

YOUTH UNEMPLOYMENT IN BULGARIA AND OTHER COUNTRIES OF CENTRAL AND EASTERN EUROPE

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Abstract

This paper aims to assess the relationship between GDP growth and changes in youth unemployment in Bulgaria and other countries of Central and Eastern Europe during 2000–2023. The study empirically verifies Okun's Law in a cohort-based approach, disaggregated by age groups (15–74, 15–29, 15–24) and gender. The analysis is based on Eurostat panel data covering 11 countries in the region, with a separate model estimated for Bulgaria. To ensure the robustness of the estimates, the study employs outlier-resistant techniques and nonparametric bootstrap methods. The results confirm a negative relationship between economic growth and youth unemployment dynamics. In the pooled model for the 11 countries, the Okun coefficient for the total population (15–74) was -0.22 , and as high as -0.51 for the 15–24 age group. In the Bulgarian model, the relationship proved even stronger: -0.27 for the total population and -0.70 for the youngest workers, with young men showing the highest sensitivity to GDP fluctuations (-0.74).

Keywords: youth unemployment, Okun's law, Bulgaria, Central and Eastern Europe, robust regression

1. INTRODUCTION

Central and Eastern European labour markets have undergone several transformations in the recent decades. Although unemployment rates have generally shown a downward trend, it is essential to note that specific segments of the labour force continue to experience relatively high unemployment levels. In many Central and Eastern European (CEE) countries, including Bulgaria, youth unemployment among individuals aged 15–24 has consistently remained significantly higher than the unemployment rate for the total population.

The extent of unemployment, including youth unemployment, depends on various economic, social, demographic, and institutional factors. The literature on this subject is extensive, particularly on macroeconomic determinants. Economic theory highlights the central role played by the level and fluctuations of output in the economy. This idea was formalised by Arthur Okun, who estimated a statistical relationship between changes in the unemployment rate and the output growth rate in the U.S. economy. This relationship is now widely known in economic literature as Okun's Law.

The present paper examines the phenomenon of youth unemployment in CEE countries, with a particular focus on Bulgaria. The analysis covers the period 2000–2023 and also includes the following countries: Czechia, Estonia, Croatia, Lithuania, Latvia, Poland, Romania, Slovakia, Slovenia, and Hungary. The main objective is to identify cross-country differences in youth unemployment rates and to estimate the impact of GDP fluctuations on the dynamics of youth unemployment, particularly assessing whether Okun's Law holds in the case of young people entering the labour market.

The structure of the article is as follows. Section 2 reviews existing studies on unemployment in Central and Eastern Europe, focusing on youth unemployment. Section 3 presents the data sources and research methodology. Section 4 discusses the trends in youth unemployment, in its primary macroeconomic determinant, and youth unemployment rankings. Section 5 introduces the econometric models used to assess the role of GDP fluctuations in shaping youth unemployment rates in Bulgaria and other CEE countries. Finally, Section 6 outlines the key conclusions drawn from the empirical analyses.

2. LITERATURE REVIEW

Labour market analyses in CEE countries have been conducted not only by researchers native to the region, but also by scholars from Western Europe, who turned their attention to these countries during the early stages of their systemic transformation.

Trends in unemployment rates in CEE countries between 2004 and 2013 were examined by Kwiatkowski and Kucharski (2014). In their study, the authors decomposed changes in unemployment rates, distinguishing the roles of demand-side factors related to employment rates and supply-side factors associated with labour force participation. Their findings indicate that unemployment declined primarily due to rising employment rates during economic expansion (2004–2008). In contrast, during the global financial crisis of 2008–2010, unemployment increased, particularly in the Baltic states, mainly due to falling employment levels. However, this increase was partially mitigated by decreased labour force participation rates.

Hutengs and Stadtmann (2013) discussed the development of youth unemployment in CEE countries compared to the EU-15. They calculated Okun coefficients for different age cohorts. They found that the impact of economic growth on youth unemployment (ages 15–24) was significantly negative and notably more substantial than for older populations.

Soylu, Çakmak, and Okur (2018) conducted a panel data analysis of Eastern European countries from 1992 to 2014 to test Okun's Law. Their findings confirmed a negative relationship between unemployment and economic growth, indicating that a 1% increase in GDP reduced unemployment by approximately 0.08%.

