Sectoral stucture of employment in EU member states with an emphasis on the quaternary sector or on the GDP, 2011–2023

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Economic activities in the countries of the European Union are broken down in accordance with the NACE classification. The individual sections can be grouped into sectors. Historically, three sectors have been distinguished: primary (agriculture and mineral extraction), secondary (manufacturing and processing) and tertiary (services). As the services sector has become increasingly important over time, the nature of the services provided has changed. And entirely new services have been created: there is a need to complement the traditional three-sector model with a new sector – the quaternary sector. The quaternary sector includes services that are knowledge intensive in nature. The first part of this paper examines the structure of employment in terms of the breakdown into the four sectors mentioned above in the countries of the European Union over the period 2011–2023. It first examines developments over this period and then analyses the situation in 2023 in detail. The second part of the paper divides the countries of the EU into two groups according to the level of GDP per capita. It examines the differences between the sectoral structure of employment in the two groups of countries. The third part then examines the contribution of each sector to the country's GDP.

Keywords:
sectoral structure of the economy,
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primary sector,
secondary sector,
tertiary sector,
quaternary sector,
GDP per capita

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Introduction

At the same time as other areas of people's lives are evolving, economic activity is also evolving. Historically, changes in the form and structure of human economic activity have always been conditioned by technological developments. This has been very rapid over the last few decades, and changes in the structure of employment have been correspondingly rapid. A number of publications have been devoted to the structure of employment, its changes and developments in response to technological progress.

In the context of technological progress, advancing automation, robotics, and the development of artificial intelligence, we can trace two very different views on how emerging technologies will affect the labour market and employment. The first view sees the process of automation as a risk that must necessarily result in mass unemployment. The second view, on the other hand, is that technological development will eventually increase demand for labour and, thus, employment and wages. A similar ambivalence was evident during the scientific and technological revolution of the 1960s. Time has gradually shown that, ultimately, the use of computer technology has brought about changes in the job roles of individual professions and the emergence of new professions. Therefore, it can be assumed that the current technological advances will eventually have an undermining effect. The potential labour market impacts of technological developments are discussed in the International Labour Organization (ILO) (2016). Also, the text "The Race between Man and Machine", World Economic Forum (2016) by Daron Acemoglu, is devoted to this topic. The same issue is discussed in more detail by the same author (Acemoglu–Restrepo 2018). In the paper, the authors combine task-based models of the labour market and directed technological change model. Of course, the ultimate impact of technological change on employment depends on many external circumstances; in this article, the authors lean more towards the positive scenario. Acemoglu and Restrepo (2019) are dedicated to the allocation of tasks (task content of production) to capital and labour. In this paper, one can find the evolution of each sector's share of total employment as well as the sector's share of GDP in the United States. The analysis is carried out for two periods: 1947–1987 and 1987–2017. The slower employment growth in the second period under review is explained by an acceleration of the crowding-out effect, especially in manufacturing, a weaker recovery effect and slower productivity growth than in previous decades. In the above study, the authors work with an important idea of social scientist Jean Fourastié: more important than the actual share of each sector of economic activity in total employment is its share in total GDP.

Other authors also refer to the work of Jean Fourastié. For example, Hospers (2003) essentially confirms the fulfilment of Fourastié's vision of society in 2000 and points out other important aspects that should be given more attention. Alcouffe–

le Bris (2020) discuss the concept of cost disease as a consequence of the Fourastié model.

An important issue is the division of economic activities into sectors. Zeira–Zoabi (2015) highlight the dynamics of this division. They formulate the following conclusion: as the economy begins to develop, production becomes less concentrated and economic activity spreads across a larger variety of sectors. But there is a level of development beyond which production begins to concentrate again over a smaller variety of sectors.

The traditional division of economic activity into primary, secondary, and tertiary sectors is proving inadequate. The terms quaternary and quinary sectors emerge, the content of which was probably first defined by Foote–Hatt (1953). In particular, the shift of knowledge- and information-intensive services to the quaternary sector continues to appear in the literature. Among more recent publications, it is worth mentioning Miron et al. (2019) and Tureckova–Martinat (2014). With the shift of labour to the quaternary sector, the so-called knowledge-based economy is developing in the countries concerned. This topic is addressed with an emphasis on sustainability and competitiveness by Bak et al. (2022).

Of course, we must not forget the works dealing with the sectoral structure of the economy at the national level. In particular, the following analysis was inspired by the dissertation of Ambrozova (2015) and the papers of Burger–Hovancikova (2021) and Dietrich–Kruger (2010). Godlewska-Dziobon (2020) discusses the evolution of the sectoral structure of employment in EU countries between 2010 and 2018. She concludes that changes in sectoral structure were more pronounced in Central and Eastern European countries than in the original EU member states over the period. With the availability of more up-to-date data, we can now focus on the evolution of the sectoral and industry structure of employment in the EU over the period 2011–2023.

Methodology and data

The statistical classification of economic activities called NACE (nomenclature générale des activités économiques dans les Communauté européenne) is used in European Union countries since 1970. Several versions were developed: the current one is NACE rev. 2. Version NACE rev. 2.1 is to be used from 2025 onwards. The European classification is in accordance with United Nations´ International Standard Industrial Classification of All Economic Activities (ISIC). NACE has a five-level hierarchical structure.

The first four levels are common to all European countries:

- level 1: 21 sections identified by alphabetical letters A to U;
- level 2: 88 divisions identified by two-digit numerical codes (01 to 99);
- level 3: 272 groups identified by three-digit numerical codes (01.1 to 99.0);
- level 4: 615 classes identified by four-digit numerical codes (01.11 to 99.00).

The most detailed level 5 items may be added at the national level. The level 1 sections are listed in Table 1.

