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Exploring Labour Market Dynamics and Unemployment Trends in OECD Countries of Central and Eastern Europe (2011-2022)

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Abstract:

Purpose: *The article shows the differences between the countries studied in terms of the unemployment rates and the flow rates between employment and unemployment, as well as the determinants affecting both variables. The subject of the analysis is the phenomenon of unemployment in the OECD countries of Central and Eastern Europe for 2011-2022, considered from both the stock and flow sides.*

Design/Methodology/Approach: *The analyses should show in which countries the unemployment rates were the lowest and highest and in which countries the rates of people flows were the lowest, implying a stagnant nature of unemployment, and in which people flows were the highest, indicating dynamic nature of unemployment. The analysis should also indicate the role of determinants such as GDP dynamics, investment rates, type of employment contracts, the restrictiveness of employment protection legislation, and the scope of active labour market policy in shaping unemployment rates and flow indicators. The research undertaken in this article is based on annual data on labour markets in the OECD countries from Central and Eastern Europe in 2011-2022.*

The analyses show that the countries' labour markets differed in unemployment rates and indicators of the intensity of people's flows between employment and unemployment. The lowest unemployment rates occurred in the Czech Republic and Slovenia, while Slovakia, Latvia, and Lithuania recorded the highest unemployment rates. In turn, the indicators of the flows of people on the labour market were the highest in Estonia and the lowest in Slovakia. This means that in Estonia, the unemployment stock was the most dynamic, implying relatively short duration periods of unemployment, while in Slovakia, it was the most stagnant, characterized by relatively long periods of unemployment.

Findings: *The econometric analyses indicated the importance of several factors determining unemployment rates and the dynamics of flows between unemployment and employment in the studied countries. The following turned out to be essential determinants in reducing unemployment rates: an increase in the share of temporary employment, an increase in investments in the economy, an increase in the share of people with higher education and more restrictive provisions of employment protection legislation. Moreover, the factors that significantly influenced the increase in the dynamics of flows of people in the labour market*

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were: the increase in the share of temporary employment, the increase in the share of part-time employment and the increase in investments in the economy.
The study shows that in order to reduce unemployment, it is necessary to invest more, develop temporary employment, raise the level of education of the labor force and create legal provisions that protect employment more strongly. However, the more dynamic nature of unemployment requires increasing investments, developing temporary employment and increasing the percentage of people with higher education.
Practical Implications: *The results of the research have important practical significance for the state's economic policy. They indicate the directions of actions that should be taken in the state's economic policy in order to reduce the size of unemployment and create its more dynamic character.*
Originality/Value: *The originality of the study lies in the fact that unemployment is analyzed not only in terms of its size, but also in terms of its stagnant or dynamic nature. Moreover, the factors determining the size and nature of unemployment include not only typical economic variables (GDP, investments), but also institutional factors (EPL indices, type of employment contract, in particular temporary employment).*

Keywords: *Labour market, unemployment rate, labor market flows, CEE countries.*

JEL classification: *R23, E24.*

Paper Type: *Research article.*

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1. Introduction

Several fundamental changes have occurred in the labour markets of Central and Eastern European countries over the last three decades. They were related to several essential shocks external to these markets during this period. Firstly, at the turn of the 1980s and 1990s, the transformation of the economic system towards a market economy began in these countries, which had a significant impact on labour markets, causing the emergence of open unemployment.

Secondly, the first decade of the 21st century meant that several Central and Eastern European countries gained membership in the European Union. This implied the need to introduce many different institutional adjustments, including those in the labour market institutions.

Third, two adverse economic shocks related to the Russian crisis at the turn of the century and the global financial crisis of 2008-2009 occured. Fourth, in 2020, the COVID-19 pandemic began, significantly affecting the economies and the labour

markets. These shocks could not have been without significance for the development of unemployment.

Two approaches are used in the analysis of unemployment undertaken in economic literature: stock-based and flow-based. In the initial period of the economic system transformation in the countries of Central and Eastern Europe, unemployment research was developed primarily using a stock-based approach.

This approach was justified because it allowed to recognize trends in the unemployment pool, unemployment rates, and changes in unemployment structures due to various division criteria. However, it turned out quite quickly that this approach had its limitations, as it did not allow for the identification of several essential features of unemployment, in particular, related to the level of turnover of people in the unemployment pool, flows of people between labour market states and the duration of unemployment, which determine stagnant or dynamic nature of unemployment (Thalassinos *et al.*, 2019).

Recognizing these unemployment features requires a flow approach used in analysis. A vital impulse for the initiation and development of unemployment research from the flow side was the analysis of the dynamics and nature of unemployment in highly developed countries, undertaken, among others, by S.T. Marston, A.B. Atkinson and J. Mickelwright, O. Blanchard and P. Diamond and R. Layard, S. Nickell and R. Jackman (Schettkat, 1996, p. 1; Kucharski, 2002, p. 12 *et al.;* Kwiatkowski, 2002, p. 29 *et al*.**)**.

