

Procjena utjecaja kriznih situacija na tržište rada EU-27 u razdoblju 2018.-2024.

Assessing the impact of crisis situations on the EU-27 labour market in 2018-2024

Beata Bieszk-Stolorz¹, Krzysztof Dmytrów²

¹University of Szczecin, ul. Mickiewicza 64, 71-101 Szczecin, Poland, beata.bieszk-stolorz@usz.edu.pl,
ORCID: <https://orcid.org/0000-0001-8086-9037>

²University of Szczecin, ul. Mickiewicza 64, 71-101 Szczecin, Poland, krzysztof.dmytrow@usz.edu.pl,
ORCID: <https://orcid.org/0000-0001-7657-6063>

Abstract

The labour market is an important element of every country's economy. European Union countries vary in terms of their level of economic development. On the other hand, they are linked by their participation in the common market. European Union policy aims to reduce these differences so that the entire community becomes a relatively homogeneous, strong market that is competitive on the global market. The aim of the study is to assess the impact of crisis situations on the EU-27 labour market in the years 2018-2024. The research period covers two major crises: the COVID-19 pandemic and the war in Ukraine. We assessed the similarity of the situation in the labour markets of the EU-27 countries and their changes using selected indicators in the period before and during the COVID-19 pandemic and after the pandemic, which coincided with the outbreak of war in Ukraine. We used Eurostat quarterly data presenting basic labour market indicators: unemployment, employment and activity rates. We analysed all indicators for the entire population, young people and people aged 55+. The study was conducted in two stages. The first stage consisted of assessing the situation on the labour market using the Hellwig method. In the second stage, we examined the similarity of changes in the labour markets of the EU-27 countries using the Dynamic Time Warping method. We obtained homogeneous clusters of countries based on the similarity of time series using hierarchical clustering. We conducted the analysis in three periods: 2018-2019 (pre-pandemic period), 2020-2021 (pandemic period) and 2022-2024 (post-pandemic period and war in Ukraine). The composition of the clusters varied across all periods. This demonstrates the impact of crisis periods on the labour market situation in the EU-27.

Keywords

cluster analysis, COVID-19 pandemic, Dynamic Time Warping, EU-27 labour market, Hellwig method

Introduction

Occasionally, global economies experience shocks related to the emergence of various crisis situations. Some of these situations are local in nature. However, their impact on the global economy is significant. This is mainly due to the fact that we live in a highly globalised world. An example of a global event was the outbreak of the COVID-19 pandemic. In this case, the challenges were much greater than during previous events. Another example is the war in Ukraine, which is local in nature. However, it affects the economies of many countries. Both of these events have resulted in significant changes in the economic landscape at both the national and international levels. Political actions related to crises change both economic behaviour and the labour market.

The pandemic had significant potential to slow down economic growth and, in many cases, even lead to recession. Lockdowns and fear of the effects of the disease affected the entire society and exacerbated the negative economic effects (Onvista, 2020). One of the important challenges facing decision-makers was to manage the economy effectively in order to minimise the negative impact of any restrictions (Anjorin, 2020; Feinstein et al., 2020). Unconventional political decisions introduced by the governments of individual countries could be more dangerous than the pandemic itself (Zhang et al., 2020). Western societies, including European ones, proved to be more vulnerable to the new pandemic than Eastern ones (Trompenaars and Hampden-Turner, 2021). Industrial production stoppages and restrictions hindering economic activity had a particular impact on the labour market. The outbreak of the Russian-Ukrainian war has had a twofold impact on the global labour market. On the one hand, the war has become a significant factor prompting millions of Ukrainian citizens to migrate in search of safety (Rybachak et al., 2024). It is estimated that at the beginning of 2022, approximately 3.2 million Ukrainian refugees, or more than half of the total number of refugees, fled to Poland (Oxford Economics, 2022). Some of them are expected to become permanent residents of the country, which will increase the labour supply, employment and potential output of the economy. This has had a negative impact on the Ukrainian labour market and a positive impact on the European labour market. On the other hand, the war and restrictions on Russia have caused an increase in energy prices, which has had a negative impact on the economies of many countries around the world, particularly in Europe.

