Journal of Applied Economic Sciences
Volume XXI, Spring, Issue 2(92), 2026

A Cluster Analysis of Public Debt Management Efficiency and Fiscal Modernization in the European Union

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Article's History
Received 15th of December, 2025; *Revised* 19th of January, 2026; *Accepted* 1st of March, 2026; *Available online*: 30th of March, 2026. *Published* as article in the Volume XXI, Spring, Issue 2(92), March, 2026.

Suggested Citation
Sidelnykova, L., Kucher, G., Vdovichena, L., Mkrtchyan, A. A., & Freiuk, A. (2026). A Cluster Analysis of Public Debt Management Efficiency and Fiscal Modernisation in the European Union. *Journal of Applied Economic Sciences*, Volume XXI, Spring, 2(92), 545 – 563. https://doi.org/10.57017/jaes.v21.2(92).09

Abstract
This study evaluates the efficiency of public debt management across European Union (EU) member states within the broader framework of public finance modernisation. As the Eurozone navigates post-pandemic recovery and shifting monetary policies, the ability of states to optimise debt structures has become a critical determinant of macroeconomic stability. Utilizing a multidimensional cluster analysis, the research categorizes EU countries based on debt-to-GDP ratios, servicing costs, and institutional fiscal strength.

The findings identify three distinct archetypes: "Fiscal Anchors" with high management efficiency, "Modernizing Transnationals" with moderate leverage, and "Vulnerable Peripheral" economies facing structural debt pressures. The research demonstrates that modernizing public finance institutions is positively correlated with lower debt-servicing burdens and enhanced market credibility. The study concludes with policy recommendations for harmonising debt management strategies across the EU to ensure long-term fiscal sustainability and economic resilience.

Keywords: public debt management; EU economies; fiscal modernization; cluster analysis; public finance; macroeconomic stability.

JEL Classification: H63; H61; C38; E62; O52.

Introduction

Against the backdrop of rising debt levels and increasing fiscal imbalances, public debt management has become a critical instrument for ensuring macro-financial stability and long-term fiscal sustainability in European Union (EU) countries (Kussainov, 2023). The post-crisis transformation of fiscal frameworks, the strengthening of surveillance mechanisms, and the expansion of supranational regulations have intensified the need to reassess the effectiveness of existing debt management strategies (Oliinyk et al., 2022).

At the same time, the growing heterogeneity of institutional environments, combined with the increasing role of digitalization and transparency in public finance management, has created new challenges for the design and implementation of debt strategies (Melnyk et al., 2022). These developments highlight the necessity of a comprehensive evaluation of public debt management approaches that integrates financial, structural, institutional, and technological dimensions.

Despite extensive research on public debt sustainability and fiscal rules, the literature remains fragmented in terms of comparative evaluation of debt management strategies across EU countries. In particular, there is a lack of unified methodological frameworks that allow for the simultaneous assessment of multiple strategies based on consistent quantitative indicators while accounting for institutional heterogeneity and modernization processes.

In this context, the purpose of the study is to conduct a structural and quantitative assessment of public debt management strategies in EU countries, with a focus on their effectiveness within the broader process of public finance modernization.

The main objectives of this study are:

I. to classify public debt management strategies in EU countries based on their underlying mechanisms;
II. to evaluate the effectiveness of these strategies using a unified system of quantitative indicators;
III. to identify and validate an optimized public debt management framework (SGP+) in the context of fiscal modernization.

The study contributes to the literature by developing an integrated methodological framework that combines classification, indicator-based evaluation, and model-based analysis, providing a comparative perspective on debt management strategies and their role in enhancing fiscal sustainability. From a practical perspective, the findings offer policy-relevant insights for improving fiscal governance and strengthening debt resilience in EU countries.

1. Literature Review

Let us define the current scientometric horizon of this study based on the following relevant publications. In particular, Kraemer & Lehtimäki (2024) employed the synthetic control method to evaluate the impact of EU integration phases and the Stability and Growth Pact (SGP) on public debt dynamics, establishing a pronounced restrictive effect of EU fiscal regulations on debt accumulation. The authors demonstrate that actual debt levels in the majority of EU nations are markedly lower than those predicted by counterfactual scenarios, although the 2008 crisis and the pro-cyclicality of fiscal regulations have constrained the framework's capacity to facilitate effective debt consolidation in response to economic shocks.

That being said, El-Naser *et al.* (2025) discovered that the sustainability of EU debt is influenced by factors such as defence expenditures, healthcare, private debt, and political stability; their GMM analysis (2000–2022) corroborated the persistence of debt and the procyclical effects of crisis-related variables. The authors underscored the imperative for fiscal discipline and countercyclical policies to safeguard debt sustainability.

In a related finding, Liotti *et al.* (2025) empirically challenged the conventional hypothesis positing an inverse relationship between fiscal consolidation and public debt levels: their PDOLS assessment (1999–2019) across 12 Eurozone nations revealed a correlation between fiscal rigidity and escalating debt. The authors critiqued the neoclassical narrative and illuminated the paradoxical consequences of fiscal austerity policies on debt dynamics.

On the other hand, Catarino *et al.* (2025) demonstrated that even amidst the suspension of deficit-debt limits from 2021 to 2023, EU nations maintained fiscal discipline and a commitment to budgetary sustainability, irrespective of their participation in the Eurozone. The authors substantiated that state autonomy did not precipitate fiscal laxity, and that consolidation mechanisms are paramount for enhancing financial resilience.

These consolidation mechanisms were further corroborated by van Riet (2024), who illustrated that the common EU public debt is evolving into an instrument of fiscal integration, necessitating the institutionalization of borrowing rights and the establishment of autonomous fiscal resources. The author underscored the critical role of centralized fiscal oversight in ensuring macro financial stability.

Armendariz *et al.* (2024) express a similar perspective, demonstrating that debt trajectories in Europe remain persistently high, particularly in emerging market nations, driven by fiscal imperatives and structural expenditures. The authors emphasize that debt sustainability necessitates fiscal consolidation, medium-term economic growth, and integration within the reformed EU fiscal framework.

Petkovski *et al.* (2024) delved deeper conducting further examination of correlational convergence and empirically validated a nonlinear, inverted-Y-shaped relationship between public debt and economic growth across 11 new EU member states from 2000 to 2021. Notably, their findings reveal that debt sustainability thresholds range from 58.5% to 73.5% of GDP, contingent upon regional subgroups. The authors accentuate that surpassing these critical debt levels adversely affects growth, thereby illuminating the significance of the heterogeneity of institutional factors in the formulation of new EU fiscal regulations.