Analyses focusing specifically on Bulgaria highlight institutional and structural determinants of labour market performance. Ivanov (2019) pointed to the low level of effective employment, the high prevalence of informal work, and the weak integration of the education system with labour market demands. Arabska (2016) underscored inconsistencies between employment strategies and sustainable development goals. She emphasised barriers to labour market activation resulting from skill mismatches and the underperformance of regional support systems. These structural issues are further confirmed in Dimitrov's (2012) analysis, which identified poor job quality, lack of coordination between education and employment policies, and limited effectiveness of activation instruments as key factors contributing to youth unemployment. Vutsova and Arabadzhieva (2021) stressed that the high level of youth unemployment in Bulgaria stems from systemic inadequacies, the absence of flexible entry paths into the labour market, limited access to internships and apprenticeships, and institutional barriers to occupational mobility. In a subsequent publication, Arabadzhieva and Vutsova (2022) expanded their comparative analysis to include Romania and Serbia, exploring youth unemployment trends in a broader Eastern European context.

3. DATA AND METHODOLOGY

The empirical study presented in this article is based on annual cohort data for Bulgaria and a panel dataset comprising 11 Central and Eastern European (CEE) countries over 2000–2023. The data originate from the Eurostat database and include annual unemployment rates for three age cohorts: 15–24, 15–29, and 15–74 years. These data are disaggregated by gender: female, male, and total population and accompanied by annual real GDP growth rates expressed in percentage terms. The dataset for the pooled model takes the form of a balanced panel, with the cross-sectional unit denoted by country i ($i = 1, \dots, 11$) and the time unit by calendar year t ($t = 2000, \dots, 2023$).

The study includes both nonparametric and parametric analyses. The nonparametric part explores long-term trends in total and youth unemployment (ages 15–24) in Bulgaria and the other examined countries. It also compares Bulgaria's relative position in the youth unemployment rankings. The analysis also investigates the relationship between youth and total unemployment rates in 2000 and 2023. Unemployment trends are examined in the context of real GDP growth over the period 2000–2023, divided into four sub-periods reflecting the phases of the economic cycle: 2000–2008 and 2014–2019 (periods of economic expansion), 2009–2013 (economic slowdown), 2020–2023 (disruptions related to

the COVID-19 pandemic and the war in Ukraine). The analyses are based on average annual GDP growth rates within these sub-periods.

The model-based section is founded on estimating a dynamic version of Okun's Law, in which the dependent variable is the annual change in the unemployment rate, and the independent variable is the annual GDP growth rate. The analysis covers both country-specific data for Bulgaria and pooled data for all 11 countries. Fixed effects are not included, and the models are estimated using robust regression techniques to account for the presence of outliers.

Separate models are estimated for each of the following age cohorts: 15–24, 15–29, and 15–74, with results disaggregated by gender. Thus, the model-based analysis includes individual estimations for Bulgaria and combined estimations for the regional panel of 11 countries.

The model is specified as follows:

$$\Delta U_{it} = a_i + \gamma_k \cdot \Delta Y_{it} + \varepsilon_{it} \quad (1)$$

Where:

$\Delta U_{it} = U_{it} - U_{i,t-1}$, is the annual change in the unemployment rate (in percentage points) in country i and year t . The first-difference transformation is applied separately for each country (panel structure clustered by "Country").

- U_{it} denotes the unemployment rate in country i in year t ,
- ΔY_{it} is the annual real GDP growth rate (in percent) in country i and year t
- a_i is the constant term (intercept),
- ε_{it} is the error term,
- γ_k is the Okun coefficient for age cohort k .

In the initial phase of the econometric analysis, the model was estimated using a fixed-effects specification LSDV (Least Squares Dummy Variables). Diagnostic tests, including the Jarque–Bera test (Jarque & Bera, 1980), the Breusch–Pagan test (Breusch & Pagan, 1979), and the Durbin–Watson test, indicated significant violations of classical regression assumptions: residuals were not normally distributed, the error term displayed heteroskedasticity, and there was evidence of positive autocorrelation.

A robust estimator was applied to address these violations in line with established methodological recommendations (Driscoll & Kraay, 1998; Beck & Katz, 1995). We employed Robust Linear Regression (RLM) as a corrective response using Huber's M-estimator (Huber, 1964). This method minimises a loss function that blends the properties of least squares and least absolute deviations estimators. The function behaves quadratically for small residuals, whereas for large residuals, it becomes linear. This structure reduces the influence of outliers and produces more stable parameter estimates (Rousseeuw & Leroy, 1987; Verardi & Croux, 2009).

From the empirical methodology perspective, using an RLM model constitutes a rational choice, particularly in the context of small- N panels, the presence of outliers, and heteroskedastic disturbances (Beck & Katz, 1995; Marcellino, 2006).

The loss function is formally defined as:

$$L_{\delta}(e_t) = \begin{cases} \frac{1}{2} e_t^2, & \text{dla } |e_t| \leq \delta, \\ \delta(|e_t| - \frac{1}{2}\delta), & \text{dla } |e_t| > \delta. \end{cases} \quad (2)$$

Where:

$L_{\delta}(e_t)$ is the loss function.

