PROBLEMY EKOROZWOJU/ PROBLEMS OF SUSTAINABLE DEVELOPMENT

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Threshold Role of Democracy in the Nexus of Sustainable Development and Fiscal Stance

Progowa rola demokracji w powiązaniu zrównoważonego rozwoju i polityki fiskalnej

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Abstract
This study investigates how democratic quality conditions the fiscal implications of sustainable development policies in OECD countries. Building on the theoretical notion of a democracy threshold, the analysis explores whether fiscal stance – measured through budget balances and debt dynamics – responds differently to sustainability-oriented expenditures across varying levels of democratic maturity. Annual data for 38 OECD economies spanning 1993-2023 are employed, and a dynamic panel threshold model following Caner and Hansen (2004) and Kremer et al. (2013) is estimated to capture potential nonlinearities and endogeneity. The model integrates fiscal, macroeconomic, and institutional variables, with the democracy index serving as the threshold variable. The results reveal the presence of a statistically significant democracy threshold, indicating that below this point, sustainable development amplifies fiscal pressures, leading to higher deficits and debt accumulation. Above the threshold, however, democratic consolidation strengthens fiscal discipline and allows sustainability to be absorbed without destabilizing public finances. These findings underscore that fiscal stance and democratic governance are mutually reinforcing components of sustainable development rather than competing objectives. Policy implications highlight the importance of tailoring fiscal frameworks to institutional maturity – strengthening fiscal transparency and accountability in low-democracy regimes while integrating sustainability assessments into fiscal rules and budgeting in advanced democracies. The study contributes to the literature by introducing the democracy threshold concept into fiscal stance analysis and providing empirical evidence of regime-dependent effects of sustainable development. By linking fiscal stance, democracy, and sustainability performance within a unified empirical framework, this research aligns with SDG 8 (Decent Work and Economic Growth), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 16 (Peace, Justice, and Strong Institutions), offering guidance for designing more resilient and equitable fiscal strategies in OECD countries.

Key words: sustainable development, fiscal stance, democracy, OECD, dynamic panel threshold

Streszczenie
W niniejszym artykule analizuje się, w jaki sposób jakość demokracji warunkuje fiskalne implikacje polityki zrównoważonego rozwoju w krajach OECD. Opierając się na teoretycznej koncepcji progu demokracji, analizujemy, czy polityka fiskalna – mierzona saldem budżetowym i dynamiką długu – reaguje odmiennie na wydatki zorientowane na zrównoważony rozwój w różnych poziomach dojrzałości demokratycznej. Wykorzystano dane roczne dla 38 gospodarek OECD z lat 1993–2023, a dynamiczny panelowy model progowy, opracowany na podstawie prac Canera i Hansena (2004) oraz Kremera i in. (2013), ma odzwierciedlać potencjalne nieliniowości i endogeniczność. Model integruje zmienne fiskalne, makroekonomiczne i instytucjonalne, a indeks demokracji służy jako zmienna progowa. Wyniki ujawniają obecność statystycznie istotnego progu demokracji, co wskazuje, że poniżej tego progu zrównoważony rozwój wzmacnia presję fiskalną, prowadząc do wyższych deficytów i akumulacji długu. Powyżej tego progu natomiast konsolidacja demokratyczna wzmacnia dyscyplinę fiskalną i pozwala na absorpcję zrównoważonego rozwoju bez destabilizacji finansów publicznych. Wyniki te podkreślają, że polityka fiskalna i demokratyczne zarządzanie są wzajemnie wzmacniającymi się elementami zrównoważonego

rozwoju, a nie konkurującymi ze sobą celami. Implikacje polityczne podkreślają znaczenie dostosowania ram fiskalnych do dojrzałości instytucjonalnej – wzmocnienia przejrzystości i rozliczalności fiskalnej w systemach o niskim poziomie demokracji, przy jednoczesnym zintegrowaniu ocen zrównoważonego rozwoju z regułami fiskalnymi i budżetowaniem w zaawansowanych demokracjach. Badanie wnosi wkład do literatury naukowej poprzez wprowadzenie koncepcji progu demokracji do analizy polityki fiskalnej i dostarczenie empirycznych dowodów na zależne od systemu skutki zrównoważonego rozwoju. Łącząc politykę fiskalną, demokrację i wyniki w zakresie zrównoważonego rozwoju w ramach ujednoliconych ram empirycznych, niniejsze badanie wpisuje się w Cele Zrównoważonego Rozwoju: 8 (Godna Praca i Wzrost Gospodarczy), (Odpowiedzialna Konsumpcja i Produkcja), 13 (Działania na rzecz Klimatu) i 16 (Pokój, Sprawiedliwość i Silne Instytucje), oferując wskazówki dotyczące projektowania bardziej odpornych i sprawiedliwych strategii fiskalnych w krajach OECD.

Słowa kluczowe: zrównoważony rozwój, polityka fiskalna, demokracja, OECD, dynamiczny próg panelowy

