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PUBLIC DEBT-UNEMPLOYMENT NEXUS IN SOUTHEAST EUROPE COUNTRIES

ODNOS IZMEĐU JAVNOG DUGA I NEZAPOSLENOSTI U ZEMLJAMA JUGOISTOČNE EVROPE

Summary: *The examination of the relationship between public debt and unemployment is of crucial importance for understanding macroeconomic dynamics and for designing sustainable economic policies. In recent decades, the countries of Southeast Europe (SEE) have faced a dual challenge: persistently high unemployment rates and rising levels of public debt. This paper analyzes the causal relationship between public debt and unemployment in SEE countries over the period 2004–2023, employing correlation and panel regression analysis. The study utilizes annual data spanning 20 years and covering eight SEE countries (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, North Macedonia, Romania, and Serbia). Empirical findings indicate a significant positive association between the growth of public debt and unemployment, particularly in the aftermath of the global financial crisis. The results underscore the need for careful fiscal policy balancing in order to mitigate the adverse effects of high indebtedness on labor markets in developing economies.*
Keywords: *public debt; unemployment; Southeast Europe; panel analysis; fiscal policy*
JEL Classification: *O40, F34*

Rezime: *Ispitivanje odnosa između javnog duga i nezaposlenosti od ključne je važnosti za razumijevanje makroekonomske dinamike i za dizajniranje održivih ekonomskih politika. Posljednjih decenija, zemlje jugoistočne Evrope (JIE) suočile su se s dvostrukim izazovom: uporno visokim stopama nezaposlenosti i rastućim nivoima javnog duga. Ovaj rad analizira uzročno-posljedičnu vezu između javnog duga i nezaposlenosti u zemljama JIE u periodu 2004–2023, koristeći korelacijsku i panel regresijsku analizu. Studija koristi godišnje podatke koji obuhvataju 20 godina i obuhvataju osam zemalja JIE (Albaniju, Bosnu i Hercegovinu, Bugarsku, Hrvatsku, Grčku, Sjevernu Makedoniju, Rumuniju i Srbiju). Empirijski nalazi ukazuju na značajnu pozitivnu povezanost između rasta javnog duga i nezaposlenosti, posebno nakon globalne finansijske krize. Rezultati naglašavaju potrebu za pažljivim uravnoteženjem fiskalne politike kako bi se ublažili negativni efekti visoke zaduženosti na tržišta rada u zemljama u razvoju.*
Ključne riječi: *javni dug; nezaposlenost; Jugoistočna Evropa; panel analiza; fiskalna politika*
JEL kasifikacija: *O40, F34*

1. INTRODUCTION

Public debt represents the accumulation of a government's obligations to both domestic and foreign creditors, while unemployment reflects structural weaknesses in the labor market and directly affects social stability and economic growth. A high level of public debt may constrain the government's fiscal space, reduce its capacity to invest in productive sectors, and increase dependence on international financial institutions. Simultaneously, rising unemployment generates lower aggregate demand, social tensions, and long-term consequences for human capital. When these factors are analyzed jointly, a complex relationship emerges in which fiscal policy and labor market dynamics may interact in either mutually reinforcing or mutually restrictive ways.

For developing and transitional economies, such as the countries of Southeast Europe (SEE), this line of research is particularly important. A high unemployment rate combined with rising public debt can lead to the so-called "debt-unemployment spiral," in which declining tax revenues and increased social expenditures place additional strain on the budget, ultimately resulting in further borrowing. Analyzing this relationship enables a deeper understanding of the limits of fiscal sustainability and the design of policies that balance the need for economic growth, social protection, and macroeconomic stability.

Thus, the study of public debt and unemployment contributes not only to academic knowledge but also holds direct practical value: it assists policymakers in making evidence-based decisions, helps investors assess risk, and enables the general public to better understand the socio-economic challenges their countries face. The economic challenges experienced by SEE countries in recent decades have been shaped by a dual pressure: high public debt and persistently elevated unemployment rates. The post-1990 transition period was marked by structural reforms, privatization, and integration into European economic frameworks. However, the 2008 global financial crisis and the subsequent eurozone debt crisis significantly impacted the region, deepening fiscal deficits and increasing debt levels. The COVID-19 pandemic further intensified fiscal pressures, while lockdowns and reduced economic activity led to a surge in unemployment.

Public debt is often used as a fiscal instrument to stabilize the economy, but in cases of inefficient management, it can have counterproductive effects – particularly on the labor market. This study is based on the premise that public debt, although a necessary tool of economic policy, may have long-term adverse consequences for employment. The focus of the research is to quantify this relationship using panel analysis for SEE countries over the period 2004–2023. The subject of the study is the relationship between public debt and unemployment rates in SEE countries. The aim of this paper is to empirically examine whether a statistically significant relationship exists between the level of public debt and unemployment in the region. The importance of the research lies in providing empirical evidence to policymakers, offering insights into the potential negative effects of excessive borrowing on labor markets, and thereby contributing to the formulation of more sustainable fiscal policies in the region.

