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## Unemployment and Structural Inequality in Romania: A Macro-Level Perspective (2002–2024)

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**Abstract:** This study examines the macroeconomic determinants of unemployment in Romania between 2002 and 2024. It aims to identify structural patterns influencing labour market performance in a post-transition context, where inclusive employment remains a key developmental challenge. **Prior Work:** The research builds upon theories of human capital, segmented labour markets, and structural inequality, responding to gaps in existing studies that either focus on aggregate unemployment or omit the stratifying role of educational attainment and income distribution. **Approach:** Using a macro-level econometric design, the study employs time-series data and ordinary least squares (OLS) regression to assess the influence macroeconomic determinants on Romania's general unemployment rate. **Results:** The findings reveal that income inequality has a statistically significant but negative effect on unemployment, while gross savings and economic growth are not significant predictors. These results suggest structural segmentation in the Romanian labour market and a weak linkage between growth and job creation. **Implications:** The study has policy relevance for academics, economists, and institutional stakeholders seeking to promote labour market inclusiveness and macro-social equity. **Value:** This paper provides original empirical insight into how macroeconomic variables influence unemployment in a post-socialist EU economy, challenging conventional assumptions and offering evidence-based directions for structural reform.

**Keywords:** unemployment; income inequality; labour market; structural policy

**JEL Classification:** E24

### 1. Introduction

Have brought to the fore persistent structural asymmetries in the labour market, particularly with regard to unemployment stratified by educational attainment. In a context marked by accelerated globalization, the consolidation of the knowledge-based economy, and the growing importance of human capital as a driver of sustainable growth, understanding the differentiated impact of macroeconomic variables on unemployment rates by education level becomes an imperative for informed policy design. As Romania

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navigates the post-pandemic recovery, grappling simultaneously with inflationary pressures, demographic imbalances, and the imperative of digital and green transitions, the analysis of labour market vulnerabilities has acquired renewed relevance. Recent literature has acknowledged the complex interrelations between income inequality, gross savings, and economic growth as macro-level determinants of labour market performance. However, most empirical studies either focus on aggregate unemployment or overlook the educational dimension of joblessness, despite mounting evidence suggesting that educational attainment not only buffers individuals against unemployment risks but also mediates the effects of macroeconomic shocks. In this vein, the Romanian case presents a compelling context for inquiry, given the coexistence of relatively high tertiary educational attainment and persistent disparities in employment outcomes across skill levels.

The present study seeks to contribute to the academic and policy debates by exploring the extent to which structural inequality, proxied by the S80/S20 income quintile share ratio, economic growth measured through per capita GDP growth, and the gross saving rate, exert a differentiated influence on unemployment rates segmented by educational attainment (primary, secondary, and tertiary levels) over the period 2002–2024. The core objective of this research is to develop an empirically grounded understanding of the macroeconomic determinants of education-specific unemployment in Romania, thereby identifying systemic vulnerabilities and informing targeted interventions.

From a methodological standpoint, the study employs a macro-level econometric framework based on time-series data, integrating standard OLS estimation techniques to assess the magnitude and directionality of the relationships between selected independent variables and unemployment indicators disaggregated by education level. The novelty of this research lies not only in the temporal depth of the analysis, which spans more than two decades of socio-economic transformation, but also in its conceptual framing that combines structural inequality, intertemporal savings behaviour, and labour market segmentation. By linking these dimensions, the study advances a more nuanced understanding of how macroeconomic dynamics interact with human capital stratification to shape labour market outcomes. This research addresses a critical gap in the literature on unemployment and inequality in Central and Eastern Europe and offers policy-relevant insights into how structural factors reinforce or mitigate educationally segmented labour market disparities in Romania. Through this analytical lens, the study aspires to inform future strategies aimed at fostering inclusive employment and reducing socio-economic inequalities in the context of Romania's European integration trajectory and broader developmental goals.