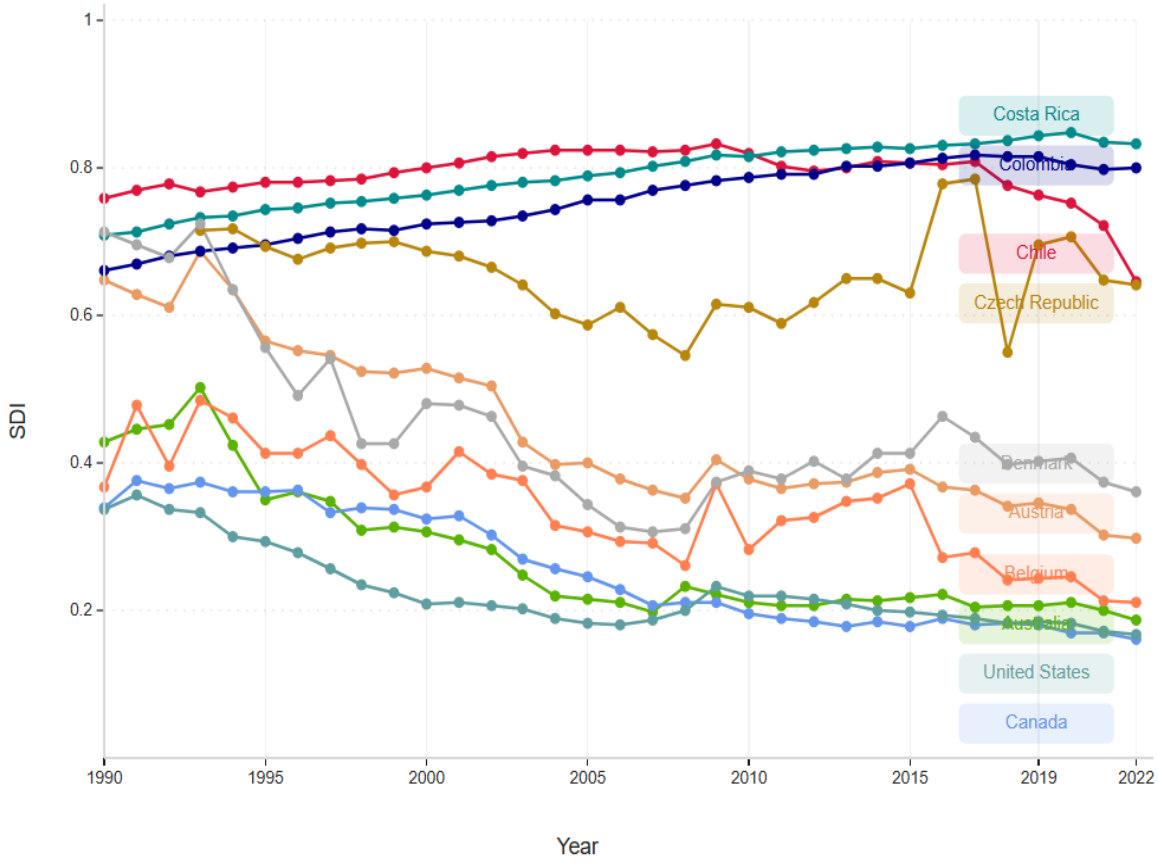
1. Introduction

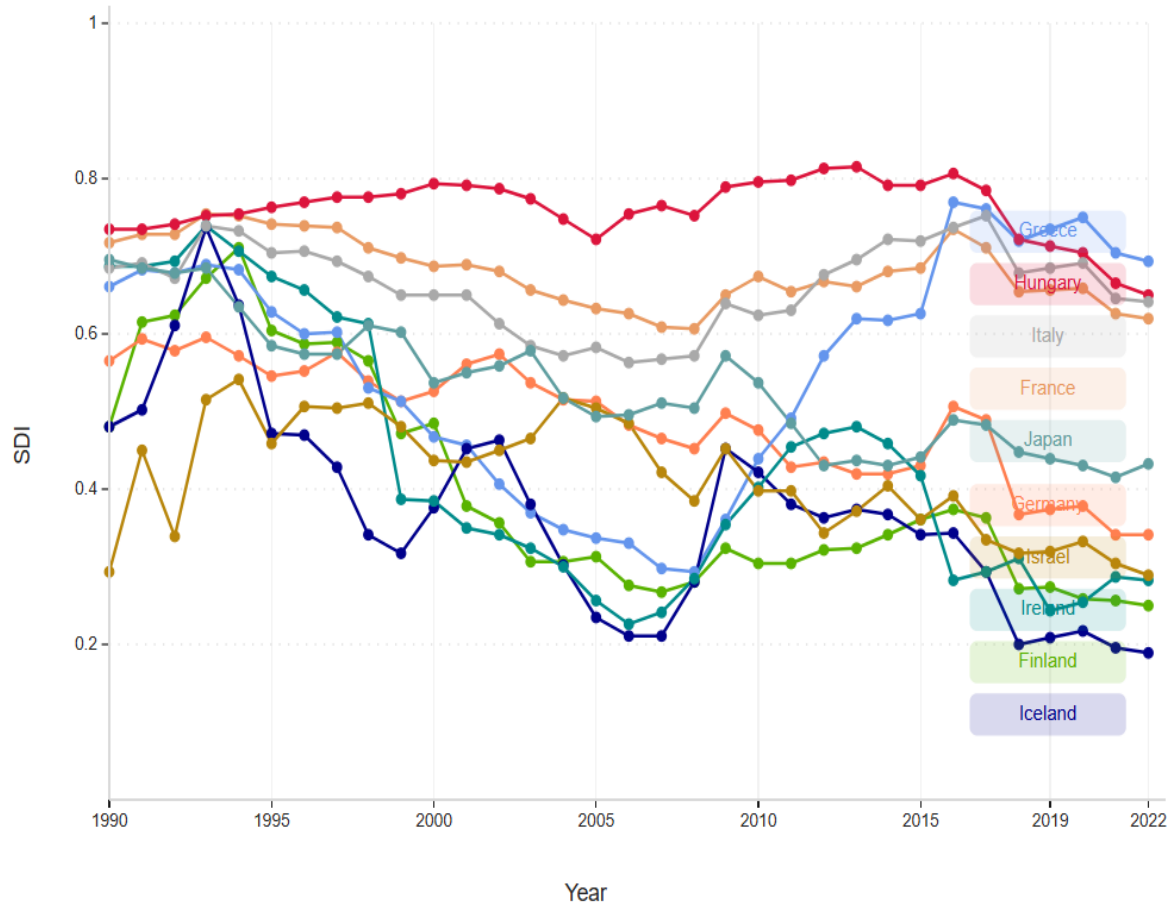
Sustainable development has been conceptualized as a multidimensional paradigm in which economic progress, environmental stewardship, and social equity are integrated within a coherent policy framework. It was defined by the World Commission on Environment and Development (WCED, 1987) as a process through which current needs are met without compromising the ability of future generations to meet their own. Over time, the concept has been transformed from a moral and environmental ideal into a central principle of fiscal and institutional policy (Daly, 1996; Whitehead, 2018). Since the adoption of the United Nations 2030 Agenda for Sustainable Development (UN, 2015), sustainability has been institutionalized as a global framework linking fiscal policy with inclusive growth, environmental transition, and social equity. The United Nations Development Program (UNDESA, 2024) has emphasized that achieving the Sustainable Development Goals (SDGs) requires integrated fiscal strategies that mobilize domestic resources, strengthen institutional capacity, and promote long-term debt sustainability to finance green and inclusive development. The fiscal feasibility of sustainability commitments has been found to vary substantially across countries due to differences in institutional strength, governance quality, and democratic maturity. Fiscal sustainability has been defined as the ability of governments to meet expenditure obligations without creating unsustainable debt burdens, and this capacity has been shown to depend critically on institutional and political conditions. Democratic quality has therefore been regarded as a key determinant of how effectively states design, finance, and implement sustainability-oriented policies. Higher levels of democratic consolidation have been associated with fiscal transparency and accountability, while weaker institutions and populist pressures have been found to distort fiscal priorities.

The interaction between democracy and fiscal sustainability has been recognized as a central dimension of the broader sustainable development agenda, particularly in advancing the United Nations Sustainable Development Goals. Sustainable development is based on three main pillars: economic, social, and environmental sustainability, operationalized through the 17 sustainable development goals. This study represents the *planetary boundaries* approach developed by Hickel (2020), which is not directly related to the 17 goals but aims to measure high human well-being within ecological limits through a critique of the Human Development Index (HDI). In short, this index critiques the classical approach to economic growth and human development, defined as gross domestic product, by emphasizing that the wealth produced, no matter how high, must be produced in a way that minimizes harm to the planet. In this way, countries that develop and prosper but over-consume and cause ecological damage have high scores in classical sustainability calculations (e.g., UN official sustainable development calculations) (e.g., Australia: 77.58, Singapore: 70.03, Canada: 79.28 for 2023), but in this index calculation, these countries have lower sustainability scores because they exceed a sustainability threshold with the planetary boundaries approach in CO_2 and material footprint and are subject to the ecological overshoot factor calculation (e.g., Australia: 0.187, Singapore: 0.125, Canada: 0.1621 for 2022) (Hickel, 2020; Sachs et al., 2025). Figure 1 represents the sustainable development indices of OECD countries for the period 1990-2022. The 2022 index values for countries like Costa Rica, Colombia, Mexico, Portugal, and Greece are measured as 0.833, 0.801, 0.758, 0.718, and 0.694, respectively. In fact, Costa Rica ranks first not only among OECD members but also among the 163 countries for which the index value has been calculated. Luxembourg (0.122), USA (0.167), Norway (0.182), Australia (0.187), Iceland (0.189), Belgium (0.210), Switzerland (0.231), Finland (0.250), Netherlands (0.254), Ireland (0.283), Korea (0.285), New Zealand (0.286), Israel (0.290), Austria (0.298), Germany (0.341), Denmark (0.361), Sweden (0.383), Lithuania (0.484), Latvia (0.485), Slovenia (0.536), United Kingdom (0.560), Slovakia (0.562) are ranked between 100 and 163 with their index values. OECD countries ranked relatively in the middle or upper middle are Poland (0.607), France (0.620), Italy and the Czech Republic (0.641), Chile (0.645), Hungary (0.649), Turkey (0.673), and Spain (0.682). In other words, a policy choice between significantly exceeding ecological limits and achieving high welfare is insufficient for sustainability. Maintaining or increasing welfare while maintaining the ecological balance is more important for sustainable development. Therefore, this study uses this index to offer a critical perspective on classical sustainability indices frequently used in the literature.

The fiscal stance variable used in the study, the democracy variable defined as the threshold variable, and the regime-dependent variables of investment, inflation, trade, expenditure, and growth have a direct and strong relationship with SDG 8 (Decent Work and Economic Growth), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 16 (Peace, Justice, and Strong Institutions). These targets are linked to the SDGs not only through the selected variables but also because the relationship between these variables directly determines the fiscal capacity required to finance sustainability transitions. While SDG 8 links fiscal and macroeconomic stability to growth and productive investment, SDG 13 implies that governments should allocate fiscal resources to mitigation, adaptation, and carbon reduction. SDG 12 promotes responsible consumption and production to ensure the sustainable use of resources and reduce environmental impact. SDG 16 shapes the institutional quality through which these expenditures are managed, monitored, and legitimized. Therefore, democracy is not considered a synonym for sustainability but rather a mechanism aligned with sustainability goals that determines whether sustainability pressures narrow or expand fiscal space. The analysis expands its contribution by addressing the fiscal-institutional dynamics of sustainable development.

Within this framework, the notion of a *democracy threshold* has been introduced as a conceptual tool that captures the minimum level of institutional functionality required for democracy to effectively sustain fiscal stability and efficient governance. This threshold emphasizes that democratic systems do not automatically generate sound fiscal outcomes; rather, they must reach a level of institutional maturity where political competition, bureaucratic capacity, and transparency mechanisms jointly support credible and consistent policymaking. Below this threshold, policy processes have tended to be short-term and reactive, driven by electoral pressures and populist incentives that encourage fiscal profligacy, rent seeking, and the misallocation of public resources. Such conditions often manifest in fiscal imbalances, mounting public debt, and the erosion of public trust in state institutions. Above the threshold, by contrast, democratic consolidation strengthens institutional checks and balances, enhances bureaucratic professionalism, and fosters rule-based decision-making. As a result, governments exhibit greater fiscal discipline, longer-term budgetary planning, and a stronger commitment to intergenerational equity in public spending. Accordingly, democratic quality is not only a determinant of the quantity of fiscal resources through improved tax compliance and revenue mobilization also of their quality, by ensuring that public expenditures are aligned with developmental and sustainability objectives.