δ is the tuning (threshold) parameter.

e_t is the residual of the model.

A clustered bootstrap procedure was applied to increase the reliability of the estimates. Entire country level units were resampled with replacement, preserving the temporal structure of the panel within each country (panel-cluster resampling). For each replication, the Okun coefficient γ_k was re-estimated. Confidence intervals were constructed using the percentile bootstrap method based on 1,000 replications (2.5th and 97.5th percentiles). This approach accounted for temporal dependence within countries and improved the robustness of the estimation to heteroskedasticity and autocorrelation in panel data.

4. STYLISTED FACTS

The subject of the analysis in this article is the labour markets of 11 Central and Eastern European (CEE) countries, including Bulgaria, with particular attention paid to youth unemployment. In the final decade of the 20th century, these countries underwent a systemic transformation, shifting from centrally planned economies to market-oriented systems. All of them are now members of the European Union, having joined in successive enlargement rounds: in 2004 (the Visegrád Group, Baltic States, and Slovenia), in 2007 (Bulgaria and Romania), and in 2013 (Croatia).

Five countries from this group adopted the euro: Estonia in 2011, Latvia in 2014, Lithuania in 2015, Slovakia in 2009, and Slovenia in 2007. Additionally, the Czech Republic, Hungary, and Poland are members of the OECD.

These institutional transformations significantly affected their economies and labour markets. Structural shifts per the three-sector hypothesis accompanied the economic development processes. The relative importance of the primary sector (agriculture, forestry, and fisheries) declined, while the tertiary (services) sector gained prominence. Between 2000 and 2023, the share of the primary sector in GDP decreased across all analysed countries from 11.0% in Bulgaria in 2000 to 1.5% in Slovenia and 3.9% in Romania in 2023. At the same time, the share of the services sector increased, reaching between 44.4% in Slovakia and 64.5% in Estonia by 2023. In 2023, the relative contribution of the services sector to GDP exceeded that of the secondary sector (industry and construction) in all countries, except the Czech Republic and Slovakia, where industry remained the dominant sector. Similar structural shifts occurred in Bulgaria: between 2000 and 2023, the share of the primary sector fell from 11.0% to 2.5%, the secondary sector increased from 34.7% to 36.1%, and the services sector rose from 54.3% to 61.4% (Eurostat).

Figure 1 presents the trends in total unemployment and youth unemployment (ages 15–24) across the examined countries from 2000 to 2023. Several conclusions emerge from these graphs. Youth unemployment rates were significantly higher than total unemployment rates in all countries. For instance, in Bulgaria, the ratio of youth unemployment to total unemployment was 2.05 in 2000 and rose to 2.81 in 2023. The dynamics of both indicators followed similar patterns within each country, but the direction and magnitude of changes varied by subperiod. From 2000 to 2008, after an initial rise, unemployment rates declined significantly in most countries except Hungary and Romania, which experienced increases. From 2009 to 2013, both unemployment rates increased across all countries. Between 2014 and 2019, both indicators declined markedly. In 2020, the pandemic caused a sharp rise in unemployment across the region. In 2021–2023, most countries saw stabilisation at relatively low levels. However, this trend did not apply to Slovakia, Romania, Croatia, and Estonia, where youth unemployment remained nearly 20%. Over the analysed period, both unemployment rates displayed considerable volatility, but fluctuations in youth unemployment were markedly more pronounced than those in total unemployment.

