

# Sustainable goals, unsustainable debt? An empirical analysis of the sustainable development goals and government financial sustainability

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## Abstract

**Purpose** – This paper aims to examine the relationship between the implementation of the sustainable development goals (SDGs) and governments' financial sustainability. It analyzes whether progress toward the 2030 Agenda is associated with increasing public debt, thereby highlighting the potential fiscal implications of sustainability-oriented policies.

**Design/methodology/approach** – The study uses a balanced panel of 145 countries covering the period 2016–2023. A dynamic model is estimated using the two-step system generalized method of moments. The dependent variable is general government gross debt (% of gross domestic product (GDP)), while the key independent variable is the SDG Index. Additional control variables include GDP per capita, unemployment, population metrics, revenue, political ideology, gender representation and voter turnout. Several robustness checks have also been conducted, including alternative estimation methods, variable substitutions and subsample analyses.

**Findings** – The results show a significant and positive relationship between SDG performance and public debt levels. Countries with higher SDG scores tend to exhibit greater indebtedness, suggesting that SDG progress is frequently financed through borrowing.

**Originality/value** – This is among the first empirical studies to examine how SDG implementation affects national debt. It offers new insights into the financial trade-offs of sustainable development, highlighting the importance of aligning sustainability strategies with sound fiscal planning. The findings contribute to debates on financing the 2030 Agenda and inform public finance and policy decisions.

**Keywords** Sustainable development goals, Public debt, Fiscal sustainability, Countries, System GMM

**Paper type** Research article

**JEL Classification** — H63, H50, Q01, C33, O23

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## 1. Introduction

The current global landscape is characterized by multiple challenges that demand coordinated and effective responses. In this context, the United Nations (UN) Sustainable Development Goals (SDGs) represent a comprehensive and ambitious agenda designed to address these issues and foster a more equitable and sustainable future. The SDGs represent a global call to action aimed at eradicating poverty, protecting the environment and ensuring the well-being of all people by the year 2030. This set of 17 interconnected goals addresses key areas such as poverty and hunger reduction, climate action, gender equality and the promotion of peace and justice. Their design not only aims to tackle these challenges but also guides the implementation of strategies to achieve them and provides a framework for monitoring and evaluating progress (Chaparro-Banegas *et al.*, 2024; Raimo *et al.*, 2024).

Achieving sustainability relies on collective action and coordination across all segments of society. In this regard, the public sector plays a pivotal role. The attainment of the SDGs largely depends on the capacity of governments to translate these goals into concrete policies and actions. Public institutions are responsible for developing regulatory frameworks, allocating financial and technical resources, coordinating inter-institutional efforts and mobilizing key stakeholders, such as civil society and the private sector, to advance SDG implementation (Puertas and Martí, 2023; Nicolò *et al.*, 2025; Raimo *et al.*, 2025).

Implementing the SDGs is a global imperative; however, their full realization is constrained by the substantial financial resources required (Leal Filho *et al.*, 2022; Alonso-Morales *et al.*, 2024) and by the need for stable macroeconomic conditions that enable governments to sustain such investments over time (Chakraborty, 2020). According to the 2014 World Investment Report, achieving the SDGs globally would necessitate annual investments ranging between USD 5 trillion and 7 trillion from 2015 to 2030 (UNCTAD, 2014). More recently, the Fourth International Conference on Financing for Development, held in Seville from 30 June to 3 July 2025, emphasized that the successful implementation of the 2030 Agenda critically depends on addressing a persistent financing gap, currently estimated at USD 4 trillion per year. During the conference, it was acknowledged that, without a substantial increase in available public and private resources, many developing countries may be unable to implement SDG policies without compromising fiscal and financial stability (UN, 2025).

In this context, governmental efforts to implement the SDGs must be aligned with existing financial constraints, ensuring that resource allocation preserves fiscal sustainability (Anyanwu, 2021; Leal Filho *et al.*, 2022; Guarini *et al.*, 2022). Strengthening sustainable finance mechanisms is essential to bridge the SDG financing gap and deliver tangible benefits for both people and the planet (OECD, 2020). Ultimately, the social and environmental costs of failing to achieve the SDGs should drive greater international cooperation and the strategic use of synergies to foster a more equitable and sustainable future for present and future generations (Leal Filho *et al.*, 2022).

Some studies have suggested a potential link between implementing sustainability practices and maintaining stable public finances. Cordery and Hay (2022) observed that achieving the SDGs requires significant economic resources, which could influence the financial health of central governments. This highlights the importance of examining the balance between investment in sustainable development and fiscal stability, as greater involvement in SDG implementation could jeopardize the financial stability of governments. In this regard, recent contributions have studied how sustainability considerations affect public financial management practices across Europe, underscoring implications for budgeting, accounting, reporting and auditing (Bisogno *et al.*, 2024). Similarly, Manes Rossi *et al.* (2025) found that recent academic literature has begun to investigate how public financial management can be aligned with the SDGs, emphasizing the need for further research in this area.

Given the above, this study aims to analyze the dynamic relationship between SDG implementation and public debt. To this end, data from countries included in the Sustainable Development Reports prepared by the UN Sustainable Development Solutions Network

(SDSN) are used, covering the period from 2016 to 2023. This analysis seeks to provide insights into how the adoption of the SDGs influences public financial management and the implications for governments' long-term economic viability.

In recent years, the academic literature on the SDGs has expanded significantly, with most studies focusing on specific goals or targets (e.g. Guppy, 2017; Giupponi *et al.*, 2018; Aust *et al.*, 2020; Huan *et al.*, 2021) or examining the progress and implementation of the SDGs within specific countries or regions, such as the OECD (OECD, 2019; Shinwell and Cohen, 2020), Europe (e.g. Adamišin *et al.*, 2015; Janković Šoja *et al.*, 2016; Vorontsova *et al.*, 2020; Bisogno *et al.*, 2024; De Francesco *et al.*, 2024), BRICS (Ali *et al.*, 2018), the Arab region (Allen *et al.*, 2017, 2019) and the G20 (Schmidt-Traub *et al.*, 2017).

Other contributions have classified countries according to their level of sustainable development using various methodologies, particularly cluster analysis (e.g. Adamišin *et al.*, 2015; Jabbari *et al.*, 2019; Drastichova, 2020; Çağlar and Gürler, 2022; Martí and Cervelló-Royo, 2023). Similarly, numerous studies have supported SDG advancement by addressing strategic planning, policy adaptation, implementation tools and goal specification (Persson *et al.*, 2016; Gusmão Caiado *et al.*, 2018; Carlsen and Bruggemann, 2022; Kostetckaia and Hametner, 2022; Chen, 2023).