The subject of the analysis in this article is the phenomenon of unemployment in the OECD countries of Central and Eastern Europe, considered both from the stock and flow perspective. The analyses cover the period 2011-2022. The studied countries include the Czech Republic, Estonia, Lithuania, Latvia, Poland, Slovakia, Slovenia and Hungary.

The analysis is limited to OECD countries due to the lack of some statistical data for a larger group of countries. The focus is on the stock-based indicators of unemployment rates and the flow-based indicators of the flow of people between the unemployment and employment states.

The order of further considerations in the article is as follows. Part 2 reviews unemployment research in Central and Eastern European countries, paying particular attention to the use of the flow approach. Part 3 is devoted to the presentation of data and the research methods used.

Part 4 presents the groupings and rankings of the studied countries according to unemployment rates and indicators of flows between unemployment and employment. Econometric panel models indicating the role of several factors determining unemployment rates and flow rates in the studied countries are

presented in Part 5. Part 6 contains more important conclusions resulting from the analyses performed.

2. Review of Research in Economic Literature

Analysis of labour markets in Central and Eastern European countries is carried out from both the stock and flow perspectives. Research undertaken in the initial period of transformation in Polish economic literature also contributed to the popularization of the flow approach. It is worth mentioning the study by Kotowska and Podogrodzka (1995), which analyzed the situation in regional labor markets in Poland in the years 1992-1994 based on two types of indicators, namely stock variables (including the registered unemployment rate) and flow variables.

This emphasized the need to study both the extent of unemployment and the nature of unemployment. A similar approach was used in the analysis by Kwiatkowski and Gawrońska (1995). The flow approach's importance in analyzing local labour markets was also emphasized in the research of Góra and Sztanderska (2006).

This approach was used to distinguish stagnant labour markets (with stable employment and unemployment resources and low flows of people between resources) and dynamic labor markets (with significant changes in resources on the labor market and high flows of people between these resources) (Góra and Sztanderska 2006, pp. 39-41; Adamopoulos and Thalassinos, 2020).

Boeri (1999) considered the problem of the optimal pace of economic reforms and economic restructuring in transformation countries, using data on the flow of people between the stocks of the employed, the unemployed, and the economically inactive from the 1990s. In Poland, the outflows of people from employment to inactivity were twice as large as those from employment to unemployment.

In contrast, the outflows of people from unemployment were dominated by outflows to inactivity and, to a small extent, they were employed in the private sector (Boeri, 1999, p. 11). Such trends in the flow of people inhibited the increase in unemployment in Poland. According to Boeri, implementing economic reforms cannot be too fast because it may cause high unemployment and social unrest. However, it cannot be too slow because the resources necessary for developing the private sector must be released.

The unemployment problem in Central and Eastern European countries was addressed in the 1990s by A. Nesporova and S. Cazes (Nesporova, 2002; Cazes and Nesporova, 2004). Observing the persistently high unemployment rate in the transformation countries, they attempted to identify the causes of this situation and its countermeasures. They rejected the view of neoliberal economists, who saw the cause of this situation as the excessive rigidity of labour markets.

Based on the collected data and information, they proved that in the 1990s, labor markets in the transformation countries became more flexible, as evidenced by the growing share of temporary employment and rising rates of flows of people on the labor market, as well as decreasing indices of employment protection legislation in many countries.

According to Cazes and Nesporova, high persistent unemployment results from the model adopted in the countries of Central and Eastern Europe, in which the responsibility for supporting people laid off from work was transferred from enterprises to public institutions dealing with job placement, active labor market programs and financial support for the unemployed.

As they claim, although this model increases the flexibility of adjustments in the labour market and increases the effectiveness of sectoral allocation of the labour force and the level of overall labour productivity, the effectiveness of financial assistance to the unemployed and the speed of finding a new job depends on the quality and efficiency of public institutions. These do not always perform their tasks properly.

Gozgor (2013) examined the causes of high unemployment in the countries of Central and Eastern Europe, trying to verify whether they could be related to the hypothesis of the NAIRU theory, indicating that fluctuations in unemployment rates are cyclical deviations from equilibrium unemployment, or to the hypothesis of hysteresis of unemployment, which emphasizes that negative shocks affecting unemployment have not a temporary, but a lasting impact on its level.

The analysis of monthly data from 1998-2012 led the author to conclude that the persistence of unemployment rates occurs in Central and Eastern European countries and that the hypothesis related to unemployment hysteresis was justified.

Trends in changes in unemployment rates in Central and Eastern European countries in 2004-2013 were the subject of the study by Kwiatkowski and Kucharski, (2014). The article decomposes changes in unemployment rates in the studied countries, indicating the role of demand factors related to the employment rate and the role of supply factors related to the economic activity rate.

The study shows that during the good economic situation of 2004-2008, unemployment rates decreased primarily due to increased employment. However, during the global financial crisis of 2008-2010, unemployment rates increased, most strongly in the Baltic countries, mainly due to the decline in employment rates. The increase in unemployment rates was curbed during this period by declines in labor force participation rates.