## **2. Literature Review**

The relationship between unemployment and income inequality is complex and interdependent, with each phenomenon influencing the other in a cycle that can perpetuate economic and social imbalances. Recent studies highlight how these two aspects can amplify each other, affecting social cohesion and economic stability. Unemployment, especially among young people and vulnerable groups, contributes significantly to increasing income inequality. The lack of a job not only reduces individuals' disposable income but also limits their access to professional and social development opportunities. In the context of the COVID-19 pandemic, studies show that unemployment has had a disproportionate impact on people with low levels of education and on those in less protected economic sectors, thus amplifying

existing inequalities (Zhang et al., 2022). On the other hand, income inequality can perpetuate unemployment by limiting access to the resources needed for vocational training and education. People from low-income households often have fewer opportunities to improve their skills, which reduces their chances of obtaining stable, well-paid employment. The analysis of economic resilience capacity through the lens of information systems highlights the role of capital taxation as a relevant variable in forecasting macroeconomic policy decisions (Dragomir, 2025b).

The integration of information systems in the development of macroprudential policies supports a deeper understanding of the structural mechanisms affecting the labor market (Dragomir-Constantin, 2025c). Regarding decision modeling in uncertain economic contexts, the specialized literature emphasizes the importance of structured and algorithmic approaches in supporting predictive analyses (Dragomir, 2017a). This dynamic is highlighted in the study by (Zungu & Mtshengu, 2023), who show that income inequality and unemployment contribute significantly to rising crime rates in emerging African economies, indicating a link between lack of economic opportunities and social instability. Economic crises accentuate the interdependence between unemployment and income inequality. During the COVID-19 pandemic, income inequality has increased in countries such as the United States and Brazil, despite government support measures. This suggests that existing policies have not been sufficient to counteract the negative effects of unemployment on income distribution (Alfani et al., 2024). The analysis of economic resilience capacity through the lens of information systems highlights the role of capital taxation as a relevant variable in forecasting macroeconomic policy decisions (Dragomir, 2025b). Structural labor market reforms, such as making employment contracts more flexible or reducing employee protections, have been promoted to boost employment. In the context of the circular economy, the use of intelligent information systems enables the identification of adaptive decision-making patterns, which are also relevant to employment policies (Dragomir-Constantin, 2025d). However, research shows that such reforms can have adverse effects on income inequality. A study by Wiese et al. (2023) indicates that labor market reforms can lead to increased income inequality in OECD countries, especially when they are not accompanied by adequate compensatory measures. In the context of the circular economy, the use of intelligent information systems enables the identification of adaptive decision-making patterns, which are also relevant to employment policies (Dragomir-Constantin, 2025d). In decision analysis, cognitive traps can be corrected through high-performance information systems, which has direct implications for the accurate evaluation of factors influencing unemployment (Dragomir-Constantin, 2025e), (Dragomir-Constantin, 2025f).

Active labor market policies (ALMPs) are a set of government measures designed to improve the functioning of the labor market by increasing employment and reducing structural unemployment. These policies include vocational training programs, employment subsidies, support for entrepreneurial initiatives, and job placement services. The main goal of ALMPs is to facilitate the sustainable integration of job seekers into the labor market and reduce socio-economic inequalities. Recent studies highlight the effectiveness of ALMPs in reducing unemployment and income inequality. In Slovakia, a self-employment support program demonstrated a significant positive impact on employment among participants compared to those who did not receive this support (Svabova & Gabrikova, 2024). This result suggests that PAPMs can be effective tools in combating unemployment, especially among vulnerable groups. Economic crises, such as the COVID-19 pandemic, have highlighted the importance of the adaptability of PAPMs. In Poland, government support measures, including employment subsidies and vocational training program, have helped to mitigate the negative impact of the pandemic

on the labour market (Zieliński, 2022). These interventions have been particularly appreciated by employers, highlighting the crucial role of PAPMs in maintaining economic stability in times of crisis. Digital consulting and electronic commerce, as emerging domains, reveal structural transformations in the economy that may indirectly influence labor market dynamics (Tache & Postolache, 2010). PAPMs encompass a diverse range of instruments, each with a different impact on employment. Vocational training programs and employment subsidies have been associated with significant increases in the employment rate of higher education graduates (Khayati et al., 2024). These results highlight the importance of tailoring PAPM to the specific needs of different groups in the labor market.

