Comparative Economic Research. Central and Eastern Europe
Volume 27, Number 4, 2024
https://doi.org/10.18778/1508-2008.27.33

Labor Market Slack in the EU during the COVID–19 Crisis

Ewa Rollnik-Sadowska https://orcid.org/0000-0002-4896-1199
Ph.D., Bialystok University of Technology, Bialystok, Poland, e-mail: e.rollnik@pb.edu.pl

Ewa Cichowicz https://orcid.org/0000-0002-9379-9127
Ph.D., SGH Warsaw School of Economics, Warsaw, Poland, e-mail: ewa.cichowicz@sgh.waw.pl

Katarzyna Dębkowska https://orcid.org/0000-0001-5319-6228
Ph.D., University of Bialystok, Bialystok, Poland, e-mail: k.debkowska@uwb.edu.pl

Abstract

The general aim of the article is to verify the extent of labor market slack at three moments considered crucial when analyzing labor market changes caused by the COVID–19 pandemic. The main goal is to identify similarities and differences between EU countries grouped into clusters identified during the research.

The study uses cluster analysis to classify the EU members into groups of similar countries according to the labor market slack variables observed before (2019) and during the pandemic (2020, 2021). A two-stage approach was selected. In the first stage, hierarchical analysis was used to determine the initial number of groups, while in the second stage, the proper classification of objects was made using the k-means method.

A comparison of changes taking place in the labor markets of the analyzed countries allows us to select four homogeneous clusters of countries in all periods under study. The results also show that the labor market slack in most EU countries did not change over the analyzed period, although some countries improved (like Ireland, France, and Cyprus). The reason could be the effectiveness of measures that support labor markets that were implemented during the pandemic. The country where the labor market slack situation worsened is Italy.

It would be valuable to analyze in more detail the effectiveness of labor market policies and programs from countries in the identified clusters because they contributed to a relatively stable labor market slack situation. Future research should also be directed towards analyzing changes on the side of employment, including a sectoral analysis, which would expand

Received: 19.01.2024. Verified: 15.03.2024. Accepted: 24.09.2024

the knowledge of the labor market during the COVID–19 crisis. Moreover, to deepen the analysis of labor market slack, the demographic structure could be included.
Analysis of the labor market based solely on the unemployment rate is insufficient, which is even more visible in the face of the consequences caused by the COVID–19 pandemic as that measure does not include the "discouraged worker effect". For the EU, there is a research gap regarding this effect, which can be gleaned from the labor market slack statistics. This article, therefore, fills the gap.

Keywords: labor market slack, unemployment, COVID–19, anti-crisis policy, cluster analysis

JEL: J01, J08, J21

Introduction

Labor market slack is a key concept in understanding labor market equilibrium. It refers to the gap between the amount of work that workers desire and the amount of work that is actually available. Labor market slack goes beyond the unemployment rate by summing unemployment, underemployment (individuals who work part-time and claim they want a full-time job), people seeking a job but not currently available, and people not seeking a job but available to work. Those final two groups create unemployment "halos" (de la Fuente 2011). Individuals who are seeking but not available and not seeking but available for work are excluded from the labor force and are considered inactive. Labor market slack is therefore expressed as the sum of all unmet labor supply among the four groups as a percentage of the extended labor force (ELF = the labor force + the two groups not counted as part of the labor force – called the potential additional labor force) (Gros and Ounnas 2021).

Analyses of the labor market based solely on the unemployment rate are insufficient (Fontaine 2016), which is even more visible in the face of the consequences caused by the COVID–19 pandemic. Although the components of labor market slack have been published by Eurostat for many years, they have become more important. Taking them into account gives a more complete picture of the labor market, which allows for a better understanding of the market, especially during the pandemic (Statistics Poland 2020). In particular, in the first phase of the crisis, the implementation of active measures to reduce job losses more often led to absenteeism than to dismissal, and people were unable to look for work or were unavailable due to restrictive measures. Therefore, they were not counted as unemployed.

Unemployed people have, on average, the largest share of the labor market slack in the European Union (EU). However, in Italy in 2021, for example, the largest share constituted people available to work but not seeking it. Unemployment rates can hide the "discouraged worker effect", that is, potential workers who stopped looking for jobs

to wait for conditions to improve and economic sectors to reopen. Research shows that this phenomenon most likely took place in the US during the pandemic (Coibion, Gorodnichenko, and Weber 2020). For the EU, there is limited research into this effect (Gros and Ounnas 2021). On the other hand, some studies indicate this effect may also be present in Europe, e.g., in Norway from 1988 to 2008 (Dagsvik, Kornstad, and Skjerpen 2013).

Despite this, it is reasonable to conclude that the economic shocks caused by the pandemic have put the labor market into a transitional phase as it seeks a new equilibrium. Given the distinct sources of shock compared to previous events, such as the Global Financial Crisis, economies have responded differently (Ando et al. 2022). Interestingly, unlike other pandemics, COVID–19 also had an unprecedented impact on the labor market (Li et al. 2022).

The starting point for explaining the current state of the labor market involves the policies adopted by individual countries during the pandemic. While they led to lockdowns, these policies were largely responsible for the relatively quick and significant revival of the labor market, although they had an asymmetric impact on various sectors of the economy (Verick, Schmidt-Klau, and Lee 2022). In the EU, holiday and short-term work programs were the most important. In addition, Zinecker et al. (2021) also noted that the Small and Medium Enterprise (SME) sector had been backed by funds that allowed the implementation of part-time work schemes. Thanks to this solution, it was possible to maintain many jobs, and the unemployment rate increased only moderately. At the same time, while studying the other components of labor market slack, it can be seen that in Poland, for example, the partial or complete closure of businesses led to a decline in employment with a simultaneous increase in underemployment and only a slight increase in unemployment (thanks to the government, which temporarily took over the burden of maintaining employment).

In line with the above statements, the aim of the article is to verify the extent of labor market slack at three moments that are considered crucial when analyzing changes in the labor market caused by the pandemic. The main goal is to identify similarities and differences between EU countries. This will allow us to group them into clusters identified during the research. Cluster analysis was used for this purpose. The components of labor market slack were used to group all EU countries into separate clusters except for the United Kingdom, as it left the EU during the study period (hereinafter: the EU–27). Taking into consideration the characteristics of some periods (justified later in this paper), the data were taken for the second quarters of 2019, 2020 and 2021.

The two research hypotheses were set out, which were verified in the research process:

H1: Labor market slack in the EU deteriorated during the COVID–19 crisis.

H2: The COVID–19 crisis reduced the differences in labor market slack between the EU–27 countries.

The rest of this paper is organized as follows. In the first part, an in-depth review of the literature on labor market slack is conducted. Following this, in the second section, the method used to verify the hypotheses was developed. In the third part, considerations and analyses are carried out, and then the results are presented. The fourth section compares the results with those of other authors. Finally, the last part presents the conclusion of the research.

Theoretical background

Research on labor market slack is conducted from various perspectives. First of all, labor market researchers increasingly emphasize that due to the characteristics of the COVID–19 crisis and the dynamics of changes, conducting analysis based on annual data or the unemployment rate indicator is not only insufficient but also leads to erroneous conclusions (Lee, Schmidt-Klau, and Verick 2020). The unemployment rate may not be an accurate measure of labor market slack when analyzing countries with large-scale labor market programs, e.g., an Active Labor Market Policy (Pannenberg and Schwarze 1998). Additionally, there are also drawbacks to the earlier focus on the unemployment rate as the main measure of underutilization of the labor market. These drawbacks include the inability to take into account the behavior of the employed in the unemployment rate or the failure to include all people who represent underutilization of the labor market in the unemployment rate (Faberman et al. 2020).

Szörfi and Tóth (2018) noted a better reflection of the labor market situation (especially during the Global Financial Crisis and the recovery) thanks to an approach based on a broad measure of labor underutilization. According to Blanchflower and Levin (2015), in the face of a deep recession and slow recovery, labor market slack cannot be measured solely by a conventional measure of the unemployment rate. Employment gap assessments should reflect the prevalence of underemployment and the extent of hidden unemployment. Moreover, each of these forms of labor market slack puts significant pressure on lower nominal wages. Research confirming the importance of underemployment in changes in the level of wages was carried out by, among others, Bell and Blanchflower (2018).