Table 1

NACE category – level 1, sections

Section code	Economic area
A	Agriculture, forestry, and fishing
B	Mining and quarrying
C	Manufacturing
D	Electricity, gas, steam, and air conditioning supply
E	Water supply; Sewerage, waste management, and remediation activities
F	Construction
G	Wholesale and retail trade; Repair of motor vehicles and motorcycles
H	Transportation and storage
I	Accommodation and food service activities
J	Information and communication
K	Financial and insurance activities
L	Real estate activities
M	Professional, scientific, and technical activities
N	Administrative and support service activities
O	Public administration and defence; Compulsory social security
P	Education
Q	Human health and social work activities
R	Arts, entertainment, and recreation
S	Other service activities
T	Activities of households as employers; Undifferentiated goods and service producing activities of households for own use
U	Activities of extraterritorial organisations and bodies

Source: Eurostat.

Economic activities can be simplistically divided into a small number of main groups. The traditional concept of the sectoral structure of the economy includes the categories described in Table 2.

Table 2

The traditional concept of the sectoral structure of economy

Sector	Sections included	Nature of the sector
Primary	A, B	Agriculture, forestry and fishing, mining, and mineral processing
Secondary	C, D, E, F	Industry and construction
Tertiary	G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U	Services

Source: Tureckova–Martinat (2016).

In this traditional view, we divide economic activity into three sectors: extraction of raw materials (primary), manufacturing (secondary), and services (tertiary). The three-sector model was developed by Allan Fisher (1939) and Colin Clark (1940), and

it was further elaborated by Jean Fourastié (1949) in the first half of the 20th century. According to Fourastié, the change in the share of each sector in total production takes place in three phases. In the first phase, the so-called traditional civilisation, the distribution of the labour force is approximately as follows:

- 70% primary sector,
- 20 % secondary sector,
- 10 % tertiary sector.

European countries were at this stage in the Middle Ages; today, a similar sectoral structure is found only in the least industrialised developing countries. This is followed by the transition period of the second phase also called industrial civilisation. The transition is conditioned by the replacement of manual work in the primary sector by machine work. The employment structure by sector gradually changes to roughly the following representation:

- 20% primary sector,
- 50 % secondary sector,
- 30 % tertiary sector.

The third phase (tertial civilisation) is characterised by the increasing mechanisation and automation in the primary and secondary sectors. Labour productivity is rising, and therefore, the demand for labour is decreasing. This is spilling over into the tertiary sector as dynamic development in the service sector takes place. The distribution of the labour force across economic sectors should gradually stabilise at around these percentages:

- 10% primary sector,
- 20 % secondary sector,
- 70 % tertiary sector.

The sectoral structure in developed countries corresponds to this stage. The extent to which this division is valid for individual European countries will be verified later in this article.

Jean Fourastié's predictions and their degree of fulfilment are discussed in more detail in Hospers (2003), Alcouffe–le Bris (2020) or Dietrich–Kruger (2010).

Of course, this trend can also be traced historically. The sectoral structure directly follows the development of the company's level over the entire period of its existence. From the earliest times (hunter-gatherer society, agricultural revolution), through antiquity to the Middle Ages (agrarian society), the subsistence economy dominated economic relations. The share of the primary sector was considerable, although it gradually declined in proportion to the growth of the productive sector and services (more clearly in the period of manufacturing, 15th–17th centuries). During the 18th century, the structure of the economy changed as a result of the First Industrial Revolution and the secondary sector became dominant, only to be overtaken two centuries later by the rapidly expanding tertiary service sector. This scheme of sectoral

development, thus broadly described, may not apply literally because it is implicitly typical only of economically developed countries (regions).

There have been and continue to be major changes in the development of the world economy and the economies of individual countries: the three-sector model and Fourastié's three phases are gradually becoming obsolete. It is no longer suitable to describe the economy of the 21st century. Since the 1960s, several approaches have emerged to describe economic sectors. For obvious reasons, all have placed the main emphasis on the service sector. It has gradually gained importance in developed countries. Schafran et al. (2018), for example, singles out urbanisation and control as a separate economic sector. Another possible approach is based on the so-called extended sectoral structure of the economy. Some of the services from the original tertiary sector are shifted to the quaternary sector. The quaternary sector is described in detail in Tureckova–Martinat (2014). The quaternary sector of EU countries defined using the gross value added for selected industries, classified according to NACE Rev. 2, is analysed here in the direct context of economic growth, respectively progress of per capita GDP, in the years 2003–2012 of individual membership countries in selected years. The quaternary sector includes knowledge, computing, and data processing services. In various literature sources, we can find different divisions in the service sector between the tertiary and the quaternary sectors. For the purpose of further investigation, we use the division in line with Tureckova–Martinat (2016), which is presented in Table 3.