From a public policy perspective, the research findings argue for a combined intervention model that integrates effective active policies with passive social protection measures and structural reforms in education and taxation. The use of artificial intelligence in the decision-making process is becoming an increasingly valuable tool for analyzing the complex relationships among macroeconomic indicators (Dragomir & Alexandrescu, 2017b). The axiomatic nature of decision-making provides a formal analytical framework that can support econometric models in interpreting the phenomenon of unemployment (Dragomir & Alexandrescu, 2017c). Thus, a coherent and balanced policy framework can contribute not only to reducing unemployment, but also to combating income inequality in the long term, supporting an inclusive and resilient labor market.

### **3. Methodology**

The conceptual underpinning of this study draws on an integrated framework combining elements from the Human Capital Theory (Becker, 1975), Segmented Labour Market Theory (Reich et al., 1973), and the Stability of structural inequality published by Stewart and Blackburn (1975). According to Human Capital Theory, individuals with higher education levels accumulate skills that enhance employability, resilience to macroeconomic fluctuations, and productivity. The Segmented Labour Market Theory posits that educational groups are embedded in distinct labour market segments, each governed by different institutional and structural constraints. Structural inequality theories further contend that macroeconomic outcomes, such as unemployment, are not equally distributed but are filtered through mechanisms of unequal access to income, capital, and opportunity. In this regard, the study conceptualizes unemployment not merely as a cyclical outcome but as a structurally determined phenomenon, influenced by aggregate economic performance, household saving behaviour, and the degree of income inequality in society. The framework posits that the interaction between these macroeconomic variables and individual-level education determines the probability of unemployment, as well as the depth and persistence of joblessness within educational cohorts.

In light of the theoretical considerations and the contextual specificities of the Romanian labour market, the present study formulates the following research hypotheses:

H1. Income inequality, measured by the S80/S20 income quintile share ratio (IID), has a statistically significant effect on the overall unemployment rate (ILO) in Romania.

H2. Gross savings as a percentage of GDP (GSvGDP) do not exert a statistically significant influence on the general unemployment rate in Romania.

H3. Among the tested macroeconomic predictors, income inequality (IID) is the dominant explanatory variable for the variation in unemployment in Romania.

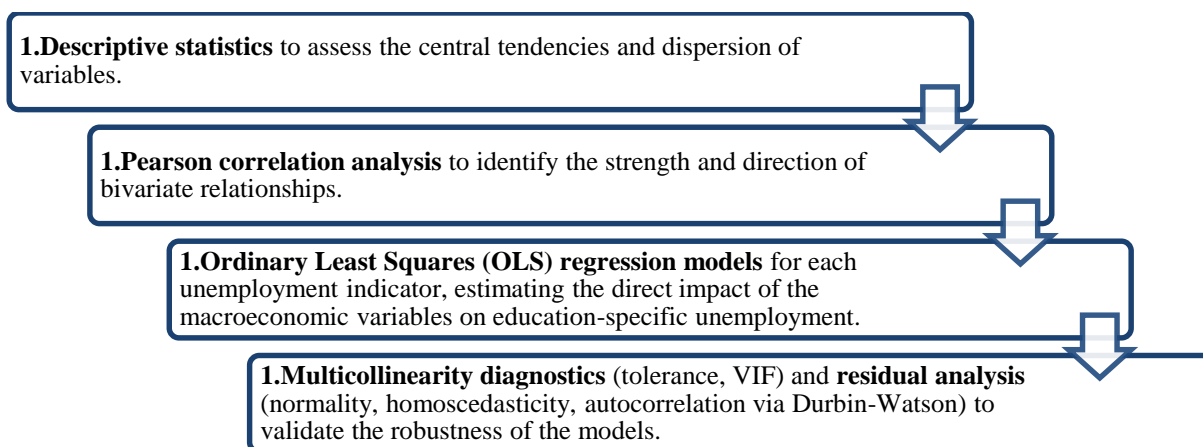
The research adopts a macro-level, deductive, and explanatory methodological design, employing a quantitative econometric approach to test the proposed hypotheses. The analysis is based on annual time-series data for Romania, covering the period 2002–2024, obtained from the official databases of the Romanian National Institute of Statistics (2025).

The dependent variables include:

- ✓ ILO: general unemployment rate (%),

The independent variables are:

- ✓ IID: Income inequality (S80/S20 ratio),
- ✓ GSvGDP: Gross savings as a percentage of GDP (%),
- ✓ GwGDP: GDP per capita growth rate (%).