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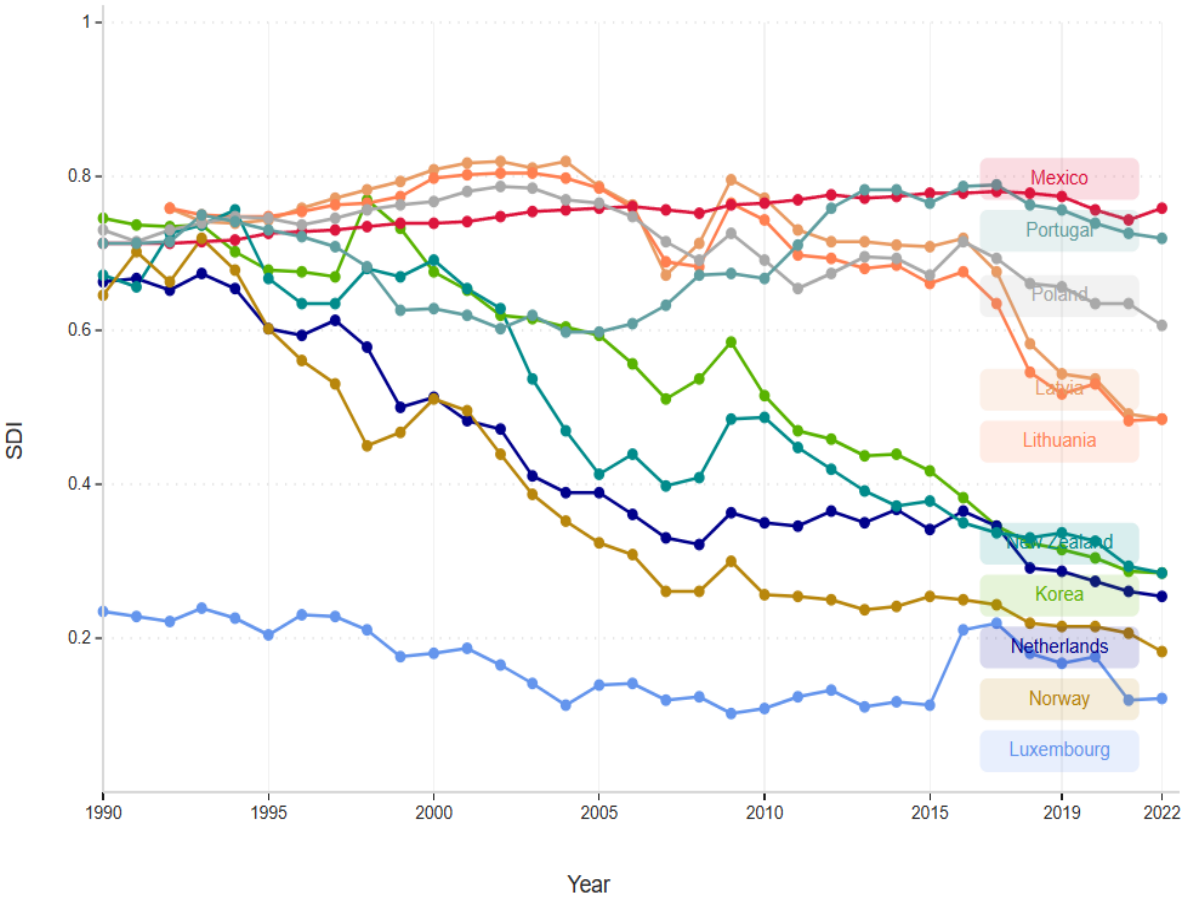
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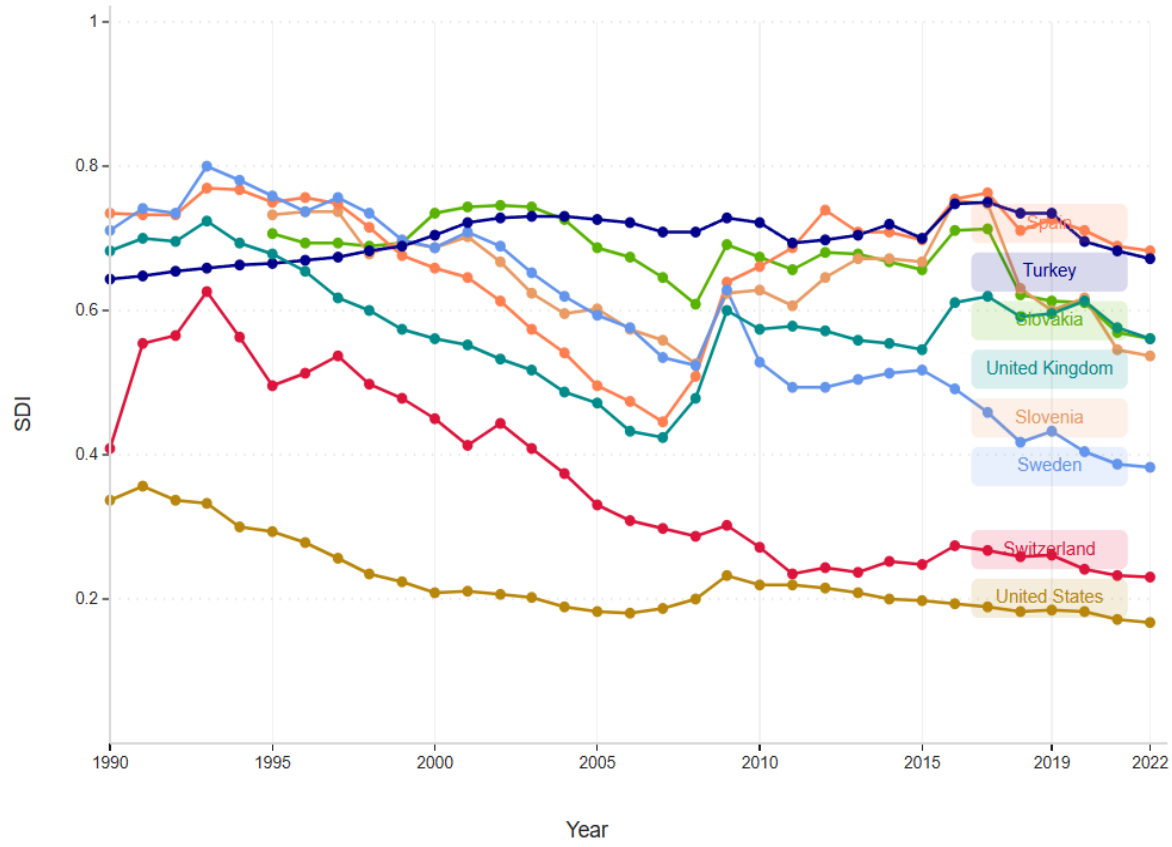

Figure 1. Sustainable development index course of OECD countries (1990-2022), source: graphed by the author(s) using Hickel (2020)'s data

Recent literature has increasingly framed fiscal sustainability not merely as a macroeconomic outcome, but as a reflection of institutional and democratic configurations (Persson & Tabellini, 2003; Acemoglu & Robinson, 2019; Rodrik, 2021). Democracies characterized by greater citizen participation, judicial independence, freedom of information, and an active civil society tend to manage public goods more efficiently and allocate resources toward long-term sustainable development goals (North et al., 2009; Haggard & Kaufman, 2021). These institutional features enhance fiscal transparency, reduce corruption, and limit the politicization of budgetary processes, thereby supporting resilient fiscal systems capable of absorbing economic shocks and financing sustainability transitions. Conversely, fragile or hybrid democracies – where institutional accountability mechanisms remain weak—often experience procyclical fiscal policies, underdeveloped tax systems, and limited capacity to finance green and social infrastructure investments. In such contexts, fiscal policymaking becomes vulnerable to political cycles and external pressures, undermining efforts to achieve fiscal sustainability and environmental commitments. Therefore, the moderating effect of democracy thresholds on the fiscal consequences of sustainability-oriented expenditures has emerged as a central dimension for empirical inquiry, especially among OECD countries, where varying levels of democratic consolidation and institutional quality produce heterogeneous fiscal and developmental outcomes (Özdemiray & Kodranjeci, 2025).