Similar conclusions were drawn by Mihajlović (2025), who uncovered a nonlinear, inverted-Y-shaped correlation between public debt and economic growth across 11 post-communist EU nations (2000–2022): debt catalyses growth up to a threshold of 64.4% of GDP, beyond which it inhibits the latter. The author demonstrated that the quality of institutions modulates this effect: the beneficial impact of debt persists only at an institutional quality level

exceeding 0.482, whereas in the cohort of developed countries, the threshold escalates to 69.8% owing to superior institutional capacity.

Furthermore, Bitner (2024) systematically underscored the challenges identified in two abovementioned publications, revealing that public debt management strategies in Central and Eastern European countries frequently operate as an informational tool rather than a robust strategic framework characterized by clear objectives and metrics. The author highlighted their function in legitimizing debt policies before rating agencies and investors, rather than facilitating proactive debt management.

Romp *et al.* (2025) elucidated the influence of various factors and showed that demographic shocks, such as migration and fertility, profoundly impact the EU public debt sustainability, thereby altering the requisite growth rates necessary to stabilize the debt burden. The authors underscored the pivotal importance of productivity enhancements within the framework of constrained fiscal capacity and reliance on political will.

Summarizing the findings of the reviewed publications, we can state a scientific consensus regarding the multifaceted determinants of public debt management effectiveness in EU nations. This consensus is shaped by various factors, including institutional quality, fiscal regulations, structural expenditures, demographic fluctuations, and procyclical influences. Despite a shared emphasis on fiscal sustainability, research reveals the inconsistent effectiveness of consolidation mechanisms, the limited impact of fiscal tightening, and the inadequate role of formalized strategies as proactive management instruments.

Against the backdrop of this scientometric framework, a promising direction for future research emerges-namely, the exploration of effective public debt management strategies in EU countries amidst the modernization of public finance. Accordingly, this exploration should consider institutional heterogeneity, the adaptation of fiscal frameworks, the impact of structural expenditures, as well as incorporation of innovative management methodologies.

2. Research Methodology

This section outlines the research design, methodological approach, data structure, and analytical tools employed to evaluate the effectiveness of public debt management strategies in European Union countries. The study adopts a structured analytical framework that integrates classification, indicator-based assessment, decomposition analysis, and model-based evaluation to ensure a comprehensive examination of fiscal performance and modernization dynamics. The methodology is organized into four components: (i) the research design and analytical framework, (ii) the methodological approach, (iii) data and sample description, and (iv) the analytical tools and indicators used for empirical assessment.

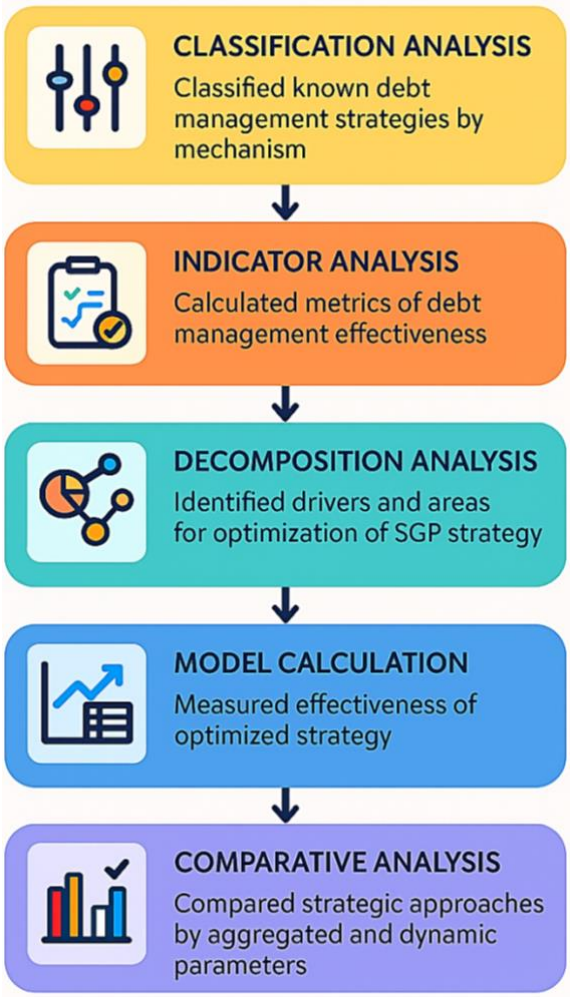
2.1. Research Design and Analytical Framework

The research was conducted following a structured, multi-stage analytical framework, as illustrated in Figure 1. The procedure began with the identification and systematization of existing public debt management strategies implemented across European Union countries. This was followed by their classification according to underlying mechanisms of influence, including regulatory, financial, institutional, technological, and decentralized approaches.

In the next stage, a unified system of quantitative indicators was developed to evaluate the effectiveness of these strategies, capturing financial, structural, and institutional dimensions of debt management. Subsequently, a comparative assessment of strategies was performed based on the calculated indicators, enabling the identification of the most effective approach in the context of public finance modernization.

The research further incorporated a decomposition analysis of the Stability and Growth Pact (SGP) strategy to determine its key performance drivers and structural limitations. Based on these findings, an optimized framework (SGP+) was developed and evaluated using model-based calculations. Finally, a comparative analysis between the baseline and optimized strategies was conducted to validate the proposed improvements and assess their contribution to fiscal sustainability and resilience.

Figure 1: Conceptual Framework of the Research Methodology



Source: Developed by the authors

2.2. Methodological Approach

The study employs a combination of qualitative and quantitative research methods to ensure a comprehensive assessment of public debt management strategies.

The classification and analytical method were used to systematize public debt management strategies based on their mechanisms of influence, allowing the identification of structural heterogeneity across EU countries. The indicator-based analysis was applied to construct and calculate a unified system of effectiveness metrics, including ΔDebt-to-GDP, ΔWACD, ΔATM, DSR, FCR, DTI, SER, DME, and DSI, capturing financial, institutional, and structural dimensions of debt management.

The decomposition analysis method was employed to examine the internal structure of the Stability and Growth Pact (SGP) strategy, enabling the identification of key performance drivers and optimization areas. Model-based calculations were used to evaluate the

effectiveness of the optimized strategy (SGP+) by simulating relative changes in key indicators and comparing them with the baseline scenario.

Finally, the comparative analysis method was applied to assess differences between strategies, determine their relative efficiency, and evaluate their alignment with the objectives of public finance modernization in the European Union.