**Figure 1. The Methodological Steps of the Analysis**

The models are estimated using SPSS vers. 26.0, with significance levels set at 5%. Additionally, partial regression plots and standardized residual diagnostics are employed to evaluate model fit and to detect potential outliers or influential observations.

The general OLS model can be expressed as follows:

$$ILO = \alpha \cdot GwGDP + \beta \cdot IID + \gamma \cdot GSvGDP + \varepsilon \quad (1)$$

Where:

- ✓ ILO (general unemployment rate) – dependent variable;
- ✓ GwGDP, IID, GSvGDP – independent variables
- ✓  $\alpha, \beta, \gamma$  – regression coefficients.

This methodological design ensures a rigorous and replicable analytical framework capable of uncovering the differentiated impact of structural macroeconomic variables on unemployment outcomes

across educational strata, thus contributing to a more granular understanding of labour market dynamics in Romania.

#### 4. Results and Discussions

Using the above methodology, the regression equation estimated by the OLS model can be expressed as follows:

$$ILO = 11.793 - 0.007 \cdot GwGDP - 0.880 \cdot IID - 0.056 \cdot GSvGDP \quad (2)$$

The regression model demonstrates a moderate explanatory capacity and statistical significance (Table 1).

**Table 5. Model Summary**

Model a,b	R	R square	Adjusted R square	Std. Error of the estimate	Change statistics				
					R square change	F change	Df1	Df2	Sig. F change
1	0.661	0.437	0.348	1.0718	0.437	4.910	3	19	0.011

a. Predictors: (constant), GSvGDP, GWGDP, IID; b. Dependent variable: ILO

Table 1 presents the summary statistics of the multiple linear regression model assessing the relationship between the national unemployment rate (ILO) and three macroeconomic predictors: GSvGDP (Gross savings as a percentage of GDP), GwGDP (GDP per capita growth rate), and IID (Income inequality, proxied by the S80/S20 income quintile share ratio). The multiple correlation coefficient ( $R = 0.661$ ) indicates a moderately strong linear relationship between the observed unemployment rate and the values predicted by the model.

This suggests that the model exhibits a fair explanatory capacity with respect to fluctuations in unemployment over the 2002–2024 period. The R-squared value ( $R^2 = 0.437$ ) implies that approximately 43.7% of the variance in the unemployment rate is explained jointly by the three independent variables included in the model. While this leaves a substantial proportion of variance unexplained, the result is meaningful in macroeconomic models that typically account for complex and multifactorial phenomena. The standard error of the estimate (1.0718) reflects the average distance that the observed values fall from the regression line. Given that the mean unemployment rate in the dataset hovers around 6%, an error of approximately 1.07 percentage points is acceptable, albeit indicative of moderate variability.

In table 2 it is presented the ANOVA test.

**Table 6. Anova Test**

Model a,b		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.919	3	5.640	4.910	.011
	Residual	21.825	19	1.149		
	Total	38.744	22			

a. Dependent Variable: ILO; b. Predictors: (Constant), GSvGDP, GwGDP, IID

The analysis of variance from table 2 provides a statistical test of the overall significance of the regression model by decomposing the total variation in the dependent variable — in this case, the national unemployment rate (ILO) — into two components: explained variance (regression sum of squares) and unexplained variance (residual sum of squares). The regression sum of squares is 16.919, which represents the portion of the total variability in the unemployment rate that is accounted for by the combined effect of the three predictors: GSvGDP (gross savings), GwGDP (economic growth), and IID (income inequality). This reflects the explanatory contribution of the model. The residual sum of squares is 21.825, capturing the remaining variance in unemployment that the model fails to explain — in other words, the part due to omitted variables, measurement error, or inherent randomness. The total sum of squares is 38.744, representing the overall variation in the dependent variable (ILO) across the 23 observations (2002–2024).

The model is tested for significance through the F-statistic, calculated as the ratio between the model mean square and the residual mean square (4.910). This statistic follows an F-distribution with 3 and 19 degrees of freedom (df1 = number of predictors; df2 = sample size minus number of parameters). The associated p-value is 0.011, which is statistically significant at the 5% level. This allows us to reject the null hypothesis that all regression coefficients are simultaneously equal to zero. It is result that, the independent variables exert a statistically significant influence on the unemployment rate in Romania over the 2002–2024 period. The ANOVA test thus validates the overall utility of the model and supports the inclusion of the chosen predictors.