Bonam, de Haan, and van Limbergen (2021) compared the Phillips wage curve to alternative measures for labor market slack for the five biggest Eurozone countries. They concluded that the unemployment gap was unable to adequately capture the persistence in additional labor market slack, which may, therefore, lead to an overly optimistic view of the situation in the labor market (after the recent financial crisis and perhaps also

after the crisis caused by the pandemic). Byrne and Zekaite (2020) analyzed the sensitivity of wage growth depending on the labor market situation in terms of tightness and slack in the eurozone in the period Q1 1999 – Q2 2018. They argued that the Phillips wage curve in the euro area is convex. They concluded that when the labor market slack was high, wage growth did not respond to the changing labor market conditions. Therefore, their results indicate the negative impact of underemployment on wage growth and explain the "missing wage growth" phenomenon witnessed during high levels of labor market slack. A change in wages depends not only on the labor market slack; another important determinant is inflation (Donayre and Panovska 2018).

Some researchers, wishing to eliminate the disadvantages associated with relying only on the unemployment rate, explore alternative measures of labor market slack. For example, Berger and Vierke (2017) created a multivariate unobserved-components model using information on GDP, inflation, and hours worked. By formally comparing models, they contend that the estimated hourly gap exceeds the conventional measures of the unemployment gap in the Taylor rule. They demonstrated that labor force participation and hours worked play important roles in the adjustment process, including that additional information, other than the unemployment rate, can help in a more accurate assessment of the state of the labor market. While their observations pertain to the Global Financial Crisis, particularly in Germany, the methodologies applied (e.g., short-term and part-time work programs) suggest potential applicability to the COVID–19 crisis.

Conversely, Gallant et al. (2020) propose considering the distinction between temporary and permanent unemployment, the share of the temporary unemployed who actively seek employment, and the differentiation between short-term and long-term unemployment rather than focusing solely on the unemployment rate. Their model incorporates the job separation rate, the recall rate of workers on temporary layoff, and vacancy rates. They argue that this approach will be useful in forecasting the dynamics of the labor market as a result of the COVID–19 recession.

Important research trends include analyses of labor market slack in selected countries or areas (e.g., the EU). Table 1 below summarizes notable research on labor market slack.

When analyzing the pandemic period, the situation in the United States and in the EU is often contrasted. In particular, the rapid impact of COVID–19 on the rise in unemployment rates in individual US states is noted, in contrast to a much weaker rise in unemployment and its gradual adjustment in Europe. This is partly explained by the differences in the labor markets and in the implemented anti-crisis programs (Adams-Prassl et al. 2020).

Table 1. Selected papers on labor market slack

Researchers	Focus
MacKay and Davies (2008)	Labor market slack in the United Kingdom
Hurley and Patrini (2017)	Labor market slack in the EU
Ellul (2019)	Labor market slack in Malta
Martins and Seward (2020)	Measuring labor market slack in Portugal
Galasso and Foucault (2020)	The impact of the COVID–19 pandemic on the labor market in 12 countries
Ens et al. (2021)	The importance and unevenness of COVID–19's impact on the Canadian labor market, highlighting the need for a broader approach than traditional measures

Source: own elaboration.

Research on labor market slack also concerns the issue of differentiating the credibility of the unemployment rate indicator depending on the labor market of individual social groups. For example, Komlos (2019) demonstrated that in the United States, the position of the most vulnerable groups of society, i.e., minorities, youth, and the less educated, is better reflected by labor market slack and its components. These conclusions were confirmed by Pouliakas and Branka (2020) and Fana et al. (2020), according to whom the segments of the workforce most likely to be impacted by social distancing measures and practices due to the COVID–19 pandemic are also the most vulnerable groups, such as women, non-natives, those with non-standard contracts (e.g., the self-employed and temporary workers), the lower educated, those employed in micro-sized workplaces and low-wage workers. In line with these findings, Palomino, Rodríguez, and Sebastián (2020) demonstrated that the crisis increased inequality and poverty in all EU–27 countries.

Research methodology

The research analyzes the impact of COVID–19 on labor market slack in the EU–27 in the second quarters of 2019, 2020, and 2021. The second quarter of 2019 represented the period before the COVID–19 crisis, while in the second quarter of 2020, the influence of the pandemic on the labor market was already noticeable; however, the prevention policies had not yet been implemented. The second quarter of 2021 marked a period of the development of the pandemic with a simultaneous implementation of prevention policies in the EU–27 countries.

The quarterly data come from Eurostat and refer to all EU–27 countries at the country level. Labor market slack was analyzed using four variables:

X_1 – unemployed as a percentage of the extended labor force,

X_2 – people available to work but not seeking employment as a percentage of the extended labor force,

X_3 – people seeking work but not immediately available as a percentage of the extended labor force,

X_4 – underemployed people working part-time as a percentage of the extended labor force.

Cluster analysis was used to classify the EU–27 into groups of similar countries according to labor market slack variables observed before the pandemic (2019) and during the pandemic (2020, 2021). Cluster analysis is a very popular multidimensional statistical method with a fundamental aim of classifying (observing) objects into groups (clusters), and it has been used for the clustering of labor markets (Rollnik-Sadowska and Dąbrowska 2018; Dmytrów and Bieszk-Stolorz 2021).

Cluster analysis as a grouping method allows for the identification of clusters that contain similar objects (Tryon 1939). Clustering techniques are applied in various research fields, as highlighted by Hartigan (1975), who summarized many studies that describe the results of cluster analysis. This method represents interdependence analysis, where all variables in the analysis are treated as interdependent without distinguishing between dependent (effects) and independent variables (causes). In such cases, the analysis is usually aimed at identifying the structure of the examined sets of variables or objects. Cluster analysis, as a grouping method, makes it possible to identify internally consistent groups of objects. The research is conducted in four main phases: (I) selecting variables and adopting a method for determining similarities between objects, (II) choosing the manner of designating data objects into homogeneous groups, (III) selecting the number of identified clusters, and (IV) interpreting and profiling the obtained clusters.

The literature offers two basic approaches to clustering: hierarchical and non-hierarchical. In the former, a hierarchical structure of similarities among objects is represented as a dendrogram (Ward 1963). Among the non-hierarchical approaches, the k-means method stands out, as it allows for faster and more efficient grouping of cases. It is an iterative method that is conducive to grouping sets of objects, whether they contain just a few observations or several thousand. However, in this method, the researcher must specify the number of clusters in advance. Therefore, a two-stage approach is quite commonly used in research, as was the case in this study. In the first stage, hierarchical analysis is used to determine the initial number of groups, while in the second stage, proper classification of objects is performed using the k-means method.

The k-means method divides the entire set of cases into k different, possibly distinct clusters. The algorithm of this method involves transferring objects between the specified number of clusters to minimize variation within clusters and maximize the variation

between clusters. When analyzing the results of the clustering, the averages for each cluster are examined in every dimension to assess the extent of differentiation among the distinguished k clusters. The k-means method relies on estimating the distance between clusters and objects (MacQueen 1967).

Research results

In the first stage of the research, cluster analysis was conducted to verify the research hypotheses. To ensure comparability of the results, variable standardization of X_1, X_2, X_3, and X_4 was performed before conducting the cluster analysis. Each standardized variable has a mean of 0 and a standard deviation of 1. The subsequent figures (Figure 1–3) depict the standardized values of the variables.