Table 3

The expanded concept of the sectoral structure of economy

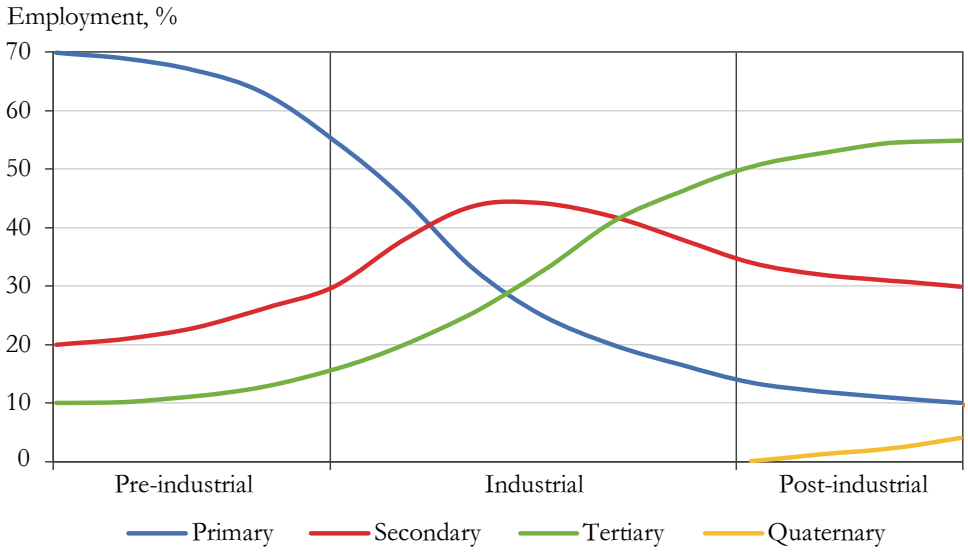
Sector	Sections included	Nature of the sector
Primary	A, B	Agriculture, forestry, and fishing
Secondary	C, D, E, F	Industry and construction
Tertiary	G, H, I, L, O, R, S, T, U	Traditional services
Quaternary	J, K, M, N, P, Q	Information and knowledge

Source: Tureckova–Martinat (2016).

The Clark Fisher model in Figure 1 shows how countries move through three phases: pre-industrial, industrial, and post-industrial. During the pre-industrial phase, most of the population works in the primary sector, with only a few people working in the secondary sector. In the industrial phase, the share of people employed in the primary sector is declining rapidly, while the share of employees in the tertiary sector is increasing. The percentage of employees in the secondary sector reached its peak in this phase and began to decline. The post-industrial phase is characterised by an above-half share of employees in services, the share of the primary and secondary sectors declining slowly, and the quaternary sector gradually gaining importance. According to Zeira–Zoabi (2015) there are traditional and modern sectors, and economic growth is driven by the rising productivity of the modern sectors.

Figure 1

Clark Fisher model



Source: Geography is easy (2014).

The sectoral breakdown shown in Table 3 is not the only possible one, as mentioned above. In fact, an unambiguous definition of sectors is not even realistic. The sectors intersect with each other in various ways: see for example, Cook–de Laurentis (2002). The following analysis will be based on the breakdown in Table 3 and will use data published by Eurostat.

Trends in the number of persons employed in the four sectors

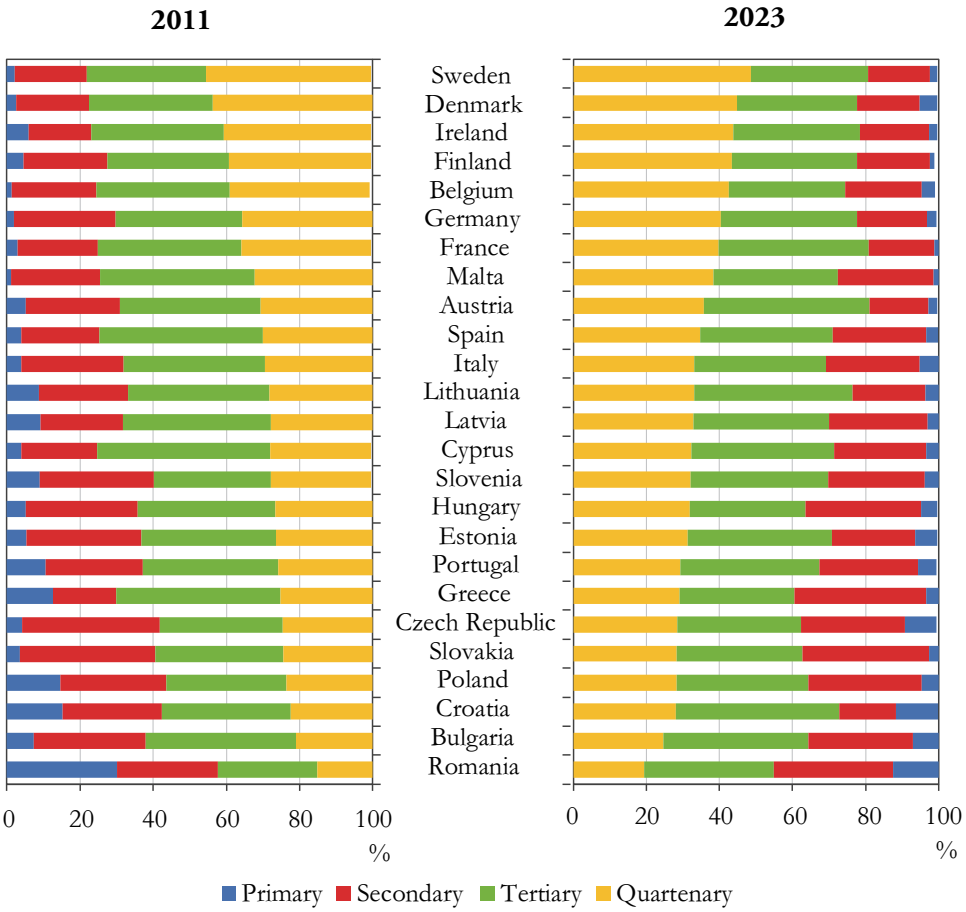
As mentioned above, technological progress is the main cause of changes in the structure of employment. How robotization affects the employment structure in European countries is analysed in detail in Reljic et al. (2023). The Eurostat database provides the time series of numbers of employees by section of economic activity (in accordance with the NACE classification) for the period 2011–2023. First, according to the distribution in Table 3, we summed the number of employees for each sector. The percentages of individual sectors are more informative than the absolute numbers. Therefore, we calculated the percentage share of each sector in total employment for all countries and all years (from 2011 to 2023) of the reference period.