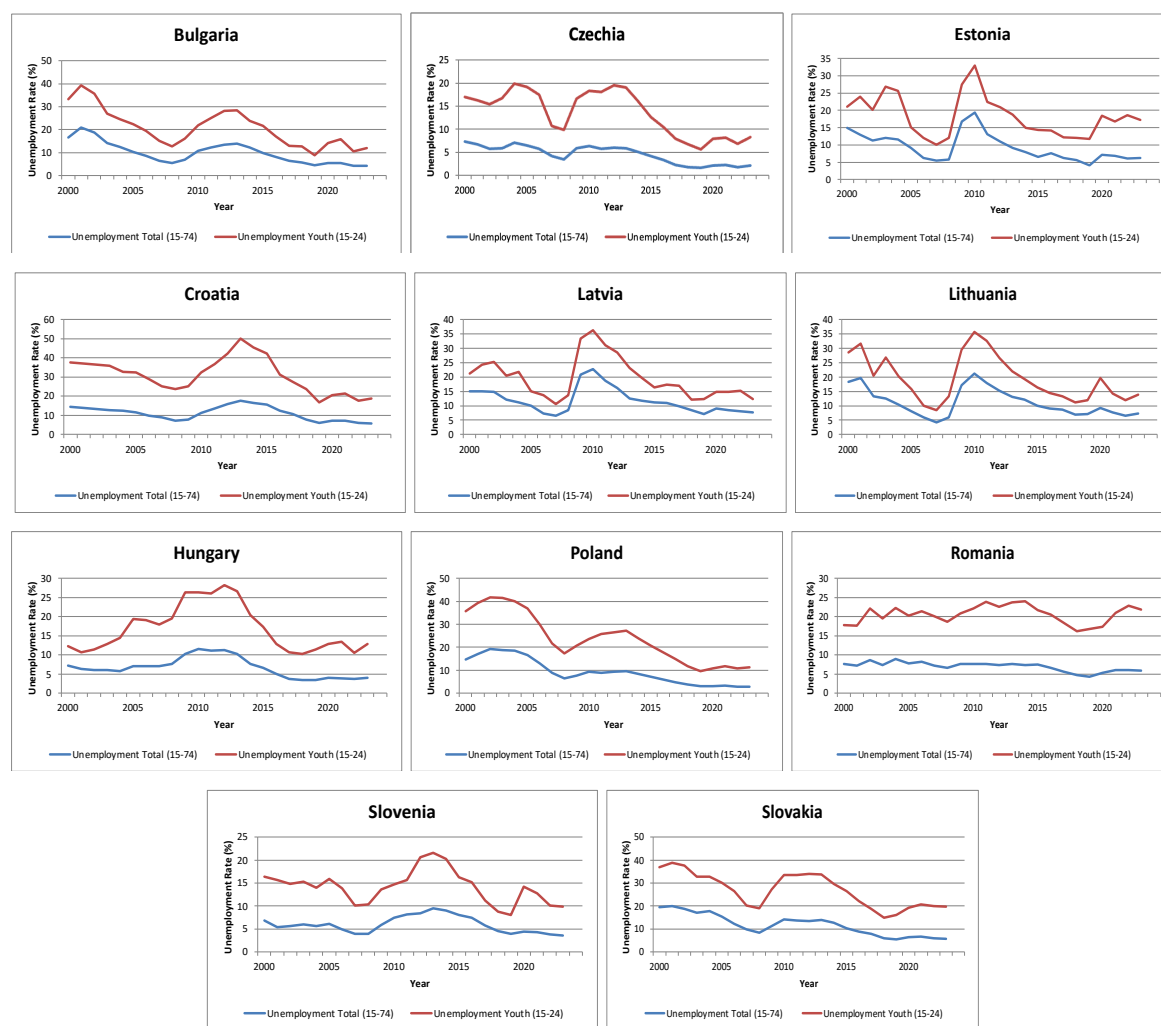


Fig. 1. Trends in youth and total unemployment rates in Central and Eastern European Countries, 2000–2023 (%)

Source: Author's elaboration based on Eurostat (2024), *Unemployment rates by age and sex – annual data* [lfsa_urgan], accessed on 23 April 2025 at: <https://ec.europa.eu/eurostat/>.

The trends in unemployment rates across the examined countries were undoubtedly related to fluctuations in real GDP growth. Information on GDP dynamics from 2000 to 2023 is presented in Figure 2, with the overall period divided into sub-periods based on the prevailing economic conditions. The data reveal considerable cyclical variation in economic activity across the region during the analysed period. 2000–2008 was a period of strong economic growth, with average annual GDP growth rates between 3.5% and 7% across most countries. In Bulgaria, the average annual growth reached 4.45%. This period of robust expansion contributed to a noticeable decline in unemployment rates. 2009–2013 marked a downturn associated with the global financial crisis. Most countries experienced negative average GDP growth rates (excluding Poland, Slovakia, and Bulgaria), accompanied by rising unemployment. 2014–2019 brought a renewed recovery, with average annual GDP growth between 2.6% and 4.4% (2.80% in Bulgaria). This was again associated with falling unemployment rates. 2020 saw the economic shock of the COVID-19 pandemic, which led to negative GDP growth in all countries and a general increase in unemployment. The impact in Bulgaria was especially severe, with a GDP contraction of –3.97%. A clear economic rebound was observed in the most recent period (2021–2023). Average annual GDP growth rates again turned positive, ranging from 1.1% in Estonia to 7.6% in Croatia, with Bulgaria recording a substantial recovery of 4.45%.