The central research question is: Does public debt significantly affect the unemployment rate in SEE countries? Additional research questions, which will be explored qualitatively, descriptively, and through comparative analysis (without inclusion in the regression model), include: Does the effect of debt differ between crisis and post-crisis periods? And does the institutional framework and EU membership mitigate or amplify this relationship?

The main research hypothesis is:

H1: An increase in public debt raises the unemployment rate in SEE countries.

In addition to this hypothesis, the study will attempt to validate two secondary hypotheses through descriptive, qualitative, and comparative analysis:

H2: The effect of public debt on unemployment is stronger during crisis periods.

H3: EU member states are more effective in mitigating the negative effects of public debt.

The significance of this research lies in its contribution of empirical evidence to both policymakers and the academic community, offering region-specific findings that may support the development of more sustainable fiscal policy frameworks.

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2. THEORETICAL FRAMEWORK

The relationship between public debt and unemployment has been the subject of longstanding theoretical debate, with various schools of economic thought offering divergent explanations. According to Keynesian theory (Keynes 1936), an increase in public debt during periods of recession may have a short-term positive effect on employment. Specifically, additional government spending financed through borrowing stimulates aggregate demand and output, leading to higher employment and reduced unemployment. This mechanism is grounded in the concept of the fiscal multiplier, which posits that each additional unit of public expenditure generates a proportionally greater increase in GDP, provided that economic resources are not fully utilized. However, these effects are typically limited to the short run, while in the long term, rising debt levels may produce adverse consequences (Jahan, Mahmud, and Papageorgiou 2014, 53).

In contrast, neoclassical theory emphasizes the negative implications of public debt through the so-called crowding-out effect (Dombi and Dedák 2019). An increase in government borrowing in financial markets reduces the availability of funds for the private sector, which in turn raises interest rates and diminishes the volume of private investment. While such borrowing may initially stimulate demand, the long-term outcome is reduced economic efficiency and rising unemployment. This effect is particularly pronounced in countries with underdeveloped financial markets and limited domestic savings capacity, whereas in economies with well-developed capital markets, its impact may be less significant.

Furthermore, the theory of fiscal sustainability highlights the importance of market stability and investor confidence (Salmon 2025). When public debt exceeds a certain threshold, investors may begin to question the government's ability to service its obligations in a timely manner. This skepticism can lead to an increase in risk premiums and interest rates, thereby placing additional strain on public finances and potentially triggering fiscal and macroeconomic crises. Such circumstances not only constrain the scope for effective economic policymaking but also exert a negative impact on economic activity and labor market performance. Accordingly, this theory emphasizes that debt sustainability depends on maintaining a balance between GDP growth, fiscal discipline, and the structure of public borrowing.

On the other hand, endogenous growth models offer a more nuanced perspective on the relationship between public debt and employment. These models posit that the impact of public debt depends primarily on its intended use. If borrowed funds are allocated to productive investments – such as education, research and development, or infrastructure – debt can stimulate productivity growth, enhance competitiveness, and generate new employment opportunities. However, if resources are directed toward non-productive purposes or solely toward current consumption, debt may merely increase fiscal risks without yielding long-term benefits. In other words, public debt is neither inherently positive nor negative; its effects depend on the quality of fiscal management and the broader institutional framework.

These theoretical perspectives demonstrate that the relationship between public debt and unemployment is not unambiguous, but rather depends on the time horizon, structural characteristics of the country, and the orientation of fiscal policy. While Keynesian theory emphasizes the short-term benefits of borrowing, neoclassical and fiscal sustainability approaches highlight the long-term risks. Endogenous growth models further underscore the importance of public debt management quality, suggesting that the purpose and efficiency of resource allocation ultimately determine its actual economic and social impact. In the context of Southeast European countries, elevated public debt levels may exacerbate unemployment – an effect that is empirically examined in this study.

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3. PREVIOUS RESEARCH

The impact of public debt on economic growth and labor market performance has been the subject of extensive empirical research worldwide. A review of prior studies facilitates a deeper understanding of the mechanisms through which debt influences employment and overall economic performance, as well as the identification of factors that amplify or mitigate these effects. In this section, we highlight several recent studies that examine the relationship between public debt and unemployment.

Checherita-Westphal and Rother (2010) conducted a panel analysis of 12 euro area countries over the period 1970–2009, employing a dynamic and nonlinear model. Their findings indicate that public debt exerts a negative effect on economic growth, particularly when the debt-to-GDP ratio exceeds the threshold of 90–100%. These results provide additional support for debt reduction strategies aimed at sustaining long-term growth prospects (Checherita-Westphal and Rother 2010). Similar conclusions are drawn by Reinhart and Rogoff (2010) in their global analysis of 44 countries spanning two centuries, which demonstrates that debt levels above 90% of GDP significantly reduce average growth rates and indirectly affect employment outcomes (Reinhart and Rogoff 2010, 573).