Additionally, research has investigated the factors that influence the extent of SDG implementation across countries (Olayinka and Osariemen, 2019; Osuji and Nwani, 2020; Cristóbal *et al.*, 2021; Reverte, 2022; Guariso *et al.*, 2023; Thullah, 2023; Chaparro-Banegas *et al.*, 2024; Lyulyov *et al.*, 2024; Bisogno *et al.*, 2025; Guillamón *et al.*, 2025). Finally, several studies have adopted bibliometric and systematic literature review approaches to map trends in SDG research and identify gaps in the literature (Allen *et al.*, 2018; Gusmão Caiado *et al.*, 2018; González Del Campo *et al.*, 2020; Boar *et al.*, 2021; Liu *et al.*, 2022; Yeh *et al.*, 2022).

Despite this growing body of research, to the best of the authors' knowledge, no study has yet empirically explored the effect of SDG implementation on the financial sustainability of governments.

This study makes a valuable contribution to the existing literature by providing new empirical evidence on the relationship between the SDG implementation and countries' financial sustainability. Although thematically aligned with an emerging area of research, this paper advances previous studies by employing a balanced panel of 145 countries from 2016 to 2023 and applying a dynamic two-step system generalized method of moments (GMM) estimator. This methodological approach addresses the issue of endogeneity, heterogeneity and fiscal persistence, offering a more robust and reliable analysis than earlier descriptive or case-based study investigations. By combining extensive cross-country coverage with analytical rigor, this study provides a comprehensive, temporally consistent perspective on how progress toward the SDGs influences governments' financial health, thereby complementing and extending prior contributions. Furthermore, the findings offer practical insights to policymakers, regulators, citizens and other stakeholders.

The remainder of the paper is structured as follows. Section 2 reviews the literature on the relationship between SDG implementation and financial sustainability. Section 3 outlines the methodology, and Section 4 presents the empirical results. Section 5 discusses the main findings in light of the theoretical and policy context and reports the robustness checks. Finally, Section 6 concludes with the main policy implications and directions for future research.

## 2. Literature review

Guarini *et al.* (2022) argued that the implementation of the SDGs requires considerable time, effort and financial resources from governments, prompting public decision-makers to assess the opportunity costs of reallocating constrained resources. Strategic planning, understood as a core component of strategic management within public administration, constitutes a structured process for defining an organization's mission, actions and long-term direction (Koteen, 1989; Bryson and George, 2024). This process offers a formal mechanism through which political

and financial priorities can be articulated, positioning it as a key tool for integrating the 2030 Agenda and its SDGs into governmental policy frameworks. By aligning financial planning with the SDGs and linking each goal to measurable outcomes, public administrations can undertake transparent and strategic decisions regarding resource allocation (Guarini *et al.*, 2022).

In this context, analyzing how political and administrative leaders distribute and manage resources for sustainability initiatives is essential to understanding the broader fiscal implications of SDG implementation. As emphasized by Cristóbal *et al.* (2021), national governments bear the responsibility of allocating budgets effectively to support sustainable development. Addressing the wide-ranging challenges posed by the 2030 Agenda requires an active contribution from public financial management, approached from multiple perspectives. Recent evidence highlights that sustainability considerations have significant implications for budgeting, accounting, reporting and auditing practices across Europe, indicating that public financial management systems must evolve to integrate the SDGs (Bisogno *et al.*, 2024). Thus, increasing attention is being paid to how public financial systems can be aligned with the SDGs, underscoring the need for further research on their role in supporting sustainable development through integrated planning, budgeting and accountability mechanisms (Manes Rossi *et al.*, 2025).

Although numerous studies have examined the SDGs at the national level, limited research has investigated how SDG implementation may affect a country's financial sustainability. Some contributions, however, suggest a potential link between the adoption of sustainability practices and the soundness of public finances.

Cordery and Hay (2022) argued that achieving the SDGs requires substantial economic resources, which may influence public financial balances. They advocated for an expanded role of Supreme Audit Institutions in conducting performance audits not only to monitor SDG progress but also to oversee public debt, given the importance of managing growing indebtedness effectively and efficiently. Similarly, Anyanwu (2021) underscored that sustained financial mobilization is critical for achieving the SDGs. While policymakers often emphasize increased public spending in key sectors such as health, education and infrastructure as necessary to close development gaps, this strategy may entail risks to fiscal and debt sustainability. At the same time, although sustainable investments represent a logical approach to advancing the 2030 Agenda, several challenges remain, including high associated costs, limited investor awareness and lingering perceptions that such investments are not financially profitable (Leal Filho *et al.*, 2022). Nevertheless, if public investments financed by debt are targeted effectively, they can foster economic growth and increase government revenues. This could potentially reduce the debt-to-GDP ratio, despite initial increases in debt levels. This view is reinforced by Vaggi and Frigerio (2024), who showed that external debt sustainability can improve when countries increase spending in core human development areas, particularly health and education, which are central to the SDGs.

Building on these considerations, Ailincă (2021) empirically analyzed the effect of selected SDG indicators, specifically those related to research and innovation (nine target indicators), on real gross domestic product (GDP) per capita, economic growth, public balances and public debt, using data from 27 European Union countries for the period 2009–2020. The analysis did not identify a statistically significant relationship between the selected indicators and public debt. The findings suggested that variations in public debt cannot be reliably attributed to the research and innovation indicators considered, thereby underscoring the need for further investigation and the inclusion of additional variables to better capture the underlying dynamics. In a broader international context involving a sample of 59 countries, Ten Bosch *et al.* (2022) found that stronger SDG performance is associated with lower sovereign default risk, as evidenced by narrower credit default swap spreads. This effect is particularly pronounced for longer-term bonds, suggesting that SDG progress may confer financial benefits to governments in addition to social and environmental advantages. At the local level, Benito *et al.* (2023) identified that municipalities with higher levels of SDG compliance tend to

have shorter payment periods to suppliers and report smaller budget surpluses or larger deficits. However, an increased level of SDG implementation does not necessarily translate into changes in gross savings or per capita municipal debt.

Considering the above, it is acknowledged that while the implementation of the SDGs may have meaningful implications for public finances, the empirical literature on this relationship remains limited and fragmented. Accordingly, the following hypothesis is proposed:

- H1.* There is a significant relationship between the level of SDG implementation and a country's financial sustainability.

### 3. Methodology

#### 3.1 Data and variables

To construct the sample for this study, the starting point was the set of countries analyzed by the UN SDSN, which has published the Sustainable Development Report annually since 2016 to monitor countries' progress toward SDGs [1]. This source was selected as it provides the data necessary to define the independent variable, as detailed in the subsequent section.

Since the number of countries included in the report varies over time, the analysis was limited to those that appeared in every edition from 2016 to 2023 [2] to ensure temporal consistency. The sample was further refined by including only countries with complete data for all variables across the entire period, resulting in a balanced panel. The final dataset therefore includes 145 countries, each of which is observed over the full study period from 2016 to 2023.