The percentage share of sectors in total employment for EU member states at the beginning of the reference period (2011) and at its end (2023) are shown in Figure 2. Countries were ranked in ascending order in terms of the share of the quaternary

sector in 2011. The Netherlands and Luxembourg have been omitted from this assessment due to inadequate data. For this reason, both countries are missing from Figure 2.

Figure 2

The percentage share of economic sectors in total employment of EU member states



Source: own processing of Eurostat data.

Figure 2 shows large differences in the representation of the primary sector. Its percentage share ranges from 1.14% in Malta to 30.20% in Romania. From the blue parts of the bars, we can see those countries with a large share of the primary sector in 2011 also included Croatia, Poland, Greece, and Portugal. Secondary sector representation ranges from 17.11% in Ireland to 37.64% in the Czech Republic. In addition to the Czech Republic, more than 30% of the economically active population works in the secondary sector in Bulgaria, Slovakia, Estonia, Hungary, and Slovenia.

In 2011, the tertiary sector was the least represented in Romania (26.98%), and the most represented in Cyprus (47.26%). Other tourism-oriented countries also had a tertiary sector representation of more than 40%, including Greece, Spain, and Malta. A large representation of the tertiary sector was also found in Latvia. As far as the quaternary sector is concerned, the differences here were probably the largest. In Romania, the quaternary sector was 15.20% represented in 2011, while in Sweden it was 45.05%.

The right part of Figure 2 shows the share of economic sectors in total employment in 2023 for EU member states (except for Luxembourg and the Netherlands).

Next, let us compare the situation in 2023 with the situation in 2011. Table 4 shows the changes in the percentage of each sector within the European Union and the euro area.

Table 4

Percentage change in 2023 compared to 2011

(%)

Sector	European Union	Euro area
Primary	–2.14	–0.92
Secondary	–1.45	–1.82
Tertiary	–0.17	–0.70
Quaternary	4.08	3.91

Source: own processing of Eurostat data.

In Table 4 we can see that the only sector where there was an increase in the percentage representation during the period under review was the quaternary sector. In the other sectors, there was a decrease in the percentage representation, both in the European Union as a whole and in the eurozone. Table 5 then shows the countries with the largest and smallest differences in the percentage of economic sectors in 2023 compared to 2011.

As different as the situation in Romania may appear from the graph in Figure 2 to be from other countries, there is also a clear tendency for the labour force to move to the tertiary and quaternary sectors (Miron et al. 2019).

Table 5

Countries with the largest and smallest differences in the percentage of economic sectors in 2023 compared to 2011

(%)

Sector	Countries with	
	the largest difference	the smallest difference
Primary	Malta (0)	Romania (–17.64)
	Belgium (0.26)	Croatia (–10.18)
	France (0.27)	Portugal (–7.18)
Secondary	Romania (4.90)	Malta (–6.35)
	Lithuania (1.23)	Cyprus (–4.56)
	Slovenia (0.69)	Estonia (–4.48)
Tertiary	Romania (8.57)	Ireland (–3.32)
	Croatia (2.93)	Lithuania (–2.63)
	Poland (0.98)	Belgium (–2.25)
Quaternary	Cyprus (8.17)	Denmark (0.26)
	Malta (7.25)	Hungary (1.57)
	Croatia (7.13)	Italy (2.60)

Source: own processing of Eurostat data.

Percentage of sectors in EU member states in 2023

Let us now return to Fourastié's prediction that the sectoral distribution of employees in the post-industrial phase will stabilise at around 10% in the primary sector, 20% in the secondary sector and 70% in the tertiary sector. Let us assess to what extent this has been fulfilled in 2023 in EU countries. Fourastié predicted that the share of those employed in the primary sector would fall to around 10%. The share of the primary sector in the European Union as a whole was 3.81% in 2023. Within the eurozone, it was even lower at 2.91%. Only Greece (11.51%) and Romania (12.56%) had a higher share than the predicted 10% in 2023. The share of those employed in the secondary sector was forecast to fall to around 20%. In the European Union in 2023 it was 23.96%, in the eurozone 22.70%. In seventeen member states, the share of the secondary sector was above 20%, and in some member states even above 30%, in particular in the Czech Republic (36.05%), Slovakia (34.61%), Romania (32.52%), Slovenia (31.68%), and Hungary (30.99%). The share of employees in the service sector (tertiary and quaternary) was forecast to rise to around 70%. Within the European Union, the share of the service sector in 2023 was 71.89%, and in the eurozone, it was even slightly higher at 74.05%. Most member states are either above or close to 70%. The exceptions are Romania with 54.92%, the Czech Republic (60.57%), Poland, Slovakia, Slovenia, Bulgaria, and Hungary. On the contrary, in some countries, the share of those employed in services is even higher than 80%: Sweden (80.66%), Malta (80.84%), and Cyprus (81.07%). The Netherlands and Luxembourg have also been excluded from this analysis due to inadequate data.

Table 6

Comparison of Fourastié's prediction and the actual situation, 2023

(%)

Sector	Fourastié's prediction	European Union	Euro area
Primary	10	3.81	2.91
Secondary	20	23.96	22.70
Tertiary	70	71.89	74.05