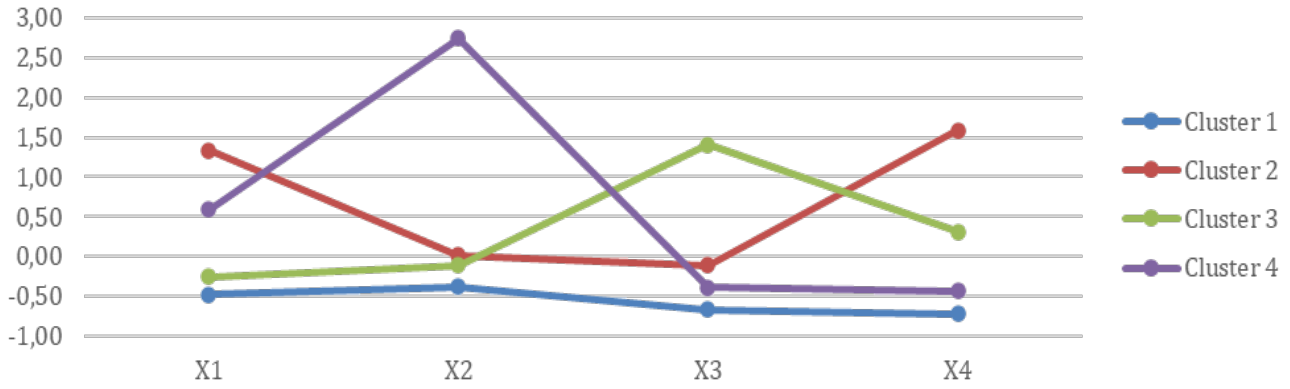
Before the pandemic, in the second quarter of 2019, the following four clusters of EU countries were identified (Figure 1):

Cluster 1. Variables below the average level

Cluster 2. Very high unemployment, average professional inactivity, very high underemployment

Cluster 3. Low unemployment, average availability but not seeking, high seeking but not available, above-average underemployment

Cluster 4. Above-average unemployment, very high availability but not seeking, below-average seeking but not available, below-average underemployment.



X_1 – unemployed as a percentage of the extended labor force, X_2 – available but not seeking as a percentage of the extended labor force, X_3 – seeking but not available as a percentage of the extended labor force, X_4 – underemployed part-time workers as a percentage of the extended labor force.

* Standardized variables.

Figure 1. The clusters of labor market slack in the EU–27, Q2 2019

Source: own calculations based on Eurostat 2021.

Table 2 presents the means for variables X_1–X_4 achieved in each of the clusters of labor market slack in the second quarter of 2019. Before the pandemic, the first cluster, which groups countries with variables below the average level, mainly comprised Central and Eastern European (CEE) countries such as Bulgaria, Czechia, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia and Slovakia, although it also included Germany, Malta and Portugal. This is the largest cluster. The values of all variables were the lowest among those achieved in all clusters in this period. The average value for X_1 in this cluster was 4.3, while the total mean for all countries was 5.8. Czechia had the lowest level of the X_1 variable, at only 2.0. It was also the lowest value among all countries in all three quarters included in the analysis. Similarly, the lowest values in all three analyzed periods were reached in Q2 2019, both in terms of cluster means and overall means. Again, Czechia had the lowest value of the X_4 variable at 0.3, and this value remained at the same level in all analyzed quarters. The mean for the entire cluster in Q2 2019 was 1.3 and was almost twice lower than the mean for all countries. The average in the cluster for variable X_3 was also twice lower than the mean for all countries and reached a very low level of 0.4. In the case of variable X_2, four countries from the cluster (Bulgaria, Estonia, Latvia, and Portugal) achieved values above the mean for all analyzed countries in this period.

The second cluster, which is characterized by very high unemployment and underemployment, and average professional inactivity, included Ireland, Greece, Spain, France and Cyprus. It is a cluster with an average X_1 level of 10.1, which is more than twice as high as the average for the first cluster and twice as high as the third cluster. It includes the only two countries where the X_1 variable reached a double-digit value – Spain (13.5) and Greece (16.9). In turn, the average value of the X_4 variable in this cluster is practically twice as high as the mean calculated for all analyzed countries and amounts to 4.7. For comparison, it is more than three times the analogous mean from the first cluster. It is noteworthy that the X_4 level was the highest in all three analyzed quarters. The average values of variables X_2 and X_3 were equal to the corresponding means calculated for all countries in Q2 2019.

The third cluster was described by low unemployment, average availability but not seeking, high seeking but not available, above above-average underemployment. It includes the Scandinavian countries, as well as Belgium, Luxembourg, the Netherlands and Austria. In this cluster, the average level of the X_3 variable, which was 1.8, is the most noteworthy. This value was more than twice as high as the mean calculated for all countries and even more than four times higher than the corresponding value in the first cluster. Particularly high values were achieved in Finland and Sweden (2.2 and 2.3, respectively), which were the same two countries where variables X_1 and X_4 were higher than average (both for the cluster and in total).

The fourth cluster, characterized by above-average unemployment, very high availability but not seeking, below-average seeking but not available, and below-average underemployment, included two countries – Croatia and Italy. The average value of the X_2 variable

here was exceptionally high, at 7.8, i.e., three times higher than the corresponding mean for all countries in this period. Compared to the other clusters, this level was three times higher or even more. Although both countries had a high level of the X_2 variable, attention is drawn to Italy, where this variable reached a value of 10.0. It was also the highest value among all the countries analyzed in Q2 2019. The level of the X_1 variable was also quite high, amounting to 7.7 (which was also largely influenced by Italy; it was 9.0).

Table 2. Clusters of labor market slack in the EU–27, Q2 2019

	Means for variables in clusters*			
Cluster	X1	X2	X3	X4
1	4.3	1.9	0.4	1.3
2	10.1	2.6	0.8	4.7
3	5.0	2.4	1.8	2.9
4	7.7	7.8	0.6	1.8
Total average**	5.8	2.6	0.8	2.4

* Variables are non-standardized.
** Average weighted by the number of countries in the cluster.
Source: own calculations based on Eurostat 2021.

In the second quarter of 2020, the following four clusters were designated with different sets of variables than the year before (Figure 2):

Cluster 1. Variables below the average level.

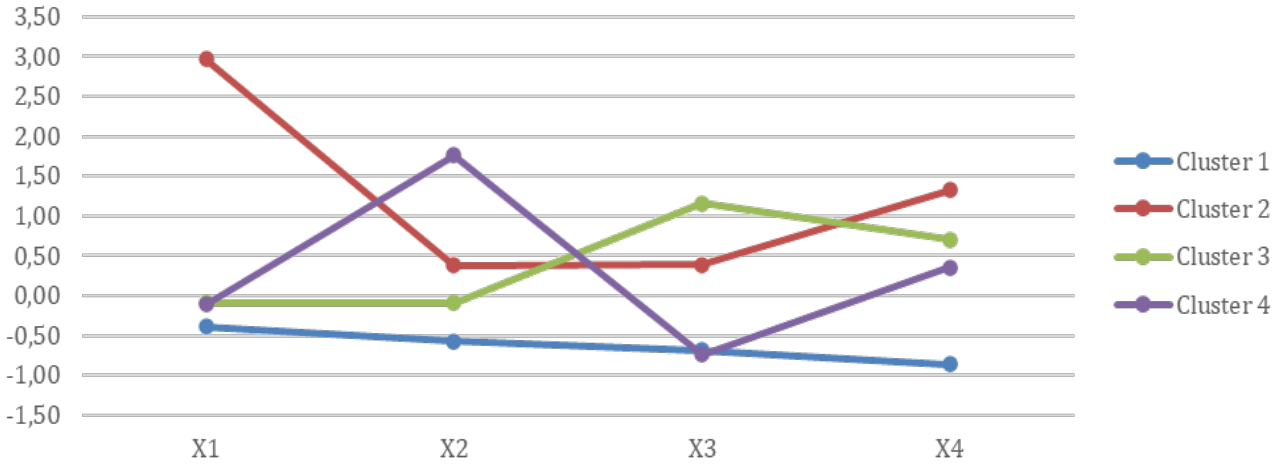
Cluster 2. Very high unemployment, above-average professional inactivity, very high underemployment.

Cluster 3. Average unemployment, average available but not seeking, very high seeking but not available, above-average underemployment.

Cluster 4. Average unemployment, very high available but not seeking, below-average seeking but not available, above-average underemployment.

As shown in Table 3, the first cluster was described by variables below the average level. This cluster includes CEE countries such as Bulgaria, Czechia, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia and Slovakia, as well as Germany and Malta. It was still the most numerous cluster. The composition remained unchanged compared to Q2 2019, except for Portugal, where the share of people available to work but not seeking in the extended labor force increased significantly and was included in the fourth cluster. In the first cluster, compared to Q2 2019, the average values of variables X_1, X_2 and X_3 increased, while the value of X_4 decreased to 1.1, which was more than twice lower

than the general average for all countries and more than twice lower than the average from the remaining clusters, and in the case of the second cluster, almost four times lower. In this period, although all variables for the first cluster were below the total mean for all countries, only the X_4 variable was lower each time compared to the means calculated for individual clusters for each variable.