To measure the financial sustainability of governments, this study adopts general government gross debt as a percentage of GDP (*debt*) as the dependent variable. Public debt is commonly used as a key indicator of financial sustainability (Biondi, 2023), as it reflects the cumulative fiscal commitments of a government and its ability to meet long-term obligations. Unlike short-term indicators, such as annual budget deficits or government revenues, public debt captures the structural balance of public finances and serves as an early warning signal for potential fiscal risks. Elevated or increasing debt levels may indicate underlying fiscal imbalances, whereas sustainable debt levels suggest that a government can finance its activities without undermining future fiscal space or placing excessive burdens on future generations. Accordingly, public debt is considered a comprehensive and forward-looking metric of a country's fiscal health and financial sustainability.

The main independent variable of this analysis is the *sdg\_score*, which reflects a country's overall progress in achieving the SDGs. Specifically, this study employs the SDG Index, published annually by the UN SDSN in the Sustainable Development Report [3]. This index assesses national performance across all 17 SDGs, assigning equal weight to each goal. Scores range from 0 to 100, where 100 denotes full achievement and 0 signifies the lowest possible performance. Accordingly, a country's score indicates the percentage of the optimal target that has been attained, while the gap to 100 highlights the remaining effort required. The SDG Index thus serves both as a diagnostic tool and as a benchmark for monitoring progress toward the 2030 Agenda.

The index is constructed using a standardized set of indicators and thresholds applied uniformly across countries, ensuring the comparability of scores and rankings. To minimize potential bias arising from missing data, countries with coverage below 80% of the indicators are excluded from the overall score and ranking. Since its initial release in 2016, the SDG Index has undergone peer review, and its global edition was audited by the European Commission in 2019 to verify its statistical reliability (Sachs *et al.*, 2023). Additional methodological details are available on the official SDSN platform [4].

To account for additional factors that may influence the level of public debt, several control variables are included in the model. Their inclusion helps to improve the robustness of the analysis by isolating the specific contribution of SDG implementation to fiscal sustainability. The variables have been selected based on the existing literature and are described below.

- (1) Economic level (*lgdppc*) is proxied by the natural logarithm of GDP per capita in constant 2015 US dollars. Wealthier countries may be more capable of sustaining higher levels of public debt, as stronger economies typically have greater borrowing capacity to support investment, public services and social programs (Guillamón *et al.*, 2011; Balaguer-Coll and Ivanova-Toneva, 2019).
- (2) Unemployment (*unemployment*) is included as a proxy for labor market performance, measured as the total unemployment rate expressed as a percentage of the labor force (International Labour Organization (ILO) estimates). Higher unemployment tends to reduce tax revenues and increase welfare spending, contributing to larger deficits and, over time, higher debt (Feld and Kirchgässner, 2001; Benito *et al.*, 2016; Cabaleiro-Casal and Buch-Gómez, 2021).
- (3) Population size (*lpop*), measured as the natural logarithm of the total population, captures the scale of public service provision. Larger populations are often associated with greater demand for infrastructure, education and healthcare, which may increase the need for government borrowing (Cuadrado-Ballesteros *et al.*, 2024).
- (4) Population density (*denpop*), defined as the number of inhabitants per square kilometer, reflects demographic concentration. While its effect on debt is not conclusive, some studies suggest that higher density may reduce per capita debt through economies of scale, whereas others highlight the cost pressures associated with urban services (Vicente *et al.*, 2013; Benito *et al.*, 2015).
- (5) The dependency ratio (*popdep*), which is calculated by dividing the number of individuals under the age of 14 and over the age of 65 by the total population, serves as an indicator of demographic pressure. A higher ratio implies greater fiscal demands, especially for health and social services, which can strain public finances (Bisogno *et al.*, 2019; Guillamón *et al.*, 2024).
- (6) Government revenue (*revenue*), expressed as a percentage of GDP, reflects the fiscal capacity of the state. Higher revenue enables governments to finance expenditures without relying excessively on debt, thereby improving overall financial sustainability (Feld and Kirchgässner, 2001; Guillamón *et al.*, 2011; Vicente *et al.*, 2013; Balaguer-Coll and Ivanova-Toneva, 2019; Cuadrado-Ballesteros *et al.*, 2024).
- (7) Government ideology (*ideology*) is captured through a dummy variable coded as 1 for conservative-led governments and 0 otherwise. While it is often assumed that conservative parties are more fiscally restrained and progressive parties more inclined toward social spending (Seitz, 2000; Tellier, 2006), some scholars argue that ideological differences have become less relevant in shaping fiscal policy due to convergence across political systems (Skinner, 1976).
- (8) Female representation (*women*) is measured as the percentage of seats in parliament held by women. Some studies associated higher female participation with greater fiscal responsibility and compliance with financial rules (Balaguer-Coll and Ivanova-Toneva, 2021; Cuadrado-Ballesteros *et al.*, 2024), while others reported mixed or even opposite results (Cabaleiro-Casal and Buch-Gómez, 2021).
- (9) Voter turnout (*turnout*), defined as the percentage of registered voters who participate in parliamentary elections, is a proxy for civic engagement. While greater electoral participation can enhance public accountability and fiscal discipline (Norton and Elson, 2002), it can also reflect higher expectations of public services among citizens, which can increase pressure on government spending (Alt *et al.*, 2001). Furthermore, fiscal expansions aimed at gaining political support during election cycles may lead to higher debt (Drazen, 2008).

Table 1 presents all variables used, along with their data sources, definitions and descriptive statistics.

### 3.2 Model

This study examines the extent to which the implementation of the SDGs influences the financial sustainability of countries. To address this objective, the following empirical model is specified:

**Table 1.** Description of variables

Variable	Definition	Source	Mean	Std. Dev	Min	Max
<i>debt</i>	General government gross debt as a percentage of GDP	International Monetary Fund (IMF)	61.4250	36.8978	2.9000	357.7000
<i>sdg_score</i>	SDGs index score (ranging from 0 = no compliance to 100 = full compliance)	UN SDSN	65.9890	11.0566	26.1024	86.8000
<i>lgdppc</i>	GDP per capita (constant 2015 US dollars), expressed in natural logarithm	World Bank	8.6924	1.4453	5.5355	11.6121
<i>unemployment</i>	Unemployment rate, based on ILO modeled estimates (% of total labor force)	World Bank	7.1253	5.2984	0.1000	34.0070
<i>lpop</i>	Total population, expressed in natural logarithms	World Bank	16.4230	1.5406	12.7232	21.0866
<i>denpop</i>	Population density (people per square kilometer)	World Bank	193.7997	669.9241	1.9455	7965.8780
<i>popdep</i>	Dependency ratio: The share of the population under 14 and over 65 years old, relative to the total population	Own elaboration based on World Bank data	36.5815	6.7761	9.0064	52.0835
<i>revenue</i>	Government revenue as a percentage of GDP	IMF	27.7165	12.2748	3.4879	78.6315
<i>ideology</i>	Political orientation of the head of government (1 = conservative; 0 = otherwise)	Own elaboration based on the Database of political institutions	0.5129	0.5001	0	1
<i>women</i>	Share of seats in the national parliament held by women	Parline database on national parliaments	24.8535	12.0974	0.0000	63.8000
<i>turnout</i>	Voter turnout in parliamentary elections (% of registered voters)	International Institute for Democracy and Electoral Assistance (IDEA)	62.0722	19.3942	0.0000	99.2600

$$debt_{it} = c + \beta_1 debt_{it-1} + \beta_2 sdg\_score_{it} + \sum_{j=3}^n \beta_j Z_{itj} + \eta_i + \varepsilon_{it} \quad (1)$$