The aim of the study is to assess the impact of crisis situations on the EU labour market in the period 2018-2024. The research period covers two major crises: the COVID-19 pandemic and the war in Ukraine. We assessed the similarity of the situation in the labour markets of EU countries and their changes using selected indicators in the period before and during the COVID-19 pandemic and after the pandemic, which coincided with the outbreak of war in Ukraine. The assessment of the situation was conducted using the Hellwig method, and the similarity of changes was examined using the Dynamic Time Warping method. Homogeneous clusters of countries based on the similarity of time series were obtained using hierarchical clustering.

We have formulated the following research hypothesis:

H: Periods of crisis affect individual EU-27 countries differently.

1. Literature review

Analyses of the impact of COVID-19 on the economic and financial situation have included research on the impact of COVID-19 on the labour market. The crisis caused by the pandemic has highlighted existing differences in the labour market in the EU-28. In times of crisis, the labour market is one of the first to experience serious turmoil. Employability is one of the parameters that has undergone significant changes in connection with the current global health crisis. The first to lose their jobs were people employed in flexible forms of employment (Schoon and Bynner, 2017; Mikołajczak, 2021), as well as young people (Gavriluta et al., 2022), women (Lee et al., 2020), small traders, the self-employed, migrant workers and daily wage labourers (Mamgain, 2021). Botha et al. (2021) demonstrated the significant negative relationship between labour market shocks triggered by the COVID-19 crisis and financial wellbeing. They show that these labour market shocks are disproportionately felt by people at the lower end of the financial wellbeing distribution.

Svabova et al. (2021) demonstrated that restrictions on the economic activity of companies operating in Slovakia led to a decline in consumer demand. This forced employers to reduce costs through layoffs. As a result, unemployment increased.

The introduction of teleworking and the instability of traditional jobs in the new digitalised context have brought about changes in the labour market in the EU-

28 (Dunphy et al., 2000; Hodder, 2020; Fana et al., 2020; Webb and McQuaid, 2020).

Research by Rybchak et al. (2024) indicates that Ukrainian migrants constitute approximately 1% of the population in European Union countries and represent 15% of Ukraine's overall demographic structure. As many as 81.2% of them are of working age, between 18 and 49 years old. This demographic structure has a positive impact on the economy of the European Union and, at the same time, has negative repercussions for the domestic labour market in Ukraine.

Estimated number of refugees from Ukraine recorded in Europe and worldwide since February 2022 as of May 31, 2025 was equal 5.6 million, of which approximately 91 percent, resided in Europe (Statista, 2025a). Over 1.2 million refugees from Ukraine due to the Russian invasion fled to Germany as of April 2025. Furthermore, the second-highest number was recorded in Poland (about 1 million) (Statista, 2025b).

2. Research data and methods

In order to verify research hypothesis H, the study was conducted in two stages. In the first stage, rankings of the EU-27 countries were constructed according to the situation on their labour markets. In the second stage, the EU-27 countries were hierarchically clustered by similarity of the situation on their labour markets.

2.1. Data used in the research

In the study, we used data from the EUROSTAT database, presenting basic labour market indicators – unemployment rate, employment rate and economic activity rate. We used the total unemployment rate and the unemployment rate for young people (aged 15–24). The employment and activity rates were for the whole population, young people, and people aged 55–64. This was quarterly data covering the years before the COVID-19 pandemic (2018-2019), the COVID-19 pandemic period (2020-2021) and the post-pandemic period, which coincided with full-scale war in Ukraine (2022-2024).

2.2. Research methodology

In the first stage of the study, we used the dynamic version of the Hellwig method (Hellwig, 1981) to rank the EU-27 countries in terms of their labour market situations. This method allows for both comparisons between countries and assessments of labour market dynamics.

The Hellwig method is one of the linear ordering methods used in multivariate statistical analysis. Linear ordering methods enable the ordering of objects (in our case, the EU-27 countries) described by means of multiple variables by determining a certain composite measure. The Hellwig method is based on determining the Euclidean distances of each object (EU-27 country) from the pattern, i.e. from the best values of all variables characterising the labour market among the values occurring in each country and in each period under study.

