than one pair of regions and employment as a variable of interest, the Krugman Dissimilarity Index is expressed as follows:

$$KI_j = \sum_{i=1}^{n} \left| \frac{emp_{ij}}{\sum_{i=1}^{n} emp_{ij}} - \frac{\sum_{j=1,i}^{n} emp_{ij}}{\sum_{i=1}^{n}\sum_{j=1}^{m} emp_{ij}} \right|$$

where *i* indicates the industry and *j* the region. This means to compute the differences between the share of employment in a given industry (*i*) and region (*j*) and the share of employment in a given industry in all regions (or reference area). The absolute value of these differences is the total sum for all industries (*n*). In this case, the minimum value of the index is 0, while the maximum is *2 x (n-1)/n*.

Like the coefficient of regional specialisation, the Krugman Index should be seen only as a measure of relative specialisation; no absolute degree of specialisation can be assessed with this measure. The reference area can obviously vary, and the EU average, rather than the country average, can be used as a benchmark such that the industrial structure of regions is compared to the industrial structure of Europe rather than the country in which the regions are located. In his analysis at the regional level, Hallet (2000) highlights that the Krugman Index has a tendency to underrepresent the degree of specialisation of large countries.

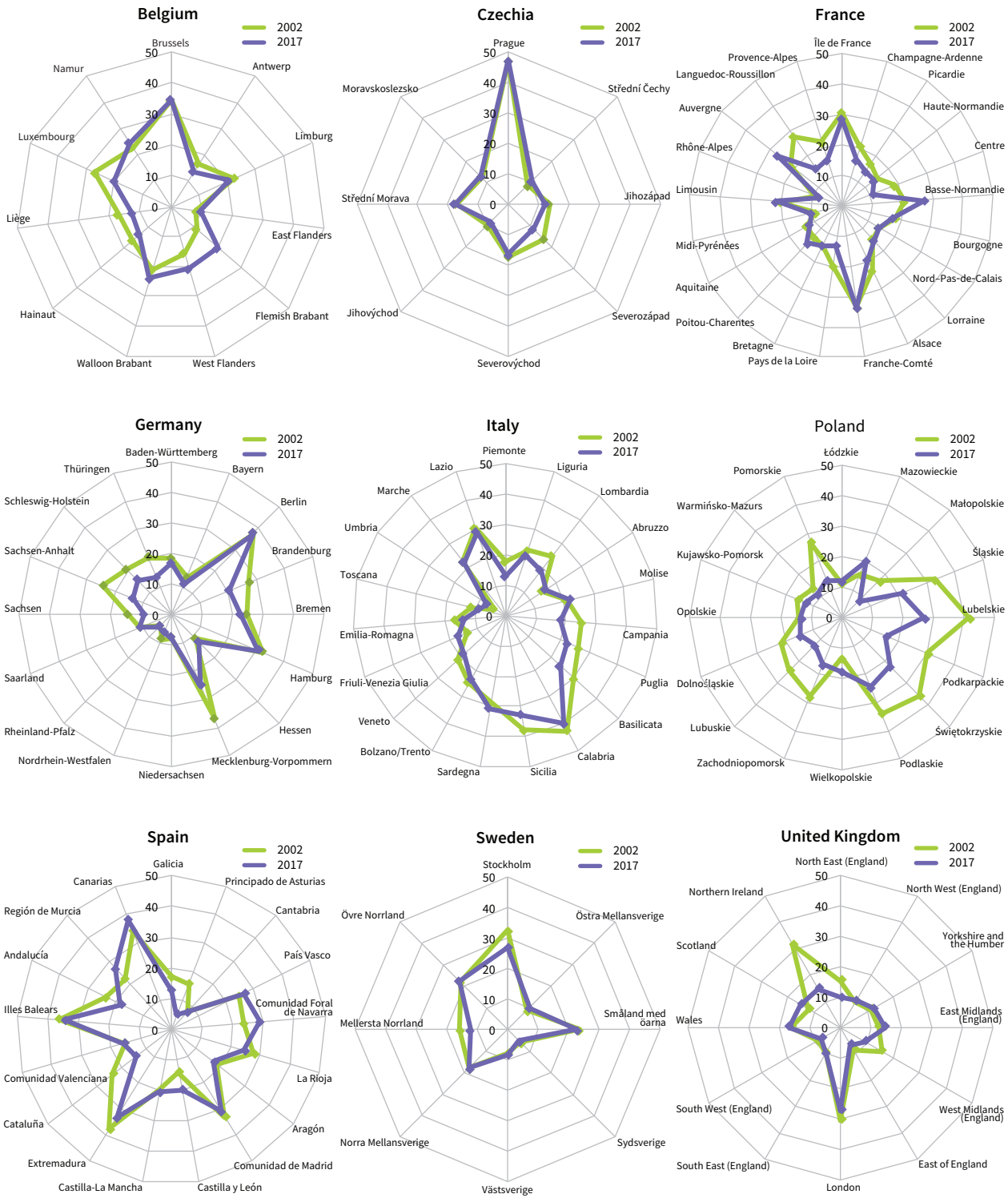
The Krugman Dissimilarity Index is a useful synthetic indicator to capture all deviations from the average industrial structure in terms of employment shares. It can be seen as a measure of relative specialisation, vis-à-vis the national average in this case. The evolution of the Krugman Index over time can suggest patterns of increasing relative specialisation (when the index increases because the industrial structure in the region is becoming less similar to the national average) or, otherwise, despecialisation. Figure A9 shows the values of the Krugman Index (rescaled to 0–100) separately for each country and computed for each region in 2002 (green line) and in 2017 (purple line).