Where:

- (1)  $i$  and  $t$  denote country and year, respectively;
- (2)  $debt_{it}$  is the dependent variable;
- (3)  $c$  is the constant term;
- (4)  $debt_{it-1}$  is the lagged dependent variable;
- (5)  $sdg\_score_{it}$  is the main independent variable;
- (6)  $Z_{itj}$  is a vector of control variables;
- (7)  $\beta_1, \beta_2, \dots, \beta_n$  are the parameters to be estimated;
- (8)  $\eta_i$  captures unobservable country-specific effects and
- (9)  $\varepsilon_{it}$  is the idiosyncratic error term.

Table 2 presents the correlation matrix for all explanatory variables. A high degree of correlation is observed among some variables, specifically  $lgdppc$ ,  $popdep$  and  $revenue$ . To mitigate potential multicollinearity issues, these three variables are excluded from the final model. Accordingly, the empirical specification is as follows:

$$debt_{it} = c + \beta_1 debt_{it-1} + \beta_2 sdg\_score_{it} + \beta_3 unemployment_{it} + \beta_4 lpop_{it} + \beta_5 denpop_{it} + \beta_6 ideology_{it} + \beta_7 women_{it} + \beta_8 turnout_{it} + \eta_i + \varepsilon_{it} \quad (2)$$

Where:

- (1)  $i$  and  $t$  denote country and year, respectively;
- (2)  $debt_{it}$  is the dependent variable;
- (3)  $c$  is the constant term;
- (4)  $debt_{it-1}$  is the lagged dependent variable;
- (5)  $sdg\_score_{it}$  is the main independent variable;
- (6)  $\beta_1, \beta_2, \dots, \beta_8$  are the parameters to be estimated;
- (7)  $\eta_i$  captures unobservable country-specific effects and
- (8)  $\varepsilon_{it}$  is the idiosyncratic error term.

### 3.3 Analytical procedures

Various econometric techniques could be applied to estimate the final model, each with its own strengths and limitations. Ordinary least squares, although widely used, relies on the assumption of strict exogeneity and is therefore inappropriate in the presence of endogeneity. Fixed-effect and random-effect models help control for unobserved heterogeneity across countries but do not adequately address simultaneity or reverse causality. Two-stage least squares (2SLS) can correct for endogeneity using instrumental variables; however, its reliability depends heavily on the strength and validity of the chosen instruments.

**Table 2.** Bivariate correlations

	<i>sdg_score</i>	<i>lgdppc</i>	<i>unemployment</i>	<i>lpop</i>	<i>denpop</i>	<i>popdep</i>	<i>Revenue</i>	<i>ideology</i>	<i>women</i>	<i>turnout</i>
<i>sdg_score</i>	1.00									
<i>lgdppc</i>	***0.816	1.00								
<i>unemployment</i>	-0.007	-0.012	1.00							
<i>lpop</i>	***-0.127	***-0.186	***-0.158	1.00						
<i>denpop</i>	0.047	***0.147	***-0.096	-0.033	1.00					
<i>popdep</i>	***-0.582	***-0.640	-0.015	***0.161	***-0.182	1.00				
<i>revenue</i>	***0.662	***0.648	***0.089	***-0.268	***-0.086	***-0.362	1.00			
<i>ideology</i>	0.040	***0.093	***-0.160	0.043	***0.073	**-0.061	-0.025	1.00		
<i>women</i>	***0.337	***0.232	0.039	*-0.056	-0.015	-0.021	***0.319	***-0.227	1.00	
<i>turnout</i>	***0.148	***0.111	**0.063	***-0.100	***0.175	**0.058	**0.073	***-0.079	***0.260	1.00

**Note(s):** \*, \*\* and \*\*\* refer to statistical relevance at 90%, 95% and 99%

**Source(s):** Authors' own elaboration

Given the dynamic nature of SDG implementation and the potential endogeneity of some explanatory variables, the GMM is considered the most appropriate estimation technique for this study. Moreover, although the model does not establish causality in the experimental sense, the dynamic system GMM specification enables the identification of statistically significant effects of SDG implementation on government debt while controlling for endogeneity and temporal persistence.

In addition to addressing endogeneity, GMM also corrects for heteroscedasticity and autocorrelation (Arellano and Bond, 1991). These features make it a more robust and efficient alternative to traditional estimation approaches. Specifically, the two-step system GMM estimator developed by Arellano and Bover (1995) and extended by Blundell and Bond (1998) is applied. This method functions as an IV estimator, using lagged values of the explanatory variables as internal instruments. These lagged instruments are assumed to be uncorrelated with the error term (Arellano and Bond, 1991) and are effective in capturing the delayed effects typical of policy implementation, where decisions may take time to materialize in observable outcomes (Pindado and Requejo, 2015). Compared to traditional IV methods, such as 2SLS, which often face challenges in identifying valid and strong external instruments, System GMM offers a more practical and internally consistent solution, especially in the presence of limited sample sizes (Blundell and Bond, 1998).

Despite these advantages, the system GMM estimator is not without limitations. It may be sensitive to instrument proliferation, which can weaken the Hansen test and compromise inference. Moreover, its validity relies on assumptions regarding the absence of serial correlation in the error term and the exogeneity of higher-order lags – assumptions that cannot be fully tested.

To assess the validity of the instruments used, two standard diagnostic tests were performed. First, the Arellano-Bond test for autoregressive (AR) (2) is used to check for the second-order autocorrelation in the first-differenced residuals, under the null hypothesis of no such correlation. Second, the Hansen test evaluates the validity of the over-identifying restrictions, with the null hypothesis indicating that the instruments are valid. The *p*-values from both tests are reported in the result table to support the robustness and reliability of the model specification (see Table 3).