We used the Hellwig composite measure values obtained in the first stage of the study in the second stage to compare the situation and changes in the labour markets of the analysed countries. For this purpose, we used the DTW (Dynamic Time Warping) method to examine the similarity of time series. The DTW method was proposed by Bellman and Kalaba (1959) for speech recognition. Currently, the DTW method is increasingly used in the study of time series describing economic and social phenomena (Dmytrów and Bieszk-Stolorz, 2019; Landmesser, 2021; Denkowska and Wanat, 2021). Changes in the labour markets of the EU-27 countries were compared in the three periods indicated above.

We applied the obtained DTW distances between EU-27 countries in hierarchical clustering using Ward's method (Ward, 1963) to cluster EU-27 countries in terms of the situation and changes in their labour markets. We set the optimal number of clusters on the basis of the Silhouette index (Rousseeuw, 1987). Clustering methods are used in many studies related to the analysis of economic and social phenomena, including the labour market (Syed Zwick and Syed, 2017; Bieszk-Stolorz and Dmytrów, 2020; Bieszk-Stolorz and Dmytrów, 2022). It is worth noticing that the biggest limitation of cluster analysis is that there is no universal accepted best method of clustering (Walesiak and Gatnar, 2011).

3. Results

In the first stage of the research, we obtained rankings of the EU-27 countries in terms of the situation on their labour markets. Table 1 shows the rankings in the pre-pandemic period. In 2018-2019, the best labour market situation was in the Netherlands, Denmark, Germany, Austria and Malta. The worst labour market situation in this period was in Greece, Spain, Italy, Romania and Croatia.

Table 2 presents the rankings during the pandemic period. In 2020-2021, the position of the countries with the best labour market situation remained

unchanged. These were still the Netherlands, Denmark, Germany, Austria and Malta. The membership of the countries with the worst situation changed slightly. Compared to the previous period, Croatia disappeared from this group, while Bulgaria appeared. The remaining countries, namely Greece, Spain, Italy, and Romania, continued to form its core.

TABLE 1. RANKINGS IN THE PRE-PANDEMIC PERIOD

Countries	Rankings							
	2018Q1	2018Q2	2018Q3	2018Q4	2019Q1	2019Q2	2019Q3	2019Q4
BEL	20	21	20	19	20	17	18	17
BGR	22	22	22	22	23	23	22	21
CZE	13	13	12	11	12	11	13	13
DNK	2	2	2	2	2	2	2	2
DEU	3	3	3	3	3	3	3	3
EST	7	6	8	6	8	9	6	6
IRL	8	9	7	9	7	7	7	7
GRC	27	27	27	27	27	27	27	27
ESP	26	26	26	26	26	26	26	26
FRA	19	19	21	21	21	22	21	22
HRV	23	23	23	23	22	21	23	23
ITA	25	25	25	25	25	25	25	25
CYP	21	16	15	18	16	13	15	14
LVA	11	11	11	14	11	16	12	10
LTU	12	10	10	10	10	10	10	11
LUX	17	20	18	16	18	18	20	20
HUN	14	14	13	12	14	15	14	15
MLT	4	5	5	5	5	5	4	4
NLD	1	1	1	1	1	1	1	1
AUT	5	4	4	4	4	4	5	5
POL	15	15	16	15	15	14	11	12
PRT	18	18	19	20	17	20	17	18
ROU	24	24	24	24	24	24	24	24
SVN	10	12	14	13	13	12	16	16
SVK	16	17	17	17	19	19	19	19
FIN	9	8	9	8	6	8	9	8
SWE	6	7	6	7	9	6	8	9

Source: own elaboration on the basis of the EUROSTAT data.