In this study, differences in the relationship between sustainable development strategies and fiscal stance among countries located below and above the democracy threshold are examined. The analysis is conducted with the expectation that lower democratic thresholds may intensify fiscal pressures arising from sustainability-related expenditures, whereas higher thresholds are assumed to strengthen fiscal resilience and enhance the efficient realization of sustainability goals. The democracy threshold is incorporated into the analytical framework of fiscal stance, thereby expanding the existing theoretical and empirical discourse that has predominantly been centered on the interaction between fiscal policy instruments and institutional indicators such as democracy, governance quality, or political stability. Unlike previous research, which has mainly investigated how democratic governance influences fiscal rules, spending priorities, or tax systems, the present study positions the fiscal stance itself-representing the overall policy orientation and sustainability of fiscal behaviour, at the core of the analysis. To the best of our knowledge, this study is the first in which the democracy threshold has been empirically applied as a moderating mechanism in the nexus between sustainable development and fiscal stance. By employing a dynamic panel threshold model, regime-dependent effects are captured, indicating that the fiscal consequences of sustainability-oriented policies differ nonlinearly across varying levels of democratic maturity. Through this approach, a

more nuanced understanding of fiscal sustainability is achieved, as institutional quality is shown to condition the capacity of governments to finance long-term sustainability transitions without undermining fiscal balance.
Furthermore, several innovative contributions are made to the literature. Conceptually, democratic thresholds are integrated into the fiscal sustainability framework, offering a novel perspective on the institutional foundations of sustainable public finance. Empirically, the dynamic panel threshold estimator is utilized, providing methodological advantages in dealing with endogeneity, dynamic persistence, and unobserved heterogeneity – issues that have often complicated cross-country fiscal analyses. From a policy standpoint, insights are generated for countries situated below and above the democracy threshold, suggesting measures to strengthen fiscal and institutional resilience in alignment with the SDGs, particularly SDG 8, SDG 12, SDG 13, and SDG 16. In this way, the study is positioned to bridge the gap between fiscal governance and democratic theory while advancing the empirical frontier of sustainability-oriented fiscal research. The subsequent sections of the paper are organized as follows: the theoretical and conceptual framework and the transmission mechanisms linking democracy and fiscal stance are presented; the data and methodology are described; the empirical findings are reported; and finally, the conclusions and policy implications are provided.

2. Theoretical and conceptual framework

2.1. Sustainable development and fiscal implications

The literature on the interaction between fiscal stance and democracy presents two main theoretical perspectives. The first argues that a stringent fiscal stance enhances fiscal sustainability by constraining deficit bias and strengthening government credibility (Alt & Lowry, 1994; Foremny, 2014; Badinger & Reuter, 2017). The second perspective emphasizes that rigid rules can fail during crises or under political pressures, as governments may circumvent them through creative accounting or discretionary spending (Wyplosz, 2005, 2012; Debrun & Jonung, 2019). Recent studies suggest that the quality of institutions and/or democracy critically shapes the efficiency of fiscal stance. While fiscal stance improves discipline in weak democracies or autocracies by substituting for institutional constraints, its marginal impact diminishes in consolidated democracies, where accountability mechanisms already ensure fiscal prudence (Ballard-Rosa et al., 2021; Aaskoven, 2023). Overall, evidence supports the view that democracy moderates the fiscal stance (earlier examples on fiscal rule, fiscal discipline, and fiscal prudence) nexus, with fiscal stance acting as substitutes rather than complements to democratic governance in achieving sustainable development or public finances.
Sustainable development has been recognized not only as an environmental or social objective but also as a fiscal and institutional challenge. It has been argued that the achievement of SDGs requires the systematic alignment of public policies that balance environmental, social, and economic dimensions through coordinated fiscal actions (Söderbaum, 2006; Meadowcroft et al., 2014). Governments have been required to undertake large-scale investments in renewable energy, green infrastructure, and social inclusion programs. Although such initiatives contribute to long-term welfare, they have been shown to generate short-term fiscal strains by increasing expenditure pressures without immediately expanding revenue capacity (Hui & Martinez-Vazquez, 2021; Morales-Casetti et al., 2024). The degree to which these pressures are absorbed has been found to depend on the institutional context. Countries characterized by effective governance have been observed to achieve higher efficiency and accountability in sustainability spending (Banik, 2022; Jahn & Suda, 2022). In contrast, resource misallocation and weak oversight have often amplified fiscal vulnerabilities in less institutionalized contexts. Therefore, the fiscal implications of sustainable development have been linked closely to the quality of governance and the maturity of democratic institutions – dimensions directly connected to SDG 16, which emphasizes the role of transparent, accountable, and inclusive institutions in sustaining development outcomes.

2.2. Fiscal stance and macroeconomic sustainability

The fiscal stance has been conceptualized as the overall direction and magnitude of fiscal policy and as an indicator of how governments balance public spending and revenue generation to achieve macroeconomic stability (Dolan, 2021; Kokoszczyński & Łyziak, 2025). Fiscal sustainability, viewed as the government's capacity to maintain solvency over time, can be represented by the following standard debt dynamic equation:

$$\Delta d_t = (r_t - g_t) \cdot d_{t-1} - s_t \quad (1)$$

where $d_t$represents the debt-to-GDP ratio, $r_t$the nominal interest rate, $g_t$the nominal GDP growth rate, and s_t. The primary budget surplus. Sustainability has been regarded as jeopardized when $r_t > g_t$, and primary surpluses have been inadequate to offset debt accumulation (El-Shagi & von Schweinitz, 2021; Afonso et al., 2025). Empirical analyses have demonstrated that GDP growth trajectories, interest-rate dynamics, expenditure efficiency, and governance quality exert significant influence on fiscal outcomes (Azizi et al., 2013; OECD, 2022, 2023). In addition, the composition of public expenditure is crucial, with evidence indicating that well-targeted sustainability investments can improve long-term fiscal sustainability by enhancing productivity and reducing environmental and social costs (Ciaffi et al., 2024). These relationships are intrinsically tied to SDG 8 and SDG 13, as fiscal discipline

and green investment have been identified as complementary pathways toward inclusive and environmentally sustainable economic growth.

2.3. Democracy, institutions, and fiscal behavior

Democratic governance has been shown to play a vital role in shaping fiscal behavior through accountability and transparency mechanisms. In consolidated democracies, institutional checks and balances have been observed to reduce corruption, limit opportunistic spending, and promote more efficient allocation of public funds (Bojanic, 2018; Qiao et al., 2019; Obeng, 2021). Conversely, fragile democratic institutions have been linked with political budget cycles, populist fiscal expansions, and unsustainable borrowing (Wurster, 2015; Daniele et al., 2021; Narita & Sudo, 2021). Within the context of sustainable development, democratic institutions have been regarded as essential for ensuring that fiscal resources are directed toward socially and environmentally beneficial outcomes (Marquardt et al., 2025). Moreover, fiscal decentralization has been found to interact with democracy: when democratic accountability is strong, decentralization enhances fiscal efficiency; when weak, it magnifies inefficiency and waste (Hui & Martinez-Vazquez, 2021). This institutional dimension directly supports SDG 16, emphasizing governance cooperation, partnership, and institutional innovation.

2.4. The democracy threshold

The concept of the democracy threshold has been employed to describe the nonlinear relationship between democratic functionality and fiscal outcomes. It has been posited that democratic effects on fiscal performance differ according to whether an institutional threshold has been surpassed. Below the threshold, weak oversight mechanisms-such as the judiciary, media, and civil society-have been associated with corruption, mismanagement, and fiscal instability. Above it, institutionalized checks and balances have been observed to enhance fiscal prudence, efficiency, and credibility (Söderbaum, 2006; Meadowcroft et al., 2014; Wurster, 2015; Qiao et al., 2019; Obeng, 2021; Banik, 2022; Lee et al., 2023; Morales-Casetti et al., 2024; Beyala & Owoundi, 2025; Marquardt et al., 2025). This analytical logic has been consistent with threshold econometric approaches, where different regimes exhibit distinct behavioral parameters once the threshold variable (here, democracy) crosses a critical value. Accordingly, it has been anticipated that the fiscal impacts of sustainability expenditures differ fundamentally between low- and high-democracy regimes.

In alignment with SDG 16, these dynamics have been interpreted as institutional foundations for achieving long-term economic, social, and environmental sustainability.

2.5. Institutional transmission channels: The democratic pathways of fiscal stance and sustainability

The relationship between democracy, sustainable development, and fiscal stance has been interpreted through several interrelated institutional transmission mechanisms. Through these mechanisms, the democracy threshold has been understood to condition how effectively fiscal sustainability and SDG-related commitments are maintained.

i) In countries situated below the democracy threshold, weak institutional oversight and limited bureaucratic capacity have been observed to lead to inefficient allocation of sustainability expenditures and greater fiscal leakage. In contrast, stronger democracies have been found to ensure accountability and transparency through auditing and participatory mechanisms, allowing public funds to be used more effectively for SDG-aligned goals (Banik, 2022; Morales-Casetti et al., 2024).

ii) Political and electoral incentives have been shown to influence fiscal cycles. In weaker democracies, sustainability expenditures have often been politicized and concentrated before elections, producing short-term deficits and undermining fiscal sustainability (Daniele et al., 2021). In consolidated democracies, fiscal rules and institutional checks have been employed to mitigate such procyclical behaviors (Wurster, 2015).

iii) The elasticity of tax revenue has been observed to differ across regimes. Higher democracy levels have been associated with stronger tax compliance and broader revenue bases, enhancing fiscal resilience in financing sustainability objectives (Obeng, 2021; Qiao et al., 2019). Below the threshold, narrow tax bases and administrative weaknesses have constrained fiscal capacity.

