

“Investigating the effects of public expenditure structure and fiscal discipline on SDGs in EU countries: An empirical analysis”

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INVESTIGATING THE EFFECTS OF PUBLIC EXPENDITURE STRUCTURE AND FISCAL DISCIPLINE ON SDGS IN EU COUNTRIES: AN EMPIRICAL ANALYSIS

Abstract

Public finance management has become increasingly important for achieving Sustainable Development Goals in European Union countries, where fiscal constraints, debt sustainability pressures, and development-oriented investment needs coexist. This study examines the effects of public expenditure structure and fiscal discipline on Sustainable Development Goals performance in EU countries. The analysis uses annual panel data for EU countries over the period 2007–2023. The SDG performance index is constructed from SDG 8, SDG 9, SDG 10, SDG 11, SDG 16, and SDG 17 indicators, while the public expenditure structure index is constructed from indicators reflecting collective government spending, total government expenditure, and the government investment share. Difference GMM and System GMM estimations are applied, and Driscoll–Kraay and KRLS estimators are used for robustness checks. The results show that public expenditure structure has a negative and statistically significant effect on SDG performance, with coefficients of -0.284 in the Difference GMM model and -0.048 in the System GMM model. Fiscal discipline has a positive and statistically significant effect, with coefficients of 0.353 and 0.315 , respectively. Robustness estimations also support the negative effect of public expenditure structure and the positive effect of fiscal discipline. However, the Driscoll–Kraay coefficient of fiscal discipline is statistically significant only at the 10% level. These findings suggest that fiscal discipline may support SDG performance through macro-fiscal stability, whereas the scale and composition of public expenditure alone may be insufficient unless they are aligned with SDG-oriented priorities.

Keywords

budget, sustainability, SDGs, Europe, GMM

JEL Classification

H61, H50, Q01, C33

INTRODUCTION

The Sustainable Development Goals (SDGs) provide a comprehensive global framework that integrates economic growth, social well-being, and environmental sustainability. Adopted by the United Nations in 2015 and designed to be achieved by 2030, the framework comprises 17 goals and 169 targets and has become an important guide for national development policies (Yılmaz & Yücel, 2022; Haberal & Işık, 2024). Achieving these goals requires not only the mobilization of public resources but also their effective allocation in accordance with development priorities. Consequently, public finance management plays a central role in translating sustainable development commitments into measurable outcomes.

Within this framework, public expenditure structure and fiscal discipline represent two important dimensions of public financial management. In this study, public expenditure structure refers to the scale

and composition of selected expenditure indicators, including collective government spending, total government expenditure, and the government investment share. Therefore, it does not directly measure expenditure efficiency or allocation quality, but rather reflects the fiscal expenditure profile through which public resources are mobilized. The literature indicates that the developmental impact of public spending depends not only on its amount but also on its composition, efficiency, and allocation across expenditure categories (Akdemir & İlgün, 2011). Previous evidence further suggests that higher expenditure does not necessarily produce better economic outcomes, emphasizing the importance of how public resources are directed and utilized (Devarajan et al., 1996).

This issue is particularly relevant for European Union (EU) countries, where commitments to sustainable development coexist with common fiscal rules, public debt constraints, and long-term investment needs. The EU has increasingly integrated the SDGs into its policy and budget processes, making the management of public expenditure and fiscal discipline particularly important for sustainable development (Källqvist, 2021). Fiscal discipline may contribute to macroeconomic stability, lower borrowing costs, and a more predictable environment for long-term policies; however, restrictive budgetary practices may also constrain investments in areas closely associated with sustainable development, including education, health, infrastructure, social inclusion, environmental protection, and institutional capacity. Therefore, lower public spending or tighter fiscal balances cannot automatically be assumed to generate better sustainable development outcomes. Against this background, this study examines whether public expenditure structure and fiscal discipline affect SDG performance in the same direction or generate different effects in EU countries. By jointly considering these two dimensions, the study seeks to clarify how the structure of public finances is associated with sustainable development performance under fiscal constraints.

1. LITERATURE REVIEW

With the rise of the Sustainable Development Goals, the literature on public finance has begun to focus not only on how much the public sector spends, but also on the purposes for which it is spent, the institutional capacity behind it, and the limits of fiscal sustainability within which it is directed. This shift is particularly significant in the European Union, as EU countries are simultaneously subject to the sustainable development agenda, common fiscal rules, and long-term investment needs. Consequently, the literature explaining SDG performance now discusses not only output indicators but also the allocation of public resources, the effectiveness of the public budget, the quality of governance, debt sustainability, and fiscal discipline (Källqvist, 2021; Eurostat, 2024; Gaspar et al., 2019).