TABLE 2. RANKINGS IN THE PANDEMIC PERIOD

Countries	Rankings							
	2020Q1	2020Q2	2020Q3	2020Q4	2021Q1	2021Q2	2021Q3	2021Q4
BEL	17	17	18	18	19	19	19	18
BGR	23	23	23	23	21	24	23	23
CZE	16	12	13	13	13	13	14	14
DNK	2	2	2	2	2	2	2	2
DEU	3	3	3	3	3	3	3	3
EST	7	8	8	9	7	9	8	9
IRL	6	9	9	7	8	7	6	4
GRC	27	27	27	27	27	27	27	27
ESP	26	26	26	26	26	26	26	26
FRA	19	16	15	16	16	17	18	16
HRV	21	21	22	19	23	22	20	19
ITA	25	25	25	25	25	25	25	25

CYP	14	11	11	11	11	10	9	11
LVA	10	10	12	12	17	14	17	17
LTU	13	15	17	14	10	16	12	8
LUX	22	22	20	21	15	12	15	20
HUN	12	13	10	10	12	11	13	15
MLT	5	4	4	5	4	4	4	6
NLD	1	1	1	1	1	1	1	1
AUT	4	5	5	4	5	5	5	5
POL	11	14	14	15	14	15	16	13
PRT	18	20	21	22	20	20	21	21
ROU	24	24	24	24	24	23	24	24
SVN	15	19	16	17	18	18	10	10
SVK	20	18	19	20	22	21	22	22
FIN	8	6	6	6	6	6	7	7
SWE	9	7	7	8	9	8	11	12

Source: own elaboration on the basis of the EUROSTAT data.

TABLE 3. RANKINGS IN THE POST-PANDEMIC PERIOD

Countries	Rankings											
	2022Q1	2022Q2	2022Q3	2022Q4	2023Q1	2023Q2	2023Q3	2023Q4	2024Q1	2024Q2	2024Q3	2024Q4
BEL	20	19	18	21	19	20	19	18	19	19	19	19
BGR	22	21	21	18	20	21	21	23	22	21	22	23
CZE	13	15	13	13	15	14	15	13	14	14	12	12
DNK	2	2	2	2	2	2	2	2	2	3	3	4
DEU	3	3	3	3	3	3	3	3	3	2	2	2
EST	8	9	9	8	8	9	13	11	10	12	14	9
IRL	5	4	6	6	5	5	6	5	5	4	5	6
GRC	27	27	27	27	26	27	27	27	27	27	26	27
ESP	26	26	26	26	27	26	26	26	26	26	27	26
FRA	17	17	15	16	16	17	17	15	15	16	16	17
HRV	18	22	23	22	23	23	22	20	18	18	20	21
ITA	25	25	25	25	24	25	25	24	25	24	24	24
CYP	11	12	14	12	10	10	9	8	8	7	7	7
LVA	16	13	17	17	13	13	12	16	12	17	13	16
LTU	10	10	11	11	17	12	11	17	17	15	17	13
LUX	19	18	19	19	21	18	18	22	20	23	23	18
HUN	15	16	12	14	12	16	14	14	16	11	15	14
MLT	6	6	4	4	6	6	4	4	4	5	4	3
NLD	1	1	1	1	1	1	1	1	1	1	1	1
AUT	4	5	5	5	4	4	5	6	6	6	6	5
POL	14	14	16	15	14	15	16	12	13	13	11	10
PRT	21	20	20	20	18	19	20	19	21	20	18	20
ROU	24	24	24	24	25	24	24	25	24	25	25	25
SVN	12	11	10	10	11	11	10	9	7	10	9	8
SVK	23	23	22	23	22	22	23	21	23	22	21	22
FIN	7	7	7	7	7	7	7	7	9	7	8	11
SWE	9	8	8	9	9	8	8	10	11	9	10	15