Kumar and Woo (2010), through a panel analysis of both advanced economies and emerging markets over the period 1970–2009, also emphasize the long-term negative impact of elevated public debt on economic growth, with the effect being less pronounced in developed economies. Their empirical findings suggest that, on average, a 10-percentage-point increase in the initial debt-to-GDP ratio is associated with a slowdown in annual per capita real GDP growth of approximately 0.2 percentage points (Kumar and Woo 2010, 1).

Mihaiu (2014) aimed to analyze public debt in EU member states through the lens of the "golden rule" of public borrowing. The study covers the period from 2008 to 2012 and examines the relationship between the level of public debt, public investment, unemployment, and economic growth, with the objective of identifying the patterns of debt utilization and its effects in the context of fiscal sustainability. The findings indicate an inverse relationship between public debt and public investment, suggesting that rising debt levels do not contribute to increased investment, but are instead accompanied by a decline in capital expenditures.

Mencinger, Aristovnik, and Verbic (2014) empirically investigate the transmission mechanism of the short-term impact of public debt on economic growth in European Union countries affected by the sovereign debt crisis. The analysis encompasses a sample of 25 EU member states and utilizes recent data, with particular attention given to the nonlinear and concave relationship between debt and growth. A panel growth model augmented with a debt variable is employed, accounting for issues of heterogeneity and endogeneity. The results confirm a statistically significant nonlinear effect of debt on per capita GDP growth. The threshold beyond which debt begins to exert a negative influence varies across country groups: for older member states, it ranges between 80% and 94% of GDP, while for newer member states, it is lower–approximately 53–54%. These findings suggest that the sustainable level of indebtedness is lower in newer member states, indicating their greater vulnerability to public debt pressures.

Coccia (2012) investigated the relationship between labor market dynamics and the drivers of technological innovation in European countries, incorporating public debt as a structural indicator. The findings reveal that public investment in education and the intensity of expenditure on research and development exert a positive influence on employment rates, whereas the growth of consolidated public debt negatively affects both employment and

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indicators of technological advancement. These empirical results provide a foundation for considering key implications for economic policy formulation.

Bexheti et al. (2020) analyzed the impact of public debt on economic growth in Western Balkan countries over the period 2003–2016. Their study identified a mild negative relationship between public debt and economic growth in the region, with a debt threshold of 50.87% of GDP beyond which the adverse effects on growth become more pronounced.

Babajić and Suljić (2024) conducted a comprehensive review of the SCOPUS database to summarize scholarly publications that examined the nexus between public debt and economic growth. The observed period spanned from 1984 to 2023, during which a total of 258 publications were identified. The highest number of studies was published in 2021 and 2022. Geographically, "countries with the largest number of published papers are: Germany (23), USA (23), South Africa (20), India (15), United Kingdom (15), etc." (Babajić and Suljić 2024, 38). In addition to the bibliometric analysis, the authors investigated the impact of public debt on economic growth in Bosnia and Herzegovina during the period 2008–2020. Their findings reveal a statistically significant and negative relationship between public debt and GDP growth. Moreover, they suggest that lower levels of indebtedness are conducive to stronger economic performance.

In its 2021 working paper focused on developing countries, the IMF emphasizes that fiscal shocks associated with high public debt further exacerbate labor market conditions. Within the European Union, Turrini (2013) demonstrated that fiscal consolidation can lead to an increase in short-term unemployment, particularly through reductions in public expenditure. Similarly, Cocozza et al. (2011) highlight a significant relationship between fiscal deficits and unemployment in the newer EU member states.

Alnaa and Matey (2023) analyze the dynamic relationship between external debt and unemployment in Sub-Saharan African countries, based on a sample of 25 states. The results indicate a significant correlation between rising external debt and increasing unemployment, largely attributed to the inadequate implementation of discretionary fiscal policies and inefficient management of borrowed funds. Furthermore, the findings suggest that the relationship between debt and unemployment is not linear, but rather exhibits more complex patterns across the observed economies.

Although there is extensive literature on the relationship between public debt and unemployment, the role of institutional quality in this nexus has largely been overlooked. Tang and Issahaku (2024) examine the impact of institutional quality on the link between public debt and unemployment in Sub-Saharan Africa, using panel data from 36 countries over the period 1996–2020. The study employs the System Generalized Method of Moments (SGMM) as its methodological framework. The results indicate that borrowing has not contributed to reducing unemployment, whereas institutional quality serves as a significant moderating factor that enables debt to be directed toward job creation. The authors conclude that in the absence of strong institutions, public debt does not support employment, and they recommend strengthening institutional capacities as a prerequisite for more effective debt utilization.

Sengupta, Talukder and Atal (2025) examine the relationship between public debt and unemployment by analyzing 162 countries, grouped into four continental regions (Africa, the Americas, the Asia-Pacific region, and Europe) and three income categories (low-, middle-, and high-income countries) over the period 1996–2019. Their findings indicate that a 1% increase in central government debt corresponds to a 1.6% rise in global unemployment (Sengupta, Talukder, and Atal 2025). Among the continents, the strongest impact is observed in Europe (4.1%), followed by Africa (0.9%), while the coefficients for the Americas and the Asia-Pacific region are not statistically significant. The dynamic assessment reveals that public debt is a significant predictor of unemployment across all regions.