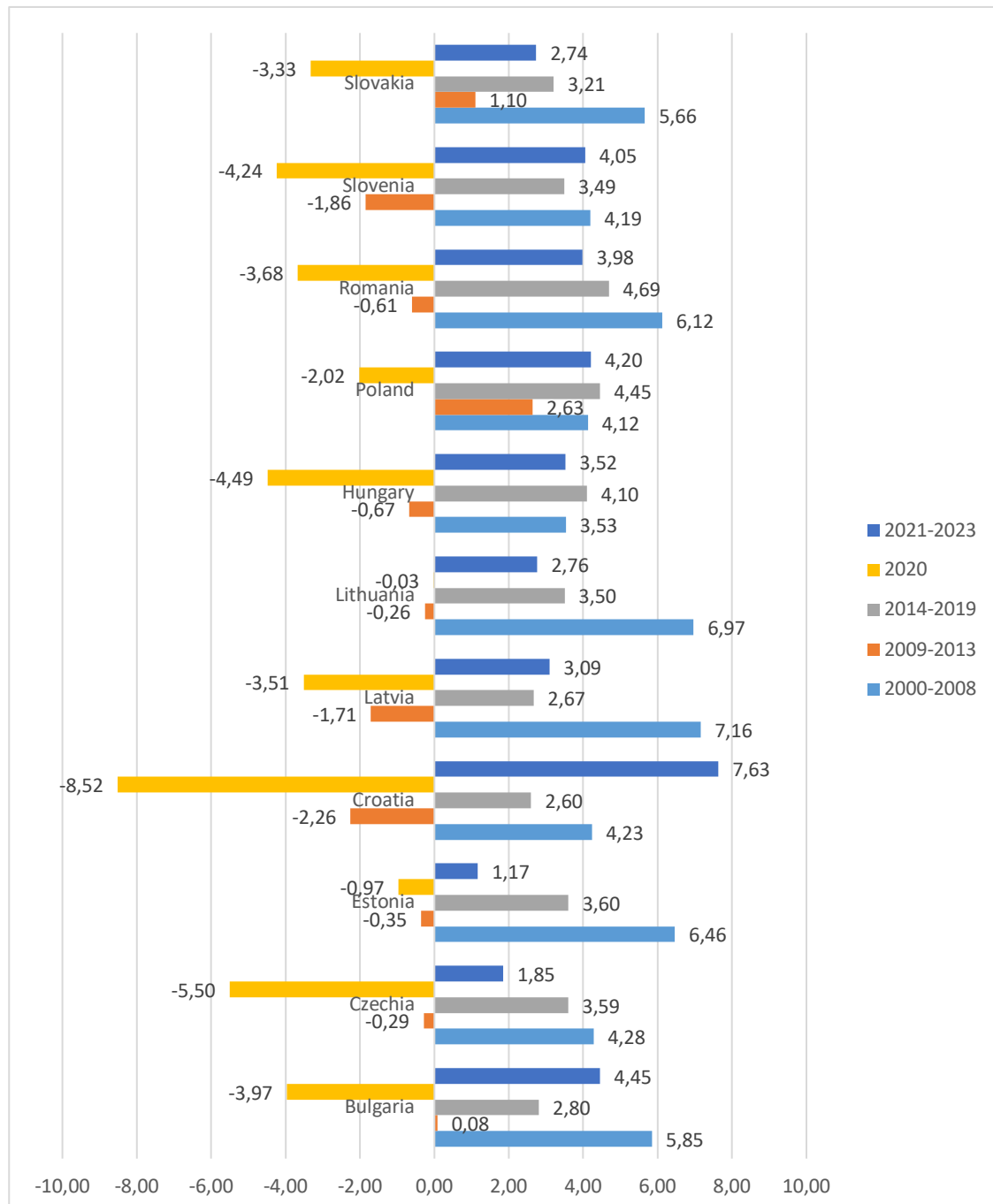


Fig. 2. Average annual real GDP growth rates by sub-periods in Central and Eastern European Countries, 2000–2023 (%)

Source: Author's elaboration based on Eurostat (2024), *Real GDP growth rate – volume [nama_10_gdp]*, accessed on 23 April 2025 at: <https://ec.europa.eu/eurostat/>.

Table 1 presents youth unemployment rates in the analysed countries for the years 2000 and 2023, along with ratios of youth to total unemployment. The data show that in all countries, youth unemployment rates in 2023 were significantly lower than in 2000.