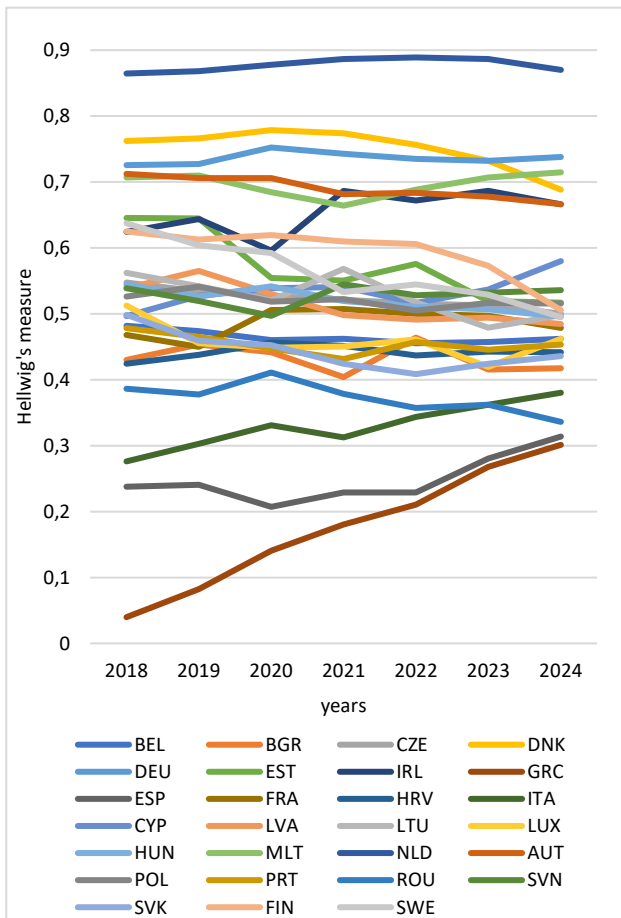
Source: own elaboration on the basis of the EUROSTAT data.

Table 3 presents the rankings in the post-pandemic period (and during the full-scale war in Ukraine). In 2022–2024, the Netherlands, Denmark and Germany remained at the top of the list in terms of the labour market situation. Ireland joined the group of top countries, alternating between fourth and sixth place with Austria and Malta. Greece, Spain and Italy remained at the bottom of the rankings, joined by

Slovakia, which shared the lowest positions with Croatia and Bulgaria.

If we take a closer look at the positions of countries in Tables 1-3, we can see several countries for which the positions changed quite significantly during the period under review. This group includes the Scandinavian countries. Denmark's position was high throughout the period (generally it occupied the second place), but at the end of the third sub-period (the post-pandemic period) it fell by two places. Sweden's position, which fluctuated around 6th-7th place in the pre-pandemic period, fell to 15th place at the end of 2024. Finland fell from 6th to 11th place. Of the remaining countries, Slovenia and Ireland are interesting cases, as their positions in the ranking fell quite sharply during the pandemic and rose sharply after 2021. On the other hand, Greece, Spain and Italy occupied the lowest positions in the rankings throughout the entire period, but the situation on their labour markets, as measured by a composite indicator, improved significantly (Figure 1).

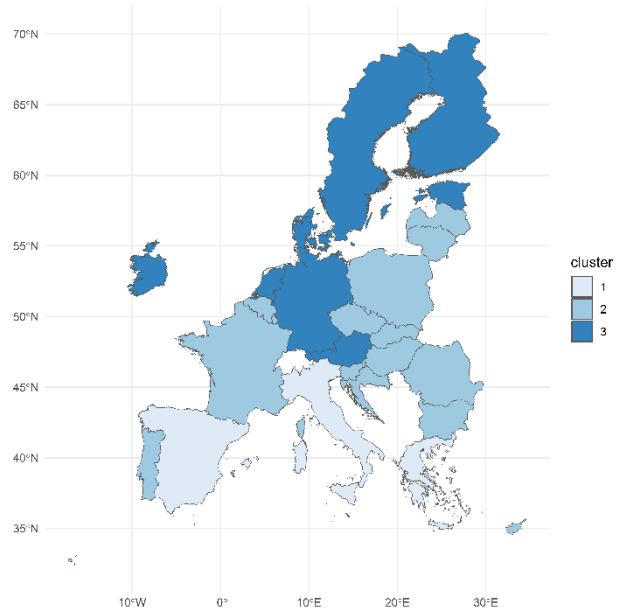
FIGURE 1. SITUATION OF THE EU-27 COUNTRIES ON THEIR LABOUR MARKETS



Source: own elaboration on the basis of the EUROSTAT data.