**Table 3.** Empirical results

<i>debt</i>	Coef	Std. Err
<i>debt</i> <sub><i>t</i>-1</sub>	***0.7183	0.0835
<i>sdg_score</i>	**0.6314	0.2973
<i>unemployment</i>	0.7623	0.4790
<i>lpop</i>	7.4920	4.6340
<i>denpop</i>	***0.0047	0.0013
<i>ideology</i>	-1.8687	1.9703
<i>women</i>	-0.1742	0.1386
<i>turnout</i>	0.0179	0.0628
<i>c</i>	*-149.2534	89.7448
Number of instruments	16	
Number of groups	145	
Arellano-Bond test for AR(1) in first differences	$z = -1.72$ ; $Pr > z = 0.085$	
Arellano-Bond test for AR(2) in first differences	$z = -0.03$ ; $Pr > z = 0.980$	
Hansen test of over-identifying restrictions	$\chi^2(7) = 5.27$ ; $Pr > \chi^2 = 0.627$	

**Note(s):** \*, \*\* and \*\*\* refer to statistical relevance at 90%, 95% and 99%, respectively

Two-step system GMM estimates are reported with Windmeijer-corrected standard errors for finite samples. The instrument matrix is collapsed, and GMM-style instruments use lag limits of 2-3

**Source(s):** Authors' own elaboration

#### 4. Results

The results of the econometric analysis, which employed a two-step system GMM estimator with a collapsed instrument matrix and Windmeijer-corrected standard errors, are summarized in Table 3.

The coefficient of the lagged dependent variable ( $debt_{t-1}$ ) is positive and highly significant (coef. = 0.7183;  $p < 0.01$ ), confirming the dynamic persistence of government debt over time. This result suggests that past debt levels are strong predictors of current debt positions, consistent with the literature on fiscal inertia and intertemporal budget constraints (Biondi, 2023).

The key independent variable,  $sdg\_score$ , presents a positive and statistically significant coefficient (coef. = 0.6314;  $p < 0.05$ ), supporting Hypothesis 1 (H1). This implies that greater national progress on the SDGs is associated with higher levels of general government gross debt as a percentage of GDP. In other words, countries that score higher in SDG implementation tend to carry greater public debt burdens, suggesting that the realization of sustainable development objectives is being financed, at least partially, through increased public borrowing. Substantively, the estimated coefficient suggests that a 10-point increase in a country's SDG score is associated with roughly a 0.94-percentage-point increase in its government debt-to-GDP ratio. While this effect may appear modest, it is not negligible when considered against the cross-country variability in public debt levels, which often exceeds 40 to 60% points.

Regarding the control variables, although *unemployment* exhibits a positive coefficient, it does not reach statistical significance (coef. = 0.7623;  $p > 0.10$ ). While this is consistent with fiscal theory and previous empirical evidence linking weak labor market conditions to lower tax revenues and higher social spending (Feld and Kirchgässner, 2001; Benito et al., 2016; Cabaleiro-Casal and Buch-Gómez, 2021), the lack of statistical significance indicates that the effect of unemployment on public debt is not robust once demographic and institutional factors are considered.

Although the coefficient is not statistically significant, population size (*Lpop*) also shows a positive relationship with public debt (coef. = 7.4920;  $p > 0.10$ ). This is consistent with the theoretical expectation that larger populations require a greater provision of public services and infrastructure, which could increase borrowing needs (Cuadrado-Ballesteros et al., 2024). However, the absence of significance suggests that population size alone does not systematically drive debt accumulation in this model.

Population density (*denpop*), while statistically significant (coef. = 0.0047;  $p < 0.01$ ), has a modest coefficient, indicating a marginal effect on debt. However, this result should be interpreted cautiously, given mixed findings in the literature. While Vicente et al. (2013) suggested that higher density reduces per capita debt through economies of scale at the local level, this study's national-level analysis reveals potential expenditure pressures associated with urbanization and infrastructure demands.

The political orientation variable (*ideology*) has no statistically significant effect on public debt (coef. = -1.8687;  $p > 0.10$ ). This finding lends weight to the suggestion that the differences in ideology between conservative and progressive governments have become less influential in determining fiscal outcomes, potentially due to policy convergence and institutional constraints (Skinner, 1976; Tellier, 2006).

In the same vein, female political representation (*women*) is not statistically significant (coef. = -0.1742;  $p > 0.10$ ), indicating that gender composition in parliaments does not systematically affect debt levels, aligning with the mixed evidence in prior research (Balaguer-Coll and Ivanova-Toneva, 2021; Cabaleiro-Casal and Buch-Gómez, 2021).

Finally, voter turnout (*turnout*) does not exert a statistically significant effect on public debt in this specification (coef. = 0.0179;  $p > 0.10$ ). This result reflects the ambiguous theoretical expectations surrounding electoral participation. While higher turnout may strengthen accountability and fiscal discipline (Norton and Elson, 2002), it may also lead to increased demand for public services from citizens or encourage the adoption of expansionary fiscal

policies aimed at securing electoral support (Alt *et al.*, 2001; Drazen, 2008). The lack of significance suggests that these opposing mechanisms may cancel each other out.

Diagnostic tests confirmed the robustness of the model. The Arellano–Bond test for AR(2) yields a  $p$ -value of 0.980, indicating no second-order autocorrelation. The Hansen test returned a  $p$ -value of 0.627, confirming the validity of the instrumental variables used. Moreover, year fixed effects are included in the baseline two-step System-GMM specification to capture unobserved time-specific shocks. Re-estimations with and without time dummies yield coefficients that remain stable in sign, significance and magnitude. Thus, this table presents the coefficients of the estimation without accounting for year effects.

## 5. Discussion

The empirical findings underscore the fiscal implications of SDG implementation and provide robust support for [Hypothesis 1](#), which posits a significant and positive relationship between SDG performance and public debt levels. This association highlights a potential policy dilemma: while the pursuit of sustainability is indispensable for addressing global challenges, it often entails fiscal expansion that may not always be supported by adequate revenue generation or sustainable financing mechanisms. Positioning these results within the sovereign debt literature, the positive association between SDG performance and public debt aligns with scenarios in which interest–growth differentials ( $r-g$ ) remain unfavorable, limiting governments' ability to stabilize debt levels despite engaging in productive investment.

The observed increase in public debt associated with higher SDG scores may reflect the widespread reliance on public borrowing to finance investments in areas such as education, healthcare, social protection, environmental sustainability and green infrastructure, all pillars of the SDG agenda (Leal Filho *et al.*, 2022; Benito *et al.*, 2023). Although such investments generate long-term social and economic returns, their short- to medium-term budgetary impact can be substantial if not managed within integrated fiscal frameworks (Guarini *et al.*, 2022). This interpretation is consistent with mechanism-focused research, which suggests that capital deepening and social spending commitments may exert upward pressure on debt ratios when not anchored in effective expenditure rules or medium-term fiscal frameworks.