The first major strand of the SDG literature demonstrates that the goals do not produce independent, linear, or single-sector outcomes; on the contrary, they involve strong interactions, complementarities, and trade-offs. Relevant studies emphasize that for the SDGs to succeed, we require

resources, policy coherence, and measurement capacity. Hák et al. (2016) argue that the selection of appropriate indicators is critical for the meaningful monitoring of the SDGs, whilst Pradhan et al. (2017) have demonstrated the need for the systematic mapping of interactions between targets. Allen et al. (2019) highlight the importance of considering countries' baseline levels, gaps, and inter-goal linkages together, whilst Nerini et al. (2019) and McGowan et al. (2019) have brought discussions on synergies and indivisibility between goals into sharper focus. This framework clearly demonstrates why public finance, within the context of SDGs, must be addressed not merely in terms of budget size, but also in terms of policy coordination and resource allocation capacity.

Within this general framework, the second strand comprises studies that link the implementation of SDGs to sectoral policy capacity and evidence-based decision-making. González-Pier et al. (2016) discuss the feasibility of a specific SDG target in the health sector alongside financial and institutional preconditions, whilst Porciello et al. (2020) propose that decision-support mechanisms be strengthened through data and analytical capac-

ity. Sobczak et al. (2021), meanwhile, demonstrate that the implementation of the poverty target is sensitive to regional and institutional differences. The most critical contribution of this line of research from a public finance perspective is highlighted by Cristóbal et al. (2021): inefficiencies in public spending could widen the financing gap required to achieve SDGs. Consequently, the literature is increasingly reaching a clear conclusion when explaining SDG success: resource mobilization is necessary, but not sufficient on its own; what is decisive is the conditions of efficiency and governance under which these resources generate outcomes.

At this point, public expenditure structure is treated in this study as an explanatory dimension of public finance. It refers to the composition and relative weight of selected government expenditure indicators rather than to expenditure efficiency itself. This distinction is important because a higher level of public expenditure or investment share does not automatically imply that resources are efficiently allocated to SDG-related priorities. The developmental effect of public expenditure depends on whether the expenditure structure is compatible with long-term sustainability, social inclusion, institutional capacity, and investment-oriented policy priorities. Although the measurement tradition of this approach is older, the seminal studies that continue to hold significance were shaped by Afonso et al. (2005), Afonso and Aubyn (2005), Herrera and Pang (2005), Gupta and Verhoeven (2001), and Joumard et al. (2010). A common thread running through these studies is that public performance should be assessed not merely in terms of expenditure levels, but in terms of output-transformation capacity. In other words, the same amount of public resources can produce very different outcomes in education, health, infrastructure, and welfare across different institutional and administrative contexts.

Recently, this measurement tradition has been directly linked to SDGs and sustainable growth. Dutu and Sicari (2016) demonstrate that there is no automatic link between 'higher spending' and 'better outcomes' by comparing the effectiveness of expenditure on health, education, and general administration in OECD countries. Ocolişanu et al. (2022), whilst discussing the impact of public

investment on sustainable growth in Central and Eastern Europe, note that the manner in which investment is directed is as important as its quantity. Afonso et al. (2005) also link the effectiveness of functional public expenditure in EU countries to SDG performance, suggesting that efficient countries produce better sustainability outcomes. Similarly, Trabelsi and Boujelbene (2024) demonstrate that the impact of public expenditure on growth depends on the degree of efficiency within the public sector; when efficiency increases, the seemingly negative effects of expenditure can turn positive. Taken together, these findings indicate that public expenditure structure may support sustainable development when the composition of spending is aligned with long-term development priorities, institutional capacity, and SDG-oriented investment needs.

However, the effect of public expenditure structure on SDG performance cannot be regarded as theoretically unidirectional. A higher expenditure share or a stronger public investment presence may support sustainable development when spending is directed toward SDG-related priorities. Conversely, if the expenditure structure reflects fiscal adjustment patterns that constrain social, environmental, infrastructure, or institutional investments, its effect on SDG performance may be negative. Therefore, the impact of public expenditure structure depends not only on the level of spending, but also on the composition and policy orientation of that spending. Whilst Cristóbal et al. (2021) demonstrate the cost of inefficiency, Gaspar et al. (2019) and Källqvist (2021) remind us that SDG financing requires not only fiscal discipline but also sufficient public investment. Consequently, the more nuanced conclusion drawn from the literature is as follows: public expenditure structure yields positive results when it implies allocation, but may yield negative results when it implies fiscal austerity that curtails development expenditure.