The work of Guzikowski (2016) is devoted to the labor market issues in transformation countries, in which the central point of consideration is the

interactions between various labor market institutions in Central and Eastern European countries. However, one of the chapters characterizes patterns and trends that are interesting from our point of view, occurring in this group of countries regarding unemployment and its determinants.

Based on the collected statistical data, it was proven that in the transformation countries, there are: negative effects of migration processes on the national labor supply, low economic activity of people of working age compared to other countries, especially in the case of young people, relatively high youth unemployment rate, high share of long-term unemployment, unfavorable change in the structure of unemployment according to education, relatively low share of expenditure on active labor market programs and relatively high, although decreasing, indices of employment protection legislation. It should be remembered that these conclusions concerned the years 1994-2011.

3. Data and Methodology

The research undertaken in this article is based on annual data on labour markets in OECD countries from Central and Eastern Europe in 2011-2022. This data includes information about:

- unemployment rates,
- flows of people in the labour market,
- other variables characterizing the economic situation in the analyzed countries.

These data come from the Eurostat database. The research undertaken in the article was carried out in two stages. The first stage shows the differences in unemployment in OECD countries from Central and Eastern Europe, grouping and ranking them. In the second stage, an attempt is made to identify the factors influencing the rates and nature of unemployment in the analyzed countries using econometric analyses.

The basis for the assessment of labour markets in the article is two indicators: the unemployment rate and the rate of flow of people between unemployment and employment. Their informational value dictated the selection of these indicators. The unemployment rate shows the degree of utilization of labor resources, which is essential for assessing the situation in the labor market.

However, this indicator does not provide information about the turnover of people in the unemployment pool and the duration of unemployment, which are equally essential when assessing unemployment. The adverse effects of unemployment depend not only on the size of unemployment but also on whether the phenomenon of unemployment affects a narrow or broader group of people and how long unemployed people remain unemployed.

To capture these aspects, it is necessary to look at unemployment from the perspective of the flow of people flowing into unemployment and the flow of people leaving this state. Therefore, as the second indicator for assessing unemployment, we adopt the indicator of the intensity of flows of people between unemployment and employment, the formula of which is as follows:

$$if_{it} = \frac{EU_{it} + UE_{it}}{U_{it}} \tag{1}$$

where the following designations were adopted:

if_{it} – indicator of the intensity of flows of people between the unemployment pool and the employment pool in country i in year t,
EU_{it} – inflow of people to the unemployment pool from the employment pool in country i during year t,
UE_{it}– outflow of people from the unemployment pool to the employment pool in the country i during year t,
U_{it} – the number of unemployed people in the country i at the end of the year t.

The indicator of the intensity of people's flows, presented in formula (1), is not neutral for the duration of unemployment. Higher flow rates, which mean a higher turnover of people in the unemployment pool, imply shorter durations of unemployment and, thus, a more dynamic nature of the unemployment pool. In comparison, with lower flow rates, durations of unemployment are longer, and the unemployment pool is more stagnant.

Both unemployment assessment indicators are the basis for grouping countries. The grouping method is based on the arithmetic mean of unemployment rates and flow indicators ($\overline{ur}, \overline{if}$)and standard deviations (s_{ur}, s_{if}) of both indicators by the principles presented in Table 1. As a result of such grouping, we obtained nine groups of countries marked with alphabet letters from A to I.

The most favourable situation in the labour market is represented by the countries belonging to group A because high flow rates accompany low unemployment rates, while the most difficult situation is in the countries from group I, where unemployment rates are high and the flow rates of people are low.

Table 1. *Grouping method based on the standard deviation from the arithmetic mean of indicators*

	Unemployment rate (ur)		
Flow	group A $ur_i < \overline{ur} - s_{ur}$ $if_i > \overline{if} + s_{if}$	group B $\overline{ur} - s_{ur} < ur_i < \overline{ur} + s_{ur}$ $if_i > \overline{if} + s_{if}$	group C $ur_i > \overline{ur} + s_{ur}$ $if_i > \overline{if} + s_{if}$

	group D $ur_i < \overline{ur} - s_{ur}$ $\overline{if} - s_{if} < if_i < \overline{if} + s_{if}$	group E $\overline{ur} - s_{ur} < ur_i < \overline{ur} + s_{ur}$ $\overline{if} - s_{if} < if_i < \overline{if} + s_{if}$	group F $ur_i > \overline{ur} + s_{ur}$ $\overline{if} - s_{if} < if_i < \overline{if} + s_{if}$
	group G $ur_i < \overline{ur} - s_{ur}$ $if_i < \overline{if} - s_{if}$	group H $\overline{ur} - s_{ur} < ur_i < \overline{ur} + s_{ur}$ $if < \overline{if} - s_{if}$	group I $ur_i > \overline{ur} + s_{ur}$ $if_i < \overline{if} - s_{if}$

Source: *Authors' calculations.*

In order to present a complete picture of the situation in the labor markets in the countries of Central and Eastern Europe, a ranking will also be prepared in terms of unemployment rates and flow indicators taken together. Hellwig's (1968) linear ordering method was used to construct the rankings. The variables of the unemployment rate and flow rate are standardized.