This finding also echoes the concerns raised by Cordery and Hay (2022), who argue that governments must avoid implementing SDG policies at the cost of fiscal sustainability. The lack of efficient alignment between budgetary systems and SDG strategies can lead to a situation where progress toward the 2030 Agenda compromises macroeconomic stability, particularly in countries with weak domestic resource mobilization capacities or limited access to concessional finance (OECD, 2020; UN, 2025). In line with the literature on debt composition and fiscal councils, countries lacking strong fiscal institutions or oversight mechanisms may be more likely to finance SDG-related spending through short-term or high-cost debt instruments, thereby increasing their vulnerability to external shocks.

Additionally, the literature on sovereign debt and fiscal governance shows that the fiscal impact of SDG investments depends on debt structure and the strength of fiscal rules. More fragile debt compositions intensify borrowing constraints and increase the likelihood of SDG implementation raising debt levels, whereas robust fiscal rules can mitigate these pressures. These mechanisms help to explain why SDG progress mainly increases indebtedness in non-OECD countries yet has no discernible effect in advanced economies.

Furthermore, the results highlight the importance of socioeconomic conditions in shaping public debt dynamics, although their impact varies across different variables. Unemployment and population size display positive coefficients, suggesting that countries with weaker labor market performance and larger populations may face greater pressure on social services and public infrastructure, potentially increasing borrowing needs. However, the lack of statistical significance suggests that these factors do not exert a consistent influence on debt levels when other structural and institutional characteristics are considered. Instead, their impact may

materialize during specific phases of the economic cycle, particularly in periods of crisis, when countercyclical fiscal policies and automatic stabilizers contribute to short-term debt accumulation, as highlighted in the literature on fiscal rules.

In contrast, population density emerges as a significant factor in determining public debt, highlighting the impact of demographic concentration on fiscal outcomes. Higher density can increase expenditure pressures related to urbanization, infrastructure provision and public service delivery, outweighing potential economies of scale. This finding is partly consistent with earlier empirical evidence emphasizing the importance of demographic factors (Cuadrado-Ballesteros *et al.*, 2024) and provides a national-level perspective to complement local-level studies suggesting efficiency gains from higher density (Vicente *et al.*, 2013).

The absence of a significant effect for government ideology indicates that fiscal restraint cannot be guaranteed by political orientation alone. Although conservative administrations are typically linked to budgetary discipline (Seitz, 2000; Tellier, 2006), these findings align with recent arguments suggesting a convergence of fiscal policies across party lines. Global economic integration, institutional constraints and recurrent economic shocks seem to restrict the potential for fiscal divergence driven by ideology, strengthening the idea that institutional arrangements, such as binding fiscal rules or the existence of independent fiscal councils, may be more influential in determining debt trajectories than partisan preferences alone (Skinner, 1976).

With regard to female political representation, the results indicate that the proportion of women in parliament has no statistically significant impact on public debt levels. While the estimated coefficient is negative, suggesting a potential link between increased female representation and reduced debt, this relationship is not robust in the empirical model. This implies that female representation alone is insufficient to influence aggregate debt outcomes and that its potential impact may be influenced by broader institutional settings, political coalitions or policy priorities rather than the gender composition itself.

Finally, voter turnout does not have a statistically significant effect on public debt. While higher electoral participation is frequently linked to greater political accountability and fiscal discipline (Alt *et al.*, 2001; Norton and Elson, 2002), it can also indicate stronger demands for public spending and social provision. The absence of a clear effect suggests that these opposing mechanisms may cancel each other out, resulting in no systematic relationship between civic engagement and public debt in this context.

From a policy perspective, the results underline the urgent need for strategic fiscal frameworks that integrate SDG financing with long-term debt sustainability goals. Governments must enhance domestic revenue generation, reduce inefficiencies and promote innovative financial instruments such as SDG-linked bonds and green finance mechanisms (Leal Filho *et al.*, 2022; OECD, 2020). To prevent SDG progress from translating into structurally higher debt, countries may need to strengthen fiscal rules, improve debt management strategies and enhance the role of independent fiscal councils in overseeing SDG-related expenditure commitments. International institutions also have a role to play by expanding access to concessional funding, providing technical assistance and supporting countries through coordinated debt relief initiatives when necessary.

In conclusion, while advancing the SDGs remains imperative, the findings of this study call for a more fiscally responsible approach to sustainability, one that ensures future generations are not burdened by the unintended fiscal consequences of today's development ambitions. Explicitly linking SDG financing strategies to the mechanisms identified in the literature on sovereign debt and fiscal rules can help build more resilient pathways toward sustainable development.

To evaluate the robustness of the empirical findings, a series of additional analyses were performed using alternative specifications, estimation techniques and fiscal indicators. These robustness checks assess whether the positive association between SDG implementation and public debt persists under different modeling assumptions.

First, an extended specification was estimated by reintroducing the variables previously excluded due to multicollinearity (namely, *lgdppc*, *popdep* and *revenue*). As shown in Table 2, these variables exhibit high pairwise correlations, which may inflate standard errors and reduce estimation precision. Although excluding them enhances the reliability of the baseline model, they represent key structural dimensions of fiscal capacity and demographic pressure. Reincorporating them enables testing whether the effect of *sdg\_score* is sensitive to the inclusion of these collinear fundamentals. The model was re-estimated using the two-step system GMM estimator, employing a collapsed instrument matrix, lag limits of 2–4 for GMM-style instruments and Windmeijer-corrected standard errors to ensure instrument parsimony and robust inference. As reported in Table 4, the coefficient of *sdg\_score* remains positive and statistically significant, suggesting that the relationship between SDG performance and public debt is robust to the inclusion of these structural controls.

Second, the fully specified model was estimated using a fixed-effect estimator with cluster-robust standard errors. Although the fixed-effect estimator does not address potential endogeneity, it absorbs all unobserved time-invariant heterogeneity, providing a complementary benchmark that does not rely on IV assumptions. The results, also shown in Table 4, confirm that the coefficient on *sdg\_score* retains both its sign and significance, reinforcing the consistency of the main findings across estimation techniques.