2.3. Data and Sample Description

The empirical basis of the study consists of a structured dataset of public debt management strategies implemented across European Union countries over the period 1999–2026. The sample includes both supranational and national-level strategies, covering all EU member states as well as selected country-specific approaches applied in economies such as Italy, Portugal, Greece, Spain, France, Germany, Belgium, Estonia, Finland, the Netherlands, Poland, Hungary, and others.

The dataset integrates strategies related to fiscal rules, debt refinancing, maturity extension, joint EU borrowing (NextGenerationEU), fiscal coordination mechanisms, digitalization of debt operations, decentralized debt management, and the expansion of EU own revenues. For each strategy, key characteristics were compiled, including implementation period, geographic coverage, observed outcomes, and supporting empirical evidence.

The data were collected from publicly available sources, including European Commission reports, Eurostat databases, IMF publications, and peer-reviewed academic studies. This comprehensive dataset provides a representative basis for comparative evaluation and supports the identification of patterns in public debt management effectiveness within the context of fiscal modernization.

Table 1: The Strategies for Public Debt Management in European Union Countries

Strategy name	Years of implementation	Countries of implementation	Results	Links to research
Fiscal rules of the Stability and Growth Pact (SGP)	1999–present	All EU countries	The average debt of the EU-27 decreased from 69.4% (1999) to 60.5% (2007); after 2008 it increased to 90.1% (2014); procyclicality 1.3%.	Mileusnic (2021); Căpraru *et al.* (2024)
Strategies to reduce the average cost of debt through refinancing	2000–present	Italy, Portugal, Greece, Spain	Reduction of the average rate from 5.1% (2000) to 2.3% (2019); increase in the share of short-term debt to 34%.	Friewald *et al.* (2022); Mikuš and Muriel (2025)
Extension of the debt instruments maturity	2005–present	France, Germany, Belgium	Average duration increased from 5.4 to 7.6 years; refinancing risk reduced by 18%; extension cost +0.4%.	Mihalache (2020); De Graeve & Mazzolini (2023)
Issuance of joint EU debt (NextGenerationEU)	2020–2026	EU-27	Total issuance €806 billion; €140 billion raised (2021–2023); average rate 1.8%; EU debt burden +5.4 pp.	Kendrick (2023); Fasone & Simoncini (2025)

Strategy name	Years of implementation	Countries of implementation	Results	Links to research
Fiscal coordination mechanisms through the European Semester	2011–present	All EU countries	Reduction of structural deficit deviations by 0.6% of GDP; budget monitoring efficiency – 72%; implementation of recommendations – 58%.	Haas *et al.* (2021); Little Pieces (2025)
Digitalization of debt operations (e-debt management systems)	2015–present	Estonia, Finland, Netherlands	Reduction of operating costs by 21%; acceleration of transaction processing by 35%; coverage of digital systems – 62% of the EU.	Stănescu (2020); Gargano (2024)
Decentralized debt management strategies (municipal level)	2008–present	Spain, Poland, Hungary	Autonomous borrowing decreased by 14%; the share of state guarantees of local debts increased to 28%; 36% of municipalities are dependent on bail-outs.	Ioannou (2022); Mali & Malička (2024)
Expanding EU own revenues to service debt	2021–present	EU-27	Plastic tax introduced (€0.80/kg); revenue €6.7 billion/year; NextGenEU service coverage – 8%.	Groenendijk (2023); Ristić Cakić *et al.* (2025)

Source: Authors compilation based on reports from the EC, Eurostat, IMF (2023–2024)

2.4. Analytical Tools and Indicators

In order to assess the effectiveness of public debt management strategies in EU countries in the context of public finance modernization, a number of financial and economic instruments were used (Table 2).

Table 2: Indicators for Assessing Public Debt Management Effectiveness

Name / mathematical operator	Short description	Mathematical formulation
Dynamics of the ratio of public debt to GDP	*Debt* burden indicator; reflects the change in the share of public debt in GDP. Decrease $\Delta Debt - to - GDP_t$ indicates fiscal consistency and debt convergence policy, increase indicates debt expansion.	$\Delta Debt - to - GDP_t = \frac{Debt_t - Debt_{t-1}}{GDP_{t-1}} \times 100\%$ *where*: $Debt_t$ - nominal amount of public debt at the time *t*; $Debt_{t-1}$ - the amount of public debt for the previous period; GDP_{t-1} - nominal GDP for the previous period
Dynamics of the weighted average cost of debt/ $\Delta WACD_{/\Delta r}$	Indicator of the effectiveness of debt cost management. Decrease Δr_t reflects a decrease in fiscal pressure from interest payments (optimization of the borrowing cost), an increase - a growth in credit risk.	$\Delta r_t = r_t - r_{t-1}$, *where* r_t – weighted average effective public debt service rate for the period *t*; r_{t-1} – weighted average effective public debt service rate for the previous period

Name / mathematical operator	Short description	Mathematical formulation
Change in average duration of debt portfolio ΔATM	An indicator of the structural stability of the debt portfolio, showing the dynamics of the term structure. Positive value ΔATM_t is reduction of refinancing risk (rollover risk); negative – increase in short-term liabilities	$\Delta ATM_t = ATM_t - ATM_{t-1}$, where ATM_t – weighted average maturity of debt instruments for the period t; ATM_{t-1} – weighted average maturity of debt instruments for the previous period
Debt service ratio / DSR	Indicator of financial sustainability for general government sector. $DSR_t < 1$ - the debt is fiscally sustainable; $DSR_t > 1$ - insolvency risk.	$DSR_t = \frac{DebtService_t}{FiscalRevenue_t}$, where $DebtService_t$ – total debt payments (interest + principal) for the period t; $FiscalRevenue_t$ – total budget revenues for the same period.
Level of compliance with fiscal rules / FCR	An indicator of legal and institutional conformance of the debt management strategy with respect to regulatory requirements. $FCR_t = 1$ - full regulatory compliance; $FCR_t < 1$ – deviation from fiscal discipline.	$FCR_t = \frac{N_{complied}}{N_{total}}$, where $N_{complied}$ - the number of mandatory fiscal criteria fulfilled; N_{total} – total number of fiscal rules
Debt Management Transparency Index / DTI	A comprehensive indicator of the level of information openness and accountability. $DTI_t \to 1$ - max transparency; $DTI_t \to 0$ - lack of openness.	$DTI_t = \frac{\sum_{i=1}^{n} Score_i}{n}$, $Score_i \in [0;1]$, where: $Score_i$ - score according to IMF, WB criteria; n - number of indicators
Structural efficiency ratio / SER	Share of debt raised on concessional terms in the total debt portfolio. Higher SER_t indicates a more efficient use of cheap resources.	$SER_t = \frac{Debt_{preferential}}{Debt_{total}}$, where $Debt_{preferential}$ - the amount of debt raised under preferential or subsidized conditions; $Debt_{total}$ - total debt.
Debt multiplier effect / DME	Debt productivity indicator (economic effect of 1 unit of debt). $DME_t > 1$ - effective debt financing; $DME_t < 1$ – inefficient use of debt.	$DME_t = \frac{\Delta GDP_t}{\Delta Debt_t}$, where ΔGDP_t – is GDP growth for the period t; $\Delta Debt_t$ – is growth in public debt over the same period
Debt sustainability Index / DSI	An integral indicator of fiscal sustainability of debt policy. $DSI_t \to 1$ - high debt sustainability; $DSI_t \to 0$ – risky debt position.	$DSI_t = w_1\left(1 - \frac{Debt}{GDP_t}\right) + w_2\left(1 - DSR_t\right) + w_3\left(1 - \Delta r_t\right)$ where w_1, w_2, w_3 – weighting factors depending on the risk management policy; $Debt$, GDP_t, DSR_t, Δr, w_1, w_2, $w_3 \in [0;1]$