X_1 – unemployed as a percentage of the extended labor force, X_2 – available but not seeking as a percentage of the extended labor force, X_3 – seeking but not available as a percentage of the extended labor force, X_4 – underemployed part-time workers as a percentage of the extended labor force.
* Standardized variables.

Figure 2. Clusters of labor market slack in the EU–27, Q2 2020

Source: own calculations based on Eurostat 2021.

Based on the data, it can be concluded that if countries did not implement countermeasures at the onset of the pandemic, the consequences became visible in Q2 2020. The second cluster, characterized by very high unemployment, above-average professional inactivity and very high underemployment, took into account two countries – Greece and Spain. In this cluster, the mean calculated for variable X_1 was 15.3, and it was the highest share of the unemployed in the extended labor force in all clusters in all three periods. Interestingly, in Greece, the value of X_1 remained very high, but it decreased compared to Q2 2019. In Spain, on the other hand, the level of X_2 increased significantly compared to Q2 2019, almost doubling the average value of this variable calculated for X_2 in terms of Q2 2020 vs Q2 2019. The average level of variable X_4 was higher than in the other clusters (4.3), which was almost four times the analogous mean for the first cluster.

The third cluster was characterized by average unemployment, average available but not seeking, very high seeking but not available, and above-average underemployment, and it included the Scandinavian countries as well as Belgium, Luxembourg, the Netherlands, Austria, France, and Cyprus. Both France and Cyprus had been in the second cluster in Q2 2019. The average value for variable X_3 was 1.6, which was basically

four times higher than the corresponding value calculated for the first and fourth clusters. Such a high level was mainly due to the share of people seeking work but not immediately available in the extended labor force in Luxemburg (2.2), but also in Austria and the Scandinavian countries. On the other hand, the higher-than-average level of X_4 was mainly influenced by the situation in France, Cyprus, and the Netherlands.

The fourth cluster included countries with average unemployment, very high available but not seeking, below-average seeking but not available, and above-average underemployment. It included Ireland, Croatia, Italy, and Portugal. The average level of the X_2 variable is noteworthy in this cluster. At 8.8, it was the highest of all clusters in all three periods. The share of people available to work but not seeking in the extended labor force in Italy had the greatest impact here, where it reached 13.0. In turn, the mean calculated for variable X_3 in the fourth cluster was the lowest among all clusters in Q2 2020, at only 0.4. It was slightly more than twice lower than the mean calculated for all countries in this period. What is also worth noting is that each country in this cluster recorded a comparable value of this variable.

Table 3. Clusters of labor market slack in the EU–27, Q2 2020

	Means for variables in clusters*			
Cluster	X1	X2	X3	X4
1	5.3	2.3	0.5	1.1
2	15.3	5.0	1.1	4.3
3	6.1	3.6	1.6	3.4
4	6.1	8.8	0.4	2.9
Total average**	6.4	3.9	0.9	2.4

* Variables are non-standardized.
** Average weighted by the number of countries in the cluster.
Source: own calculations based on Eurostat 2021.

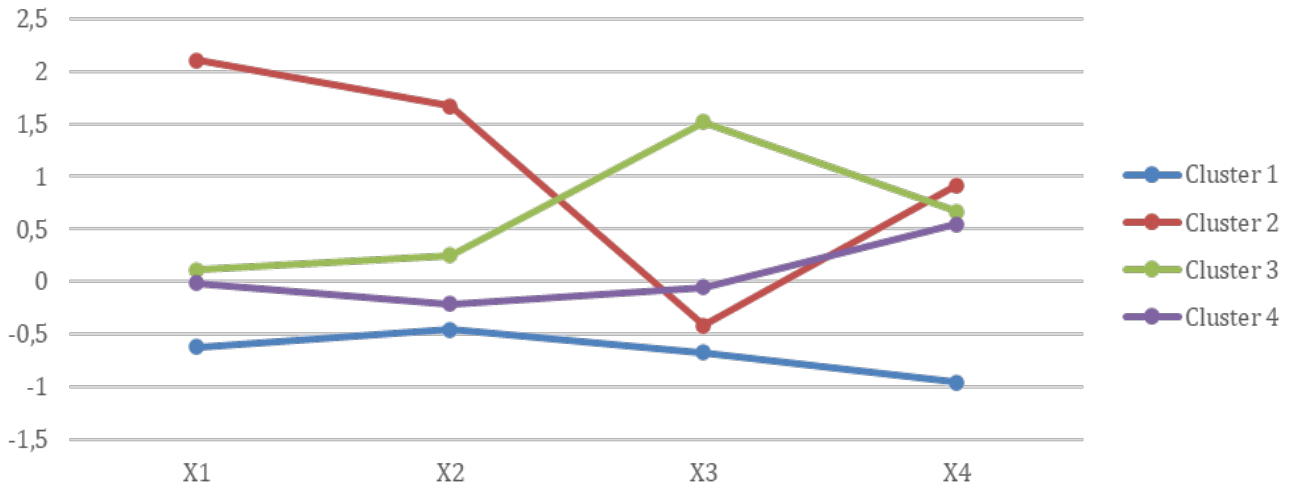
In the second quarter of 2021, the following four clusters were distinguished (Figure 3):

Cluster 1. Variables below the average level.

Cluster 2. Very high unemployment, very high available but not seeking, below-average seeking but not available, above-average underemployment.

Cluster 3. Average unemployment and availability but not seeking, high seeking but not available, above-average underemployment.

Cluster 4. Below-average unemployment and inactivity, above-average underemployment.



X_1 – unemployed as a percentage of the extended labor force, X_2 – available but not seeking as a percentage of the extended labor force, X_3 – seeking but not available as a percentage of the extended labor force, X_4 – underemployed part-time workers as a percentage of the extended labor force.
* Standardized variables.

Figure 3. Clusters of labor market slack in the EU–27, Q2 2021

Source: own calculations based on Eurostat 2021.

The first cluster, characterized by below-average variables (Table 4) included CEE countries, such as Bulgaria, Czechia, Estonia, Lithuania, Hungary, Poland, Romania, Slovenia, and Slovakia, as well as Germany and Malta. In Q2 2021, Portugal and Latvia were absent from the first cluster, both of which had migrated to the fourth cluster. The means for all variables in this cluster were the lowest compared to those of the other clusters in the same period. The average value of variable X_1 decreased compared to the average recorded in Q2 2020, although the corresponding average for all countries increased in relation to Q2 2020. In turn, the mean for this cluster calculated for variable X_4 was two and a half times lower than the total mean calculated for all countries, at 1.0. In addition, the share of underemployed people working part-time in the extended labor force in this cluster was the lowest in this period from all analyzed periods.

In the second quarter of 2021, when the EU–27 implemented measures to mitigate the pandemic, the second cluster included countries with very high unemployment, very high available but not seeking, below-average seeking but not available, and above-average underemployment – Greece, Spain, and Italy. The average level for variable X_1 was about twice the mean for all countries and amounted to 13.0. The average value of X_4 was higher than the corresponding means in the other clusters in this period, at 4.0. Both means (for X_1 and X_4) were lower in this cluster than the values obtained in Q2 2020, while the means for all countries in Q2 2021 were higher for X_1 and X_4 than in Q2 2020. The average value for variable X_2 for this

cluster was the highest among the averages for X_2 from the other clusters, with a value that was more than twice as high as the total mean for all countries.

The third cluster was characterized by average unemployment and availability but not seeking, high seeking but not available, and above-average underemployment, and it included Ireland, France, Luxembourg, Austria, Finland, and Sweden. In this cluster, the average value for variable X_1 stood at 7.1, slightly exceeding the mean for all countries and influenced mainly by the level of this variable in Sweden, France, and Finland. It was also the highest value for this cluster from all three analyzed periods. It was similar for the mean calculated for variable X_4. The mean for X_2 remained at the same level both in Q2 2020 and in Q2 2021. What is also noteworthy is the high level of the mean calculated for X_3, which is more than twice the corresponding mean calculated for all countries, over four times the corresponding value in the first cluster, and even more than three times the value in the second cluster.