The literature on institutional quality and governance constitutes the second major theoretical strand that helps to explain this uncertainty. This approach argues that public expenditure or fiscal discipline do not, on their own, produce results; rather, performance depends on the institutional context in which these instruments are

implemented. Charron et al. (2014), who demonstrate that differences in regional and national governance within the EU have an impact on outcomes, show that public performance cannot be explained by size alone. Da Cruz et al. (2016), on measuring transparency in local government, and Cucciniello et al. (2017), who systematically review research on public transparency, demonstrate that accountability is a central mechanism in terms of public service quality, trust, and oversight. Mungiu-Pippidi and Dadašov (2016), meanwhile, treat anti-corruption and public integrity capacity as structural factors determining state performance. This line of literature explains why SDGs are not merely financial but also institutional objectives.

More recent studies have brought this debate into sharper focus within the European context. Kroll et al. (2019) argue that governance capacity and policy alignment are crucial for translating SDGs into synergies. Cuadrado-Ballesteros and Bisogno (2022), discussing the impact of public accounting reforms in Europe on transparency and allocation, suggest that a shift from cash basis to accrual basis accounting could strengthen public accountability. The OECD (2023) presents an institutional framework demonstrating that trust, capacity and performance management in the public sector are interlinked, whilst the World Bank (n.d.) maintains that governance indicators remain one of the key benchmarks for cross-country comparison. In their direct analysis of EU countries, Negri and Dincă (2023) demonstrate that governance quality, anti-corruption measures, the rule of law, human capital, and digital public applications have a significant impact on public sector effectiveness. While Lnenicka et al. (2024) discuss the contribution of open data and digital public ecosystems to sustainable governance capacity in Europe, the European Commission (2024) emphasizes that digital transformation and public service capacity play a central role in the EU's long-term transformation agenda. Within this framework, the institutional quality literature functions not as a 'background variable' explaining public expenditure structure, but as the mechanism that determines how allocation is actually produced.

The literature on fiscal discipline and public debt, meanwhile, examines the relationship between

public finances and SDG performance from a third perspective. According to this line of thinking, the sustainable management of the budget deficit, debt stock and fiscal rules influences the long-term investment climate, inflation expectations, borrowing costs and policy predictability, thereby impacting development outcomes. Eyraud et al. (2018) argue that second-generation fiscal rules must strike a balance between simplicity, flexibility, and enforceability. Truger (2016) emphasizes the importance of the 'golden rule' approach – which specifically protects public investment – for the European fiscal framework. The European Commission's 2024 reform and the assessments by the European Fiscal Board (2024) also demonstrate that the new EU fiscal framework now seeks to consider not only nominal discipline but also debt sustainability alongside reform and investment pathways (European Commission, 2024; European Fiscal Board, 2024). Marti and Cervelló-Royo (2023) and Lobonț et al. (2025) also argue that strong fiscal positions and effective fiscal rules can facilitate public policies oriented toward sustainable development. From this perspective, fiscal discipline is viewed as a stabilizing infrastructure that supports SDG performance.

However, the literature does not present a clear-cut conclusion on this point either. This is because the impact of fiscal discipline depends not only on the 'existence of discipline' but also on how it is achieved. Baret (2023) emphasizes that there is a non-mechanical relationship between compliance with fiscal rules and social welfare. The IMF's latest Fiscal Monitor report, whilst highlighting the importance of limiting public debt, also implies that adjustments that excessively constrain growth and investment could create medium-term risks (IMF, 2024). Guillamón et al. (2025) argue that low budget deficits can be associated with weaker SDG performance, demonstrating that fiscal consolidation based on cutting public investment may conflict with development objectives in the short term. Similarly, Malak and Demir (2023) suggest that more flexible fiscal policy instruments in OECD countries may be positively associated with human development. In contrast, Bisiriyu and Dhar (2025) point out that SDG progress is undermined, particularly when debt accumulation and reliance on external financing exceed a certain threshold. Consequently, the more balanced message from

the fiscal discipline literature is as follows: discipline is positive in strengthening macroeconomic stability; however, it can have a negative impact when it excessively restricts investment, social spending, and institutional capacity.

When this literature is considered as a whole, two conclusions emerge. Firstly, public expenditure structure and fiscal discipline are not one and the same in terms of sustainable development; the impact of both variables is conditioned by institutional quality, the composition of expenditure, and whether or not the investment sector is protected. Secondly, existing studies often address these two dimensions separately; a limited number of studies jointly examine the simultaneous and potentially opposing effects of public expenditure structure and fiscal discipline on SDG performance, particularly in EU countries.