The country ranking reveals that in 2000, the highest youth unemployment rates were observed in Croatia, Slovakia, and Poland, while the lowest were recorded in Hungary, Slovenia, and Czechia. By 2023, the ranking had shifted somewhat: the highest rates were now seen in Romania, Slovakia, and

Croatia, while the lowest were in Czechia, Slovenia, and Poland. Bulgaria improved its ranking from fourth highest in 2000 to eighth in 2023. These rankings suggest that Czechia and Slovenia have consistently maintained relatively low youth unemployment rates, whereas Slovakia and Croatia have faced persistently high levels. In both examined years, youth unemployment rates were considerably higher than total unemployment rates. The youth-to-total unemployment ratios ranged from 1.5 to 4.07, with all countries recording higher ratios in 2023 than in 2000.

Youth unemployment rates (%) and country rankings in 2000	Ratio of youth unemployment to total unemployment in 2000	Youth unemployment rates (%) and country rankings in 2023	Ratio of youth unemployment to total unemployment in 2023
Croatia - 37,5	2,14	Romania - 21,8	3,89
Slovakia - 36,9	1,93	Slovakia - 19,8	3,41
Poland - 35,7	2,17	Croatia - 18,9	3,09
Bulgaria - 33,3	2,05	Estonia - 17,3	2,70
Lithuania - 28,6	1,78	Lithuania -13,8	2,00
Latvia - 21,3	1,50	Hungary -12,8	3,12
Estonia - 21,1	1,57	Latvia - 12,3	1,89
Romania - 17,8	2,50	Bulgaria - 12,1	2,81
Czechia - 17,0	1,93	Poland - 11,4	4,07
Slovenia - 16,4	2,37	Slovenia - 9,9	2,67
Hungary - 12,3	1,86	Czechia - 8,3	3,19

Table 1. Country rankings by youth unemployment rate and youth-to-total unemployment ratio in 2000 and 2023

Source: Author's own elaboration based on Eurostat (2024), Unemployment rates by age and sex annual data [lfsa_urgan], European Commission. Available at: <https://ec.europa.eu/eurostat/> (Accessed: 23 April 2025).

The statistical data presented above clearly indicate that unemployment rates among young people are significantly higher than among the general population. This persistent trend can be attributed to various economic, social, institutional, and behavioural factors. One crucial determinant is the responsiveness of youth unemployment to GDP growth dynamics, which is the subject of the next section of this article.

Another important factor is the youth enrolment rate, which reflects the share of young people participating in formal education. Notably, the lowest enrolment rates in 2022 were observed in Romania (54.8%), Slovakia (59.2%), and Bulgaria (57.7%) (Eurostat), countries that also report relatively high youth unemployment rates. Conversely, Slovenia and Czechia, which maintain relatively low youth unemployment, report high youth enrolment rates of 75.4% and 69.7% respectively (Eurostat).

The structure of employment contracts in each country also plays a role. It is well established that labour turnover and the probability of job loss are much higher under temporary contracts (fixed-term and casual work) than permanent employment. Moreover, temporary jobs are disproportionately filled by young workers. In many CEE countries, the share of temporary employment has remained high, contributing to elevated youth unemployment rates, particularly in countries such as Poland (28.9% in 2014), Croatia (21.2% in 2015), Slovenia (19.4% in 2011), and Hungary (12.1% in 2013). Interestingly, in Bulgaria, the share of temporary employment has remained relatively low (4.3% in 2000 and just

2.7% in 2023), yet youth unemployment has remained persistently high. This suggests that other structural or institutional factors may also be in the Bulgarian labour market.

5. ECONOMETRIC RESULTS

5.1. Panel model for 11 Central and Eastern European Countries

Table 2 presents the results of a robust linear regression (RLM) with bootstrap standard errors, estimated for a balanced panel of eleven Central and Eastern European (CEE) countries over 2000–2023. The model was estimated separately for the total population (ages 15–74) and selected age cohorts: youth (15–24) and young adults (15–29), with additional disaggregation by gender. Estimated Okun coefficients and the corresponding t-statistics are reported in Table 2.

Cohort 15-74	γ (RLM)	const	t-stat	95% CI γ (bootstrap)
Total	-0.2203	0.2234	-13.059	[-0.269, -0.172]
Men	-0.2271	0.226	-12.18	[-0.285, -0.171]
Women	-0.2075	0.2453	-12.115	[-0.254, -0.163]
Cohort 15-29	γ (RLM)	const	t-stat	95% CI γ (bootstrap)
Total	-0.3769	0.5998	-12.146	[-0.501, -0.285]
Men	-0.3886	0.6316	-10.134	[-0.514, -0.275]
Women	-0.3129	0.4367	-9.192	[-0.382, -0.243]
Cohort 15-24	γ (RLM)	const	t-stat	95% CI γ (bootstrap)
Total	-0.5069	0.9376	-10.809	[-0.659, -0.362]
Men	-0.5113	1.021	-9.272	[-0.674, -0.343]
Women	-0.479	0.9467	-9.289	[-0.616, -0.358]

Table 2. Results of Robust Linear Regression (RLM) for 11 Central and Eastern European Countries, 2000–2023

Source: Author's own elaboration based on Eurostat (2024), GDP growth and unemployment data [nama_10_gdp, lfsa_organ].