Moreover, the robustness analysis was extended to an alternative fiscal outcome by replacing the dependent variable with general government net debt (% of GDP), as reported by the International Monetary Fund (*net debt*). Net debt accounts for governments' financial

**Table 4.** Robustness analysis (a)

	<i>debt</i> GMM		Fix effects	
	Coef	Corrected Std. Err	Coef	Robust Std. Err
<i>debt</i> <sub>t-1</sub>	***0.7090	0.0849	***0.3662	0.1009
<i>sdg_score</i>	**1.0533	0.5070	***1.2409	0.3015
<i>unemployment</i>	**2.9852	1.4506	*0.7892	0.4682
<i>lpop</i>	-2.8777	20.5240	23.8895	18.2080
<i>denpop</i>	0.0348	0.0498	0.0067	0.0205
<i>ideology</i>	3.7434	3.8619	0.7331	1.0387
<i>women</i>	-0.0040	0.2704	**0.2393	0.1053
<i>turnout</i>	-0.2206	0.1911	-0.0388	0.0651
<i>lgdppc</i>	-10.4484	15.8285	** -53.1418	22.5488
<i>popdep</i>	1.2867	1.3185	0.5691	0.4094
<i>revenue</i>	0.6248	0.8148	** -0.8624	0.4031
<i>c</i>	6.4980	493.1245	18.7657	295.9023
Number of instruments	36			
Number of groups	145		145	
Arellano–Bond test for AR(1) in first differences	$z = -1.59$ ; $\text{Pr} > z = 0.112$			
Arellano–Bond test for AR(2) in first differences	$Z = 0.18$ ; $\text{Pr} > z = 0.854$			
Hansen test of over-identifying restrictions	$\chi^2(24) = 33.37$ ; $\text{Pr} > \chi^2 = 0.100$			
Within R-squared			0.3676	
F			$F(11,144) = 36.66$ ; $\text{Pr} > F = 0.000$	

**Note(s):** \*, \*\* and \*\*\* refer to statistical relevance at 90%, 95% and 99%, respectively

Two-step system GMM estimates are reported with Windmeijer-corrected standard errors for finite samples. The instrument matrix is collapsed, and GMM-style instruments use lag limits of 2–4. Estimates were obtained using fixed-effect regression with cluster-robust standard errors

**Source(s):** Authors' own elaboration

assets and thus provides an additional perspective on fiscal sustainability – particularly relevant for countries with substantial sovereign wealth or liquid reserves. The dynamic system GMM estimation using *net debt* (Table 5) continues to show a positive and statistically significant effect of *sdg\_score*, suggesting that the observed relationship is not contingent on the specific definition of public indebtedness.

Finally, to further assess the robustness of the main findings, the model was re-estimated separately for the Organization for Economic Co-operation and Development (OECD) member countries and non-OECD countries, allowing the SDG–debt relationship to be examined under two distinct structural contexts (see Table 6). The results reveal clear differences across the two subsamples. Among OECD countries, the coefficient for *sdg\_score* is negative and statistically insignificant (−0.280), suggesting that SDG performance does not have a measurable impact on debt dynamics in advanced economies. In contrast, the effect becomes positive and statistically significant in the non-OECD sample (1.433,  $p < 0.05$ ), indicating that progress toward SDGs is associated with higher debt levels in less developed economies, possibly due to greater reliance on borrowing to finance development-related investments.

Figure 1 provides a compact coefficient plot that compares the *sdg\_score* of OECD and non-OECD countries, further illustrating these differences. The figure allows for a quick visual evaluation of the magnitude and accuracy of the estimated effects. It shows that the confidence interval for OECD countries overlaps zero, whereas the estimate for non-OECD countries is clearly positive. By displaying the coefficients and the confidence intervals together, the plot supplements the regression results, emphasizing the degree of heterogeneity across structural contexts and reinforcing the asymmetric nature of the SDG–debt relationship.

Across all robustness checks, diagnostic statistics continue to support the validity of the estimation strategy. The Arellano–Bond AR(2) test shows no evidence of second-order

**Table 5.** Robustness analysis (b)

	<i>net debt</i> GMM	Corrected Std. Err
	Coef	
<i>net debt</i> <sub><i>t</i>-1</sub>	***0.6585	0.1065
<i>sdg_score</i>	**1.2811	0.5230
<i>unemployment</i>	**2.5613	1.0943
<i>lpop</i>	2.1985	5.7110
<i>denpop</i>	0.0097	0.0066
<i>ideology</i>	1.7560	2.7679
<i>women</i>	−0.1094	0.2249
<i>turnout</i>	−0.0638	0.1063
<i>lgdppc</i>	−1.9060	5.4238
<i>popdep</i>	1.3753	*0.7722
<i>revenue</i>	−0.3970	0.4801
<i>c</i>	−144.255	135.4367
Number of instruments	36	
Number of groups	80	
Arellano–Bond test for AR(1) in first differences	$z = -1.13$ ; $\text{Pr} > z = 0.259$	
Arellano–Bond test for AR(2) in first differences	$z = 0.83$ ; $\text{Pr} > z = 0.404$	
Hansen test of overidentifying restrictions	$\chi^2(24) = 22.85$ ; $\text{Pr} > \chi^2 = 0.529$	

**Note(s):** \*, \*\* and \*\*\* refer to statistical relevance at 90%, 95% and 99%, respectively  
Two-step system GMM estimates are reported with Windmeijer-corrected standard errors for finite samples.  
The instrument matrix is collapsed, and GMM-style instruments use lag limits of 2–4

**Source(s):** Authors' own elaboration

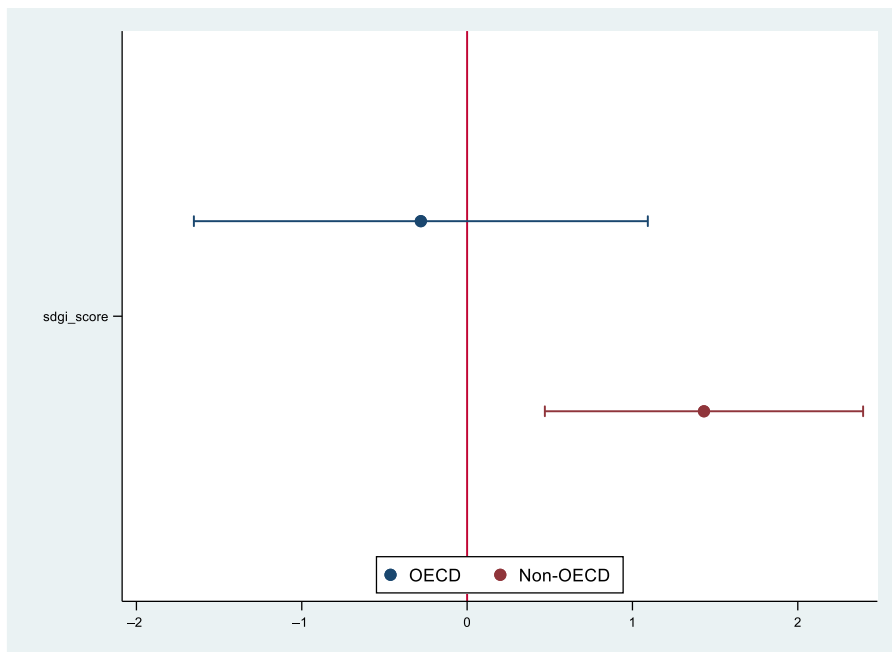
**Table 6.** Robustness analysis (c)