In the second stage of the study, the EU-27 countries were clustered according to the situation and changes in their labour markets in three sub-periods: pre-pandemic, pandemic and post-pandemic. In the pre-COVID-19 period (2018-2019), three homogeneous clusters of countries were identified. The cluster of best-performing countries with a similar direction of change (cluster 3) consisted of the Netherlands, Denmark, Germany, Austria, Sweden, Ireland, Finland, Malta and Estonia (Figure 2). On the other side there were the worst-performing countries with a similar direction of change (cluster 1): Greece, Spain and Italy. The remaining, most numerous group of countries was in the cluster 2.

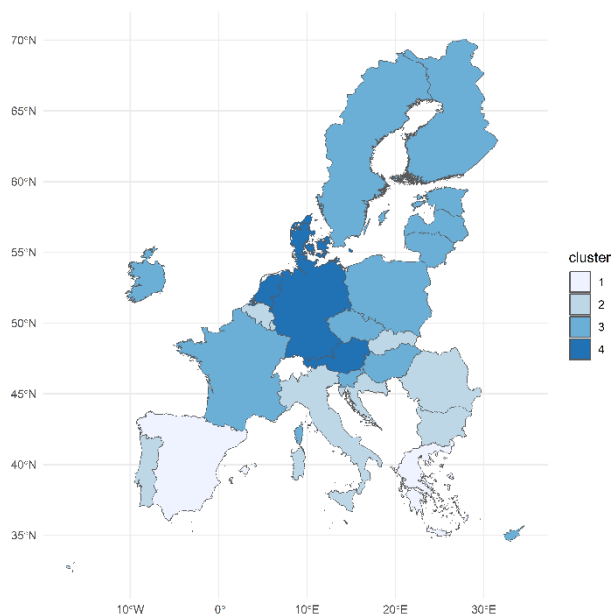
FIGURE 2. CLUSTERS OF THE EU-27 COUNTRIES WITH RESPECT TO SIMILARITY OF THE SITUATION ON THEIR LABOUR MARKETS IN THE PRE-PANDEMIC PERIOD



Source: own elaboration on the basis of the EUROSTAT data.

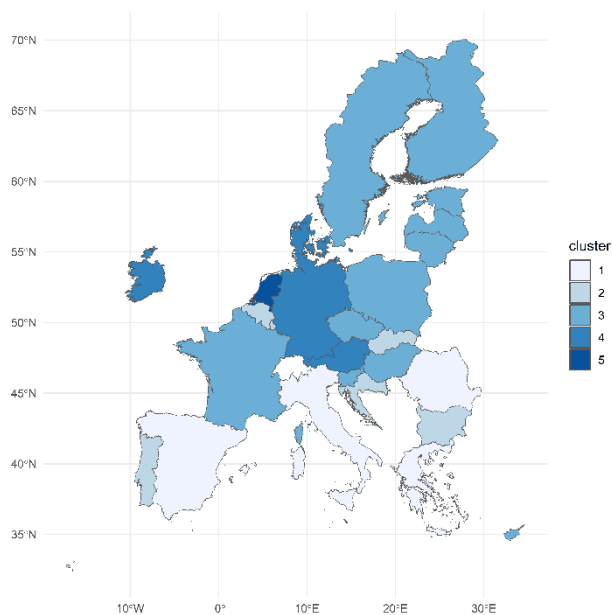
The situation was slightly different during the pandemic period (2020–2021). Four homogeneous clusters of countries with similar situation and direction of change in the labour market were identified (Figure 3). The best group of similar countries was formed by (cluster 4): the Netherlands, Denmark, Germany, Malta and Austria. The group of countries with the worst situation and a similar direction of change (cluster 1) consisted of Greece and Spain. The second group with the worst situation and a similar direction of change (cluster 2) consisted of Belgium, Bulgaria, Croatia, Italy, Luxembourg, Portugal, Romania and Slovakia. The remaining, most numerous group of countries formed cluster 3.

FIGURE 3. CLUSTERS OF THE EU-27 COUNTRIES WITH RESPECT TO SIMILARITY OF THE SITUATION ON THEIR LABOUR MARKETS IN THE PANDEMIC PERIOD



Source: own elaboration on the basis of the EUROSTAT data.