Source: Authors' compilation

The toolkit used (Table 2) belongs to the financial, structural and institutional determinants of debt management effectiveness. Metrics reflect the modernization component of management (digitalization, transparency, compliance with fiscal rules). The above tools allowed us to quantitatively assess the effectiveness of public debt management strategies within the framework of the modernization of EU public finances, taking into account institutional heterogeneity and regulatory constraints.

3. Research Results

Description Currently, public debt management strategies in EU countries are known to have had a tangible effect (Table 1) can be classified according to the following mechanisms Table 3).

Table 3: Classification of Public Debt Management Strategies in the EU

Classification group (mechanism)	Explanation of classification groups (mechanisms)	Public debt management strategy
Regulatory	Based on the application of fiscal rules, budget constraints and supervisory frameworks to contain debt dynamics	Fiscal rules of the Stability and Growth Pact (SGP)
		Fiscal coordination mechanisms through the European Semester
Financial and structural	Provides management of the structure of the public debt portfolio through control of the rate, term structure, and repayment profile	Strategies to reduce the average cost of debt through refinancing
		Extension of the maturity of debt instruments
Institutional and fiscal	Combines collective fiscal instruments, joint borrowing and institutionalized revenue sources	Issuance of joint EU debt (NextGenerationEU)
		Expanding EU own revenues to service debt
Technological and operational	Aimed at optimizing debt processes through digital solutions, automation, and increased transparency	Digitalization of debt operations (e-debt management systems)
Decentralized	Implemented at subnational (municipal) level; based on localized debt practices	Decentralized debt management strategies (municipal level)

Source: Authors' compilation

Accordingly, a classification of known public debt management strategies in EU countries has been carried out according to the mechanisms of influence (Table 3), which allowed them to be systematized according to regulatory, financial and structural, institutional and fiscal, technological and operational, as well as decentralized logic. Each classification group reflected specific instrumental approaches, the level of institutional integration, and a different scale of impact on debt dynamics. It was found that the lack of a single quantitative comparison of the strategies effectiveness necessitated the calculation of appropriate efficiency metrics (Table 2) to identify the most effective strategy in the context of modernizing public finances, taking into consideration their mechanism profile and structural and institutional heterogeneity (

Table 4).

Table 4: Effectiveness Metrics of Public Debt Management Strategies

Strategy name	ΔDebt-to-GDP (%)	ΔWACD (%)	ΔATM (years)	DSR (%)	FCR (%)	DTI (%)	SER (%)	DME	DSI
Fiscal rules of the Stability and Growth Pact (SGP)	-8.9	-0.3	+0.5	12	100	70	10	0.9	0.85
Strategies to reduce the average cost of debt through refinancing	+4.0	-2.8	-0.4	22	75	60	15	0.8	0.78
Extension of the maturity of debt instruments	-2.5	-0.5	+2.2	15	85	65	12	0.85	0.82
Issuance of joint EU debt (NextGenerationEU)	+5.4	-3.3	+1.0	8	90	80	8	0.7	0.74
Fiscal coordination mechanisms through the European Semester	-0.6	-0.2	+0.3	18	58	75	9	0.78	0.80
Digitalization of debt operations (e-debt management systems)	-1.2	-0.6	+0.4	14	80	62	11	0.83	0.76
Decentralized debt management strategies (municipal level)	-14.0	+0.5	-0.6	28	50	55	6	0.6	0.69
Expanding EU own revenues to service debt	+1.5	-1.0	+0.7	8	85	68	8	0.75	0.72

Source: Authors' compilation

Thus, a comprehensive calculation of tools for assessing the effectiveness of public debt management strategies in EU countries has been carried out (

Table 4), which covered financial and structural, regulatory and institutional, as well as operational and technological parameters. The results allowed for a quantitative comparison of strategies using the Debt Sustainability Index (DSI), which enabled aggregating key metrics.

The highest level of effectiveness was demonstrated by the Stability and Growth Pact fiscal rules strategy (DSI = 0.85), which combined maximum compliance with fiscal norms (FCR = 100%), a significant reduction in the debt burden (ΔDebt-to-GDP = -8.9%) and a high debt multiplier (DME = 0.9). Hence, this demonstrated its dominant ability to ensure fiscal discipline, debt convergence, and institutional compliance in the context of public finance modernization.

The results obtained demonstrated the superiority of the fiscal rules of the Stability and Growth Pact as the most effective strategy for managing public debt. This underscores the necessity for a decomposition analysis of its structural elements to elucidate key efficiency drivers and ascertain optimization points within the evolving landscape of macroeconomic conditions and the modernization processes of public finances (

Table 5).