	<i>debt</i> GMM OECD		<i>Non-OECD</i>	
	Coef	Corrected Std. Err	Coef	Corrected Std. Err
<i>debt</i> <sub>t-1</sub>	***0.715	0.093	***0.579	0.102
<i>sdg_score</i>	-0.280	0.700	**1.433	0.491
<i>unemployment</i>	***2.856	0.855	*3.230	1.727
<i>lpop</i>	6.039	5.006	1.378	14.624
<i>denpop</i>	-0.017	0.046	0.040	0.036
<i>ideology</i>	-0.911	2.957	3.772	4.018
<i>women</i>	-0.434	0.347	0.092	0.356
<i>turnout</i>	-0.027	0.287	-0.297	0.341
<i>lgdppc</i>	7.562	6.718	-20.855	16.595
<i>popdep</i>	**4.048	1.588	0.113	1.127
<i>revenue</i>	0.222	0.574	-0.213	0.672
<i>c</i>	** -285.075	114.399	66.523	407.509
Number of instruments	52		52	
Number of groups	37		111	
Arellano–Bond test for AR(1) in first differences	z = -3.44 Pr > z = 0.001			
Arellano–Bond test for AR(2) in first differences	z = -0.67 Pr > z = 0.503		z = -1.37 Pr > z = 0.170	
Hansen test of overidentifying restrictions	$\chi^2(40) = 34.87$ Prob >		$\chi^2(40) = 49.76$ Prob >	
	$\chi^2 = 0.700$		$\chi^2 = 0.139$	

**Note(s):** \*, \*\* and \*\*\* refer to statistical relevance at 90%, 95% and 99%, respectively

Two-step system GMM estimates are reported with Windmeijer-corrected standard errors for finite samples. The instrument matrix is collapsed, and GMM-style instruments use lag limits of 2–6

**Source(s):** Authors' own elaboration



**Figure 1.** Compact *sdg\_score* coefficient plot. Source: Authors' own elaboration

autocorrelation, while the Hansen test confirms the adequacy of the instrument set in all models. Taken together, the results reveal that the positive and significant association between SDG implementation and public debt is robust across alternative specifications, estimation techniques, fiscal indicators and country-group subsamples.

## 6. Conclusions

This study has empirically examined the relationship between countries' performance in implementing the SDGs and their levels of public debt, using a dynamic panel analysis across 145 countries from 2016 to 2023. The results reveal a clear and statistically significant positive association: countries that make greater progress in achieving the SDGs tend to accumulate higher levels of government debt, particularly among non-OECD countries. This finding underscores a central challenge of sustainable development in the 21st century: how to finance long-term transformative goals without compromising fiscal stability.

### 6.1 Theoretical implications

From a theoretical standpoint, this study contributes to a growing body of literature that questions the fiscal neutrality of sustainability agendas. While sustainable development is often presented as a normative imperative, this research shows that it carries concrete macroeconomic consequences. The results support the notion that the SDG agenda, by encompassing expansive public investments in health, education, infrastructure, social protection and environmental resilience, inherently increases the demand for public financing. In the absence of adequate and diversified funding mechanisms, governments may turn to borrowing, potentially exacerbating debt vulnerabilities, especially in emerging and low-income countries.

The findings extend existing theories on fiscal sustainability and development economics by empirically demonstrating that the implementation of the SDGs may generate fiscal pressures in the short and medium term. Methodologically, this study contributes by applying a dynamic two-step system GMM model to a broad cross-country panel, providing robust evidence of a statistically significant relationship between sustainability policies and public indebtedness.

### 6.2 Managerial and policy implications

From a managerial and policy perspective, the results underline the urgent need for governments to design strategic fiscal frameworks that integrate SDG financing with long-term debt sustainability objectives. Policymakers should enhance domestic revenue mobilization, reduce inefficiencies in public expenditure and promote innovative instruments such as green bonds, SDG-linked bonds, blended finance and impact investing. At the same time, it is important to recognize that, although support for SDG compliance may exert short- and medium-term pressure on public deficits, it represents an investment whose long-term returns are well justified. The social and environmental benefits of such investments often extend far beyond the immediate fiscal horizon. To guide decision-making, a cost-benefit approach should be employed, one that not only accounts for government expenditures on SDG-related initiatives but also assigns monetary value to their outcomes.

At an international level, multilateral institutions should assume a stronger role by facilitating concessional funding, implementing debt relief initiatives and providing technical assistance. Such support would enable countries to pursue SDG-oriented policies without undermining financial stability.

In conclusion, achieving the SDGs and safeguarding fiscal sustainability are not mutually exclusive goals but are inherently interdependent. Addressing this interdependence requires strategic foresight, institutional coordination, innovative financing instruments and robust accountability mechanisms. Ultimately, the credibility of the global commitment to

sustainable development depends not only on declared intentions but also on the systems and resources mobilized to ensure that this agenda is viable, equitable and enduring.

### 6.3 Limitations and future research agenda

Despite its contributions, this study presents several limitations that open pathways for further investigation. First, while the use of aggregated national indicators allows for broad cross-country comparisons, it may obscure important regional or sectoral differences. Future studies could address this issue through more disaggregated analyses, relying on subnational data or focusing on specific SDGs, such as SDG 3 or SDG 13, to uncover the differentiated fiscal implications. Second, extending the temporal scope of the analysis would offer valuable insights into the long-term fiscal sustainability of SDG-oriented policies. Longitudinal studies could help assess whether early investments in sustainable development ultimately translate into lasting economic growth, social equity and institutional strength. It should also be noted that the study period included the COVID-19 pandemic, which triggered extraordinary fiscal responses, sharp increases in public borrowing and atypical patterns of social spending. These shocks may partially influence the estimated coefficients, despite the inclusion of fixed effects. Third, enhancing the policy relevance of findings is another promising direction. This could involve estimating the specific fiscal costs and returns of individual SDGs, exploring alternative financing mechanisms and including additional macroeconomic variables such as the cost of debt. Such refinements would provide policymakers with more actionable evidence. Similarly, country-level case studies could better account for the diversity of fiscal capacities and institutional settings, acknowledging that global trends intersect with deeply rooted national specificity. Finally, future research should engage with the broader debate on global debt justice and sustainable financing systems. This could include examining the evolving role of international financial institutions, the impact of global shocks on SDG funding and the design of new fiscal frameworks that reconcile sustainability ambitions with macroeconomic stability.

### Notes

1. See <https://unstats.un.org/sdgs/> for more information.
2. Although the report for 2024 is available, it has not been included in the sample because data for some variables are still missing.
3. <https://dashboards.sdgindex.org/explorer>.
4. <https://sdgtransformationcenter.org/>.

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