In the analyzed approach, the level of unemployment rates is treated as a destimulant and the level of the flow intensity index as a stimulator. The standardized variable unemployment rate was transformed into a stimulant. Then, the arithmetic mean was calculated, assuming equal weights for both variables.

The rankings were prepared in descending order, i.e., from countries with the best situation (low unemployment rates and high flow rates) to those with the most challenging situation, expressed by high unemployment rates and low flow rates.

In the second stage of the research undertaken in the article, econometric panel models were constructed to verify the significance of the impact of determining factors on unemployment rates and people flow rates in the analyzed countries. The selection of potential explanatory variables for models is based on the theoretical achievements of economics and the availability of statistical information. For these reasons, the potential determinants influencing the rates and nature of unemployment in OECD countries from Central and Eastern Europe include:

- change in GDP,
- share of temporary employment in total employment,
- share of part-time employment in total employment,
- share of investment in GDP,
- share of people with higher education in the number of economically active people,
- share of employment in knowledge-intensive fields in total employment,
- employment protection legislation index,
- share of expenditure on active labor market policy in GDP,
- pandemic dummy variable for 2020.

The mentioned variables are included in relative formulas, allowing for comparisons between countries. The econometric analysis was carried out using panel models based on cross-sectional data (annual data from 2011-2022 in 8 OECD countries from Central and Eastern Europe).

In panel models, it is assumed that not only the variables included in them influence the development of the phenomenon under study (Kufel, 2004). It is also affected by unmeasurable factors, constant in time and specific to a given object, called group effects, and unmeasurable factors, constant about objects, specific to a given period, called time effects. This can be put as follows:

$$ur_{it} = x_{it} \cdot \beta + u_i + \varepsilon_{it} \quad (2)$$

$$if_{it} = x_{it} \cdot \beta + u_i + \varepsilon_{it} \quad (3)$$

where:

ur_{it} – unemployment rate in country i in year t,
if_{it} – indicator of the intensity of flows of people between unemployment and employment in country i in year t,
x_{it} – explanatory variable (vector of explanatory variables),
β – a vector with dimensions N of structural parameters of the model with explanatory variables,
u_i-individual effect,
ε_{it} - pure random error.

The subject of estimation in the models is the β_{it} parameters. Logarithms of the values of individual variables were modelled. Therefore, the obtained parameters have an elastic interpretation, meaning that the estimated parameter values indicate a percentage increase or decrease in the values of the explained variables resulting from an increase in the value of the explanatory variable by 1%, assuming ceteris paribus.

4. Groupings and Rankings of Countries According to the Level and Nature of Unemployment

Figure 1 shows the development of unemployment rates and indicators of people's flows between unemployment and employment in the eight countries surveyed in 2011-2022. As can be seen in the chart, there was a specific relationship between both indicators: in most cases, higher unemployment rates were accompanied by lower flow rates.

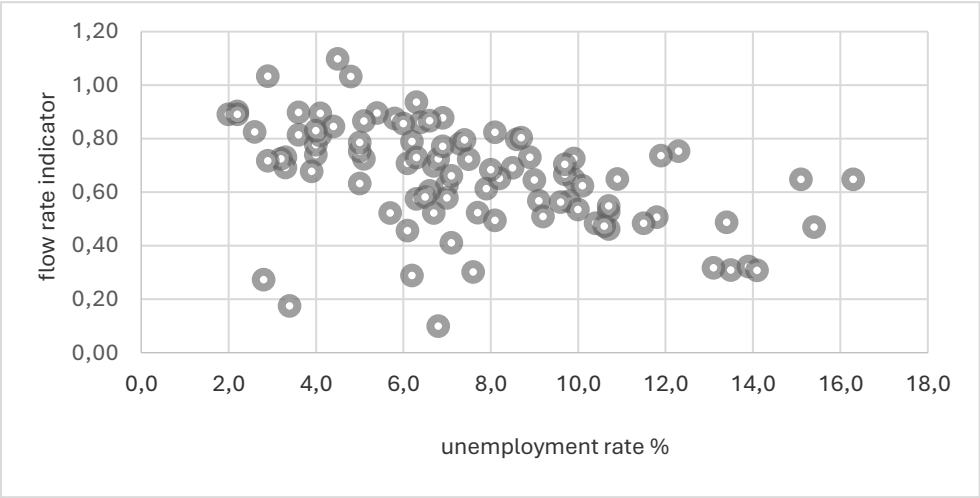
Therefore, the better situation in labor markets, reflected in relatively low unemployment rates, was related to the more dynamic nature of unemployment,

which meant a higher turnover of people in the unemployment pool and shorter periods of duration.