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Finally, the World Bank's 2023 report on the Balkan region reveals a correlation between public expenditure and labor market conditions, suggesting that fiscal policy exerts a direct influence on employment and economic performance in the region.

All of these findings point to the existence of a negative impact of high public debt on economic growth and employment, with effects being amplified in the presence of fiscal shocks, weak institutional frameworks, and within countries with lower economic capacity. This theoretical and empirical evidence provides a foundation for further analysis of the mechanisms through which debt influences labor market dynamics and overall economic stability.

4. DATA AND METHODOLOGY

The study utilizes panel data for 10 Southeast European (SEE) countries: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, North Macedonia, Montenegro, Romania, Serbia, Kosovo*[1], and Greece, covering the period from 2004 to 2023. Due to data limitations, Montenegro and Kosovo* were excluded from further analysis. The data were obtained from the International Monetary Fund (IMF) database. Table 1 presents the research variables and their respective notations used in the model.

Table 1. Research Variables

Types of variables	Name of variable	Variable Labels
Dependent variable	unemployment rate (% of labor force)	UNEMP
Independent variable	public debt (% GDP)	DEBT
Control variables	GDP per capita	GDP
	inflation rate	INF

Source: Authors' creation

A fixed effects (FE) model was used due to the expected heterogeneity across countries. The model is as follows:

$$UNEMP_{it} = \beta_0 + \beta_1 DEBT_{it} + \beta_2 GDP_{it} + \beta_3 INF_{it} + \alpha_i + \varepsilon_{it} \qquad \text{(Formula 1)}$$

Where is it:
UNEMP – unemployment rate
DEBT – public debt
GDP – gross domestic product per capita (in thousands USD)
INF – inflation rate
β – coefficients
α_i *– non-territorial fixed component*
ε_{it} *– error*
i – observed SEE country (where is i = 1–8; where is it 1=Albania, 2=BiH,...)
t – time period (year) (where is t = 2004–2023)

The analysis was performed in STATA software. The following tests were applied:

- Hausman test – choosing between FE and RE models. The Hausman test rejects the null hypothesis that the random effects estimator is consistent ($p < 0.05$), indicating that the fixed effects model is the appropriate specification.
- Skewness/Kurtosis tests for Normality – for testing the normality of the distribution

[1] This designation is without prejudice to status and is in line with United Nations Security Council Resolution 1244 and the official position of Bosnia and Herzegovina.

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- Variance inflation factor – autocorrelation testing
- Breusch-Pagan / Cook-Weisberg test – heteroskedasticity check
- Levin-Lin-Chu test – stationarity check.

In this research, the first hypothesis (H1) is formally tested, which refers to the connection between public debt and the unemployment rate in the countries of Southeast Europe. The fixed effects regression model was applied to panel data for the period 2004–2023. Basic model assumptions, including multicollinearity, normality, and heteroskedasticity, were tested prior to estimation, and no serious problems were identified.

Additional research questions, addressing the intensity of effects during crisis and post-crisis periods (H2), as well as the role of institutional frameworks and European Union membership (H3), were examined qualitatively through descriptive and comparative analysis of available data. This approach ensures methodological consistency – the formal model is focused on the core relationship between public debt and unemployment, while the broader institutional and crisis-related context is explored descriptively and comparatively.

5. ANALYSIS RESULTS

Table 2 presents the basic results of descriptive statistics for the variables used in the analysis of Southeast European (SEE) countries. The table reveals a general heterogeneity among SEE countries, while a more detailed breakdown by country and year sheds light on specific trends. The average level of public debt during the observed period was 58.8% of GDP. However, the range is quite wide – from as low as 12.49% to as high as 226.65%, with a standard deviation of 45.3 –indicating substantial differences in indebtedness across countries. Some countries maintain relatively stable fiscal positions, while others are characterized by pronounced over-indebtedness.

In terms of country-specific debt levels, Greece represents the most extreme case. Its public debt ranged from 104.3% of GDP in 2004 to a record 226.6% in 2020, reflecting the financial and sovereign debt crisis that peaked between 2009 and 2015. On the other hand, the lowest debt level was recorded in Romania in 2008 (12.49% of GDP), during a period of strong economic growth prior to the global financial crisis. Bosnia and Herzegovina maintained moderate debt levels (around 25–35%) for an extended period, but experienced an upward trend after 2009, reaching a peak of 47.23% in 2014. A similar pattern is observed in Serbia, where debt exceeding 60% of GDP in 2004 declined by 2008, only to rise again and reach 70% in 2015. Albania also entered a zone of high indebtedness, with a steady increase from around 55% in the mid-2000s to over 74% in 2020–2021.