iv) Debt management practices have been influenced by institutional strength. In fragile democracies, politically motivated borrowing has contributed to unsustainable debt accumulation, whereas in consolidated democracies, the institutionalization of fiscal councils and transparency mechanisms has sustained investor confidence and reduced risk premiums (Azizi et al., 2013; OECD, 2023).

v) Sustainability expenditures have been found to exert divergent fiscal effects across regimes. In low-democracy settings, high-cost sustainability investments have generated structural deficits and debt expansion. In higher-democracy settings, effective implementation and fiscal discipline have allowed similar investments to stimulate productivity and environmental improvement without jeopardizing fiscal balance (Ciaffi et al., 2024; Riblier, 2023).

vi) Transitional dynamics in democracy have been associated with heightened fiscal volatility. When countries have crossed the democracy threshold-either upward through democratization or downward through institutional erosion-fiscal discipline has been temporarily weakened as new governance arrangements have emerged (Narita

& Sudo, 2021; Marquardt et al., 2025). Considering these mechanisms, it has been anticipated that in countries below the democracy threshold, sustainability expenditures exert stronger pressures on fiscal stance, manifesting as higher deficits and debt ratios (SDG 8 and SDG 13). In contrast, in countries above the threshold, institutional efficiency and accountability contribute to more stable fiscal management (SDG 16). Furthermore, enhanced tax elasticity in consolidated democracies has been expected to improve fiscal resilience and facilitate the financing of green and inclusive investments. Conversely, below-threshold and transitional democracies have been considered more vulnerable to fiscal crises and volatility, highlighting the importance of institutional reforms and democratic consolidation for achieving long-term sustainability.

3. Empirical literature review

The empirical investigation of fiscal sustainability and democracy has been widely conducted across different institutional settings, periods, and methodological approaches. Early studies focusing on subnational and national fiscal behavior have established the institutional roots of fiscal imbalances. Alt and Lowry (1994) analyzed 50 U.S. states over 1968-1987, showing that divided governments exhibited weaker fiscal responsiveness and larger budget deficits, while unified governments performed better under balanced-budget constraints. Similarly, Foremny (2014) examined 15 European countries between 1980 and 2008, demonstrating that fiscal rules and tax autonomy significantly reduced regional deficits, though their effectiveness depended on the degree of national oversight. These findings were reinforced by Badinger and Reuter (2017), who employed dynamic panel GMM estimations for 74 countries from 1985 to 2012 and reported that balanced-budget rules reduced deficits by 1-2% of GDP, with stronger effects observed in low-debt and less democratic settings. However, the limitations of rigid fiscal frameworks were noted by Wyplosz (2005, 2012) and Debrun and Jonung (2019), who observed that rules often failed during crises when governments relied on creative accounting to maintain flexibility. Collectively, these studies demonstrated that fiscal sustainability depends not only on macroeconomic fundamentals but also on institutional enforcement.

Parallel efforts have been made to assess solvency and sustainability conditions in OECD economies. Azizi et al. (2013) tested the No-Ponzi and transversality conditions for 21 OECD countries between 1961 and 2010, revealing that both were simultaneously satisfied in less than one-third of the sample, indicating fragile solvency conditions. Similarly, Beqiraj et al. (2018) and Afonso et al. (2025) confirmed, using fiscal reaction functions and quantile regressions for OECD panels, that sustainability improved with higher growth and lower interest rates, although debt sensitivity and fiscal responsiveness varied with the debt ratio. Evidence from Sakuragawa and Sakuragawa (2020) in Japan demonstrated that nonnegative fiscal surpluses and long-term sustainability could be achieved under favorable growth and bond-yield dynamics. Complementary studies by El-Shagi and von Schweinitz (2021) and Tran (2018) identified state-dependent and threshold-based fiscal dynamics, where the effectiveness of fiscal consolidation and sustainability depended on initial debt levels and institutional quality. These findings emphasized that fiscal sustainability is inherently nonlinear and institutionally conditioned.

The role of democracy and governance quality has been examined as a determinant of fiscal discipline and macrofiscal outcomes. Wurster (2015) compared fiscal sustainability in 130 countries from 1990 to 2008 and found that democracies historically experienced fewer defaults but tended to accumulate more debt after 2000 due to electoral incentives and short-term policy cycles. Daniele et al. (2021) further demonstrated through difference-in-differences estimations in Italian municipalities that dynastic or clientelist political structures distorted resource allocation and weakened development outcomes. Conversely, Ballard-Rosa et al. (2021), analyzing 245,000 sovereign bond issues from 131 countries (1990-2016), found that democracies benefited from enhanced creditworthiness during periods of global liquidity, while autocracies faced higher borrowing costs in adverse global conditions. The interaction between democracy and market access was refined by Aaskoven (2023), who analyzed 121 countries from 1990-2015 and found that autocracies adopting fiscal rules faced no disadvantage in bond markets, suggesting that rule-based institutions could offset the *autocratic disadvantage*. A similar conclusion was reached by Beyala and Owoundi (2025), who demonstrated for 97 countries (1985-2021) that the deficit-reducing effects of fiscal rules weakened with higher democratic quality, indicating a substitution between institutional and democratic accountability. These findings collectively showed that democracy moderates the institutional-fiscal relationship by conditioning the credibility and efficiency of fiscal mechanisms.

Institutional quality has also been analyzed through the lens of decentralization and fiscal efficiency. Qiao et al. (2019) used data for 76 countries (1972-2013) to reveal that fiscal decentralization constrains government size under democratic conditions but loses effectiveness in autocratic regimes. Obeng (2021) confirmed this mediating role of democracy using V-Dem indices from 1970-2013, demonstrating that participatory democracy reduces government spending through improved fiscal efficiency. In a related context, Bojanic (2018) found an inverted-U relationship between decentralization and liberty in 12 American countries from 1972-2015, suggesting optimal fiscal autonomy around mid-level decentralization. Hui and Martinez-Vazquez (2021) provided similar evidence,

reporting that moderate fiscal decentralization promotes sustainable development, whereas excessive fragmentation undermines fiscal coordination. These studies collectively indicated that decentralization's fiscal benefits depend critically on the institutional environment and the maturity of democratic oversight.

More recent research has linked fiscal institutions directly to sustainable development and environmental governance. Banik (2022) examined the contrasting experiences of China and India between 2015 and 2021, arguing that while autocratic regimes can achieve rapid progress, democratic systems sustain more legitimate and deliberative policy processes that improve long-term outcomes. Jahn and Suda (2022), analyzing OECD and EU countries from 2013 to 2019 using SGI data, demonstrated that governments embedded in consensus-based and efficient decision-making structures achieve higher sustainability performance. Their findings challenged the conventional notion of a trade-off between efficiency and consensus, showing that institutional coherence amplifies sustainability-oriented policy preferences. Supporting evidence was provided by Marquardt et al. (2025), who documented that democratic innovations-such as participatory budgeting-enhance policy coherence, reduce polarization, and strengthen sustainability transitions. Morales-Casetti et al. (2024) further found, in a cross-sectional analysis of 120 UN member states, that governance quality, well-being, and democracy collectively explain nearly three-quarters of SDG performance variation, underscoring the centrality of institutional design in achieving sustainability goals.

Empirical evidence has also expanded toward financial and environmental dimensions of fiscal sustainability. Riblier (2023), using U.S. data from 1889–2015, identified that high debt-servicing costs shorten the duration of fiscal expansions, while low-cost states sustain output gains longer. Ciaffi et al. (2024) confirmed, using nonlinear SVAR and local projections for 14 OECD countries (1981-2017), that expansionary spending in high-debt regimes can reduce debt-to-GDP ratios through growth effects, challenging the conventional view of consolidation. In parallel, Lee et al. (2023) used a dynamic threshold model for 82 countries (1996-2017) and found that debt sustainability improves only after institutional quality surpasses a specific threshold. Extending the discussion on environmental finance, Zheng et al. (2025) analyzed 103 countries (2000-2020) and showed that green finance significantly enhances ESG performance through green innovation, particularly in financially and institutionally advanced economies. Likewise, Luo et al. (2025) demonstrated that China's green fiscal policies, examined through a difference-in-differences approach, increase green total factor productivity, with stronger effects observed in regions characterized by transparency and digitalization. These studies established that sustainability-oriented fiscal actions are shaped by institutional and governance quality, reinforcing the multi-dimensional nature of fiscal sustainability.

Taken together, the empirical literature indicates that fiscal stance and institutional governance, such as democracy, are deeply interlinked components of sustainable development. Fiscal rules and institutions act as substitutes for weak democratic accountability in less developed governance contexts, but function as complements in mature democracies. Despite significant advances, limited attention has been devoted to the nonlinear interaction between democracy thresholds and the fiscal consequences of sustainability-oriented spending. Previous research has typically examined democracy, institutions, and fiscal outcomes in isolation, neglecting how variations in democratic functionality condition the fiscal response to sustainability commitments. The present study contributes to filling this gap by employing a dynamic panel threshold model for 38 OECD countries from 1993 to 2023 to examine how democracy thresholds alter the relationship between sustainable development and fiscal stance. By integrating fiscal sustainability analysis with institutional heterogeneity and SDG-related governance frameworks, this research advances the empirical understanding of how democratic maturity determines the fiscal feasibility of sustainability under the UN 2030 Agenda. The related hypotheses in this context are as follows:

Hypothesis 1: There exists a nonlinear relationship between sustainable development and fiscal stance.