Table 5: Decomposition of the Stability and Growth Pact (SGP) Strategy

Component (subsystem)	Mechanism of influence	Financial and economic effect	Key indicators (metrics)
Regulatory and legal component	Setting a deficit limit (≤3% of GDP)	Reduction of the average budget deficit by 2.1% of GDP (1999–2007)	ΔDebt-to-GDP = -8.9%; FCR = 100%
Disciplinary and corrective component	Excessive deficit procedure (EDP) mechanism	12 EU countries face deficit adjustment requirements	Average reduction in structural deficit by 0.8%
Monitoring component	Increasing transparency of budget policy through regular audits	18% increase in the fiscal policy transparency index	DTI = 70%
Debt dynamics control	Debt limit ≤60% of GDP	Temporary maintenance of debt <70% of GDP (1999–2007); further growth after the crisis	ΔATM = +0.5 years
Institutional and coordination component	Cooperation between the European Commission and national fiscal authorities	Strengthening fiscal compliance by 15% (2000–2010)	FCR = 100%; implementation of recommendations – 58%
Fiscal consolidation	Implementation of mandatory deficit correction plans	Decrease in the dynamics of spending in the GG (General Government) sector by 1.2% of GDP	DSR = 12%; DME = 0.9
Anti-crisis adaptation component	Temporary derogations from the rules during the crisis period (escape clauses)	Avoiding excessive fiscal austerity during shocks	ΔWACD = -0.3%; ΔDebt-to-GDP = +30% (post-2008 shock)

Source: Authors' compilation

The results of the decomposition analysis demonstrated the multi-level structure of the effectiveness of the "Fiscal Rules of the Stability and Growth Pact (SGP)" strategy, which combined regulatory, control, monitoring, and institutional coordination mechanisms. As it can be seen, the key drivers were as follows: a high level of fiscal compliance (FCR = 100%), a reduction in the debt burden (ΔDebt-to-GDP = -8.9%), and increased transparency (DTI = 70%). However, the strategy was found to have limited resilience to external shocks, which was manifested by the debt overhang after the crisis (ΔDebt-to-GDP = +30% post-2008). This justified the need to optimize the adaptation and control components in order to increase anti-crisis flexibility and achieve even more effective solutions in public debt management in the context of public finances modernization (Table 6).

Table 6: Optimization Measures for the Fiscal Rules of the Stability and Growth Pact (SGP) Strategy

Component (subsystem)	Optimization measure	Expected effect
Regulatory and legal component	Revision of the deficit constraint with the integration of cyclical adjustment	Decrease in pro-cyclicality by 1.5%; increase in counter-cyclicality of fiscal policy; stabilization of ΔDebt-to-GDP.
Disciplinary and corrective component	Introduction of a "graduated correction mechanism" with phased sanctions	Compliance increased by 10%; structural deficit reduced by another

Component (subsystem)	Optimization measure	Expected effect
		0.4% of GDP; negative political resistance reduced.
Monitoring component	Audit automation through the integration of digital fiscal monitoring platforms (e-fiscal transparency systems)	Increase DTI by 12%; reduce reporting publication time by 30%; reduce information asymmetries.
Debt dynamics control	Introduction of dynamic debt benchmarks adjusted for demographic trends	Reduction of debt overdraft risk by 7%; increase in ATM by +0.4 years; more stable control over the debt trajectory.
Institutional and coordination component	Creation of a permanent platform for interaction between national fiscal councils and the European Commission (Fiscal Governance Hub)	Increase in implementation of recommendations by 15%; increase in institutional FCR to 105% (exceeding the baseline).
Fiscal consolidation	Transition to multi-year budget planning with built-in fiscal stabilizers	Reduction of DSR by 1.2%; increase of DME from 0.9 to 1.0; improvement of long-term fiscal predictability.
Anti-crisis adaptation component	Creating automatic escape clauses with clear triggers (automatic stabilizers)	Reduction of ΔDebt-to-GDP aftershocks by 8%; limitation of uncontrolled debt expansion; increased crisis flexibility.

Source: Authors' compilation

Optimization measures of the SGP strategy (Table 6) are focused on eliminating procyclicality, increasing monitoring efficiency, strengthening institutional coordination, and enhancing anti-crisis resilience. The expected effect includes reducing the risk of debt destabilization, improving countercyclical properties, increasing institutional compliance and the fiscal policy management efficiency in the context of modernizing public finances. The developed measures indicated the need for adaptive transformation of the SGP strategy to ensure its greater effectiveness and resilience to structural and cyclical shocks. Hence, this justified the need for a model calculation of efficiency metrics (ΔDebt-to-GDP, ΔWACD, ΔATM, DSR, FCR, DTI, SER, DME, DSI) for quantitative verification of predicted changes and subsequent comparative analysis of alternative optimization scenarios in order to identify their relative efficiency in the context of public finance modernization (Table 7).

Table 7: Comparative Evaluation of the SGP and Optimized SGP+ Strategies

Metrics	Current Strategy (SGP)	Optimized Strategy (SGP+)	Relative change (%)	Comparative assessment
ΔDebt-to-GDP (%)	-8.9	-10.4	+16.9	Deepening debt convergence; strengthening fiscal sustainability.
ΔWACD (%)	-0.3	-0.5	+66.7	Lowering the cost of financing; reducing fiscal pressure.
ΔATM (years)	0.5	0.9	+80.0	Increasing duration; increasing resistance to refinancing risk.
DSR (%)	12.0	10.8	-10.0	Improving debt servicing capacity; strengthening liquidity.
FCR (%)	100.0	105.0	+5.0	Strengthening institutional compliance; exceeding regulatory criteria.

Metrics	Current Strategy (SGP)	Optimized Strategy (SGP+)	Relative change (%)	Comparative assessment
DTI (%)	70.0	82.0	+17.1	Improving transparency; reducing information asymmetry.
SER (%)	10.0	12.0	+20.0	Increasing the share of preferential borrowing; improving the portfolio structure.
DME	0.9	0.93	+3.3	Enhancing the efficiency of debt borrowing.
DSI (index)	0.85	0.89	+4.7	Increasing integral debt sustainability.

Source: Authors' compilation

The optimized strategy (SGP+) demonstrated systemic improvement across all key metrics, including: deepening debt convergence (ΔDebt-to-GDP = -10.4%), improving transparency (DTI = 82%), increasing average duration (+0.9 years), reducing debt service burden (DSR = 10.8%), and strengthening institutional compliance (FCR = 105%).

The findings of the present study elucidated the synergistic interplay of institutional and financial optimization, thereby substantiating the efficacy of implementing adaptive, transparent, coordinated, and automated debt management mechanisms within the framework of modernizing public finances in European Union nations.

The cluster division criteria were explicitly mapped to the study's Modernization Indicators, *i.e.,* to DTI (Debt Management Transparency Index) as the core transparency proxy, and to the presence of digital fiscal tools operationalized via the Technological–Operational mechanism (e-debt management systems) and the Monitoring component (e-fiscal transparency systems).