The robust linear regression (RLM) analysis results reveal varying degrees of sensitivity of unemployment to economic growth across age cohorts and gender groups. All estimated Okun coefficients (γ) are negative, consistent with theoretical expectations and the classical formulation of Okun's Law, suggesting that improvements in macroeconomic performance are associated with reductions in unemployment rates. However, the magnitude of this effect differs significantly across demographic segments.

When examining the age cohorts, a transparent gradient emerges: unemployment responsiveness to GDP growth is stronger among younger groups. For the total population aged 15–74, the Okun coefficient is -0.2203 , implying that a one-percentage-point increase in real GDP growth is associated, on average, with a 0.22 percentage point decrease in the unemployment rate. Among young adults (15–29), the coefficient is -0.3769 ; for the youngest group (15–24), it reaches -0.5069 . This indicates a significantly greater vulnerability of youth unemployment to business cycle fluctuations.

This phenomenon may be explained by the greater employment instability experienced by young people, who are more likely to hold seasonal, short-term, or flexible jobs. Young workers are also often the last hired and the first fired in times of economic downturn. Labour markets typically offer youth limited

contractual protection or institutional support compared to more established workers. Moreover, employers tend to prioritise work experience in their hiring decisions, putting young, inexperienced candidates at a disadvantage during periods of uncertainty or economic slowdown.

Gender-specific results further reveal differentiated effects. In all age cohorts, unemployment among men appears slightly more responsive to GDP changes than women's. For the 15–74 group, the Okun coefficient is -0.2271 for men and -0.2075 for women. Among those aged 15–29, the coefficients are -0.3886 and -0.3129 , respectively, and for the youngest cohort (15–24), -0.5113 for men and -0.4790 for women.

These differences may be attributed to sectoral patterns of employment. Men are more likely to work in industries susceptible to business cycles, such as construction, manufacturing, and transportation. Conversely, women tend to be more concentrated in relatively stable sectors such as education, healthcare, and public administration. Other contributing factors include differences in labour force participation rates and caregiving responsibilities, which may provide women with greater employment stability and limit the flexibility of their labour market engagement.

All estimated coefficients were statistically validated using clustered bootstrap confidence intervals, which confirmed their significance. In none of the cases did the confidence interval include zero, indicating robust and persistent effects throughout the 2000–2023 period.

Overall, the findings support the relevance of Okun's Law in the context of Central and Eastern Europe, while highlighting substantial heterogeneity across age and gender groups. The strongest responsiveness to economic growth is observed among youth, especially young men, whereas women and the general population exhibit a more moderate reaction.

5.2. Cohort-Based Model for Bulgaria

The following analysis involved estimating a cohort-based panel model for Bulgaria, based on Eurostat data for 2000–2023. The population was divided into three age cohorts: 15–24, 15–29, and 15–74. Table 3 presents the estimated Okun coefficients for each age group, disaggregated by gender.

Cohort 15-74	γ (RLM)	const	t-stat	95% CI γ (bootstrap)
Total	-0,2732	0,1433	-3,684	[-0,432; -0,121]
Men	-0,3004	0,1666	-3,453	[-0,452; -0,161]
Women	-0,2381	0,1416	-3,144	[-0,398; -0,114]
Cohort 15-29	γ (RLM)	const	t-stat	95% CI γ (bootstrap)
Total	-0,4421	0,4556	-3,056	[-0,660; -0,074]
Men	-0,4440	0,3873	-2,666	[-0,731; -0,114]
Women	-0,4497	0,6398	-2,427	[-0,700; -0,169]
Cohort 15-24	γ (RLM)	const	t-stat	95% CI γ (bootstrap)
Total	-0,7001	1,2126	-2,563	[-1,030; -0,260]
Men	-0,7393	1,3809	-2,774	[-1,115; -0,207]
Women	-0,6012	0,9725	-2,297	[-0,997; -0,193]

Table 3. Results of Robust Linear Regression (RLM) for Bulgaria, 2000–2023

Source: Author's own elaboration based on Eurostat (2024), GDP growth and unemployment data [nama_10_gdp, lfsa_organ].