Table 2 presents the grouping of the analyzed countries based on indicators averaged over the entire period of 2011-2022. As Table 2 shows, during the entire period under study, the lowest unemployment rate was in the Czech Republic and the highest in Slovakia and Latvia.

However, the most dynamic nature of the unemployment pool was in Estonia, and the most stagnant was in Slovakia.

Figure 1. *Flow intensity indicators and unemployment rates in Central and Eastern European countries in 2011-2012*



Source: *Authors' calculations.*

Table 2. *Grouping of OECD countries from Central and Eastern Europe based on average indicators for 2011-2022*

unemployment rate (ur)			
labor market flow indicator (if)	**group A** -	**group B** Estonia	**group C** -
	group D Czechia	**group E** Slovenia Poland Hungary Lithuania	**group F** Latvia
	group G -	**group H** -	**group I** Slovakia

Source: *Authors' calculations.*

Table 3 presents the ranking of the surveyed countries in terms of average unemployment rates and flows of people on the labour market for the entire period (Bak, 2018; Bozek, 2002; Kukula and Luty, 2015). The table shows that the most favourable situation in the labour market was in the Czech Republic and the most difficult in Slovakia.

Table 3. *Ranking of countries based on average indicators of unemployment rates and flow rates in 2011-2022*

No.	Country	Linear ordering indicator
1.	Czechia	1,742
2.	Hungary	1,255
3.	Estonia	1,192
4.	Slovenia	1,183
5.	Poland	0,766
6.	Latvia	0,358
7.	Lithuania	0,232
8.	Slovakia	-0,394

Source: *Authors' calculations.*

The analyses show that the countries' labour markets differed in unemployment rates and indicators of the intensity of people's flows between employment and unemployment. The lowest unemployment rates occurred in the Czech Republic and Slovenia, and in the final years of the period under study, also in Poland, while Slovakia, Latvia, and Lithuania recorded the highest unemployment rates. In turn, the indicators of the flows of people on the labour market were the highest in Estonia and the lowest in Slovakia.

This means that in Estonia, the unemployment rate was the most dynamic, implying relatively short duration periods of unemployment, while in Slovakia, it was the most stagnant, characterized by relatively long periods of unemployment. These conclusions are confirmed by the data in Table 6.

Table 6. *The average duration of unemployment for steady-state conditions (in years)*

No.	Country	Unemployment/Inflow into unemployment 2011 - 2022	Unemployment/Outflow from Unemployment 2011 - 2022
1.	Czechia	1,79	1,686
2.	Estonia	1,66	1,570
3.	Latvia	1,69	1,650
4.	Lithuania	2,56	1,906
5.	Hungary	1,99	1,671
6.	Poland	2,04	2,099
7.	Slovenia	1,68	1,527
8.	Slovakia	3,58	3,633

Source: *Authors' calculations.*

Table 6 contains estimates of the average duration of unemployment in the studied countries for steady-state conditions, i.e., assuming equal inflows into unemployment and outflows from unemployment and stable levels of the unemployment stock.

These estimates were calculated based on (1) the ratio of the unemployment stock in a given year to the inflow of people into unemployment during that year and (2) the ratio of the unemployment stock to the amount of outflow of people from unemployment. For example, the average duration of unemployment in Estonia estimated by this first method of 1.66 years means that such an average duration of unemployment would occur in Estonia if the outflows of people from unemployment were equal to the inflows assumed in the calculation.

Although these estimates are only an approximate measure of the actual duration of unemployment, they provide some indication of the nature of unemployment. The data in Table 6 confirm that in the studied group of countries, the shortest average duration of unemployment occurred in Estonia, indicating the dynamic nature of the unemployment pool. In contrast, the most extended durations occurred in Slovakia, suggesting a stagnant unemployment pool.

5. Determinants of the Level and Nature of Unemployment - Panel Model

In the panel model analysis, the parameters of two regression functions were estimated, which take the following form:

$$ln\_ur_{it} = \beta_0 + \beta_1 ln\_GDP_{it} + \beta_2 ln\_TE_{it} + \beta_3 ln\_PTE_{it} + \beta_4 ln\_INV_{it} + \beta_5 ln\_HE_{it} + \beta_6 ln\_KIE_{it} + \beta_7 ln\_EPL\_01_{it} + \beta_8 ln\_\text{ALMP}\_01_{it} + \beta_9 ln\_\text{PAND}\_01_{it} + u_i + \varepsilon_{it} \quad (4)$$

and

$$ln\_if_{it} = \beta_0 + \beta_1 ln\_GDP_{it} + \beta_2 ln\_TE_{it} + \beta_3 ln\_PTE_{it} + \beta_4 ln\_INV_{it} + \beta_5 ln\_HE_{it} + \beta_6 ln\_KIE_{it} + \beta_7 ln\_EPL\_01_{it} + \beta_8 ln\_ALMP\_01_{it} + \beta_9 ln\_PAND\_01_{it} + u_i + \varepsilon_{it} \quad (5)$$

where the following designations were adopted:

ur_{it} – unemployment rate in country i at the end of year t,
if_{it} – indicator of the intensity of flows of people between unemployment and employment in country i in year t,
GDP_{it} – year-on-year change in GDP in % in country i in year t,
TE_{it} – share of temporary employment in total employment in % in country i in year t,
PTE_{it} – share of part-time employment in total employment in % in country i in year t,
INV_{it} – share of investment in GDP in % in country i in year t,