Hypothesis 2: Democracy acts as a threshold in this relationship.

Hypothesis 3: The impact of sustainable development on fiscal stance may differ both below and above the democratic threshold, with the effects of regime-independent controls.

4. Data selection and forecasting method

Table 2 presents the variables employed in the empirical analysis, encompassing the dependent, threshold, and control variables within the broader framework of fiscal governance and institutional economics. The dependent variable-fiscal stance (net lending/borrowing, % of GDP)-captures the overall fiscal position of governments, reflecting whether fiscal policy is expansionary or contractionary. Consistent with Persson and Tabellini (2003), Foremny (2014), Badinger and Reuter (2017), Beqiraj et al. (2018), Bojanic (2018), Debrun and Jonung (2019), El-Shagi and von Schweinitz (2021), Hui and Martinez-Vazquez (2021), Rodrik (2021), Aaskoven (2023), Lee et al. (2023), Riblier (2023), Ciaffi et al. (2024), Afonso et al. (2025), Beyala and Owoundi (2025), and Kokoszczyński and Mackiewicz-Łyziak (2025) this measure represents the institutional and political foundations of fiscal sustainability, as fiscal outcomes are shaped not only by macroeconomic constraints but also by governance quality and rule-based decision-making. The democracy threshold, proxied by the V-Dem polyarchy index, serves as an institutional cutoff point that differentiates regimes according to the maturity of democratic institutions.

Drawing on Söderbaum (2006), North et al. (2009), Meadowcroft et al. (2014), Wurster (2015), Acemoglu and Robinson (2019), Qiao et al. (2019), Ballard-Rosa et al. (2021), Obeng (2021), Banik (2022), Jahn and Suda (2022), Lee at al. (2023), and Morales-Casetti et al. (2024), democracy is viewed as a structural condition enhancing fiscal discipline through greater transparency, accountability, and citizen participation, thereby embodying the conceptual notion of a *democracy threshold* developed in the theoretical section. The Sustainable Development Index (SDI) functions as the regime-dependent variable and reflects the core principle of the SDGs: Achieving high social outcomes while remaining within planetary boundaries. Following Hickel (2020), SDI combines human development outcomes (life expectancy, expected and mean years of schooling, and income) representing the social pillar (SDG 1, SDG 3, SDG 4, SDG 10) with ecological efficiency measured through consumption-based CO_2 emissions and material footprint relative to their fair planetary shares (SDG 7, SDG 12, SDG 13) (see table 1). This approach ensures that countries are not rewarded for growth achieved through unsustainable resource use. Accordingly, SDI is not a fragmentary or partial measure but a composite, SDG-consistent indicator of social well-being within ecological limits, integrating both the social and environmental pillars of sustainability into a single empirical variable. An additional reason for choosing this variable is that it has been consistently calculated since 1990, while many alternative sustainability indicators are only available for the post-2000 period. This longer temporal coverage allows for a more robust panel structure and increases the reliability of time-differentiated analyses.

Table 1. Sustainable development index connection and rationale with SDGs, source: edited by the author(s) using SDGs and Hickel (2020)'s methodology

SDG No	Goal Name	Strength of Relation	Reason/Explanation
1	No poverty	Medium	SDI includes an income indicator (log GNI/capita + sufficiency threshold). Reducing extreme poverty raises the wellbeing score, but the main focus is on producing wellbeing with ecological cost.
3	Good health and well-being	Very strong	Life expectancy is one of the core components of SDI. Strong health systems = higher SDI.
4	Quality education	Very strong	Education indicators (expected and mean years of schooling) are used directly. Higher education = higher wellbeing score.
7	Affordable and clean energy	Strong	Consumption-based CO_2 emissions are penalized. Transition to renewables directly improves SDI.
10	Reduced inequalities	Medium	A *sufficiency threshold* in income prevents very high incomes from adding extra points; logarithmic scaling partially penalizes inequality.
12	Responsible consumption and production	The strongest	Material footprint is measured directly and penalized against planetary boundaries. Responsible consumption = low overshoot = high SDI.
13	Climate action	The strongest	Consumption-based CO_2 emissions are directly measured and penalized against a 1.6t/person/year threshold. Climate-friendly policies = high SDI

The dependent variable is primarily linked to SDG 12 because it reflects the sustainability and efficiency of public spending, resource allocation, and long-term fiscal sustainability. It is also strongly related to SDG 13, as fiscal balance is directly affected by climate mitigation expenditures, green investments, and environmental fiscal policies. Finally, the control variables – economic growth, inflation, trade openness, investment, and public expenditure – represent standard macroeconomic determinants of fiscal dynamics, consistent with prior studies emphasizing growth-enhancing, stabilizing, and structural dimensions of fiscal policy (Tran, 2018; Qiao et al., 2019; Obeng, 2021; Sakuragawa & Sakuragawa, 2020; Haggard & Kaufman, 2021; Riblier, 2023; Ciaffi et al., 2024;

Table 2. Description of variables, source: own edited

Variable	Definition	Source	SDG Connection and Justification of Choice
Dependent Variable			
Fiscal Stance (Net Lending/Borrowing, % of GDP) (fis)	The overall balance of general government revenues and expenditures expressed as a share of GDP, indicating whether fiscal policy is expansionary (deficit) or contractionary (surplus). A negative value reflects net borrowing, while a positive value denotes net lending.	International Monetary Fund (IMF), World Economic Outlook Database	SDG 12 SDG 13 Efficiency of public spending, climate mitigation expenditures, green investments, resource allocation, long-term fiscal sustainability, and environmental fiscal policies
Threshold Variable			
Democracy Threshold (Polity Project / V-Dem (v2x_polyarchy) (dem)	An index (between 0 and 1) capturing the extent of electoral democracy, measuring citizens' ability to participate in elections, the competitiveness of political processes, and the integrity of electoral institutions. 0 represents fully authoritarian regimes. 1 means fully democratic (high electoral democracy) regimes. The variable serves as a threshold indicator for institutional quality and democratic maturity.	Varieties of Democracy (V-Dem) Project; Polity V Dataset	SDG 16 Institutional maturity and governance quality
Threshold Regime-Dependent Variable			
Sustainable Development Index (ln_sdi)	A composite indicator (0 is the lowest sustainable performance, 1 is the highest sustainability performance) assessing countries' performance in achieving human development within planetary boundaries by adjusting the Human Development Index for ecological efficiency. Higher scores indicate greater sustainability-adjusted well-being.	Hickel, J. (2020)	SDG 1, SDG 3 SDG 4, SDG 7, SDG 10, SDG 12, SDG 13 Composite social-environmental sustainability measurement
Threshold Regime-Independent Variables			
Economic Growth (gdp)	The annual percentage change in GDP per capita represents how quickly the average income level in an economy is rising.	World Bank Database	SDG 8 Inclusive and sustained economic growth
Inflation, Consumer Prices Annual (inf)	The yearly percentage change in consumer prices, based on a representative basket of goods and services purchased by households.	World Bank Database	SDG 13 Macroeconomic stability under transition dynamics
Trade (% of GDP) (ln_tra)	The ratio of total exports and imports of goods and services to GDP, showing the degree of an economy's integration into global trade.	World Bank Database	SDG 12 Responsible consumption and production patterns
Gross Fixed Capital Formation (% of GDP) (inv)	The value of investment in long-term assets-such as infrastructure, machinery, and equipment-expressed as a share of GDP, reflects productive capacity growth.	World Bank Database	SDG 8 Productive capacity and sustainable capital formation
Expense (% of GDP) (ln_exp)	The share of total government spending in gross domestic product reflects the scale of public sector activity and fiscal policy intensity within the economy.	World Bank Database	SDG 12, SDG 13 Green spending and sustainability-oriented budget composition

Luo et al., 2025; Marquardt et al., 2025). Each control variable corresponds to a specific sustainability dimension. These all capture social-ecological efficiency consistent with SDG 8, SDG 12, SDG 13, and SDG 16. GDP growth and investment represent the economic pillar under SDG 8. Inflation and trade openness reflect macroeconomic resilience and integration, which influence the fiscal capacity to finance sustainability (SDG 12, SDG 13). Expense variable proxies the fiscal commitment to public expenditure, social welfare, and climate-related infrastructure (SDG 12, SDG 13). Finally, the democracy index measures institutional quality, transparency, and accountability, aligning with SDG 16. Modelling the interaction between SDI and democratic institutions reflects how the four

pillars of sustainability jointly influence fiscal stance. All regime-independent variables are sourced primarily from the World Bank, ensuring comparability and consistency across countries. Together, these variables provide a comprehensive framework to assess how sustainable development interacts with fiscal stance across different levels of democratic institutionalization. Missing data have been filled using linear interpolation. Please note that the sustainable development index, trade openness, and expense variables are calculated in natural logarithmic form in the analysis. The other variables are included in the model in their natural forms due to the negative values.
Table 3 lists the sample countries, comprising 38 (full) OECD members. Advanced economies such as Germany, Japan, the United States, and Sweden represent mature fiscal and democratic systems, while the other developing OECD economies contribute additional variation in governance quality and fiscal performance. This heterogeneity allows for meaningful identification of the democracy threshold effect within the panel threshold model, as the sample captures countries at different stages of democratic consolidation and institutional development. The presence of both high-income and upper-middle-income economies enhances the external validity of the results by reflecting structural and policy differences in fiscal management, public expenditure efficiency, and sustainability transitions. Data for all countries span the period 1993-2023, enabling the analysis of both cyclical and structural dynamics in fiscal stance under varying degrees of democratic maturity and sustainable development performance.