The average unemployment rate stands at 15.8%, which is significantly above the European Union average (5.6% in 2024) and the broader European average (3.6% in 2024), indicating a chronic labor market issue in the observed region. The minimum recorded value is 4.2%, while the maximum reaches 37.3%, with a standard deviation of 8.1 – highlighting deep structural disparities among Southeast European (SEE) countries. Some economies are closer to full employment, while others experience exceptionally high unemployment rates.

North Macedonia recorded the highest unemployment rates, exceeding 36% between 2004 and 2006, although the situation improved considerably by 2023 (13.1%). A similar pattern is observed in Bosnia and Herzegovina, where unemployment stood at 31.1% from 2004 to 2006 and gradually declined to 13.2% in 2023. Greece experienced a dramatic surge in unemployment following 2010 – from 9.6% in 2009 to a peak of 27.5% in 2013 – clearly reflecting the consequences of the economic crisis and austerity measures. In contrast, Bulgaria, Romania, and Croatia have shown a downward trend in unemployment over the

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past decade. Bulgaria reduced its rate from 12.2% in 2004 to 4.4% in 2023, while Romania fell below 5% as early as 2019.

GDP per capita averages USD 9.7 thousand, which is significantly below the average of developed European economies (USD 62.32 thousand in the EU in 2024). The lowest recorded value is USD 2.4 thousand, while the highest reaches USD 31.74 thousand, with a standard deviation of USD 6.3 thousand. These figures confirm the existence of a substantial gap in the level of economic development within the region itself. The highest value was recorded in Greece in 2008 (USD 31.7 thousand), while Albania had the lowest in 2004 (USD 2.4 thousand). However, Albania has made notable progress over the past 20 years, reaching USD 8.5 thousand in 2023. Croatia also experienced stable growth, increasing from USD 9.7 thousand in 2004 to USD 21.9 thousand in 2023, while Romania rose from USD 3.5 thousand in 2004 to USD 18.4 thousand in 2023. These trends clearly indicate a convergence of certain Southeast European countries toward the EU average.

Inflation averaged 3.55%, which falls within the range of moderate inflation, but was marked by considerable volatility. The minimum recorded value was -1.6% (deflation), while the maximum reached 16.3%, with a standard deviation of 3.8. These figures suggest that Southeast European (SEE) countries experienced episodes of macroeconomic instability during the observed period. The most volatile inflation rates were recorded in Serbia and Romania. In Serbia, inflation peaked at 16.3% in 2005, while Romania registered 11.9% in 2004. Both countries later experienced periods of deflation – Romania at -1.6% in 2016, Bulgaria at -1.6% in 2014, and Croatia at -0.6% in 2016.

In contrast, the entire region faced a strong inflationary shock in 2022, driven by global energy and food crises: Albania (6.7%), Bosnia and Herzegovina (14.0%), North Macedonia (14.2%), Romania (13.8%), Serbia (12.0%), Bulgaria (13.0%), Croatia (10.7%), and Greece (9.3%). This surge clearly demonstrates the vulnerability of SEE countries to global price disruptions and their dependence on energy imports.

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
debt	160	58.828	45.295	12.49	226.65
unemployment	160	15.789	8.109	4.2	37.3
gdp pc	160	9.705	6.295	2.4	31.74
inflation	160	3.554	3.802	-1.6	16.3

Source: Authors' creation

Overall, the presented statistics confirm the heterogeneity of Southeast European (SEE) countries. While some economies exhibit more stable macroeconomic performance, others face high public debt, structural unemployment issues, and inflation volatility – further underscoring the need for a comparative approach in economic analysis and policy design. In this context, the data reveal several key patterns:

1. Greece stands out due to its extremely high public debt and dramatic fluctuations in unemployment.
2. Bosnia and Herzegovina and North Macedonia have long struggled with chronically high unemployment, although recent trends indicate improvement.
3. Albania and Romania have achieved significant growth in GDP per capita, while Croatia and Bulgaria demonstrate a more stable convergence toward the EU average.
4. Inflation has fluctuated throughout the observed period, but the global crisis of 2022 exposed a shared vulnerability among all SEE countries.

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This heterogeneity clearly indicates that, although Southeast European (SEE) countries share certain similarities, their developmental trajectories and macroeconomic challenges remain distinct. This implies the need for tailored policy approaches rather than uniform regional solutions.

Following the descriptive statistics and the explanation of variable trends across countries and over time, a further data analysis was conducted to determine the intercorrelation among the observed variables. In this context, it was first necessary to assess whether the variables were stationary during the observed period. The Levin-Lin-Chu panel unit root test indicated that all variables were non-stationary, as the p-values were greater than or equal to 0.05, meaning the null hypothesis of non-stationarity could not be rejected. First differences were applied, and upon retesting, the variables were found to be stationary. The Levin–Lin–Chu test indicated that all observed variables are non-stationary in level, but stationary in the first difference. Given that the paper did not conduct panel cointegration testing, the empirical analysis based on the fixed-effects model in the first differences is interpreted exclusively as an analysis of the short-term dynamics between changes in public debt and unemployment. Accordingly, the results do not allow for conclusions to be drawn about the long-term relationships between the variables.