Therefore, this study aims to address this gap by jointly examining the effects of public expenditure structure and fiscal discipline on SDG performance in European Union countries.

The hypotheses are as follows:

- H1: Public expenditure structure has a significant impact on SDG performance in European Union countries.*
- H2: Fiscal discipline has a significant impact on SDG performance in European Union countries.*

The hypothesized relationships among the study variables are illustrated in Figure 1.

2. METHODOLOGY

The initial sample consisted of the 27 European Union member states. However, Romania, Bulgaria, Cyprus, and Malta were excluded because complete data were not available for the study period. The initial phase of the research envisioned the inclusion of all member states of the European Union in the analysis. However, some financial data needed to calculate the public expenditure structure (PES) and fiscal stability and sustainability (FD) indices, which form the cornerstones of the study, could not be accessed continuously and completely for some specific countries. This situation necessitated a reduction in the sample size to maintain data integrity.

Accordingly, chronic data gaps have been identified, particularly in the financial indicators of Bulgaria and Romania for the years 2007–2023. Since the Principal Components Analysis (PCA) methodology is used in the construction of the PES and FD index structures, the absence of even a single variable in the model completely prevents the calculation of the index value for that year and country. Therefore, due to these significant systematic gaps in the dataset, the aforementioned two countries have been excluded from the analytical framework.

The study covers the period 2007–2023, and annual data for each country were used. SDGs are a set of goals established by the United Nations, outlining ideal levels for countries in different areas. Therefore, they are of great importance to countries. Whether fiscal discipline and expenditure structure contribute to the countries' SDG data constitutes the research question and starting

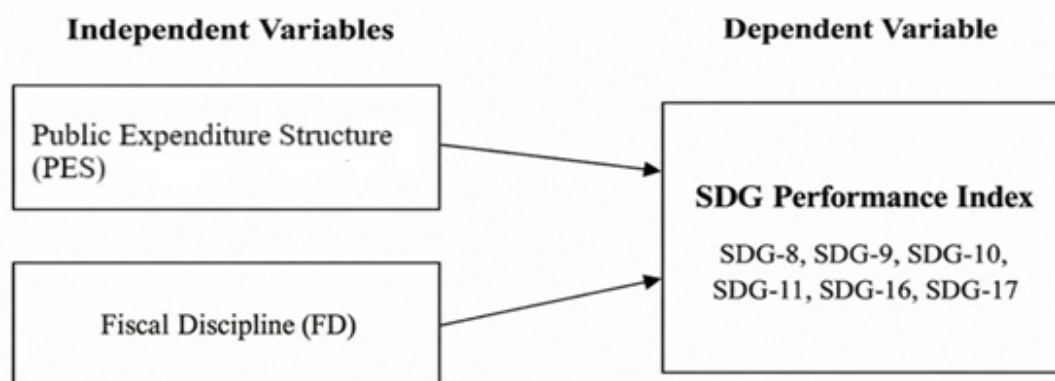


Figure 1. Research model of the study

Table 1. Variables used in the study

Abb	Variables		References	Expected
SDG	Sustainable Development Goals	SDG-8, SDG-9, SDG-10, SDG-11, SDG-16, SDG-17	United Nations Statistics Division (UNSD)	
PES	Public expenditure structure	Total General government spending by destination Collective, % of GDP	World Bank	+
		Total General government expenditures % of GDP		
		Total government investment as a share of total investment		
FD	Fiscal Discipline	Total General government fiscal balance % of GDP		+
		Total General government gross debt as a percentage of GDP		

point of the study. The variables used in the study, their definitions, data sources, and expected relationships are presented in Table 1.

Since the study included multiple dependent and independent variables, they were converted into indices using Principal Component Analysis (PCA). This method is used to convert multiple variables into a single variable. In this case, it provides a solution to the intervariate dependency structure and the multicollinearity problem (Jolliffe, 2002; Maddala, 1992; Malinvaud, 1997).

The public expenditure structure (PES) index is constructed from three indicators reflecting the fiscal expenditure profile of governments: collective government spending as a percentage of GDP, total government expenditure as a percentage of GDP, and government investment as a share of total investment. The first indicator captures the share of public resources allocated to collective services, the second reflects the overall size of government expenditure within the economy, and the third indicates the relative role of government in total investment. Higher values of the PES index indicate a stronger presence of public expenditure and government investment within the economy. However, the index should not be interpreted as a direct measure of expenditure efficiency or allocation quality; rather, it reflects the scale and composition of selected public expenditure indicators.