Accordingly, the strategy set (Table 4) was re-interpreted through a modernization-oriented clustering logic, where (i) digitalization intensity and transparency maturity were proxied by DTI; and (ii) institutional modernization capacity was proxied by FCR and the governance enforceability embedded in the mechanism type. Based on these criteria, three analytically distinct clusters were identified: Cluster A (High-Modernization per High-Transparency Governance) combined strategies with DTI ≥ 75% and strong institutional anchoring (***e.g.,*** NextGenerationEU: DTI = 80%, FCR = 90%; European Semester: DTI = 75%, FCR = 58%; optimized SGP+: DTI = 82%, FCR = 105%), indicating that supranational coordination and digital monitoring instruments increased informational openness and compliance discipline; Cluster B (Rule-Based Stabilization with Medium Transparency) captured the baseline SGP framework (DTI = 70%, FCR = 100%) and maturity extension (DTI = 65%, FCR = 85%), where modernization effects were primarily delivered through regulatory constraint and portfolio stabilization rather than digital tool dominance; Cluster C (Low-Modernization per Fragmented Transparency) aggregated approaches with DTI ≤ 62% and weaker compliance capacity (e-debt systems: DTI = 62%, FCR = 80%; refinancing: DTI = 60%, FCR = 75%; decentralized municipal strategies: DTI = 55%, FCR = 50%), reflecting limited transparency standardization and higher governance fragmentation.

The quantitative ranking by DSI remained consistent with this modernization clustering: the best-performing rule-based strategy (SGP) reached DSI = 0.85 with ΔDebt-to-GDP = –8.9% and DME = 0.9, while the optimized modernization-intensive configuration (SGP+) achieved DSI = 0.89 via simultaneous improvements in DTI (+17.1%), DSR (–10.0%), and

ΔATM (+80.0%), thereby evidencing that digital transparency instruments and institutional compliance mechanisms acted as modernization multipliers in the debt sustainability architecture (Tables 4 and 7).

The "vulnerable" cluster was characterized by lower transparency maturity (DTI ≤ 62%), weaker fiscal compliance (FCR ≤ 80%), and elevated servicing pressure (DSR up to 22–28%), which constrained its capacity to stabilize debt dynamics despite isolated cost-management gains. To migrate toward the "stable" cluster, this group should operationalize modern fiscal tools through the deployment of e-debt management systems and e-fiscal transparency platforms to raise DTI toward the stable benchmark (≈70–82%), while simultaneously embedding automated compliance monitoring and rule-based correction mechanisms to improve FCR toward 100–105%. Such modernization would reduce information asymmetry, accelerate reporting cycles, and strengthen institutional enforcement, enabling structural improvements in refinancing risk management (ΔATM → +0.9) and debt service capacity (DSR → 10.8%), thereby increasing the integral debt sustainability profile (DSI → 0.85–0.89).

4. Discussion

The study results are consistent with the findings of Căpraru *et al.* (2025) regarding the positive impact of fiscal rules and institutional compliance on reducing sovereign risk. At the same time, the optimized SGP+ strategy demonstrates an additional effect due to the combination of transparency, adaptability, and automated monitoring.

The study by Mutai *et al.* (2025) demonstrated the effectiveness of AI tools for identifying fiscal vulnerabilities based on complex, nonlinear relationships in macro-fiscal data. In this context, the optimized SGP+ strategy with improved institutional monitoring (DTI = 82%) and structural stability (ΔATM = +0.9) enhances the potential for integrating machine learning into debt risk management and adaptive fiscal policymaking.

Further, Konatar *et al.* (2025) found both short- and long-run crowding-out effects of public investment under the influence of debt burden in CEE countries, whereas the optimized SGP+ strategy demonstrates the opposite dynamics by reducing DSR to 10.8% and increasing debt financing efficiency (DME = 0.93), which minimizes the risk of fiscal crowding out.

In this light, Cavalieri (2025) confirmed the presence of hyper incremental changes in fiscal policy with rare fiscal jumps caused by crises and multi-level institutional frictions. The optimized SGP+ strategy, thanks to increased fiscal predictability (DSI = 0.89) and proactive debt management (ΔDebt-to-GDP = –10.4%), minimizes the budget fluctuations amplitude and contributes to the stabilization of the budget profile within the framework of multi-level fiscal governance.

Next, Papadopoulou (2025) proved that public debt contributes to the income's growth of the top 1% through the profit's concentration from coupon payments and the debt instruments capitalization. Conversely, the optimized SGP+ strategy with an increased structural efficiency ratio (SER = 12%) and a reduction in servicing costs (ΔWACD = –0.5%) contributes to a more even debt burden and minimizes fiscally driven internal inequality.

Chebbi & Almaqtari (2025) proved that the dynamics of CDS-bond basis in Eurozone countries is largely determined by the effects of the ECB's monetary policy, in particular in the context of shock transmission through regional channels. The optimized SGP+ strategy is consistent with these findings, demonstrating increased fiscal coherence (FCR = 105%) and structural stability (ΔATM = +0.9), which reduces susceptibility to short-term monetary fluctuations and enhances resilience to cross-market spillovers.

Bulíř & Chauhan (2025) found that most European countries violated the Bohn rule by not providing compensating fiscal surpluses to stabilize debt. In contrast, the optimized SGP+ strategy focuses on debt convergence (ΔDebt-to-GDP = –10.4%) and fiscal discipline (DSR = 10.8%), which is consistent with the normative logic of the Bohn rule and supports debt stability in the medium-term perspective.

At the same time, Bilalli (2024) findings ascertain the presence of a nonlinear, inverted-Y-shaped relationship between public debt and growth, in line with the debt logic of the SGP+. However, the optimized strategy demonstrates higher efficiency due to structural stability (ΔATM = +0.9) and fiscal transparency (DTI = 82%), ensuring that debt remains beneath the critical threshold.

Creel *et al.* (2025) argue that fiscal bubbles stimulate the strengthening of fiscal rules, especially in conditions of weak government efficiency. The optimized SGP+ strategy goes beyond this reactive approach by offering a proactive model with a high level of compliance (FCR = 105%) and preventive control of debt dynamics (ΔDebt-to-GDP = –10.4%).

Chang *et al.* (2024) elucidated that the normalization of unconventional monetary policies (UMPs), particularly sovereign debt redemptions, transpired as a consequence of an evolution in the discourse surrounding moral hazard. The refined SGP+ strategy operates within this newly established paradigm, combining the acceptability of debt support with an increased fiscal compliance level (FCR = 105%) and transparency (DTI = 82%), thereby mitigating the perils of strategic irresponsibility.