Table 3. Pairwise correlations

Variables	**(1)**	**(2)**	**(3)**	**(4)**
(1) d_debt	1.000			
(2) d_unemployment	0.308*	1.000		
(3) d_gdp_pc	-0.340*	-0.341*	1.000	
(4) d_inflation	-0.226*	-0.146	0.151	1.000

**** p<0.01, ** p<0.05, * p<0.1*

Source: Authors' creation

Table 3 presents the pairwise correlations among the observed variables: changes in public debt (d_debt), unemployment rate (d_unemployment), GDP per capita (d_gdp_pc), and inflation (d_inflation). The results indicate a positive and statistically significant relationship between changes in public debt and unemployment rate ($r = 0.308$, $p < 0.1$), suggesting that rising public debt is often accompanied by increasing unemployment. Conversely, changes in public debt show a negative and significant correlation with changes in GDP per capita ($r = -0.340$, $p < 0.1$), implying that debt accumulation may be associated with slower economic growth.

Additionally, a negative correlation is observed between changes in unemployment and GDP per capita ($r = -0.341$, $p < 0.1$), which aligns with theoretical expectations – employment growth typically coincides with increased economic output. Regarding inflation, it exhibits a negative but weaker association with changes in public debt ($r = -0.226$, $p < 0.1$), while its correlations with other variables (unemployment and GDP per capita) are low and statistically insignificant. This suggests that inflation, within the observed sample, has a limited connection to other macroeconomic indicators.

Overall, the correlation results highlight that the relationships between public debt, unemployment, and economic growth are the most pronounced and statistically significant, whereas inflation appears to be less strongly linked to the other variables.

For the purposes of this research, a panel regression framework was employed, allowing for the simultaneous observation of variability across countries and over time. Both fixed effects (FE) and random effects (RE) models were tested in the analysis. The choice between fixed effects and random effects specifications was formally assessed using the Hausman test. The results indicate a statistically significant difference between the FE and RE

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estimators ($p = 0.038 < 0.05$), supporting the use of the fixed effects model. The Breusch–Pagan Lagrangian multiplier test was applied solely to reject the pooled OLS specification in favor of a panel framework. This outcome aligns with the initial assumption, given the heterogeneity among countries.

The fixed effects approach enables control for country-specific characteristics that remain constant over time – such as geographic location, institutional legacy, and cultural attributes – which could otherwise influence the estimates. Consequently, the estimated coefficients in this model reflect the pure relationship between changes in public debt and unemployment within countries.

To ensure the validity of the model, additional diagnostic tests were conducted. First, the normality of residuals was examined using the Skewness/Kurtosis tests for Normality, confirming that the error distribution does not significantly deviate from normality, thereby enhancing the reliability of the estimates. Next, multicollinearity among explanatory variables was assessed through a correlation matrix and evaluation of the Variance Inflation Factor (VIF), with no issues detected that could compromise coefficient stability. The Breusch-Pagan test for heteroskedasticity was also performed, and the results did not indicate significant signs of heteroskedasticity.

Based on all the diagnostic tests conducted, it can be concluded that the selected fixed effects model is stable and suitable for empirical analysis of the relationship between public debt, unemployment, and additional macroeconomic variables in Southeast European countries.

Table 4. Regression results (FE model)

d_unemployment	**Coef.**	**St.Err.**	**t-value**	**p-value**	**[95% Conf**	**Interval]**	**Sig**
d_debt	.047	.02	2.34	.050	0	.093	*
d_gdp_pc	-.429	.094	-4.57	.003	-.651	-.207	***
d_inflation	-.025	.03	-0.81	.444	-.097	.047	
Constant	-.364	.063	-5.81	.001	-.513	-.216	***

Mean dependent var	-0.515	SD dependent var	1.727
R-squared	0.171	Number of obs	152
F-test	168.783	Prob > F	0.000
Akaike crit. (AIC)	565.628	Bayesian crit. (BIC)	574.700

**** p<.01, ** p<.05, * p<.1*

Source: Authors' creation

The results of the fixed effects panel regression are presented in Table 4. The dependent variable is the change in the unemployment rate (d_unemployment), while the explanatory variables include changes in public debt (d_debt), GDP per capita (d_gdp_pc), and inflation (d_inflation).

The coefficient for public debt (d_debt) is positive (0.047) and statistically significant at the 10% level ($p = 0.050$)., indicating that, in the short run, increases in public debt are associated with rising unemployment rates. This result reflects short-term fiscal and macroeconomic adjustments within countries rather than long-term structural effects.

The coefficient for GDP per capita is −0.429 and is statistically significant at the 1% level ($p = 0.003$). The negative sign indicates that an increase in economic output per capita reduces the unemployment rate, which is consistent with economic theory and empirical expectations. In other words, economic growth contributes to improved labor market conditions.

The coefficient for inflation is −0.025, but it is not statistically significant ($p = 0.444$). This indicates that inflation during the observed period did not exhibit a clear or stable relationship with the unemployment rate. This finding is somewhat expected, given that

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inflation in the region was largely driven by external shocks (e.g., global energy prices) and did not directly reflect labor market dynamics.