The fiscal stability (FD) index aims to keep the public finance structure free from vulnerabilities and maintain a balanced structure. This ratio is constructed using two key fiscal parameters: firstly, the ratio of the general government fiscal balance to GDP; and secondly, the weight of the gross public debt burden in GDP.

During the analysis, while the fiscal balance parameter positively impacts financial soundness and debt obligations, being factors that weaken fiscal performance, was subjected to directional standardization (reverse coding) before Principal Components Analysis (PCA). Since an increase in public debt levels signals a decline in fiscal performance, the direction of gross public debt (% GDP) has been reverse-coded and scaled accordingly. Accordingly, the observed increase in the final index score symbolizes the achievement of a stronger and more stable level of financial discipline in public finances. PCA results offer alternatives through the use of factor analysis.

The variables for PCA were standardized using the following formula (Jain et al., 1999).

$$Z_i = \frac{x_i - \bar{x}}{SD} \quad (1)$$

where Z_i represents the standardized value, x_i is the value used in the analysis of the relationship between the variables, $\bar{x}$ is the mean of the variables, and SD is the standard deviation. Additionally, the values related to PCA are shown in Table 2.

Table 2. PCA data

Variables	KMO	Eigenvalue	Explained variance
Spending	0.4599	1.44651	0.4822
Expenditures	0.4131	1.0255	0.3418
Investment	0.4301	0.527992	0.1760
Overall	0.4403	—	1.0000

The overall KMO value is 0.4403, indicating relatively low sampling adequacy. Therefore, the PCA results should be interpreted cautiously. The

first principal component explains 48.22% of the total variance for the public budget allocation indicators.

Public budget discipline, which focuses on balancing revenues and expenditures in the state budget, covers a more limited area compared to fiscal discipline. In contrast, fiscal discipline requires a much broader perspective, demanding that all public debt and financial commitments be managed sustainably in a way that does not jeopardize the future. Public budget discipline, which focuses on the alignment of revenues and expenditures while maintaining the periodic balance of the state budget, represents a narrow fiscal framework (Alesina & Perotti, 1995). Macro-level financial discipline, on the other hand, is not limited solely to budget results; it encompasses broader dimensions such as the state's debt stock, interest costs, and the sustainability of the fiscal structure for the future. Accordingly, while budget discipline reveals the immediate or short-term success of fiscal management, financial discipline measures the resilience of public finances to future shocks and their long-term sustainability. Therefore, examining both phenomena independently in this research allows for a much more holistic and in-depth analysis of the quality of the fiscal structure in different areas (Schick, 1998).

In countries, particularly through strict monetary policies and fiscal discipline, and by using budgets efficiently, development will be aided not only economically but in many other areas. In line with the principle of the welfare state, it leads to governments providing maximum benefit to society. Furthermore, the variables related to fiscal discipline and public expenditure structure share similar objectives with the Maastricht Criteria. The variables were taken from the official websites of the United Nations and the World Bank.

Expenditure structure and fiscal discipline are fundamental goals for every country. However, deviations occur due to factors such as crises, natural disasters, political crises, geopolitical risks, inter-country tensions, etc. For this purpose, the importance of this has been emphasized in the study. The model related to the study is as follows:

$$SDG_{i,t} = \beta_0 \cdot SDG_{i,t-1} + \beta_1 \cdot PES_{i,t} + \beta_2 \cdot FD_{i,t} + \epsilon_{i,t}, \quad (2)$$

where *SDG* represents the index containing goals 8, 9, 10, 11, 16, and 17 of the Sustainable Development Goals; $SDG_{i,t-1}$ represents the lagged value of the Sustainable Development Goal; *PES* represents the Public Expenditure Structure Index, which is constructed from collective government spending, total government expenditure, and government investment share indicators; *FD* represents the Fiscal Discipline Index for variables including Fiscal Discipline; and ϵ represents the margin of error.

Panel data analysis is frequently used in datasets containing multiple samples. Traditional panel data models risk delivering biased estimates due to the potential endogeneity relationship between expenditure structure, fiscal discipline, and SDG performance. Furthermore, past outcomes also influence the current state of SDG performance, meaning the process is dynamic (Blundell & Bond, 1998). In order to overcome the aforementioned methodological obstacles, the GMM (Generalized Moments Method) estimator, which controls unobservable fixed effects and uses internal instrumental variables, was used in this study. In this context, dynamic panel GMM techniques introduced to the literature by Arellano and Bond (1991) and Blundell and Bond (1998) were utilized. In dynamic panel data analysis, the reliability of GMM estimates is generally assessed through serial correlation tests (AR(1) and AR(2)) and Sargan or Hansen tests which test the validity of over-description constraints. The fact that the AR(2) test is insignificant and the Sargan/Hansen test confirms the validity of the instrumental variables indicates that the model produces consistent estimates (Arellano & Bond, 1991). Looking at these values, it is seen that the method is usable.