The fourth cluster, characterized by average unemployment, below-average inactivity, and above-average underemployment, consisted of Belgium, Denmark, Croatia, Cyprus, Latvia, the Netherlands and Portugal. The average for variable X_1 is slightly higher than in Q2 2020 but lower than in Q2 2019. On the other hand, the average value of variable X_2 dropped sharply, primarily influenced by the levels of this variable in Denmark, the Netherlands and Belgium. Compared to Q2 2020, it decreased in this cluster more than three times, reaching 2.6. Meanwhile, the average value for variable X_4 increased, which was significantly influenced by the value of this variable recorded in the Netherlands and Cyprus. It is important to note that the composition of the cluster changed in terms of the countries it encompasses.

Table 4. Clusters of labor market slack in the EU countries, Q2 2021

	Means for variables in clusters*			
Cluster	X1	X2	X3	X4
1	4.9	2.1	0.4	1.0
2	13.0	6.4	0.5	4.0
3	7.1	3.6	1.7	3.6
4	6.7	2.6	0.8	3.4
Total average**	6.7	3.0	0.8	2.5

* Variables are non-standardized.
** Average weighted by the number of countries in the cluster.
Source: own calculations based on Eurostat 2021.

Three clusters can be distinguished with a similar set of variables, which were identified before the pandemic in Q2 2019 as well as during the pandemic – in Q2 2020

and Q2 2021 (Table 5). The first cluster comprises countries where the level of variables was below average. Interestingly, this cluster was characterized by a relative constancy of members and was composed mainly of CEE countries, along with Germany and Malta. In 2019, Portugal was also included. However, in 2020, it moved to the cluster that included countries with average unemployment, very high available but not seeking, below-average seeking but not available, and above-average underemployment. In Q2 2020, both the unemployment rate and the share of underemployed part-time workers in the extended labor force fell in comparison to Q2 2019. By contrast, there was significant growth in the share of people available to work but not seeking as a percentage of the extended labor force (from 3.2% to 6%). However, there was no change in terms of the share of people seeking work but not immediately available in the extended labor force. This indicator includes, among others, discouraged jobseekers and people prevented from job-seeking due to personal or family circumstances (Eurostat).

Table 5. Clusters of labor market slack changes in the EU countries, Q2 2019, Q2 2020, Q2 2021

Cluster	2019 Q2	2020 Q2	2021 Q2
Cluster 1: Variables below the average level	Bulgaria	Bulgaria	Bulgaria
	Czechia	Czechia	Czechia
	Germany	Germany	Germany
	Estonia	Estonia	Estonia
	Latvia	**Latvia**	Lithuania
	Lithuania	Lithuania	Hungary
	Hungary	Hungary	Malta
	Malta	Malta	Poland
	Poland	Poland	Romania
	Portugal	Romania	Slovenia
	Romania	Slovenia	Slovakia
	Slovenia	Slovakia	
	Slovakia		
Cluster 2: Very high unemployment, average/above-average professional inactivity, very high underemployment	**Ireland**	Greece	Greece
	Greece	Spain	Spain
	Spain		**Italy**
	France		
	Cyprus		

Cluster	2019 Q2	2020 Q2	2021 Q2
Cluster 3: Low/average unemployment, average availability but not seeking, high seeking but not available, above-average underemployment	Belgium	Belgium	**Ireland**
	Denmark	Denmark	**France**
	Luxembourg	**France**	Luxembourg
	Netherlands	**Cyprus**	Austria
	Austria	Luxembourg	Finland
	Finland	Netherlands	Sweden
	Sweden	Austria	
		Finland	
		Sweden	

Source: own calculations based on Eurostat 2021.

In 2021, Latvia left the below-average cluster. In that year, both Latvia and Portugal moved to the group of countries with below-average unemployment and inactivity and above-average underemployment.

The next set of variables included very high unemployment, average/above-average professional inactivity, and very high underemployment in one cluster over the analyzed period. Both Spain and Greece were permanent members of this cluster, while other members changed. During the pandemic, in 2020, Ireland, France, and Cyprus left, which seemed to improve their situation regarding labor market slack. They developed a rolling series of measures to support the labor market (Brioscú, O'Reilly, and Coates 2021). In 2021, Italy joined that cluster.

The third cluster that was typical for all the analyzed periods was characterized by low/average unemployment, average availability but not seeking, high seeking but not available, and above-average underemployment. It was composed of the Nordic countries (Denmark left in 2021), Belgium, Luxembourg, Austria, and the Netherlands (which also left in 2021).

The analysis shows that during the analyzed period, labor market slack in most countries did not change. Some improved their situation (like Ireland, France, and Cyprus), which may be due to the effectiveness of measures they implemented to support labor markets. Therefore, hypothesis H1 has only been partially confirmed. The country where the labor market slack worsened was Italy.

One argument for the continued differentiation of countries is that comparing changes in the labor markets leads to the same four homogeneous clusters in all the analyzed periods. However, it is worth noting that some countries do migrate between these clusters over time, albeit relatively few. Nonetheless, four clusters are still created that differ from

each other in terms of the analyzed criteria included in the labor market slack. Additional information in this area is also provided by the analysis of data for individual countries and within individual clusters. Thus, the H2 hypothesis cannot be confirmed.

Discussion

The crisis related to the COVID–19 pandemic posed a challenge to the economies and livelihoods in each of the analyzed countries. The shock to the economy was greater in Southern Europe than in Eastern and Northern Europe. In order to protect jobs and employees, special programs were implemented, the effectiveness of which was also reflected in the level of labor market slack. At the same time, their diversity should be emphasized, especially in terms of the scale of aid, the conditions for obtaining it and its duration. This diversity was caused primarily by the economic situation of the country before the pandemic and the structure of the economy, existing anti-crisis programs, and to a lesser extent, political and even cultural conditions.

A review of the available information on aid programs shows that while in Germany and Czechia, for example, various types of subsidies played an important role, in Sweden and the Netherlands, subsidies and loans were crucial. In Italy and Spain, the multitude of solutions in the field of tax policy is noteworthy, while Spain, along with Sweden, also had extensive employee support programs. Less emphasis was placed on employee support programs in Hungary, Slovakia and the Netherlands. Important tools used to fight the pandemic included instruments that supported the labor market, which helped to maintain employment or subsidized wages.

The use of job retention schemes (Müller, Schulten, and Drahokoupil 2022; Lam and Solovyeva 2023) in a range of anti-crisis solutions should be mentioned. Ebbinghaus and Lehner (2022) showed that almost half of the 25 European countries, they investigated, introduced new schemes (nine without a prior scheme and three added a new scheme to an existing scheme), while a group of 14 countries relied on existing schemes but often improved their conditions. Continental, Mediterranean and Nordic countries often used existing instruments that were adapted, while most liberal market economies and CEE countries had to establish new job retention schemes. As shown by Corti, Ounnas, and Ruiz De La Ossa (2023), countries where the system was already in place permanently (i.e., Austria, Belgium, Denmark, Finland, France, Germany, Italy, Luxembourg, Portugal, and Spain) immediately launched solutions, extending the scope and duration of interventions. Some of the countries that temporarily introduced job retention programs during the global finance crisis reintroduced these programs (i.e., Slovakia and Slovenia) while relaxing the eligibility criteria and extending the duration. Other countries introduced new schemes (e.g., Ireland) or more than one job retention scheme (i.e., Bulgaria, Czechia and Hungary). In turn, all countries that did not have

exemplary solutions for protecting jobs before (i.e., Croatia, Cyprus, Estonia, Greece, Latvia, Malta and Romania) introduced at least temporary measures for the duration of the pandemic.