The constant term is negative (−0.364) and statistically significant ($p < 0.01$), indicating that there are additional factors influencing unemployment that are not captured by the model.

The R-squared value = 0.171 indicates that the model explains about 17% of the variation in unemployment within countries over time. Although this percentage may seem modest, it is common for macroeconomic panel studies where complex relationships between fundamental economic variables are analyzed.

The F test is 168.783, $p = 0.000 < 0.01$, confirming that the model as a whole is statistically significant, that is, that it explains the variation of the dependent variable better than the model without predictors.

The results of the FE model confirm that public debt has a statistically significant and positive impact on the unemployment rate, while GDP per capita growth significantly reduces unemployment. Inflation, on the other hand, does not show a stable relationship with the labor market. These findings highlight the need for careful management of fiscal policy in SEE countries: although public debt is often used to mitigate crises, its excessive increase can further strain the labor market.

6. DISCUSSION OF EMPIRICAL RESEARCH RESULTS

It is important to emphasize that the interpretation of the empirical results refers to the short-term relationships between changes in public debt and unemployment, given that the analysis was conducted in first differences without testing long-term cointegration. The results confirm that public debt has a significant and positive impact on unemployment in the region. This relationship is particularly pronounced during crisis years (2008–2012 and 2020), when countries adopted expansionary fiscal policies without achieving effective labor market outcomes – increasing public spending without a proportional reduction in unemployment. These findings are consistent with the results of Sengupta, Talukder and Atal (2025), but diverge from the Keynesian perspective, which would anticipate the opposite effect.

The correlation results provide valuable insight into the interrelationships among the key observed macroeconomic variables during the analyzed period. Particularly noteworthy is the positive and statistically significant association between changes in public debt and changes in unemployment ($r = 0.308$). This finding suggests that, in many cases, increases in public debt occur alongside rising unemployment rates. Although correlation analysis does not permit conclusions about causality, the result clearly indicates that fiscal pressures and labor market dynamics are closely linked and should be considered jointly in economic analysis and policy design.

Another important finding is the negative correlation between public debt and GDP per capita ($r = −0.340$). This result suggests that rising debt levels often coincide with declining economic growth. In other words, higher borrowing tends to occur during periods of economic weakness, further underscoring the vulnerability of countries with elevated levels of public debt.

The negative correlation between unemployment and GDP per capita ($r = −0.341$) confirms one of the fundamental macroeconomic principles: economic growth tends to reduce unemployment, whereas stagnation or recession leads to deteriorating labor market conditions. This result aligns with theoretical expectations and provides additional confirmation of the validity of the data and methods used.

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With regard to inflation, its correlations with other variables are weak and statistically insignificant. This indicates that, within the observed sample, inflation does not exhibit a clear or stable relationship with public debt, unemployment, or GDP per capita. Such a finding may reflect the specific characteristics of the analyzed period, marked by various crisis episodes, during which inflation did not consistently follow the typical patterns of movement observed in other macroeconomic indicators.

In a broader sense, these findings confirm that public debt cannot be viewed in isolation. Its dynamics are inextricably linked to labor market developments and economic growth. Although debt accumulation often represents a necessary response to economic shocks, it also serves as an indicator of deteriorating macroeconomic performance. Therefore, fiscal policy focused solely on debt control should not overlook its implications for employment and citizens' living standards. The results are consistent with the findings of Alnaa and Matey (2023), while also reflecting regional specificities.

Empirical research indicates that public debt in Southeast European (SEE) countries is significantly associated with short-term increases in unemployment, with the adverse effects being particularly pronounced during crisis years. A detailed country-level analysis provides insight into the specific characteristics and mechanisms through which public debt is associated with short-term deterioration in labor market conditions:

Greece

Greece was the most severely affected by the debt crisis during the period 2010–2015. Public debt exceeded 180% of GDP, leading to a record unemployment rate of 27% in 2013. Our empirical findings strongly confirm this situation, indicating a direct correlation between high debt levels and a dramatic deterioration in labor market conditions, particularly among youth and in the construction sector. The crisis also revealed the limitations of fiscal policy under extreme debt conditions, where reductions in public spending further exacerbated unemployment.

Croatia

Following its accession to the EU in 2013, Croatia experienced a rise in public debt after 2008, accompanied by high youth unemployment. However, EU membership enabled access to structural and cohesion funds, which contributed to a reduction in unemployment and a gradual recovery of the labor market. This case highlights the importance of institutional support and international assistance in mitigating the adverse effects of public debt on employment.

Romania and Bulgaria

Both countries recorded rapid economic growth that helped reduce unemployment, although public debt increased after 2009. The impact of public debt on the labor market was weaker than in Greece or Croatia, suggesting that strong economic growth and diversification can partially offset the negative consequences of high debt levels.

Serbia and Bosnia and Herzegovina

Both countries are characterized by persistently high unemployment. Fiscal expansion and increased public spending did not lead to significant reductions in unemployment, indicating the presence of structural labor market issues, including mismatches between education systems and labor market needs, labor market rigidity, and weak institutional frameworks.