Results from panel data analysis can be interpreted on a panel basis or on a country/company basis. However, when the country/company cross-section (n) is larger than the time cross-section (t) ($n > t$), dynamic panel data analysis will yield more reliable results. One of the most commonly preferred techniques in dynamic panel data analysis is the Generalized Moments Method (GMM), de-

veloped by Hansen (1982), and further developed by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (2000). By including the lagged value of the dependent variable as an independent variable in the model, the aim is to obtain more consistent and reliable results. Furthermore, the fact that the method does not take into account issues such as stationarity of the series, cross-sectional dependence, autocorrelation, and heteroskedasticity makes it more usable (Baltagi, 2005; Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 2000).

3. RESULTS

The statistical values are presented in Table 3. Data on countries' fiscal discipline and public expenditure structure are presented as a ratio to GDP, meaning they are used as percentages rather than amounts, resulting in low standard deviation values. Significant differences are observed between countries regarding the ratio of their debt to GDP. The differing monetary and fiscal policies pursued by countries have created large variations among the variables. The public expenditure structure, fiscal discipline, and SDG indices generally show fluctuations between -3 and +3.

The correlation results (Table 4) show a negative association between public expenditure structure and SDG, while the association between fiscal discipline and SDG is weak and positive. Furthermore, there is a negative correlation between public expenditure structure and fiscal discipline. High levels of government spending alone do not guarantee the achievement of sustainable development goals. If available funds are not redirected to priority sectors supporting sustainability, or if the expenditure structure does not align perfectly with long-term growth strategies, the added benefit of government spending can backfire and produce negative results.

To determine the direction and coefficient of the relationship between the variables, the study calculated Difference GMM (D-GMM) and System GMM (S-GMM) dynamic panel coefficients (Table 5).

Public expenditure structure is found to have a significant effect on SDG at the 1% significance level, while fiscal discipline has a significant effect at the 1% significance level. Public expenditure structure has a negative effect on SDG, while fiscal discipline has a positive effect. A 1-unit increase

Table 3. Statistical values of variables

Variable	Obs.	Mean	Std. Dev.	Minimum	Maximum
Spending	391	8.277167	1.390967	3.752238	12.02188
Expenditures	391	47.27338	7.05278	21.38	64.89
Investment	391	3.723202	1.06776	1.55	7.42
PES	391	-4.99010	1.000002	-3.671377	2.49782
Fiscal	391	-2.966427	3.702076	-32.12	5.11
Debt	391	81.77191	41.37811	7.19	236.78
FD	391	0.025109	1.000007	-1.96545	2.18159
Sdg-8	391	1.299622	4.073289	-14.64231	23.44369
Sdg-9	391	1.837939	8.599591	-23.92642	83.41699
Sdg-10	391	1.416236	5.753541	0.2323232	32.4
Sdg-11	391	74.09116	12.07107	51.983	98.189
Sdg-16	391	2.929056	6.937473	0.1840422	43.35943
Sdg-17	391	21.23499	5.245691	10.18928	36.58507
SDG	391	2.51310	1.000002	-2.996002	3.486399

Note: PES = Public expenditure structure; FD = Fiscal discipline.

Table 4. Correlation analysis results

Variable	SDG	PES	FD
SDG	1.0000		
PES	-0.2590	1.0000	
FD	0.2014	-0.3888	1.0000

Note: PES = Public expenditure structure; FD = Fiscal discipline.

Table 5. GMM analysis results

Variable	D-GMM			S-GMM		
	Coef.	Std. Err.	P > z	Coef.	Std. Err.	P > z
SDG (-1)	-0.186794	0.005864	0.0000	-0.180913	0.007431	0.0000
PES	-0.284377	0.028061	0.0000***	-0.047741	0.016819	0.0048***
FD	0.352823	0.014240	0.0000***	0.315173	0.012679	0.0000***
Wald	591.3128 (0.0000)			551.6050 (0.0000)		
Sargan	20.45156 (0.367)			20.61840 (0.358264)		
AR1 / AR2	0.053 / 0.074			0.036 / 0.085		
Number of Obs	330			330		
Number of Groups	22			22		
Number of Inst.	123			123		

Note: *** indicates a significance level of 1%. A lag of 1 is assumed. PES = Public expenditure structure; FD = Fiscal discipline.

in PES reduces SDG by 0.28. This result suggests that a more expenditure-intensive public finance structure may not improve SDG performance unless expenditure is directed toward SDG-related priority areas.