The use of job retention schemes across the EU–27 helped prevent widespread job losses and stabilize household incomes. However, other studies also indicate that, overall, European labor markets were surprisingly resilient: employment fell slightly in the face of the pandemic recession, which was of an unprecedented magnitude (Gros and Ounnas 2021). That tendency also applies to changes in unemployment and inactivity. According to D'Amuri et al. (2022), the unemployment rate changed very little in the euro area from what would have happened if there had not been a decline in labor activity. Using the example of Italy, they indicate that in order to understand what happened during the pandemic, it is crucial to use models that consider not only flows into and out of employment but also into and out of the labor force. An interesting approach was used by Forsythe et al. (2020), who provided a taxonomy of the non-employed that makes it possible to divide non-employed individuals into three groups and distinguish people actively seeking new employment. They recognized that in relation to the pandemic, the unemployment of jobseekers should be measured in a way that takes into account the atypical composition of the unemployed population (e.g., due to the rising importance of temporary layoffs and recalls).

Hensvik, Le Barbanchon, and Rathelot (2021) described the Swedish context, where the anti-pandemic policy can be defined as a system of recommendations based on the voluntary compliance of citizens. They showed a correlation between the decreasing intensity of job searches by users of Sweden's largest online job board and the decrease in the number of job vacancies at the beginning of the pandemic. Expanding the topic of labor market flows to the Dutch market, Balgová et al. (2022) showed different job search behaviors depended on individuals' expectations regarding the duration and severity of the impact of the pandemic on the labor market. They also demonstrated that workers affected by changes in the number of hours worked and those in the hardest-hit sectors look for jobs differently than in a "normal" recession. In addition, they indicated differences (e.g., due to increased childcare burdens due to school closures) in job searches during the recession caused by COVID–19 compared to "normal" recessions and to normal times. In conclusion, they pointed out the risk of amplifying detachment from the labor market during the pandemic due to the atypically low search effort of the unemployed during the COVID–19 recession.

Baert (2021) demonstrated that unemployment-to-population and inactivity-to-population ratios in most European countries did not receive a huge blow from COVID–19 in 2020. He also observed important differences between countries: inactivity rose more sharply in Southern Europe, while unemployment increased dynamically in the Baltic States. Fana, Torrejón Pérez, and Fernández-Macías (2020) demonstrated that the employment

impact is asymmetric within and between countries. For example, southern countries (such as Spain or Italy), due to their productive specialization and labor market institutions, were most affected by pandemic restrictions. Their labor markets could also be described as more vulnerable even before the crisis.

A slight increase in the EU unemployment rate translates into a much smaller decrease in employment overall. The dynamics of unemployment rates appear to be driven mostly by the economic shock affecting supply and demand in the EU (Smith 2020). The widespread use of short-term work provisions isolated the European labor market from large swings in output (Gros and Ounnas 2021). Merkl and Weber (2020) drew attention to the shortening of working time in order to save existing jobs as part of the policies to counteract the pandemic crisis. However, they were not enough to prevent a decline in the labor market.

Conclusion

The value added of the study is the identification of changes in the labor market slack of the EU–27 during the COVID–19 pandemic. The results of the analysis show that during the analyzed period, the labor market slack in the majority of countries did not change. Some improved their situation (like Ireland, France, and Cyprus). In Ireland, the large-scale implementation of working from home allowed inactivity and unemployment to decrease (Stefaniec et al. 2022). In France, the measures were quite effective at dampening the impact of the lockdown on employment and the income of households and firms (Cahuc 2022). Cyprus noticed significant GDP growth in 2021, which positively influenced the labor market situation (Eures 2022). The country where the labor market slack deteriorated was Italy, which may be because of strict lockdown policy influenced the decrease in economic activity (Fiaschi and Tealdi 2022). Thus, the first research hypothesis was partially confirmed.

Comparing the changes in the labor markets leads to the creation of four homogeneous clusters of countries in all the analyzed periods. The second research hypothesis that the COVID–19 crisis reduced labor market slack differences between the EU countries cannot be confirmed. CEE countries experienced the relatively best labor market slack situation between 2019 and 2021, while Greece, Spain, and Italy experienced the worst. The CEE countries, unlike the southern countries, had very low unemployment rates (Szustak, Gradoń, and Szewczyk 2021). Additionally, they recorded relatively high economic growth, which positively influenced the labor market. By contrast, the southern countries were still suffering from the consequences of the financial crisis.

The reason for a relatively stable situation of labor market slack in EU countries during the pandemic can be the effectiveness of measures for mitigating the negative

impact of the COVID–19 outbreak on the labor market. The International Labour Organization (2020) claims that labor market policies and programs have been critically important in helping workers and employers deal with redundancies, furloughs, or reduced work schedules as a result of the pandemic. The main tool to mitigate the negative impact of COVID–19 on the labor market was temporary workforce reduction programs (involving either a temporary reduction in working hours or a temporary suspension of contracts), a scheme used throughout Europe. At the end of April 2020, it is estimated that such reductions were requested for 27% of EU workers (Duarte 2020). This was key in preventing the collapse in GDP from triggering a sharp rise in unemployment.

The slight decrease in employment may have been caused by fiscal incentives implemented during the pandemic. It was an instrument that included a series of changes to income taxes (Gajewski et al. 2021). Granting them to business owners was conditional on maintaining the same level of employment as before the pandemic. In order to cushion the drops in labor incomes related to changes in employment, governments introduced a new set of policy instruments, which complemented the existing tax-benefit system. The largest and probably the most influential instrument for preserving formal employment in affected businesses was the short-time working scheme (Sologon et al. 2022).

During the COVID–19 crisis, the tax-benefit system acted as an important stabilizer, reducing losses in disposable household income and restraining an increase in inequality generated by the loss of labor market incomes. This impact was largely driven by the short-term working schemes implemented in many countries, such as Germany, Luxembourg, and Poland (Bruckmeier et al. 2021).

The limitations of this study result from the focus on examining the dynamics of changes in labor market slack without elaborating on the demographic structure of that measure (such as sex or age). Additionally, some traditional indicators do not adequately capture the pandemic context. Firstly, the lockdown made it difficult to obtain statistical data, and secondly, restrictions on activity prevented unemployed people from seeking work or being immediately available to work; hence, they were not formally considered unemployed. Moreover, some authors claim that analyzing the effects of Non-Pharmaceutical Interventions (NPIs) on additional labor market statistics during the pandemic would provide valuable insights into their full impact on labor outcomes (Gros and Ounnas 2021).

Future research will focus on analyzing employment changes, including a sectoral analysis, which will enhance knowledge of the labor market situation during the COVID–19 crisis. Moreover, incorporating the demographic structure would enrich the analysis of labor market slack.

References

Adams-Prassl, A., Boneva, T., Golin, M., Rauh, C. (2020), *Inequality in the impact of the coronavirus shock: Evidence from real time surveys*, "Journal of Public Economics", 189, 104245, https://doi.org/10.1016/j.jpubeco.2020.104245

Ando, S., Balakrishnan, R., Gruss, B., Hallaert, J.-J., Jirasavetakul, L.-B.F., Kirabaeva, K., Nir Klein, N., Lariau, A., Liu L.Q., Malacrino, D., Qu, H., Solovyeva, A. (2022), *European Labor Markets and the COVID–19 Pandemic: Fallout and the Path Ahead*, European Department, International Monetary Fund, Washington, https://doi.org/10.5089/9798400200960.087

Baert, S. (2021), *What shifts did COVID–19 year 2020 bring to the labour market in Europe?*, "Applied Economics Letters", 29 (15), pp. 1447–1454, https://doi.org/10.1080/13504851.2021.1959893

Balgová, M., Trenkle, S., Zimpelmann, C., Pestel, N. (2022), *Job search during a pandemic recession: Survey evidence from the Netherlands*, "Labour Economics", 75, pp. 1–21, https://doi.org/10.1016/j.labeco.2022.102142

Bell, D.N.F., Blanchflower, D.G. (2018), *The lack of wage growth and the failing NAIRU*, "National Institute Economic Review", 245, pp. R40–R55, https://doi.org/10.1177/002795011824500114

Berger, T., Vierke, H. (2017), *Estimating the natural rate of hours*, "Macroeconomic Dynamics", 21 (6), pp. 1426–1453, https://doi.org/10.1017/S1365100515000917

Blanchflower, D.G., Levin, A.T. (2015), *Labor market slack and monetary policy*, "NBER Working Paper Series", 21094, pp. 1–24, https://doi.org/10.3386/w21094

Bonam, D., Haan, J. de, Limbergen, D. van (2021), *Time-varying wage Phillips curves in the euro area with a new measure for labor market slack*, "Economic Modelling", 96, pp. 157–171, https://doi.org/10.1016/j.econmod.2020.12.027

Brioscú, A., O'Reilly, J., Coates, D. (2021), *The COVID–19 pandemic and Ireland's labour market: insights through the lens of the pandemic unemployment payment and the characteristics of impacted workers*, "The Economic and Social Review", 52 (2), pp. 193–216.