HE_{it} – share of people with higher education in the number of professionally active people in % in country i in year t,
KIE_{it} – share of employment in knowledge-intensive fields in total employment in % in country i in year t,
EPL_{it} – index of employment protection legislation as a 0-1 variable, where 1 is values above the average in country i in year t,
$ALMP_{it}$ – share of expenditure on active labour market policy in GDP in % as a 0-1 variable, where 1 is the value above the average in country i in year t,
$PAND_{it}$ - a dummy variable taking the value 1 in 2020 and zero in other years in country i in year t,$u_i - individual\ effect$,,
$\varepsilon_{it} - pure\ random\ error$.

For both panel models, the same set of explanatory variables was used. All variables, except dummy variables, were logarithmized. The correlation matrix for the variables and selected descriptive statistics are presented in the Appendix, in Tables 12 and 13, respectively. There was no excessive correlation of the variables. The analysis of correlation coefficients allows us to conclude that the highest correlation occurs between the following variables: PAND and GDP (-0.66); EPL and TE (-0.476); INV and TE (-0.445).

The most significant variation, measured by the coefficient of variation in percent, where

$$V = \frac{\bar{x}}{\sigma} \cdot 100\%; \tag{6}$$

$\bar{x}$– arithmetic mean,
δ – standard deviation,
were variables: TE (79.20%); ur (42.66%); HE (29.52%).

In the first step, the model was estimated, considering the occurrence of FE effects. The occurrence of FE and RE effects was verified using the Hausman test. The obtained test statistics indicate the correct model quality with the exclusive inclusion of FE effects.

The results obtained at this stage, presented in Table 7, showed that the estimates of not all parameters were statistically significant. If a significance level 0.05 is set in the unemployment rate model, one explanatory variable is statistically significant (p-value<0.05): PTE. Therefore, we abandon the panel model and use the multiple regression method.

However, in the case of the flow model, the parameters for the following variables are insignificant: GDP, PTE, KIE, EPL, ALMP, and PAND. It was decided to exclude them from the analysis due to their low variability in the analyzed analysis period.

After excluding variables that did not indicate significance in explaining the studied phenomenon in the first iteration, another estimation of the flow model was carried out.

***Table 7**. FE model, the first iteration*

No.	**Independent variables**	**Unemployment rate model**			**Flow model**		
		parameter estimation	**t**	**p-value**	**parameter estimation**	**t**	**p-value**
1.	Intercept	-10,1641	-1,78375	0,079281	-2,89445	-0,35929	0,720580
2.	GDP	1,1986	1,07026	0,288587	-0,45604	-0,28804	0,774262
3.	TE	-0,1174	-0,99777	0,322210	0,45528	2,73780	0,008030
4.	PTE	0,3369	2,33063	0,022988	0,24973	1,22186	0,226312
5.	INV	0,1271	0,54507	0,587632	1,40765	4,27091	0,000067
6.	HE	0,2427	0,36892	0,713422	2,29128	2,46346	0,016503
7.	KIE	1,4253	1,59242	0,116296	-1,60934	-1,27178	0,208126
8.	EPL	-0,3725	-0,96758	0,336952	1,08360	1,99078	0,050846
9.	ALMP	0,0925	1,82337	0,072993	-0,13269	-1,85043	0,068942
10.	PAND	-0,3592	-3,17241	0,002337	0,16389	1,02368	0,309903
Effects Specification							
Cross-section fixed (dummy variables)							
11.	R-squared	0,937862			0,831469		
12.	Adjusted R-squared	0,919313			0,767267		
13.	Sum squared	17,68779			10,65695		
14.	F statistic	50,56191			12,95080		
15.	Prob (F-stat.)	0,00000			0,00000		
16	Test for normality	Kołmogorow Smirnow p>0,20			Kołmogorow Smirnow p>0,20		

***Source:** Authors' calculations.*

For the flow model, all remaining variables, i.e., TE, INV, HE, significantly (at the significance level of 0.05) influence the estimation of the independent variable, and the obtained estimates are consistent with the assumed logic (Table 8).