A 1-unit increase in fiscal discipline is associated with a 0.35-unit increase in SDG performance according to the Difference GMM estimation. Similarly, the System GMM result also indicates a positive effect of fiscal discipline on SDG performance. Therefore, the GMM results support *H1* and *H2*. The robustness estimations also support the direction of these effects, although the statistical strength of fiscal discipline differs across estimators. These findings suggest that fiscal discipline may contribute to SDG performance by creating a more stable, predictable, and sustainable fiscal environment. However, this result should be interpreted cautiously, since the magnitude and significance level of the fiscal discipline coefficient vary across estimation methods. Different techniques were applied to reinforce the GMM results. First, the presence of cross-sectional dependence, heteroskedasticity, and autocorrelation among the variables was investigated.

As seen in the preliminary diagnostic tests (Table 6), the model has cross-sectional dependence, autocorrelation, and heteroskedasticity problems. Robust estimator methods, which are resistant to these problems, have been used. The Driscoll–

Kraay estimator is a suitable method for panels that provides reliable predictions in different situations, can give healthy results when applied to large datasets with cross-sectional and time dependence, and provides resistance to cross-sectional dependence, autocorrelation, and heteroskedasticity problems (Sultana & Rahman, 2024).

The KRLS (Kernel-Based Regularized Least Squares) method is a suitable approach for researchers as it prevents biases related to incorrect specification. Furthermore, the method offers advantages over GLS by having optimal preliminary diagnostic assumptions such as unbiasedness, consistency, and asymptotic normality. The method yields similar results to GLS regression models (Awan et al., 2022).

The Driscoll–Kraay and KRLS estimators were found to be similar to the GMM test results (Table 7). The negative impact of public expenditure structure and fiscal discipline on the Sustainable Development Goals (SDGs) is consistent with the GMM findings. That is, a 1-unit increase in public expenditure structure reduces SDG by 0.21 units according to the Driscoll–Kraay Robust Estimator technique and by 0.10 units according to the KRLS Estimator technique. According to both robustness test results, a 1-unit increase in a country's fiscal discipline increases its SDG by 0.12.

Table 6. Diagnostic test results

Model specification	Pesaran Cross-Sectional Dependence Test		Wooldridge Autocorrelation Test		Breusch-Pagan / Cook-Weisberg Heteroskedasticity Test	
	T stat	Prob	F	Prob	chi2	Prob
Model	29.895	0.0000	41.255	0.0000	41.56	0.0000

Table 7. Robust estimator results

Variables	Driscoll-Kraay			KRLS		
	Coef.	D/K Std. Err.	P > z	Avg.	SE	P > t
PES	-0.2147233	0.0736966	0.010 **	-0.106673	0.042709	0.013 **
FD	0.1196326	0.0597888	0.063 *	0.119274	0.042709	0.021 **
F / Prob	11.81 (0.0007)			Lambda		6.448
R-Squared	0.0790			0.1254		
Root MSE	0.9706			Looloss		356.7

Note: ** and * indicates a significance level of 5% and 10%. PES = Public expenditure structure; FD = Fiscal discipline.

4. DISCUSSION

According to the GMM results, both public expenditure structure and fiscal discipline have a statistically significant effect on SDG performance. Public expenditure structure has a negative effect, whereas fiscal discipline has a positive effect. The negative coefficient of public expenditure structure suggests that a more expenditure-intensive public finance structure does not automatically translate into higher SDG performance. This finding should not be interpreted as evidence that public expenditure is harmful to sustainable development. Rather, it indicates that the scale and composition of public expenditure alone may be insufficient unless they are aligned with SDG-oriented priorities such as education, health, infrastructure, environmental protection, social inclusion, and institutional capacity. In this respect, the findings point to the importance of the quality and direction of expenditure composition rather than the mere size of public spending. Therefore, governments should design fiscal planning frameworks that preserve fiscal stability while ensuring that public expenditure is directed toward long-term development priorities. The Driscoll-Kraay and KRLS estimations also support the negative relationship between public expenditure structure and SDG performance.