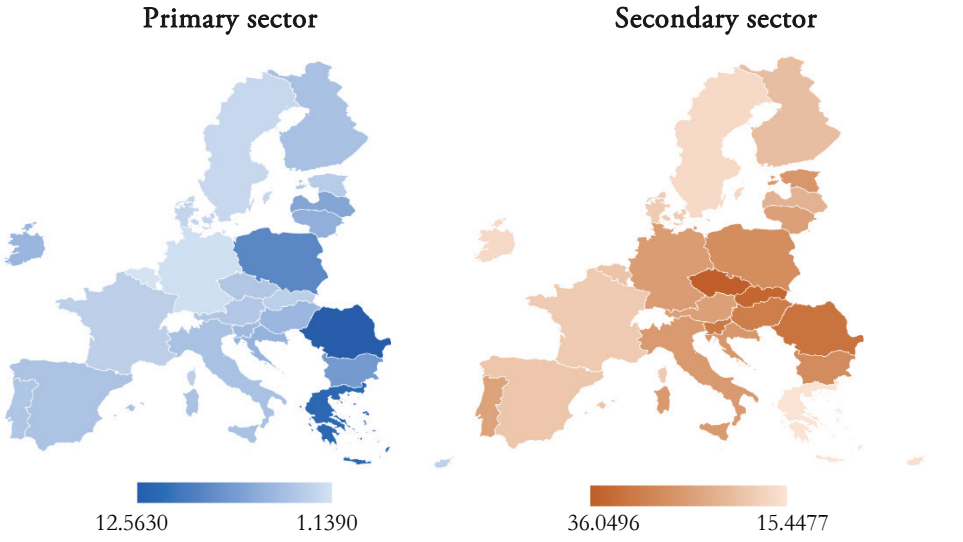
Source: own processing of Eurostat data.

Table 6 compares the Fourastié forecast for a post-industrial society with the situation in the European Union and the eurozone in 2023 respectively. It shows that the actual share of the primary sector is lower than predicted, while the share of the secondary and tertiary sectors is slightly higher than predicted.

The representation of the primary, secondary, tertiary, and quaternary sectors in each country can be seen in more detail in the cartograms in Figure 3. The development of individual economic sectors is also influenced by several factors. One of which is regulation motivated by environmental concerns, see Cerny et al. (2024).

Figure 3

The percentage share of the four distinguished sectors in total employment of EU member states, 2023



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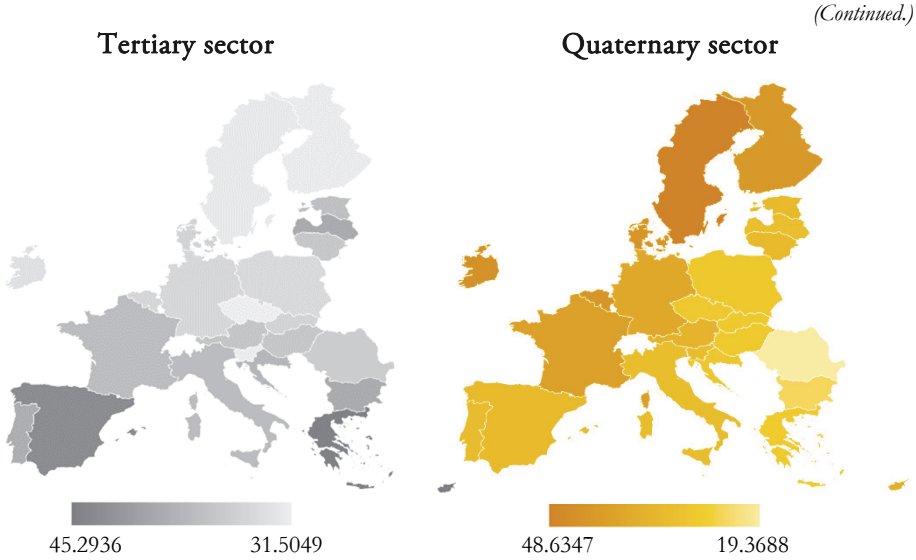


Source: own processing of Eurostat data.

Representation of economic sectors by GDP

According to the theory of Jean Fourastié (Fourastié 1949, Alcouffe–le Bris 2020), not only the share of people employed in each sector changes, but also the share of sectors in total gross domestic product (GDP).

Table 7 shows, for each EU member state, the GDP per capita in 2023 expressed in purchasing power standard and the corresponding volume index – the EU value is taken as the base. Particularly noteworthy here are the exceptionally high GDP per capita values in Luxembourg and Ireland. For the purpose of further analysis, we divide the countries into two groups. The first group will include countries with a GDP value higher than the EU average, and the second group will include countries with a lower-than-average GDP. For each country, we then quantify the share of each economic sector in total employment. We will use the number of employees by NACE sections in 2023 as published by Eurostat.

Table 8 shows that countries with above-average GDP per capita are characterised by a low share of the primary sector. Ireland has the highest share of the primary sector among these countries (4.84%). The percentage of the secondary sector in the countries in the first group ranges from 8.55% to 26.20%. Low values can be observed in Luxembourg (8.55%), the Netherlands (13.90%), Sweden (17.01%), Ireland (17.02%), and Malta (17.96%). On the other hand, Germany (26.20%) and Austria (25.54%), which are traditional industrial countries, have the highest share of the secondary sector among this group of countries. The share of the tertiary sector ranges from 31.71% to 41.14%. Malta, in particular, stands out with 41.14%. The

share of the quaternary sector is above 40% in most of the countries in the first group. The exceptions are Austria (34.65%), Germany (38.28%), and Malta (39.70%). Significantly higher shares of the quaternary sector can be seen in Sweden (48.63%) and Luxembourg (47.65%).

Adding the values in the last four columns of the Table 8 does not always give exactly 100%. This is because for some of the employed persons the field of their economic activity is not known. However, with the exception of the Netherlands and Luxembourg, the resulting value of 100% is very close. In the case of these countries, the totals are significantly lower, which is why they were not included in the analysis in the previous two sections.