Table 3. Sample countries

Australia	Costa Rica	Germany	Italy	Mexico	Slovakia	United Kingdom
Austria	Czechia	Greece	Japan	Netherlands	Slovenia	United States
Belgium	Denmark	Hungary	Korea	New Zealand	Spain	
Canada	Estonia	Iceland	Latvia	Norway	Sweden	
Chile	Finland	Ireland	Lithuania	Poland	Switzerland	
Colombia	France	Israel	Luxembourg	Portugal	Türkiye	

Table 4 summarizes the descriptive statistics for all variables. The fiscal stance variable exhibits a mean deficit of approximately -2.28% of GDP, with values ranging from -32.1% to 25.5%, indicating considerable cross-country and temporal heterogeneity in fiscal outcomes. The democracy variable shows a high average level (mean 0.84), consistent with the sample's OECD composition, though the variation (0.29-0.92) allows for meaningful threshold effects. The logarithmic form of the sustainable development index (mean -0.31) displays moderate dispersion, reflecting differences in ecological efficiency among high-income economies. Control variables demonstrate realistic distributions: average GDP growth is 2.67%, inflation averages 4.93%, and the logarithmic form of trade openness hovers around 1.89% of GDP, underscoring the outward-oriented structure of OECD economies. The standard deviations confirm the existence of variability sufficient for econometric identification. Overall, the descriptive statistics indicate that the data possess the necessary variation and stability for panel threshold estimation, mitigating concerns of limited within-country dynamics.

Table 4. Description of statistics, source: calculated by using Stata.

Variable	Observation	Mean	Std. Dev.	Minimum	Maximum
fis	1178	-2.2762	4.1014	-32.1	25.5
dem	1178	0.8361	0.0981	0.285	0.923
ln_sdi	1178	-0.3111	0.1992	-0.9871	-0.0721
gdp	1178	2.6655	3.4176	-16.2268	24.6155
inf	1178	4.9274	14.9861	-4.4475	410.4519
ln_tra	1178	1.8914	0.2307	1.1965	2.6150
inv	1178	3.7132	9.4659	-47.4573	99.6789
ln_exp	1178	1.5007	0.1426	1.0115	1.7947

The correlation matrix in Table 5 provides preliminary insights into potential multicollinearity and variable relationships. Fiscal stance is positively correlated with economic growth (0.27) and investment (0.22), suggesting that stronger economic performance and capital formation are associated with improved fiscal positions. Conversely, fiscal stance exhibits negative correlations with sustainable development (-0.27) and public expenditure (-0.25), implying that sustainability-oriented fiscal expansion may temporarily weaken fiscal balances. The negative association between democracy and sustainable development (-0.27) may reflect structural trade-offs between advanced democracies' consumption levels and ecological efficiency. However, the correlation coefficients are all below 0.5, indicating an absence of severe multicollinearity among explanatory variables. This supports the suitability of the dataset for the dynamic panel threshold regression, where the democracy variable acts as the regime-determining threshold.

Table 5. Correlation matrix, source: calculated by using Stata.

Variable	Fis	dem	ln_sdi	gdp	inf	ln_tra	inv	ln_tra
fis	1							
dem	0.1065	1						
ln_sdi	-0.2703	-0.2721	1					
gdp	0.2684	-0.1142	0.0511	1				
inf	-0.0641	-0.2609	0.1378	-0.1079	1			
ln_tra	0.1939	0.1677	-0.1608	0.0858	-0.0668	1		
inv	0.2165	-0.0587	0.0471	0.6403	0.0746	0.0534	1	
ln_exp	-0.2484	0.2113	0.0742	-0.1371	-0.1311	0.3742	-0.1048	1

4.1. Descriptive trends and stylized facts

Before proceeding with the estimation strategy, it is essential to provide an overview of the temporal evolution of the core variables – sustainable development index, democracy index, and fiscal stance – across OECD countries. These descriptive trends in time and countries offer valuable insights into the structural dynamics of the sample and clarify why nonlinear and regime-dependent estimation is theoretically justified. First, SDI levels display a clear upward trajectory from the mid-1990s to the early 2000s, followed by a period of stagnation and divergence across countries. The 2008 global financial crisis marked a visible structural break, with SDI growth particularly in countries experiencing austerity and fiscal consolidation. The structural breaks can be seen by following the left part of the graph. A second discontinuity appears in 2020-2021, when COVID-19 caused a sharp deterioration in ecological efficiency and well-being indicators in multiple OECD members. These patterns confirm that sustainable development progresses asymmetrically over time and is sensitive to major global shocks. Second, democracy trends exhibit a different pattern. While most OECD countries maintain high ratings (the trend is concentrated between 0.8 and 1 on the right side of the graph), several members show noticeable institutional erosion after 2010 and again after 2019 (the trend is concentrated between 0.2 and 0.6), including declining electoral integrity and weakening checks and balances due to the 2008 financial crisis and COVID-19. This intertemporal dispersion is consistent with the theoretical expectation that democratic consolidation is neither uniform nor linear, supporting the empirical strategy of allowing democracy to function as a threshold variable.

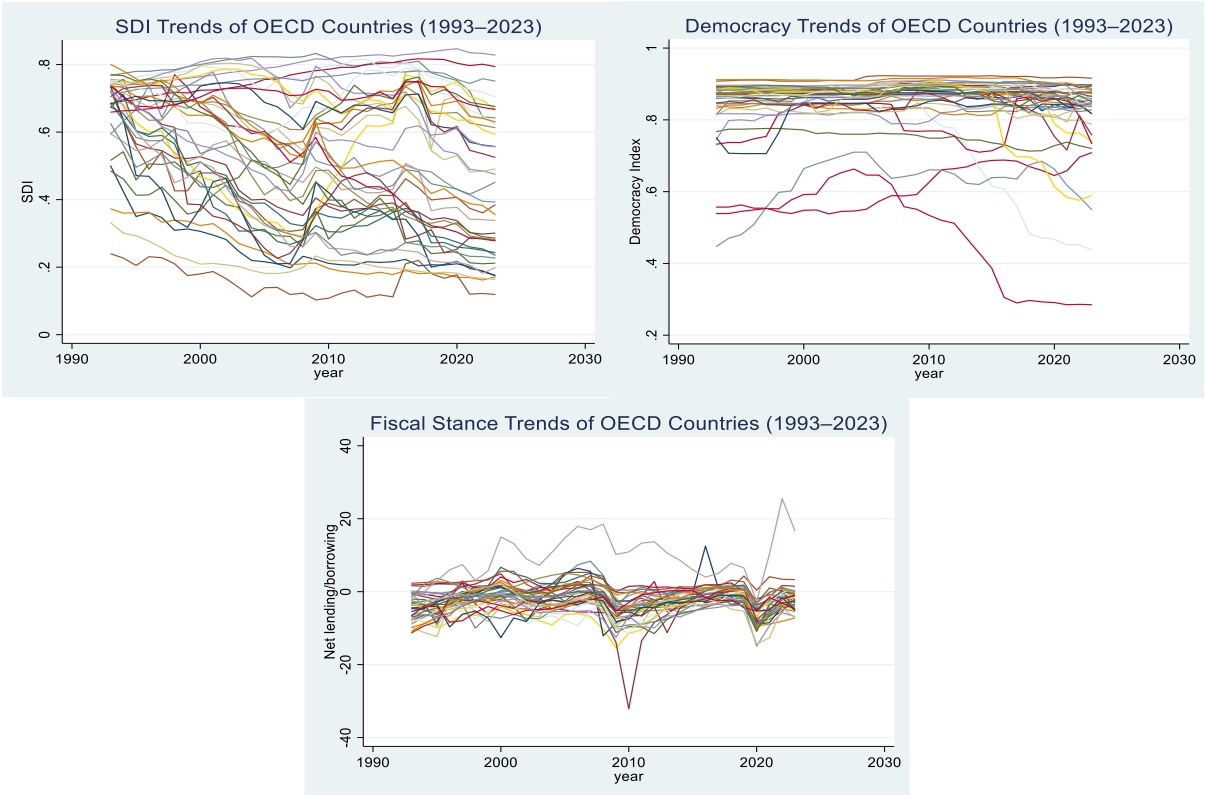

Figure 2. Sustainable development index, fiscal stance, and democracy trends in OECD countries (1993-2023), source: graphed by the author(s) using Stata

Third, the fiscal stance reveals significant cyclical fluctuations with clear breaks (sharp downward and upward trend courses in 2010 and 2020, which can be seen at the bottom of the chart). The global financial crisis created deep deficits across almost all OECD economies, while the COVID-19 period generated the largest synchronized

fiscal expansions in modern economic history. In contrast, fiscal consolidation after 2012 and again after 2021 shows substantial cross-country heterogeneity, underscoring the need for a model that incorporates both time variation and country-specific institutional differences.