Empirical findings reveal that fiscal discipline plays a stimulating role in SDG processes. Considering this alongside previous findings, it can be argued that the main structural problem in European Union member states is not fiscal discipline itself, but rather the allocation of resources generated by this disciplined financial framework to the correct expenditure categories and the rational measurement of this allocation. Governments ensure financial stability by placing budget deficits on sustainable paths, building an ideal balance be-

tween income and expenditure, and developing medium-to-long-term fiscal projections. This fiscally disciplined environment creates predictability and continuity in countries' social and environmental policies, thereby improving macro-level sustainable development performance. A strict fiscal discipline environment, by suppressing luxury public spending and increasing domestic savings, also lowers external borrowing costs, creating fiscal space for countries' sustainable development initiatives. While financial stability thus generates a vital source of funding for sustainable development, it can make it difficult to directly channel public expenditure structure toward SDGs within this rationally shrinking budget architecture. These empirical findings are broadly consistent with the global reports and empirical findings of the International Monetary Fund (IMF) and the World Bank on financial sustainability and SDGs.

When our empirical findings are compared with studies in the literature, it is noteworthy that there is both parallel and divergent empirical evidence, especially in the area of fiscal discipline. Consistent with the findings of our study, Marti and Cervelló-Royo (2023) show that a strong fiscal position of the public sector accelerates SDG processes, while Lobonç et al. (2025) argue that uncompromisingly applied fiscal rules guarantee lasting and sustainable economic growth. On the other hand, in the global GMM analysis conducted by Guillamón et al. (2025), it was found that low budget deficits (high fiscal discipline), contrary to popular belief, actually lowered SDG scores. Similarly, Bisiriyu and Dhar (2025) showed that an increase in external debt stock (weak fiscal discipline) undermined budgetary stability and disrupted sustainable development processes. These contradictory empirical results observed in the literature may stem from the scope of the datasets used, differences in the time periods examined, or variations in the operational definitions and measurement methods of the variables.

Empirical findings regarding public expenditure structure are in stark contrast to current literature trends. For example, Afonso et al. (2025) found that countries with high allocation in public spending, such as Denmark, Ireland, and Finland, also had advanced SDG performance and strategic cuts in public spending support sustainable development success. This points to a positive correlation between efficient budget management and relatively low-volume spending leading to high SDG scores. In contrast, our research empirically demonstrates that public expenditure structure creates negative pressure on SDGs. This divergence may stem from methodological differences in measuring spending efficiency or from

the structural diversity of national-level public spending policies.

The findings of the study suggest that public expenditure structure has an inverse effect on the SDGs, while pointing to empirical evidence that both aligns with and diverges from the literature regarding the stimulating role of fiscal discipline. The validity of these empirical findings is directly related to structural factors such as the operational definitions of the indicators included in the analysis, the time period covered, and the country sample examined. Therefore, the findings should be interpreted with a multidimensional and cautious approach, filtering them through parallel and contrasting empirical studies in the existing literature.

CONCLUSION

The main objective of this study is to reveal the impact of public expenditure distribution and fiscal discipline on Sustainable Development Goals (SDG) performance in European Union countries by recording data from 2007-2023. This capability is achieved through growth analysis, Difference GMM, cross-sectional analysis of variables, variances of diversity, and the presence of autocorrelation. According to the findings of the study, the results analysis revealed a negative relationship between public expenditure structure and Sustainable Development Goals (SDGs), while the relationship between fiscal discipline and SDGs was weak and positive. Another important finding of the study is that, according to the use of Difference GMM and System GMM, public expenditure distribution has a negative and statistically significant impact on SDG performance, while fiscal discipline has a positive and statistically significant impact.

In light of this information, it can be said that public spending and government investments alone do not have an impact on improving SDG performance. The contribution of public spending to sustainable development seems to depend on how the spending structure is aligned with long-term development and SDG-related priorities. Furthermore, the positive relationship between fiscal discipline and Sustainable Development Goal (SDG) performance allows for the creation of a sustainable and stable fiscal structure. This, in turn, can provide favorable conditions for pursuing long-term sustainable development goals. Therefore, fiscal discipline and public spending structure should not be considered merely as interchangeable dimensions of public finance. The effects of fiscal discipline and public spending structure on sustainable development should be addressed and evaluated with a holistic approach, as they may vary depending on the composition and orientation of public resources.

Specifically for European Union member states, instead of increasing the amount of public spending in national economies, public spending should be prioritized. The SDG targets can serve as a guide in this regard. In other words, making investments that improve the socio-economic level and well-being of citizens will increase confidence in the country. Countries should create spending performance reports, and their impact on the public should be investigated through surveys such as satisfaction polls. Efforts to achieve budgetary discipline should not jeopardize key social protection and green transition funding; economic policy should take into account the inequalities in countries' fiscal budgetary capacities. Thus, the ongoing fiscal tightening process is not a factor limiting the vision of sustainable growth; on the contrary, it strengthens the financial foundation of long-term SDG action plans. The study can be improved by applying it to country groups with different income levels and by adding different variables.

AUTHOR CONTRIBUTIONS

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