The cohort-based robust linear regression (RLM) results for Bulgaria over the period 2000–2023 confirm a strong and statistically significant inverse relationship between real GDP growth and changes in the unemployment rate. All estimated Okun coefficients (γ) are negative and statistically significant at the 5% level ($\alpha = 0.05$), confirming the presence of an Okun-type effect in the Bulgarian labour market. At the same time, the strength of this relationship varies notably across age and gender groups, and its intensity is comparable to or stronger than the regional average for Central and Eastern Europe.

For the total population aged 15–74, the estimated Okun coefficient is -0.2732 . This implies that a 1 1-percentage-point increase in real GDP growth is associated, on average, with a 0.27 percentage-point decrease in the unemployment rate. This response is stronger than the pooled model result for the region (-0.2203), indicating that the Bulgarian labour market may be more sensitive to business cycle fluctuations. This may reflect structural vulnerabilities, such as weaker labour market protections, limited development of the public services sector, and lower institutional flexibility compared to neighbouring countries.

When disaggregated by gender, male unemployment is more responsive to GDP growth ($\gamma = -0.3004$) than female unemployment ($\gamma = -0.2381$), which aligns with the regional pattern. This difference may stem from occupational sector composition, as men are often employed in cyclical sectors such as construction, heavy industry, and transport. At the same time, women are more likely to work in more stable sectors such as education, healthcare, and public administration. Nonetheless, the negative relationship is also strong and statistically significant among women, underscoring the general macroeconomic vulnerability of the Bulgarian labour market.

The most substantial Okun effect is observed among the youngest cohort (15–24 years), with a coefficient of -0.7001 well below the regional average of -0.5069 . This suggests that Bulgarian youth are especially exposed to economic fluctuations. The effect is strong for both young men ($\gamma = -0.7393$) and young women ($\gamma = -0.6012$), with the absolute value of the coefficient being significantly larger for men. This confirms that young males in Bulgaria are the most vulnerable group in the labour market.

Several structural factors may explain this exceptional sensitivity: low tertiary enrolment rates among young adults in Bulgaria limit their access to stable, high-skill employment, the segment of temporary and flexible employment is underdeveloped, reducing the ability of youth to enter the labour market smoothly during periods of economic expansion, lack of work experience, often required by employers, remains a significant barrier to labour market entry for young people entering for the first time.

All estimated γ coefficients are supported by clustered bootstrap confidence intervals that do not include zero, confirming their statistical significance. It can thus be stated with a high degree of confidence that economic growth reduces unemployment in Bulgaria. However, the elasticity of this relationship varies significantly across age and gender cohorts.

6. CONCLUSIONS

The analyses that were conducted allow for the formulation of several key conclusions.

First, in all analysed Central and Eastern European (CEE) countries, youth unemployment rates (15–24 age group) were significantly higher than total unemployment rates. Moreover, youth unemployment exhibited substantially greater volatility over time.

Second, youth unemployment rates vary considerably across the region. Country-level rankings show that Czechia and Slovenia consistently maintain relatively low levels of youth unemployment, while relatively high levels characterise Slovakia and Croatia. Notably, Bulgaria improved its ranking position in 2023 compared to 2000.

Third, the evolution of unemployment rates between 2000 and 2023 was closely linked to GDP growth dynamics. The periods 2000–2008 and 2014–2019 were marked by favourable macroeconomic conditions and high growth rates, accompanied by pronounced declines in unemployment. In contrast, 2009–2013 saw economic deterioration related to the global financial crisis, reflected in rising

unemployment. The year 2020 brought the impact of the COVID-19 pandemic, with negative GDP growth and rising unemployment recorded across most countries in the region.

Fourth, the econometric analysis of the pooled model for 11 CEE countries indicates that higher GDP growth rates are associated with declining unemployment across all demographic groups. The estimated parameters are consistently negative, confirming the validity of Okun's Law in these economies. Additionally, the magnitude of the effect varies across age cohorts, indicating differentiated sensitivity of unemployment to output fluctuations.

Fifth, the highest responsiveness of unemployment to GDP changes is observed among the youngest age group (15–24), especially among men. This effect diminishes with age, suggesting increasing job stability among older groups. Gender differences are noticeable but tend to narrow in older age cohorts. The exceptionally high sensitivity of youth unemployment can be attributed to the high prevalence of temporary employment among youth, limited work experience, and greater occupational mobility.

Sixth, the cohort-based model for Bulgaria confirms a clear negative relationship between economic growth and unemployment across all age cohorts. The most substantial effect is recorded for the 15–24 age group, with diminishing magnitude in older groups. This reflects both the vulnerability of youth to economic fluctuations and the greater occupational stability of older individuals. According to the estimated coefficient for the youngest group, a 1-percentage-point increase in GDP growth in Bulgaria reduces youth unemployment by 0.7 percentage points.

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