***Table 8.** FE model, the second iteration*

Independent variables	Flor model		
	Parameter estimation	T	P-value
Intercept	-8,99543	-2,48190	0,015582
TE	0,47722	3,21985	0,001979
INV	1,33061	4,15920	0,000093
HE	2,15809	2,48577	0,015428
Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0,812312		
Adjusted R-squared	0,756285		
Sum squared	10,41141		
F statistic	14,49875		

Prob (F-statistic)	0,00000
Test for normality	Kolmogorov Smirnov p>0,20

Source: *Authors' calculations.*

The study presented in Table 8 shows that the increase in these explanatory variables in the studied group of countries contributes to an increase in the rate of flows of people between employment and unemployment, which implies a more dynamic nature of unemployment and shorter periods of its duration. Logarithms of the values of individual variables were modelled, so the obtained parameters have an elasticity interpretation. An increase in explanatory variables by 1% results in an increase in the flow intensity index by approximately 2.1 - 0.4%.

The parameter estimates of the variables are consistent with the theoretical findings of economic theory. For example, an increase in the share of temporary employment by 1% results in an increase in the rate of people's flows between employment and unemployment by 0.48% in the studied group of countries.

An increase in the share of investment in GDP (INV) by 1% results in an increase in the rate of people's flows between employment and unemployment by 1.3%. It also turns out that the share of people with higher education in the number of professionally active people (HE) increases the rate of people's flows between employment and unemployment by 2.2%.

The coefficient of determination was used to assess the level of fit of the model estimates to the empirical data. Relatively high coefficients of determination (Adjusted R2 = 0.76 for the flow model) indicate that the flow rate model explains over 76% of the variance in the dependent variable.

In order to verify the normality of the distribution of residuals and the correctness of the selection of the functional form, Kolmogorov-Smirnov tests were used. In the case of the flow model, the p-value in the Kolmogorov-Smirnov test was more significant than the critical value (0.05), so we assume that the distribution of residuals is normal and that the model's functional form is correct.

Estimating the unemployment rate model using the multiple regression method gave the following results (Table 9).

Table 9. *Multiple regression model for the unemployment rate, first iteration*

No.	N=88	**Unemployment rate** R=0,77104304 R^2=0,59450737 Adj. R^2=0,54771976 F(9,78)=12,707 p<,00000 standard error of estimation: 0,31312			
		b	**Standard error.**	**t(78)**	**p**
1.	intercept		8,886749	2,13920	0,035548
2.	GDP	0,12726	1,935836	1,08821	0,279855
3.	TE	-1,04211	0,082331	-7,24308	0,000000

4.	PTE	0,64666	0,176581	5,82699	0,000000
5.	INV	-0,43342	0,280741	-4,95569	0,000004
6.	HE	-1,00032	0,438014	-7,76121	0,000000
7.	KIE	-0,40148	0,970193	-3,17758	0,002129
8.	EPL	-0,31518	0,087526	-3,44341	0,000927
9.	ALMP	0,07687	0,088482	0,85559	0,394848
10.	PAND	0,06723	0,194707	0,55602	0,579788

Source: *Authors' calculations.*

The results obtained at this stage, presented in Table 9, showed that the estimates of not all parameters were statistically significant. The parameters of the variables GDP, ALMP, and PAND show no significance in the unemployment rate model. It was decided to exclude them from the analysis due to their low variability in the analyzed analysis period.

Another model estimation was performed after excluding variables that did not indicate significance in explaining the studied phenomenon in the first iteration (Table 10). The coefficient of determination was used to assess the level of fit of the model estimates to the empirical data. Relatively high coefficients of determination (corrected R2 = 0.58 for the unemployment rate model indicate that the model explains more than 58% of the variation in the variance of the dependent variable.

Table 10. *Multiple regression model for the unemployment rate, the second iteration*

No.	N=88	Unemployment rate R=0,76271120 R^2=0,58172838 Adj. R^2=0,55074530 F(6,81)=18,776 p<,00000 standard error of estimation: 0,31207			
		b	**Bł. std.**	**t(81)**	**p**
1.	Intercept		3,241543	8,15022	0,000000
2.	TE	-0,98686	0,074261	-7,60441	0,000000
3.	PTE	0,632498	0,166457	6,04597	0,000000
4.	INV	-0,44599	0,277488	-5,15921	0,000002
5.	HE	-0,95025	0,384572	-8,39722	0,000000
6.	KIE	-0,33140	0,852754	-2,98415	0,003758
7.	EPL	-0,31365	0,086697	-3,45952	0,000866

Source: *Authors' calculations.*

For unemployment rate model, all variables left in the model, i.e., TE, PTE, INV, HE, KIE, EPL, significantly (at the significance level of 0.05) influence the estimation of the independent variable. The following turned out to be essential determinants in reducing unemployment rates:

- an increase in the share of temporary employment,
- an increase in investments in the economy,
- an increase in the share of people with higher education,

- an increase in the share of employment in knowledge-intensive fields,
- more restrictive provisions of legal employment protection,

However, the increase in the share of part-time employment results in an increase in the unemployment rate.

In order to verify the normality of the distribution of residuals and the correctness of the functional form selection, the Kolmogorov-Smirnov, Shapiro-Wilk, and Liliefors tests were used.