Table 7

GDP per capita in the EU, 2023

Country	GDP per capita (€ in PPS)	Volume indices (EU=100%)
European Union (27 countries)	37,600	
Euro area (20 countries)	39,200	104.26
Austria	46,200	122.87
Belgium	44,200	117.55
Bulgaria	24,100	64.10
Croatia	28,600	76.06
Cyprus	35,700	94.95
Czech Republic	34,100	90.69
Denmark	48,100	127.93
Estonia	30,700	81.65
Finland	40,700	108.24
France	38,000	101.06
Germany	43,300	115.16
Greece	25,300	67.29
Hungary	28,700	76.33
Ireland	79,600	211.70
Italy	36,700	97.61
Latvia	26,600	70.74
Lithuania	32,600	86.70
Luxembourg	90,200	239.89
Malta	39,500	105.05
Netherlands	49,000	130.32
Poland	30,000	79.79
Portugal	31,100	82.71
Romania	29,200	77.66
Slovakia	27,300	72.61
Slovenia	34,400	91.49
Spain	33,300	88.56
Sweden	43,900	116.76

Source: Eurostat data.

Table 8

Percentage share of economic sectors in total employment for EU member countries with a higher GDP per capita than the EU average, 2023

(%)

Country	Volume indices (EU=100)	Primary	Secondary	Tertiary	Quaternary
European Union – 27 countries		3.81	23.96	36.55	35.34
Euro area – 20 countries	104.26	2.91	22.70	37.20	36.86
France	101.06	2.63	19.20	37.32	40.27
Malta	105.05	1.14	17.96	41.14	39.70
Finland	108.24	3.80	20.99	31.76	42.57
Germany	115.16	1.37	26.20	34.12	38.28
Sweden	116.76	1.98	17.01	32.03	48.63
Belgium	117.55	1.16	20.08	34.14	43.43
Austria	122.87	3.29	25.54	36.31	34.65
Denmark	127.93	2.16	19.06	34.58	43.82
Netherlands	130.32	1.96	13.90	36.85	45.49
Ireland	211.70	4.84	17.02	32.93	44.82
Luxembourg	239.89	0.90	8.55	31.71	47.65

Source: own processing of Eurostat data.

In Table 9, we can see what is typical for countries with a GDP per capita below the EU average. The representation of the primary sector for countries in the second group ranges from 2.53% to 12.56%. Percentages below 3% are seen in Cyprus (2.53%), Slovakia (2.62%), and Estonia (2.99%). On the other hand, the primary sector is highly represented in Romania (12.56%) and Greece (11.51%). 15.45%–36.05% of people work in the secondary sector. The secondary sector is highly represented in the traditional industrialised countries (Czech Republic 36.05% and Slovakia 34.61%). The secondary sector is also over 30% represented in Romania (32.52%) and Hungary (30.99%). The secondary sector has a low representation in Greece (15.45%), Cyprus (16.11%), and Spain (19.90%). The representation of the tertiary sector in this group of countries varies between 31.50%–45.29%. The lowest is in the Czech Republic (31.50%) and Slovenia (31.61%). The highest is in Cyprus (45.29%). Greece (44.84%), and Spain (43.43%). The quaternary sector accounts for 19.37%–35.77% of employment in this group of countries. The representation of the quaternary sector in Romania is very low (19.37%). The quaternary sector is most represented in the second group in Cyprus (35.77%).

Table 9

Percentage share of economic sectors in total employment for EU member countries with a lower GDP per capita than the EU average, 2023

(%)

Country	Volume indices (EU=100)	Primary	Secondary	Tertiary	Quaternary
European Union – 27 countries		3.81	23.96	36.55	35.34
Euro area – 20 countries	104.26	2.91	22.70	37.20	36.86
Bulgaria	64.10	7.06	28.77	39.62	24.60
Greece	67.29	11.51	15.45	44.84	28.03
Latvia	70.74	6.05	22.68	39.57	31.25
Slovakia	72.61	2.62	34.61	34.52	28.22
Croatia	76.06	5.03	26.88	38.17	29.24
Hungary	76.33	4.58	30.99	36.20	28.20
Romania	77.66	12.56	32.52	35.55	19.37
Poland	79.79	8.52	28.49	33.87	28.49
Estonia	81.65	2.99	26.99	37.03	32.99
Portugal	82.71	3.38	25.07	39.20	32.27
Lithuania	86.70	5.30	25.57	36.04	33.09
Spain	88.56	3.63	19.90	43.43	33.03
Czech Republic	90.69	3.36	36.05	31.50	29.07
Slovenia	91.49	4.33	31.68	31.61	31.96
Cyprus	94.95	2.53	16.11	45.29	35.77
Italy	97.61	3.72	26.51	37.66	32.04

Source: own processing of Eurostat data.

If we compare Tables 8 and 9, we will find out how the two groups of countries differ. In countries with a lower GDP per capita, there is usually a higher representation of the primary and secondary sectors (compared to the EU average) and a lower representation of the quaternary sector. Countries with a higher GDP per capita, on the contrary, have a lower representation of the primary and secondary sectors and a higher representation of the quaternary sector. As for the tertiary sector, its representation is roughly the same in both groups of countries. It is represented significantly above average in countries that are popular summer tourist destinations (Cyprus, Spain, Greece, and Malta). A similar analysis is available in Burger–Hovancikova (2021) for data from 2017.