Bruckmeier, K., Peichl, A., Popp, M., Wiemers, J., Wollmershauser, T. (2021), *Distributional effects of macroeconomic shocks in real-time*, "Journal of Economic Inequality", 19, pp. 459–487, https://doi.org/10.1007/s10888-021-09489-4

Byrne, D., Zeikaite, Z. (2020), *Non-linearity in the wage Phillips curve: Euro area analysis*, "Economics Letters", 186, 108521, https://doi.org/10.1016/j.econlet.2019.07.006

Cahuc, P. (2022), *IZA COVID–19 Crisis Response Monitoring: France, (February 2022)*, IZA – Institute of Labor Economics, Bonn, https://www.iza.org/wc/files/downloads/iza__crisismonitor_countryreport_fr_202202.pdf (accessed: 8.01.2024).

Coibion, O., Gorodnichenko, Y., Weber, M. (2020), *Labor markets during the Covid–19 crisis: a preliminary view*, "NBER Working Paper Series", 27017, pp. 1–13, https://doi.org/10.3386/w27017

Corti, F., Ounnas, A., Ruiz De La Ossa, T. (2023), *Job retention schemes between the Great Recession and the COVID–19 crises Does the institutional design affect the take up? An EU–27 cross-country comparison*, CEPS In-Depth Analysis, Brussels.

D'Amuri, F., Philippis, M., Guglielminetti, E., Lo Bello, S. (2022), *Slack and prices during Covid–19: Accounting for labor market participation*, "Labour Economics", 75, 102129, https://doi.org/10.1016/j.labeco.2022.102129

Dagsvik, J.K., Kornstad, T., Skjerpen, T. (2013), *Labor force participation and the discouraged worker effect*, "Empirical Economics", 45 (1), pp. 401–433, https://doi.org/10.1007/s00181-012-0598-9

Dmytrów, K., Bieszk-Stolorz, B. (2021), *Comparison of changes in the labour markets of post-communist countries with other EU member states*, "Equilibrium. Quarterly Journal of Economics and Economic Policy", 16 (4), pp. 741–764, https://doi.org/10.24136/eq.2021.027

Donayre, L., Panovska, I. (2018), *U.S. wage growth and nonlinearities: The roles of inflation and unemployment*, "Economic Modelling", 68, pp. 273–292, https://doi.org/10.1016/j.econmod.2017.07.019

Duarte V. (2020), *The Portuguese labour market in times of the pandemic*, Caixa Bank Research, https://www.caixabankresearch.com/en/economics-markets/labour-market-demographics/portuguese-labour-market-times-pandemic (accessed: 8.01.2024).

Ebbinghaus, B., Lehner, L. (2022), *Cui bono – business or labour? Job retention policies during the COVID–19 pandemic in Europe*, "Transfer: European Review of Labour and Research", 28 (1), pp. 47–64, https://doi.org/10.1177/10242589221079151

Ellul, R. (2019), *Labour Market Slack*, "Central Bank of Malta, Quarterly Review", 1, pp. 37–41.

Ens, E., Savoie-Chabot, L., See, K., Wee, S.L. (2021), *Assessing labour market slack for monetary policy*, "Bank of Canada Staff Discussion Paper", 2021–15.

Eures (2022), *Labour market information: Cyprus*, https://eures.ec.europa.eu/living-and-working/labour-market-information/labour-market-information-cyprus_en (accessed: 8.01.2024).

Eurostat (2021), *Unemployment rate (%) – monthly data*, https://ec.europa.eu/eurostat/databrowser/view/ei_lmhr_m/default/table?lang=en (accessed: 10.01.2024).

Faberman, R.J., Mueller, A.I., Şahin, A., Topa, G. (2020), *The Shadow Margins of Labor Market Slack*, "Journal of Money, Credit and Banking", 52(S2), pp. 355-391, https://doi.org/10.1111/jmcb.12756

Fana, M., Torrejón Pérez, S., Fernández-Macías, E. (2020), *Employment impact of Covid–19 crisis: from short term effects to long terms prospects*, "Journal of Industrial and Business Economics", 47, pp. 391–410, https://doi.org/10.1007/s40812-020-00168-5

Fana, M., Tolan, S., Torrejón Pérez, S., Urzi Brancati, M.C., Fernández-Macías, E. (2020), *The COVID confinement measures and EU labour markets*, Publications Office of the European Union, Luxembourg.

Fiaschi, D., Tealdi, C. (2022), *Young people between education and the labour market during the COVID–19 pandemic in Italy*, "International Journal of Manpower", 43, pp. 1719–1757, https://doi.org/10.1108/IJM-06-2021-0352

Fontaine, I. (2016), *French Unemployment Dynamics: A "Three-State" Approach*, "Revue d'économie politique", 126 (5), pp. 835–869, https://doi.org/10.3917/redp.265.0835

Forsythe, E., Kahn, L.B., Lange, F., Wiczer, D.G. (2020), *Searching, recalls, and tightness: an interim report on the COVID labor market*, "NBER Working Papers", 28083, pp. 1–52, https://doi.org/10.3386/w28083

Fuente, A. de la (2011), *Population and social conditions*, "Statistics in Focus, Eurostat", 57, pp. 1–8.

Gajewski, D., Karwat, P., Olczyk, A., Werner, A., Wierzbicki, J. (2021), *Reakcja polskiej polityki podatkowej na kryzys związany z pandemią na tle państw Grupy Wyszehradzkiej*, [in:] A. Chłoń-Domińczak, R. Sobiecki, M. Strojny, B. Majewski (eds.), *Raport SGH I Forum Ekonomicznego*, Szkoła Główna Handlowa w Warszawie, Warszawa, pp. 20–21.

Galasso, V., Foucault, M. (2020), *Working during COVID–19: Cross-country evidence from real-time survey data*, "OECD Social, Employment and Migration Working Papers", 246, OECD Publishing, Paris, https://doi.org/10.1787/34a2c306-en

Gallant, J., Kroft, K., Lange, F., Notowidigdo, M. (2020), *Temporary unemployment and labor market dynamics during the COVID–19 recession*, "NBER Working Paper Series", 27924, pp. 1–45, https://doi.org/10.3386/w27924

Gros, D., Ounnas, A. (2021), *Labour market responses to the Covid–19 crisis in the United States and Europe*, "CEPS Working Document", 2021–01.

Hartigan, J.A. (1975), *Clustering algorithms*, Wiley, New York.

Hensvik, L., Le Barbanchon, T., Rathelot, R. (2021), *Job search during the COVID–19 crisis*, "Journal of Public Economics", 194, pp. 1–10, https://doi.org/10.1016/j.jpubeco.2020.104349

Hurley, J., Patrini, V. (2017), *Estimating labour market slack in the European Union*, Eurofound, Publications Office of the European Union, Luxembourg.

International Labour Organisation (2020), *COVID–19: Public employment services and labour market policy responses*, Policy Brief, https://www.ilo.org/publications/covid-19-public-employment-services-and-labour-market-policy-responses (accessed: 10.01.2024).