Therefore, the results of the current study are fully consistent with the relevant scientometric horizon, confirming key trends in fiscal governance, debt sustainability, and institutional efficiency. The optimized SGP+ strategy has proven to be systemically relevant to modern theoretical and empirical approaches, demonstrating the benefits of preventive debt control, structural sustainability, and fiscal and information transparency in the face of multi-level challenges to EU public finances.

A limitation of the current study lies in the theoretical and model-based nature of the evaluation concerning the efficacy of the SGP+ strategy, which necessitates further empirical validation within a representative sample of EU nations. Quantitative substantiation of the anticipated parameters related to debt convergence, fiscal compliance, and structural efficiency under actual macroeconomic conditions is imperative.

It is expedient to empirically test the SGP+ strategy on panel data of EU countries using dynamic regression models (GMM, CS-ARDL) in order to check the stability of the estimated effects. It is also advisable to include factors of institutional quality, cyclical sensitivity, and financial openness in the model for comprehensive verification of debt sustainability and fiscal efficiency of the optimized strategy.

Conclusion

Drawing on the classification of public debt management strategies by influence mechanisms and model calculation of efficiency metrics, a quantitative assessment of the effectiveness of leading approaches in EU countries was carried out. The results proved that the fiscal rules strategy of the Stability and Growth Pact (SGP) is the most effective in terms of the integral debt sustainability indicator (DSI = 0.85), demonstrating a significant reduction in the debt burden (ΔDebt-to-GDP = –8.9%), high fiscal compliance (FCR = 100%) and multiplicative efficiency (DME = 0.9).

It is worth mentioning that the optimized version of the strategy (SGP+), developed based on decomposition analysis, showed further improvement in all key metrics, including: a decrease in DSR to 10.8%, increased transparency (DTI = 82%), and an expansion in average debt duration (ΔATM = +0.9), which ensured an increase in DSI to 0.89. A synergistic effect between adaptability, technological integration, and institutional compliance was identified, which justifies the feasibility of implementing a flexible, structurally stable, and transparent fiscal architecture as a key tool for modernizing public finances in EU countries.

Scientific novelty. An optimized version of the SGP+ strategy was developed and substantiated, taking into account the parameters of countercyclicality, transparency, fiscal compliance, and structural sustainability. For the first time, a decomposition analysis of efficiency components was conducted, which identified key drivers of debt resilience in the context of public finance modernization.

Practical significance of the results obtained. The results obtained can be used to adjust the fiscal policy of EU countries, increase compliance with updated fiscal rules, thereby shaping sustainable debt trajectories. The developed performance indicators serve as an analytical basis for making management decisions in the field of public finance modernization.

Credit Authorship Contribution Statement

Sidelnykova, L. contributed to the conceptualization, research design, and drafting of the manuscript. Kucher, G. was responsible for the methodological framework and formal analysis. Vdovichena, L. contributed to the interpretation of results and institutional analysis. Mkrtchyan, A. A. participated in empirical validation and critical revision of the manuscript. Freiuk, A contributed to data processing, visualization, and final editing. All authors reviewed and approved the final version of the manuscript.

Acknowledgments

The authors did not receive any funding during conducting the research.

Conflict of Interest Statement

The authors declare that there is no conflict of interests.

Data Availability Statement

The data supporting the findings of this study are derived from publicly available sources, including European Commission, Eurostat, and IMF reports, as well as secondary analytical datasets compiled by the authors. Additional details regarding data processing and methodology are available from the corresponding author upon reasonable request.

Ethical Approval Statement

This study does not involve human participants, individual-level personal data, or experimental procedures requiring approval from an institutional ethics committee. The research is based exclusively on secondary data derived from publicly available institutional and analytical sources related to public debt management strategies in European Union countries. All data used in the analysis are aggregated and do not contain any confidential or personally identifiable information. Therefore, in accordance with internationally accepted research ethics standards, formal ethical approval was not required for this study.

References

Armendariz, S., *et al*. (2024, August 23). *Taming public debt in Europe: outlook, challenges, and policy response.* International Monetary Fund. https://www.imf.org/-/media/files/publications/wp/2024/english/wpiea2024181.pdf

Bilalli, D. (2024). Determining the threshold of public debt in the western Balkan countries. *Trends in Economics, Finance and Management Journal, 6*(2), 81–91. https://doi.org/10.69648/tnnc7924

Bitner, M. (2024). Debt management strategies in the countries of Central and Eastern Europe – an instrument of debt management or just increasing transparency of public finances? *Doradztwo Podatkowe – Biuletyn Instytutu Studiów Podatkowych, 8*(336), 31–42. https://doi.org/10.5604/01.3001.0054.7166

Bulíř, A., & Chauhan, K. (2025). Europe's Debt (Un)Sustainability: Looking Through Bohn's Magnifying Glass. IMF Working Papers. https://doi.org/10.5089/9798229007849.001

Căpraru, B., Georgescu, G., & Sprincean, N. (2025). Fiscal rules, independent fiscal institutions and sovereign risk: Evidence from the European Union. *International Journal of Finance & Economics,* 1-38. https://doi.org/10.1002/ijfe.3127

Căpraru, B., Pappas, A., & Sprincean, N. (2024). Fiscal rules in the European Union: Less is more. *Journal of Common Market Studies, 63*(1), 320-334. https://doi.org/10.1111/jcms.13628

Catarino, J. R., *et al.* (2025). Resilience of the economic and monetary union–the contribution of fiscal consolidation and public debt in the European Union. *European Studies - The Review of European Law, Economics and Politics, 11*(1), 152-177. https://doi.org/10.2478/eustu-2024-0007

Cavalieri, A. (2025). The shape of the budget. European countries' public expenditure through crises. *Journal of European Public Policy*, 1–27. https://doi.org/10.1080/13501763.2025.2475003

Chang, M., Howarth, D., & Pierret, L. (2024). From menace to mundane: Moral hazard and the politics of the European central bank's government bond purchases. *JCMS: Journal of Common Market Studies*, 1-27. https://doi.org/10.1111/jcms.13614

Chebbi, T., & Almaqtari, F. (2025). CDS bond-basis in sovereign debt markets, monetary policy and connectedness. *Journal of Financial Economic Policy*. https://doi.org/10.1108/jfep-10-2024-0330

Creel, J., Dąbrowski, M. A., Farvaque, E., Janus, J., & Stanek, P. (2025). A stringent necessity: Addressing fiscal bubbles with fiscal rules in Central and Eastern Europe. *Post-Communist Economies, 37*(1-2), 21-50. https://doi.org/10.1080/14631377.2024.2437735