The main results can be summarised in the following points.

- Within each country, the index varies considerably across regions. In particular, the highest variability (standard deviation) is recorded in Czechia, with very similar values both at the beginning and at the end of the period considered; however, this is all driven by the economic specialisation in the capital. There was also a significant level of variation in the values of the index in Poland in 2002, but this rapidly declined due to shrinking employment in agriculture in some peripheral eastern regions. In 2017, the variability in the value of the index was also high in Germany and Spain, though somewhat slightly declining in the latter.
- Prague is by far the region with the highest values on the index, and therefore the most dissimilar industrial structure compared to the average in Czechia, both at the beginning and at the end of the period considered. It is followed by the southern Italian region of Calabria.
- The capital city regions are among the most dissimilar in every country. However, while in Belgium, Czechia, France, Germany, Sweden and the United Kingdom, they all rank first in terms of the highest Krugman Index value (second in the case of France), this is not so clearly the case for countries like Italy, Poland and Spain.[19]

19 There may be a data artefact consideration here since the NUTS regions are demarcated in most of the countries so as to effectively isolate the capital city population, but in others they encompass significant hinterland territory outside the capital (especially Lazio for Rome, Italy, and Mazowieckie for Warsaw, Poland).

Figure A9: Krugman Dissimilarity Index, nine Member States, 2002 and 2017



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TJ-AN-19-101-EN-N

Accumulating evidence indicates that large metropolitan centres are faring much better than other regions within the Member States of the EU. Such interregional inequality contributes to disenchantment with existing political systems, which in turn can weaken the social bonds that ground democratic systems.

This is the context for the 2019 edition of the European Jobs Monitor, which analyses shifts in the employment structure – meaning change in the distribution of employment across occupations and sectors – of the EU regions. The analysis covers 130 regions of 9 Member States, which together account for nearly 4 out of 5 EU workers. The study finds that, while Member States are becoming more similar in their employment structures, regions within the same country are becoming more disparate. It also finds that cities have a disproportionately high share of well-paid, high-skilled services employment alongside growth in low-paid employment. The findings support continued EU regional policy assistance of regions in danger of being left behind.

The European Foundation for the Improvement of Living and Working Conditions (Eurofound) is a tripartite European Union Agency established in 1975. Its role is to provide knowledge in the area of social, employment and work-related policies according to Regulation (EU) 2019/127.

Publications Office
of the European Union

ISBN 978-92-897-2016-8
ISSN 2363-0833
doi:10.2806/997207