In table 3 it is presented the coefficients value.

**Table 7. Coefficients**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error				Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	11.793	1.628	7.244	0.000	8.386	15.200					
	GwGDP	-0.007	0.054	-0.024	0.895	-0.120	0.106	0.133	-0.031	-0.023	0.935	1.070
	IID	-0.880	0.244	-0.723	0.002	-1.392	-0.369	-0.647	-0.637	-0.620	0.736	1.358
	GSvGDP	-0.056	0.071	-0.155	0.441	-0.204	0.092	0.180	-0.178	-0.136	0.769	1.300

a. Dependent Variable: ILO

The intercept ( $B = 11.793$ ,  $p < 0.001$ ) represents the expected value of the unemployment rate when all independent variables are held at zero. While it has limited substantive interpretability in a macroeconomic context its statistical significance confirms the model's base calibration. The unstandardized coefficient for IID is -0.880, with a standard error of 0.244 and a p-value of 0.002, indicating strong statistical significance at the 1% level (H1 validation). The negative sign implies that, contrary to theoretical expectations, higher income inequality (as measured by the S80/S20 ratio) is associated with a lower overall unemployment rate in Romania. The 95% confidence interval ranges from -1.392 to -0.369, suggesting that the effect is both statistically and practically significant (H3 validation). The coefficient is -0.007, with a very high p-value (0.895), indicating no statistically significant relationship between GDP per capita growth and the overall unemployment rate (H2 validation).

## **5. Conclusions**

This study set out to explore the macroeconomic determinants of the unemployment rate in Romania over the period 2002–2024, with particular emphasis on structural inequality, savings behaviour, and economic growth. Drawing on a theoretical framework anchored in human capital theory, segmented labour market theory, and structural inequality approaches, the analysis employed an ordinary least squares (OLS) regression model to estimate the influence of income inequality (IID), gross savings (GSvGDP), and GDP per capita growth (GwGDP) on the general unemployment rate (ILO). The empirical findings underscore the statistically significant role of income inequality in shaping unemployment dynamics, albeit in a direction that challenges conventional assumptions. Specifically, higher levels of income inequality, as proxied by the S80/S20 ratio, were found to be associated with lower overall unemployment. The results contribute to the literature on post-transition economies by illustrating that labour market outcomes in Romania are not linearly or uniformly shaped by traditional macroeconomic levers, and reflect deeper structural asymmetries embedded in inequality and institutional configurations.

The findings of this study yield several important implications for labour market and socio-economic policy design in Romania. In light of the observed dynamics between income inequality, macroeconomic performance, and unemployment, it is imperative that policymakers move beyond conventional growth-oriented paradigms and adopt a multidimensional strategy aimed at addressing the structural foundations of joblessness. Given the statistically significant impact of income inequality (IID) on unemployment, policymakers should consider enhancing transparency in employment reporting, combating informality, and strengthening the integration of vulnerable groups into the formal labour market. Moreover, fiscal instruments that promote progressive redistribution, such as tax credits for low-income workers or targeted transfers, should be re-evaluated in light of their potential to harmonise social cohesion with labour market performance. The statistical insignificance of gross savings (GSvGDP) suggests that savings alone are insufficient to stimulate employment, absent targeted investment strategies. Therefore, policies should prioritise the channelling of domestic savings into productive sectors with high labour absorption capacity, such as green technologies, infrastructure, and digital services. Mechanisms such as public-private investment platforms, labour-intensive procurement policies, and fiscal incentives for SME development could enhance the employment-generating impact of national savings. In conclusion, reducing unemployment in Romania requires a strategic shift toward policies that address structural inequality, institutional integration, and productive investment, thereby laying the groundwork for a more inclusive and resilient labour market capable of adapting to the demands of the post-pandemic and digital age.

Future research should extend this analysis by disaggregating unemployment across educational levels and occupational sectors, incorporating dynamic models that account for time-lagged effects, and exploring the mediating role of institutional quality and regional disparities. By refining the understanding of how macroeconomic forces interact with social structure, such studies can better inform evidence-based policy responses tailored to Romania's evolving labour market realities.



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