De Graeve, F., & Mazzolini, G. (2023). The maturity composition of government debt: A comprehensive database. *European Economic Review, 154*, 104438. https://doi.org/10.1016/j.euroecorev.2023.104438

El-Naser, A., Dincă, G., & Dincă, M. S. (2025). Investigating the determinants of public debt sustainability for European Union countries. *Scientific Annals of Economics and Business, 72*(1), 21–40. https://doi.org/10.47743/saeb-2025-0001

Fasone, C., & Simoncini, M. (2025). Next generation EU and governance by conditionality: a transformation of the European Economic constitution? *European Papers-A Journal on Law and Integration, 9*(3), 1148-1179. https://doi.org/10.15166/2499-8249/803

Friewald, N., Nagler, F., & Wagner, C. (2022). Debt refinancing and equity returns. *The Journal of Finance, 77*(4), 2287–2329. https://doi.org/10.1111/jofi.13162

Gargano, P. (2024). *Digitalization and Cost of Corporate Debt: an Analysis of the European Landscape at a General, Country, and Industry Level.* (Doctoral dissertation). Portuguese Catholic University. Lisboa. http://hdl.handle.net/10400.14/46816

Groenendijk, N. (2023). Revenue capacity of the EU: Taxes, tax sharing, and resource pooling. *Politics and Governance*, *11*(4), 6–16. https://doi.org/10.17645/pag.v11i4.7240

Haas, J. S., D'Erman, V. I., Schulz, D. F., & Verdun, A. (2021). Economic and fiscal policy coordination after the crisis: Is the European Semester promoting more or less state intervention? In *Economic and Monetary Union at Twenty* (p.40–57). Routledge. https://doi.org/10.4324/9781003089858-4

Ioannou, S. (2022). Regional and municipal debt in the Eurozone: A cross-country analysis. *Regional Studies*, *57*(1), 97–111. https://doi.org/10.1080/00343404.2022.2047914

Kendrick, M. (2023). NextGenerationEU: Will the debt be repaid by EU own resources or member state taxpayers? *SSRN Electronic Journal, 48*(1), 29–61. https://doi.org/10.2139/ssrn.4383106

Konatar, M., Đurašković, J., Popović, N., & Radović, M. (2025). Does public debt crowd out public investment in central and eastern European economies? A dynamic approach using CS-ARDL. *Prague Economic Papers, 34*(1), 26–44. https://doi.org/10.18267/j.pep.887

Kraemer, R., & Lehtimäki, J. (2024). Government debt, European Institutions and fiscal rules: A synthetic control approach. *International Tax and Public Finance, 31,* 1112-1157. https://doi.org/10.1007/s10797-023-09791-z

Kussainov, K. (2023). Anti-corruption management mechanisms and the construction of a security landscape in the financial sector of the EU economic system against the background of challenges to European integration: Implications for artificial intelligence technologies. *Economic Affairs, 68*(1), 509-521. https://doi.org/10.46852/0424-2513.1.2023.20

Liotti, G., Musella, M., & Ofria, F. (2025). Do austerity policies reduce public debt? An analysis on twelve Eurozone countries. *Economics of Governance*. https://doi.org/10.1007/s10101-025-00325-3

Mali, S., & Maličká, L. (2024). Fiscal decentralization and public debt: New evidence from EU countries. *Ekonomika a spoločnosť, 23*(1), 69-98. https://doi.org/10.24040/eas.2022.23.1.69-98

Melnyk, D. S., Parfylo, O. A., Butenko, O.V., Tykhonova, O. V., & Zarosylo V. O. (2022). Practice of the member states of the European Union in the field of anti-corruption regulation. *Journal of Financial Crime, 29*(3), 853-863. https://doi.org/10.1108/jfc-03-2021-0050

Mihajlović, V. (2025). Debt-threshold effects on growth in post-communist EU economies: Does institutional quality matter? *Post-Communist Economies*, 1–19. https://doi.org/10.1080/14631377.2025.2487222

Mihalache, G. (2020). Sovereign default resolution through maturity extension. *Journal of International Economics*, *125*, 103326. https://doi.org/10.1016/j.jinteco.2020.103326

Mikuš, M., & Muriel, I. S. (2025). Managing problem debt in Europe. *Focaal, 2025*(101), 1–12. https://doi.org/10.3167/fcl.2025.1010101

Mileusnic, M. (2021). Steps towards a European fiscal union: Has the revised stability and growth pact delivered so far? *Journal of Contemporary European Research*, *17*(3), 409–430. https://doi.org/10.30950/jcer.v17i3.1123

Mutai, N. C., Farag, K., Ibeh, L., Chelabi, K., Cuong, N. M., & Popoola, O. M. (2025). AI Driven Fiscal Risk Assessment in the Eurozone: A Machine Learning Approach to Public Debt Vulnerability. *Preprints*. https://doi.org/10.20944/preprints202504.2189.v1

Oliinyk, O. S., Shestopalov, R. M., Zarosylo, V. O., Stankovic, M. I., & Golubitsky, S. G. (2022). Economic security through criminal policies. *Revista Científica General José María Córdova, 20*(38), 265–285. https://doi.org/10.21830/19006586.899

Papadopoulou, A. (2025). Public debt and the income share of the top one percent: The Italian case, 1974–2019. *Kyklos.* https://doi.org/10.1111/kykl.12444

Petkovski, M., Stojkov, A., & Kjosevski, J. (2024). Analysing the threshold relationship between public debt and economic growth in new EU member states from central and south Eastern Europe. *Ekonomický časopis, 72*(7-8), 360–389. https://doi.org/10.31577/ekoncas.2024.07-08.03

Ristić Cakić, M., Kalaš, B., Đurović Todorović, J., & Đorđević, M. (2025). Economic drivers of tax revenue: Insights from European economies. *Post-Communist Economies, 37*(5), 499-515. https://doi.org/10.1080/14631377.2025.2461929

Romp, W., Beetsma, R., Busse, M., &. Larch, M. M. (2025). Some intergenerational arithmetic to control public debt in the EU (No. 11669). *CESifo Working Paper*. https://www.econstor.eu/handle/10419/314708

Stănescu, C.-G. (2020). Digital debt collection. In *Discrimination, vulnerable consumers and financial inclusion* (pp. 185–205). Oxon; Routledge. https://doi.org/10.4324/9781003055075-11

van Riet, A. (2024). The rise of common public debt in Europe: A new chapter in fiscal integration? *Economia Politica: Journal of Analytical and Institutional Economics, 41*(2), 617-638. https://doi.org/10.1007/s40888-024-00326-1