FIGURE 4. CLUSTERS OF THE EU-27 COUNTRIES WITH RESPECT TO SIMILARITY OF THE SITUATION ON THEIR LABOUR MARKETS IN THE POST-PANDEMIC PERIOD



Source: own elaboration on the basis of the EUROSTAT data.

In the post-pandemic period (i.e. during the Russian-Ukrainian war), the largest number of homogeneous clusters of countries was identified, namely five (Figure 4). The Netherlands formed a separate cluster (cluster 5) with the best labour market situation. The second-best group of EU-27 countries with a similar direction of change in the labour market (cluster 4) consisted of Denmark, Germany, Austria,

Ireland and Malta. Cluster 1, i.e. countries with the worst labour market situation and a similar direction of change, consisted of Greece, Spain, Italy and Romania. Belgium, Luxembourg, Portugal, Croatia, Bulgaria and Slovakia formed cluster 2, i.e. countries with a slightly better situation than those in cluster 1. The remaining, most numerous group of countries formed cluster 3.

It is worth noting that in each subsequent sub-period, the number of clusters of countries with situation and directions of change in the labour market increased (from three clusters in the pre-pandemic period, through four in the pandemic period, to five in the post-pandemic one) (Figure 1). This was due to the fact that the variability of the distance between the Hellwig measure time series decreased (Figure 1), which caused the differences between the directions of change in the composite variable to increase (as indicated by the DTW measure).

The conducted research enabled partial verification of the research hypothesis. While in many EU-27 countries it was not possible to determine the impact of crisis periods on the development of their labour markets, in several cases such an impact can be observed. In the case of Slovenia and Ireland, a deterioration in the labour market situation can be observed during the COVID-19 pandemic, followed by a significant improvement in both countries after the pandemic. In contrast, the labour market situation in the Nordic countries (Denmark, Sweden and Finland) and Estonia deteriorated after the COVID-19 pandemic, i.e. after the outbreak of the Russian-Ukrainian war. It can therefore be concluded that the research hypothesis has been partially verified positively.

The development of the labour market in the EU-27 countries is closely linked to sustainable development goals, in this case the SDG8. European Union policy aims to reduce disparities between Member States. Studies show that this goal has been largely achieved in the Nordic countries and Western Europe. The situation is slightly worse in Southern European and post-communist countries (Bieszk-Stolorz and Dmytrów, 2023). This is partially reflected in the current study. Countries with a high level of socio-economic development coped better with labour market problems during the pandemic. In countries with relatively higher unemployment rates, the pandemic exacerbated existing problems.

4. Conclusions

The study attempts to assess the impact of crisis situations on the labour market in the EU-27 countries. In some countries, the impact of the COVID-19

pandemic is noticeable. It was not always immediately apparent (in 2020). In the most developed EU-27 countries, no significant deterioration in the labour market situation was observed, with changes being fairly mild (probably thanks to the efficient implementation of aid programmes).

The analysis of Figure 1 indicates greater turmoil in the labour market (greater changes in the composite variable) during the COVID-19 pandemic than in the post-pandemic period, i.e. during the Russian-Ukrainian war. The turmoil in the labour market during the pandemic was caused by lockdowns, which occurred globally (the vast majority of countries introduced them). The turmoil caused by the Russian-Ukrainian war was more local in nature. This is particularly evident in the case of the Polish labour market, which, especially in the initial period of the war, accepted the largest group of refugees from Ukraine. It should also be noted that the vast majority of immigrants from Ukraine undertake work, thereby contributing significantly to the improvement of the labour market situation in Poland and the increase in Poland's position in the ranking.

The European Union has allocated significant financial resources to counteract the economic effects of the pandemic. However, the proper use of these funds depends on the internal policies of member states. It seems that in the long term, the effects of the pandemic will be less noticeable than those of the war in Ukraine. As far as the labour market itself is concerned, the inflow of workforce from Ukraine will have a positive impact due to the noticeable and rapid integration of Ukrainians into the societies of the EU-27 countries. A greater problem for the European economy is the high probability of an energy crisis, which in the long term may also affect the labour market.

The main limitation of our study is access to reliable data. A natural extension of the conducted research could be the analysis of other aspects of the functioning of national economies in times of crises. These issues will be the focus of future research in this area.

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