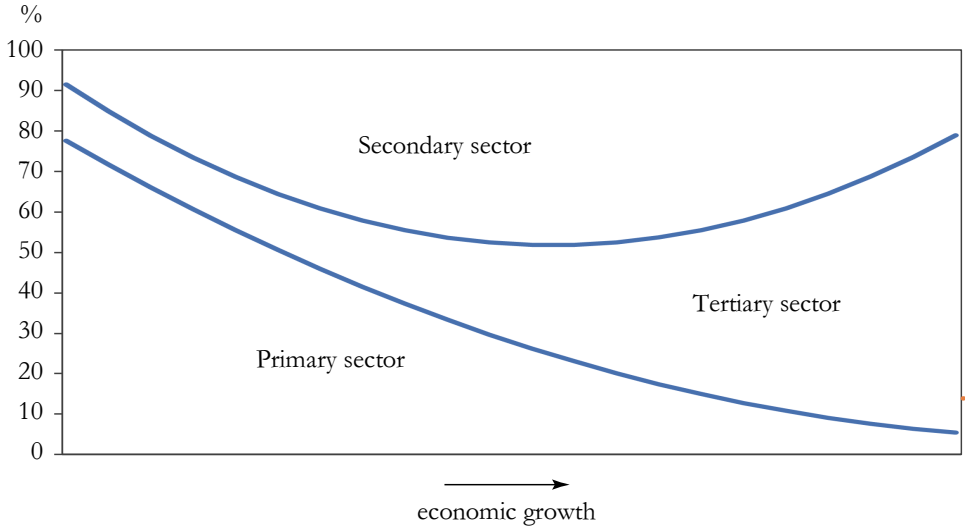
Composition of GDP by sector of origin

We will now focus on the share of sectors in total gross domestic product (GDP). According to Jean Fourastié, changes in the sectoral share of total employment are reflected in the share of GDP accounted for by people employed in each sector.

The changes that Fourastié predicted in 1949 are shown in Figure 4. The figure can be divided into two parts. The left part of the graph represents the industrial phase of the economy. There is an increase in the share of the secondary sector in total GDP, while the share of the primary sector is rapidly declining, and the share of the tertiary sector is slowly increasing. Around the middle of the figure, there is a transition to the next phase of economic development. The share of the secondary sector starts to decline. The share of the primary sector also declines, but not as fast as in the previous period. In contrast, the share of the tertiary sector on the right-hand side of the graph is growing rapidly.

Figure 4

Share of economic sectors in total GDP*



* Forecast by Jean Fourastié.
Source: Ambrozova (2015).

The Eurostat database provides primary, secondary, and tertiary sector percentages for EU member states for 2017. These data are presented in Table 10. The smallest share of the primary sector in total GDP was found in Luxembourg (0.3%), followed by Belgium (0.7%), and Germany (0.7%). The largest shares of the primary sector in GDP were found in Bulgaria (4.3%), Romania (4.2%), and Greece (4.1%). Malta had the smallest share of the secondary sector (10.2%). Low values were also found in Cyprus (12.5%) and Luxembourg (12.8%). The highest share of the secondary sector in GDP was found in Poland (40.2%), followed by Ireland (38.6%),

and the Czech Republic (36.9%). The services sector contributed the least to GDP in Poland (57.4%), Ireland (60.2%), and the Czech Republic (60.8%). The highest share of the tertiary sector in GDP was in Malta (88.7%), Luxembourg (86.9%), and Cyprus (85.5%).

Table 10

Percentage share of economic sectors in total GDP for EU members, 2017

(%)

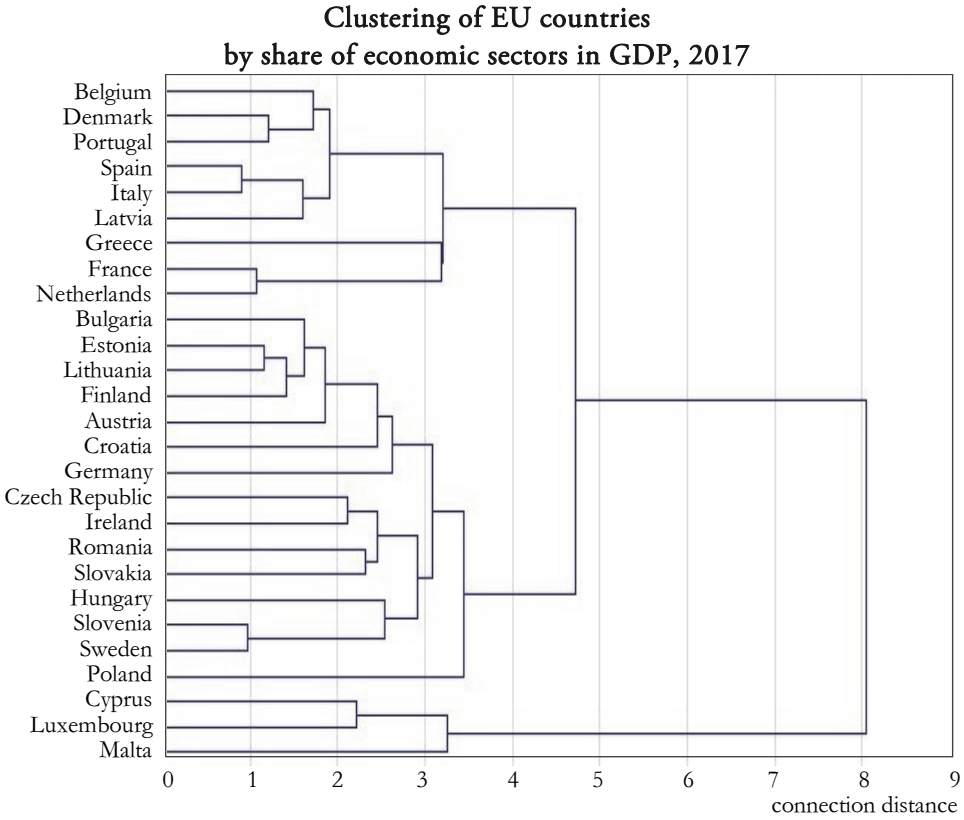
Country	Primary	Secondary	Tertiary
Belgium	0.7	22.1	77.2
Bulgaria	4.3	28.2	67.4
Czech Republic	2.3	36.9	60.8
Denmark	1.3	22.9	75.8
Germany	0.7	30.7	68.6
Estonia	2.8	29.2	68.1
Ireland	1.2	38.6	60.2
Greece	4.1	16.9	79.1
Spain	2.6	23.2	74.2
France	1.7	19.5	78.8
Croatia	3.7	26.2	70.1
Italy	2.1	23.9	73.9
Cyprus	2.0	12.5	85.5
Latvia	3.9	22.4	73.7
Lithuania	3.5	29.4	67.2
Luxembourg	0.3	12.8	86.9
Hungary	3.9	31.3	64.8
Malta	1.1	10.2	88.7
Netherlands	1.6	18.8	79.6
Austria	1.3	28.4	70.3
Poland	2.4	40.2	57.4
Portugal	2.2	22.1	75.7
Romania	4.2	33.2	62.6
Slovenia	1.8	32.2	65.9
Slovakia	3.8	35.0	61.2
Finland	2.7	28.2	69.1
Sweden	1.6	33.0	65.4

Source: own processing of Eurostat data.