Komlos, J. (2019), *Trends and Cycles in U.S. Labor-Market Slack, 1994–2019*, "Applied Economics Quarterly", 65 (3), pp. 209–235, https://doi.org/10.3790/aeq.65.3.209

Lam, W.R., Solovyeva, A. (2023), *How Effective were Job-Retention Schemes during the COVID–19 Pandemic? A Microsimulation Approach for European Countries*, "IMF Working Paper", WP/23/3, International Monetary Fund, Washington, https://doi.org/10.5089/9798400229985.001

Lee, S., Schmidt-Klau, D., Verick, S. (2020), *The Labour Market Impacts of the COVID–19: A Global Perspective*, "The Indian Journal of Labour Economics", 63 (1), pp. 11–15, https://doi.org/10.1007/s41027-020-00249-y

Li, Z., Farmanesh, P., Kirikkaleli, D., Itani, R. (2022), *A comparative analysis of COVID–19 and global financial crises: evidence from US economy*, "Economic Research – Ekonomska Istraživanja", 35 (1), pp. 2427–2441, https://doi.org/10.1080/1331677X.2021.1952640

MacKay, R., Davies, L. (2008), *Unemployment, Permanent Sickness, and Nonwork in the United Kingdom*, "Environment and Planning A", 40 (2), pp. 464–481, https://doi.org/10.1068/a39155

MacQueen, J.B. (1967), *Some methods for classification and analysis of multivariate observations. Proceedings of 5-th Berkeley symposium on mathematical statistics and probability*, University of California Press, Berkeley.

Martins, F., Seward, D. (2020), *The measurement of labour market slack: an empirical analysis for Portugal*, "Economic Bulletin and Financial Stability Report Articles and Banco de Portugal Economic Studies", April, pp. 53–74.

Merkl, C., Weber, E. (2020), *Rescuing the labour market in times of COVID–19: Don't forget new hires!*, https://cepr.org/voxeu/columns/rescuing-labour-market-times-covid-19-dont-forget-new-hires (accessed: 10.01.2024).

Müller, T., Schulten, T., Drahokoupil, J. (2022), *Job retention schemes in Europe during the COVID–19 pandemic – different shapes and sizes and the role of collective bargaining*, "Transfer: European Review of Labour and Research", 28, pp. 247–265, https://doi.org/10.1177/10242589221089808

Palomino, J.C., Rodríguez, J.G., Sebastián, R. (2020), *Wage Inequality and Poverty Effects of Lockdown and Social Distancing in Europe*, "INET Oxford Working Paper", 2020–13, https://doi.org/10.2139/ssrn.3615615

Pannenberg, M., Schwarze, J. (1998), *Labor market slack and the wage curve*, "Economics Letters", 58 (3), pp. 351–354, https://doi.org/10.1016/S0165-1765(98)00008-1

Pouliakas, K., Branka, J. (2020), *EU jobs at highest risk of COVID–19 social distancing: is the pandemic exacerbating the labour market divide?*, "Cedefop – Working Paper Series", Publications Office of the European Union, Luxembourg, https://doi.org/10.2801/968483

Rollnik-Sadowska, E., Dąbrowska, E. (2018), *Cluster analysis of effectiveness of labour market policy in the European Union*, "Oeconomia Copernicana", 9 (1), pp. 143–158, https://doi.org/10.24136/oc.2018.008

Smith, C. (2020), *Understanding Supply and Demand Shocks amid Coronavirus*, Federal Reserve Bank of St Louis, https://www.stlouisfed.org/open-vault/2020/march/supply-demand-shocks-coronavirus (accessed: 10.01.2024).

Sologon, D.M., O'Donoghue, C., Kyzyma, I., Li, J., Linden, J., Wagener, R. (2022), *The COVID–19 resilience of a continental welfare regime – nowcasting the distributional impact of the crisis*, "The Journal of Economic Inequality", 20, pp. 777–809, https://doi.org/10.1007/s10888-021-09524-4

Statistics Poland (2020), *Labour force survey in Poland II quarter 2020*, Warsaw, https://stat.gov.pl/en/topics/labour-market/working-unemployed-economically-inactive-by-lfs/labour-force-survey-in-poland-ii-quarter-2020,2,38.html (accessed: 10.01.2024).

Stefaniec, A., Brazil, W., Whitney, W., Caulfield, B. (2022), *Desire to work from home: Results of an Irish study*, "Journal of Transport Geography", 104, 103416, https://doi.org/10.1016/j.jtrangeo.2022.103416

Szörfi, B., Tóth, M. (2018), *Measures of slack in the euro area*, "Economic Bulletin Boxes, European Central Bank", 3, https://www.ecb.europa.eu/pub/pdf/other/ecb.ebbox201803_03.en.pdf (accessed: 10.01.2024).

Szustak, G., Gradoń, W., Szewczyk, Ł. (2021), *Household Financial Situation during the COVID–19 Pandemic with Particular Emphasis on Savings – An Evidence from Poland Compared to Other CEE States*, "Risks", 9 (9), 166, https://doi.org/10.3390/risks9090166

Tryon, R.C. (1939), *Cluster Analysis*, Edwards Brothers, Ann Abor.

Verick, S., Schmidt-Klau, D., Lee, S. (2022), *Is this time really different? How the impact of the COVID–19 crisis on labour markets contrasts with that of the global financial crisis of 2008–09*, "International Labour Review", 161 (1), pp. 125–148, https://doi.org/10.1111/ilr.12230

Ward, J.H. (1963), *Hierarchical Grouping to Optimize an Objective Function*, "Journal of the American Statistical Association", 58 (301), pp. 236–244, https://doi.org/10.1080/01621459.1963.10500845

Zinecker, M., Doubravsky, K., Balcerzak, A.P., Pietrzak, M.B., Dohnal, M. (2021), *The Covid–19 disease and policy response to mitigate the economic impact in the EU*, "Technological and Economic Development of Economy", 27 (3), pp. 742–762, https://doi.org/10.3846/tede.2021.14585

Niewykorzystany potencjał na rynku pracy UE w czasie kryzysu COVID–19

Celem ogólnym artykułu jest weryfikacja poziomu niewykorzystanego potencjału na rynku pracy w trzech momentach uznanych za kluczowe podczas analizy zmian spowodowanych przez pandemię. Głównym celem jest zidentyfikowanie podobieństw i różnic między krajami UE, które zostały przypisane do klastrów wyodrębnionych w procesie badawczym.

W badaniu zastosowano analizę skupień w celu klasyfikacji państw członkowskich UE do grup podobnych krajów według zmiennych niewykorzystanego potencjału na rynku pracy, obserwowanych przed pandemią (2019) oraz w jej trakcie (2020, 2021). Wybrano podejście dwuetapowe. Na pierwszym etapie zastosowano analizę hierarchiczną do określenia początkowej liczby grup, natomiast na drugim etapie dokonano właściwej klasyfikacji obiektów przy użyciu metody k-średnich.

Porównanie zmian zachodzących na rynkach pracy analizowanych krajów pozwala na wyodrębnienie czterech jednorodnych klastrów we wszystkich badanych okresach. Wyniki badania pokazują także, że w analizowanym okresie sytuacja większości krajów UE w odniesieniu do niewykorzystanego potencjału na rynku pracy się nie zmieniła. Niektóre z nich poprawiły swoją sytuację (jak Irlandia, Francja czy Cypr). Powodem takiej sytuacji może być skuteczność środków wspierających rynki pracy, które zostały wdrożone w krajach UE podczas pandemii. Krajem, w którym sytuacja w kontekście niewykorzystanego potencjału na rynku pracy pogorszyła się, są Włochy. W perspektywie dalszych badań zasadne byłoby dokonanie dokładnej analizy skuteczności polityk i programów rynku pracy stosowanych w krajach zidentyfikowanych klastrów, ponieważ przyczyniły się one do względnie stabilnej sytuacji niewykorzystanego potencjału na rynku pracy. Przyszłe badania powinny być również skierowane na analizę zmian po stronie zatrudnienia, w tym analizę sektorową, co rozszerzyłoby wiedzę na temat sytuacji na rynku pracy w czasie kryzysu COVID–19. Co więcej, aby pogłębić analizę niewykorzystanego potencjału na rynku pracy, można włączyć perspektywę struktury demograficznej populacji.

Analizy rynku pracy oparte wyłącznie na stopie bezrobocia są niewystarczające, co jest szczególnie widoczne w obliczu konsekwencji spowodowanych przez pandemię COVID–19, ponieważ ta miara nie uwzględnia „efektu zniechęconego pracownika". Dla UE istnieje luka badawcza w tym zakresie, co można wywnioskować ze statystyk niewykorzystanego potencjału na rynku pracy. Artykuł ten wypełnił więc wskazaną lukę.

Słowa kluczowe: niewykorzystany potencjał na rynku pracy, bezrobocie, COVID–19, polityka antykryzysowa, analiza skupień