Table 11. *Test of normality of residuals*

Variable	**Test of normality**					
	N	maks D	K-S p	Lillief. p	W	p
	88	0,067126	p > ,20	p > ,20	0,988155	0,611386

Source: *Authors' calculations.*

In the case of the unemployment rate model, the normality tests allow us to assume that the distribution of residuals is normal and that the model's functional form is correct.

6. Conclusions

The analyses show that the labour markets in the studied countries of Central and Eastern Europe in 2011-2022 differed in terms of unemployment rates and the dynamics of people's flows between labour market states, implying specific average periods of unemployment.

Comparative analyses of unemployment rates conducted for 2011-2022 indicate that the lowest unemployment rates occurred in the Czech Republic, Slovenia, and Poland and the highest in Slovakia, Latvia, and Lithuania. Analogous comparative analyses of the dynamics of people flows between employment and unemployment showed that the highest dynamics of people flows took place in Estonia and the lowest in Slovakia.

Unemployment in Estonia was, therefore, the most dynamic, meaning relatively short average periods of unemployment, while in Slovakia, the unemployment phenomenon was the most stagnant, implying a high share of long-term unemployment. These conclusions were confirmed by estimates of the average duration of unemployment, which indicate that the shortest periods occurred in Slovenia and Estonia and the longest in Slovakia.
The unemployment taxonomic indicator also confirmed differences in unemployment between the surveyed countries, which considers the total levels of unemployment rates and the levels of flow dynamics. In all country rankings for

2011-2022, the Czech Republic was in the top position, while Slovakia was in last place.

Unemployment in the Czech Republic is characterized not only by relatively low unemployment rates but also by the dynamic nature of unemployment, expressed in relatively short periods of its duration. The most difficult situation occurs in Slovakia, as high unemployment rates are accompanied by relatively long periods of unemployment.

The econometric analyses indicated the importance of several factors determining unemployment rates and the dynamics of people between unemployment and employment in the studied countries. The following turned out to be essential determinants in reducing unemployment rates:

- an increase in the share of temporary employment,
- an increase in investments in the economy,
- an increase in the share of people with higher education,
- an increase in the share of employment in knowledge-intensive fields,
- more restrictive provisions of legal employment protection.

However, the factors that significantly influenced the increase in the dynamics of the flow of people in the labour market were:

- the increase in the share of temporary employment,
- the increase in the share of part-time employment and
- the increase in investments in the economy.

The above conclusions resulting from the conducted research have important practical significance for the state's economic policy. They indicate the directions of actions that should be taken in the state's economic policy in order to reduce the size of unemployment and create its more dynamic character.

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Appendix :

Table 12. *Correlation matrix*

No.	VAR.	PKB	ZT	ZNP	INW	WW	ZW	EPL	ARP	PAND	SB	WP
1.	PKB	1,000	-0,082	0,076	-0,001	0,170	0,106	0,092	0,006	-0,666	0,088	-0,102
2.	ZT	-0,082	1,000	-0,10	-0,445	-0,243	-0,666	-0,476	0,390	-0,102	-0,109	-0,091
3.	ZNP	0,076	-0,104	1,000	0,153	0,674	-0,021	-0,002	-0,055	-0,010	0,095	0,369
4.	INW	-0,001	-0,445	0,153	1,000	0,033	0,481	0,147	-0,026	0,075	-0,234	0,325
5.	WW	0,170	-0,243	0,674	0,033	1,000	0,160	0,107	-0,080	0,187	-0,251	0,300
6.	ZW	0,106	-0,666	-0,02	0,481	0,160	1,000	0,124	0,180	0,170	-0,161	0,049
7.	EPL	0,092	-0,476	-0,00	0,147	0,107	0,124	1,000	-0,343	0,000	0,075	0,076
8.	ARP	0,006	0,390	-0,06	-0,026	-0,080	0,180	-0,343	1,000	0,115	-0,144	-0,059
9.	PAND	-0,666	-0,102	-0,01	0,075	0,187	0,170	0,000	0,115	1,000	-0,198	0,171
10.	SB	0,088	-0,109	0,095	-0,234	-0,251	-0,161	0,075	-0,144	-0,198	1,000	-0,438
11.	WP	-0,102	-0,091	0,369	0,325	0,300	0,049	0,076	-0,059	0,171	-0,438	1,000

Source: *Authors' calculations.*

Table 13. *Selected descriptive statistics of explanatory variables*

No.	Variables	N valid	Mean	Dev. Std	Variation coefficient
1.	*PKB*	88	103,07	2,86	2,78
2.	*ZT*	88	9,28	7,35	79,20
3.	*ZNP*	88	7,93	2,28	28,76
4.	*INW*	88	22,14	3,28	14,82
5.	*WW*	88	42,85	5,84	13,64
6.	*ZW*	88	31,84	1,94	6,09
7.	*SB*	88	7,68	3,28	42,66
8.	*WP*	88	65,08	19,21	29,52

Source: *Authors' calculations.*