Albania and North Macedonia

Although these countries have relatively lower levels of public debt, persistently high unemployment suggests that fiscal policy alone is insufficient to address labor market

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challenges. Structural reforms, institutional strengthening, and private sector development remain key factors for sustainable unemployment reduction.

Following the qualitative country analysis, panel models were applied to examine the relationships among the analyzed variables, with particular attention given to the choice between fixed and random effects models. The data analysis began with testing fundamental assumptions to ensure the validity of the results.

First, the normality of the data was assessed, and the distributions did not show significant deviations from normality, allowing for the continuation of regression analysis. Next, multicollinearity was examined using Variance Inflation Factor (VIF) values, with none of the included variables indicating a high degree of interdependence. Heteroskedasticity was also tested, and the results showed that residual variances remained approximately constant, with no significant deviations.

After confirming that no major issues were present regarding model assumptions, the Breusch and Pagan Lagrangian multiplier test was conducted to choose between fixed and random effects. Based on the test results, the fixed effects model was selected, as it demonstrated greater consistency and reliability compared to the random effects model. The application of the fixed effects model allowed for the elimination of unobservable characteristics that remain constant over time within the observed units, resulting in more precise estimates and more reliable interpretation of the relationships between variables.

The qualitative analysis further supports the findings of the regression model. The impact of public debt on unemployment was particularly pronounced during the global financial crisis (2008–2012) and the pandemic crisis (2020). In these periods, rising public debt was accompanied by increasing unemployment, consistent with the theory of pro-cyclical fiscal behavior during economic downturns.

Institutional frameworks and EU membership also emerge as significant factors. The cases of Croatia, Bulgaria, and Romania suggest that access to EU funds and institutional support can facilitate faster labor market recovery, while non-member countries such as Bosnia and Herzegovina, Serbia, and North Macedonia continue to experience chronically high unemployment rates. Although these effects were not formally tested in the regression model, qualitative indicators clearly suggest that institutional support mitigates the negative impact of public debt on labor market outcomes, in line with the findings of Tang and Issahaku (2024).

7. CONCLUSION AND RECOMMENDATIONS

This paper shows that there is a positive and significant relationship between public debt and unemployment in SEE. Although debt is often a necessary tool for economic stabilization, its excessive use can cause negative effects on the labor market (slow down the recovery of the labor market and increase the vulnerability of countries in periods of crisis). The results indicate the existence of a short-run positive association between changes in public debt and unemployment in Southeast European countries, while the analysis of long-run relationships remains beyond the scope of this study. Recommendations for the policies of developing countries, with special emphasis on SEE countries:

- Focus on productive investments that create jobs.
- Strengthen fiscal transparency and reduce unproductive spending.
- Use EU funds and international aid for structural reforms.
- Focus on debt sustainability while simultaneously creating new jobs.

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The results of the empirical analysis confirmed the basic research hypothesis - that the increase in public debt has a statistically significant effect on the growth of the short-term increases in unemployment rate in SEE countries. With this finding, the paper contributes to the literature that emphasizes the negative effects of public debt on the labor market in developing and transition countries. The remaining two research questions and hypotheses were not tested with a regression model, but were dealt with qualitatively through descriptive and comparative analysis. The results suggest that the short-term relationship between public debt and unemployment is stronger in crisis periods, and that institutional factors and EU membership moderate the negative effects of public debt. Although these findings cannot be considered formally confirmed, they represent an important direction for future research that would more deeply analyze the interaction between public debt, the labor market and the institutional framework in the region.

However, the research has certain limitations. Due to the lack of data, Kosovo* and Montenegro were not included in the analysis, which somewhat reduces the representativeness of the results. The model includes only basic macroeconomic variables (public debt, GDP per capita and inflation), while other important factors such as fiscal deficit or political stability are not included. The results refer exclusively to SEE countries and cannot be fully generalized to other regions.

Future research directions could include expanding the analysis to a larger number of countries and periods, introducing additional economic and institutional variables, and applying dynamic models such as GMM to reduce the endogeneity problem. Formal testing of the effects of crisis periods and institutional factors, including EU membership, would give an even deeper insight into the mechanisms through which public debt is associated the labor market. Future research could extend this framework by incorporating panel cointegration techniques and dynamic specifications in order to explore long-run interactions between public debt and unemployment.

Overall, the paper confirms the basic hypothesis (H1) and at the same time opens up space for additional studies. This achieves a balance between quantitative evidence and a broader qualitative understanding of the complex relationship between public debt and unemployment in SEE countries. These results offer a valuable contribution to the literature and at the same time open up space for future research that would more deeply analyze the interaction between public debt, the labor market, crisis periods and the institutional framework in the region. It should be emphasized that the findings of this study are limited to short-run relationships due to the use of first-differenced data and the absence of panel cointegration testing. Therefore, the results should be interpreted with caution and not as evidence of long-term causal effects.

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