Cluster analysis was performed for the data in Table 10 using simple clustering and Euclidean distance. The resulting dendrogram is shown in Figure 5. According to it, the countries of the EU can be divided into three main clusters formed on the basis of distances less than 3.5. The first cluster includes Belgium, Denmark, Greece, Spain, France, Italy, Latvia, the Netherlands, and Portugal. These countries are

characterised by a low contribution of the secondary sector to GDP. The second cluster consists of Bulgaria, the Czech Republic, Germany, Estonia, Ireland, Croatia, Lithuania, Hungary, Austria, Poland, Romania, Slovenia, Slovakia, Finland, and Sweden. In contrast, the share of the secondary sector in total GDP is higher in these countries than in the others. Only Cyprus, Luxembourg, and Malta belong to the third cluster. These countries have a high share of the service sector in total GDP in common.

Figure 5



Source: own processing of Eurostat data.

Conclusion

In recent years, the structure of employment has often been examined in relation to the phenomenon of polarisation. This approach can be found, for example, in Naplava (2019) or Fernandez-Macias (2012). This paper analyses the evolution of the percentage representation of individual economic sectors in individual EU member states from 2011 to 2023, and the percentage representation of economic sectors in

2023 itself. For the analysis, the so-called extended concept of the sectoral structure of the economy was used.

It has been shown that in all EU member states, there has been a shift in the labour force from the primary and secondary sectors to the service sectors, tertiary and especially quaternary. Generally speaking, the most significant changes occurred in countries that had a lower share of the primary sector than the EU average at the beginning of the period under review. It is also clear that some countries are more oriented towards the primary sector, especially agriculture. This applies to Romania, Greece, Poland, and Bulgaria. Some countries, on the other hand, are oriented towards manufacturing and thus have a high share of the secondary sector. This is the case for the Czech Republic, Slovakia, Romania, and Slovenia. In contrast, other countries have a higher share of the tertiary sector compared to others. This is typical for countries with summer tourist destinations, particularly Cyprus, Greece, and Malta. Sweden, Finland, Ireland, Denmark, and Belgium have a significantly higher share of the quaternary sector.

If we assess the European Union as a whole, then over the period under review, the percentage share of the primary sector was found to have fallen by 2.14% from 5.95% in 2011 to 3.81% in 2023. The share of the secondary sector has steadily declined over this period, from 25.41% in 2011 to 23.96% in 2023. For the tertiary sector, the changes were only minimal: the value was 36.73% in 2011 and 36.55% in 2023. Only the quaternary sector saw an increase in percentage share and even by 4%, from 31.26% to 35.34%. The development in the euro area was similar, but the share of the primary and secondary sectors was smaller than in the EU as a whole, while the share of service sectors was higher.

This is also related to another conclusion. Namely, that countries with a higher GDP per capita usually have a lower share of the first two sectors than the EU-wide value and, conversely, a higher share of the tertiary and quaternary sectors. For countries with a lower GDP per capita, the situation is usually reversed. The vast majority of euro area countries belong to the group of countries with a higher GDP per capita.

The last analysis concerned the contribution of individual economic sectors (this time in the traditional three-sector approach) to total GDP. The underlying data for this analysis were from 2017, and more recent data was not available at the time of writing this article. Here we can claim that the contribution to the total amount of GDP is lower for the primary and secondary sectors than the percentage share of these sectors in total employment. In the case of the tertiary sector, the contribution to the total amount of GDP, on the other hand, is higher than the corresponding percentage share of total employment.

Future research challenges

A number of publications and studies have been devoted to the development of the sectoral structure of employment. This assessment of the changes in the sectoral structure of employment that have taken place in the European Union's member states between 2011 and 2023 provides only a brief excursion into the issue. Of course, it would be desirable to extend the period under study to examine the evolution of the employment structure in European countries, similar to Acemoglu–Restrepo (2019) in the US.

Understandably, not only the sectoral structure of employment is changing, but also the structure of occupations and the occupational mix. The interrelationship of these changes is one of the objectives of future research. Just as the occupational structure is changing, the demand for work is also changing. Another objective is to analyse the extent to which the education system in each country responds to changing labour market demand.

Today, the technological changes brought about by the fourth industrial revolution, called Industry 4.0 for short, are the main cause of changes in the occupational and sectoral structure of employment. According to the working paper of the Research Department of the International Labour Office (2016), technological change and innovation is a complex, non-linear, and non-deterministic process which comes in waves and different phases and thereby destroys and creates jobs. Related changes in the structure of employment can be expected to come in waves. In the first wave, a reduction in the number of employees in transport and logistics, administration, trade, and construction are expected. After the first wave, technological decline and a slowdown in replacement is expected. After some time, a second wave is to follow, which will be characterised by the development and introduction of artificial intelligence, self-optimising systems that will be able to replace human work even at the level of decision-making. Another objective of future research is to assess whether and to what extent the changes expected in the first wave of Industry 4.0 have manifested themselves in EU countries.

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