These stylized facts demonstrate why the OECD sample cannot be treated as homogeneous over time and why linear specifications would be insufficient. The presence of structural breaks, institutional divergence, and regime-dependent behaviour provides strong empirical motivation for the dynamic panel threshold model used in this study.

4.2. Cross-sectional dependence test procedure

Before selecting the most suitable estimation approach, the analysis initially examines whether cross-sectional dependence exists – an essential consideration in macro-panel studies, as countries are often linked through economic, institutional, and social interactions. Ignoring these interconnections may lead to biased or inconsistent parameter estimates, particularly in contexts characterized by strong trade, policy coordination, or institutional spillover effects. To account for this, the Cross-Sectional Dependence (CD) test developed by Pesaran (2015) is applied. This test is well-suited for panels with heterogeneous structures and varying ratios of time to cross-sectional dimensions (T/N), which makes it an appropriate choice for the OECD dataset used in this study.

$$CD = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}\right) \quad (2)$$

In Equation (2), T denotes the time dimension, while i and j represent the cross-sectional units. The term $\hat{\rho}_{ij}$ refers to the pairwise correlation coefficients of residuals derived from individual ordinary least squares (OLS) regressions. Rejection of the null hypothesis indicates the presence of strong cross-sectional dependence among the units, whereas failure to reject it suggests that such dependence is weak or negligible.

4.3. Unit root test procedure

To enhance the accuracy of subsequent analyses, the study employed the Cross-sectionally Augmented Dickey-Fuller (CADF) unit root test proposed by Pesaran (2007). In contrast to conventional methods like the Im-Pesaran-Shin (IPS) test, the CADF test incorporates cross-sectional averages of lagged levels and first differences to address cross-sectional dependence effectively. This characteristic ensures its robustness across varying N/T ratios and makes it well-suited for heterogeneous macro-panel data.

$$\Delta y_{it} = \alpha_i + \rho_i^* y_{i,t-1} + d_0\bar{y}_{t-1} + d_1\Delta\bar{y}_t + \varepsilon_{it} \quad (3)$$

In the CADF framework, y_{it} represents the variable for unit $i$at time t, while $\bar{y}_{t-1}$ and $\Delta\bar{y}_t$ denote the cross-sectional averages of the lagged level and first difference, respectively. The term α_i is an individual-specific intercept, and ε_{it} is the error term. The CADF test statistic for each country is derived as the t-ratio of ρ_i^*, which tests the null hypothesis of non-stationarity. The panel-level statistic, referred to as the CIPS test, is calculated by averaging the individual CADF statistics across all units.

$$CIPS = \frac{1}{N}\sum_{i=1}^{N} CADF_i \quad (4)$$

4.4. Panel cointegration test procedure

To determine the presence of a long-run equilibrium relationship among the variables, the study utilized the Westerlund (2007) panel cointegration test. In contrast to residual-based methods, this test relies on an error-correction model (ECM) framework, making it more suitable for heterogeneous panels exhibiting cross-sectional dependence. Additionally, it facilitates robust inference using bootstrapped critical values.

$$\Delta_{y_{it}} = \alpha_i + \delta_i t + \emptyset_i(y_{it-1} - \beta_i' x_{it-1}) + \sum_{j=1}^{p_i}\gamma_{ij}\Delta y_{it-j} + \sum_{j=0}^{q_i}\theta_{ij}\Delta x_{it-j} + \varepsilon_{it} \quad (5)$$

In the model, y_{it} denotes the dependent variable, x_{it} represents the vector of regressors, ϕ_i captures the speed of error correction, α_i and $\delta_i t$ account for the intercept and trend, respectively, and ε_{it} is the disturbance term. The null hypothesis is $H_0: \phi_i = 0 \forall i$, indicating no cointegration. The alternative hypotheses for the group mean tests (G_t, G_a) are $H_1: \phi_i < 0$for at least some i, while for the panel tests (P_t, P_a), it is $H_1: \phi_i < 0 \forall i$. The presence of cross-sectional dependence justified the use of bootstrapped p-values to ensure robust statistical inference.

4.5. Dynamic panel threshold test procedure

In macro-panel data, linkages may differ across regimes defined by a threshold variable, capturing structural asymmetries and nonlinear dynamics. This study employs a (dynamic) threshold approach to examine how sustainable development influences fiscal stance, with effects varying based on democracy levels. Unlike conventional linear models, which fail to account for such regime shifts, the baseline (static) threshold regression proposed by Hansen (1999) endogenously partitions the sample based on the threshold variable ρ_{it}.

$$y_{it} = \eta_i + \vartheta_1' I(\rho_{it} \le \gamma)x_{it} + \vartheta_2' I(\rho_{it} > \gamma)x_{it} + u_i + \varepsilon_{it} \quad (6)$$

In this setup, y_{it} denotes the dependent variable, whereas x_{it} stands for the explanatory variables. The parameter η_i captures an unobserved individual fixed effect, and $I(\cdot)$ functions as an indicator that equals 1 when the given

condition is satisfied. The threshold value γ is determined endogenously. As a result, the observations are categorized into two separate regimes:

$$y_{it} = \begin{cases} \eta_i + \vartheta_1' x_{it} + \varepsilon_{it} & (\rho_{it} \leq \gamma), \\ \eta_i + \vartheta_2' x_{it} + \varepsilon_{it} & (\rho_{it} > \gamma). \end{cases} \quad (7)$$

To account for potential endogeneity and dynamic characteristics-such as the inclusion of lagged dependent variable-the study employs the dynamic panel threshold estimation technique proposed by Caner and Hansen (2004) and further developed by Kremer et al. (2013). This methodology extends Hansen's static threshold framework by incorporating the forward orthogonal deviations (FOD) transformation introduced by Arellano and Bover (1995). The transformation effectively eliminates individual fixed effects and reduces serial correlation, thereby enhancing estimator efficiency and consistency in the presence of endogenous regressors and unknown threshold parameters. The transformation of the error term is expressed as follows:

$$\varepsilon_{it}^{*} = \sqrt{\frac{T-t}{T-t+1}} \left[\varepsilon_{it} - \frac{1}{T-t} (\varepsilon_{i(t+1)} + \cdots + \varepsilon_{iT} \right] \quad (8)$$

The threshold value $\hat{\gamma}$ is selected to minimize the sum of squared residuals (SSR). Its statistical accuracy is evaluated using the likelihood ratio (LR) statistic, as outlined by Hansen (1999).

$$LR_{(\gamma)} = \frac{S_{(\gamma)} - S_{(\hat{\gamma})}}{\sigma^2} \quad (9)$$

where $S(\gamma)$ represents the sum of squared residuals (SSR) for a given candidate threshold, $S(\hat{\gamma})$ denotes the minimum SSR corresponding to the estimated threshold value, and σ^2 refers to the error variance. Because the likelihood ratio (LR) statistic does not follow a standard asymptotic distribution, bootstrap procedures are employed to obtain the critical values and confidence intervals for the estimated threshold parameter $\hat{\gamma}$. Accordingly, the final empirical specification of the model can be expressed in the following general form:

$$z_{it} = \alpha_i + \partial z_{it-1} + \gamma_1 X_{it-1} + \emptyset_1 f_{it-1} + I(q_{it-1} \leq c) + + \emptyset_1 f_{it-1} + I(q_{it-1} > c) + v_{it} \quad (10)$$

where z_{it} denotes the dependent variable representing the fiscal stance, X_{it-1} is a vector of control variables included with a one-period lag, and q_{it-1} refers to the threshold variable-here, the democracy index-that governs regime changes in the relationship between sustainable development and fiscal stance.

5. Results and discussion

Table 6 reports the results of cross-sectional dependence (CSD) and CADF panel unit root tests for all variables included in the model. The CSD statistics indicate significant cross-sectional dependence across most variables, suggesting that fiscal, economic, and institutional developments in OECD countries are interrelated common outcomes in open, financially integrated economies. Such dependence justifies the use of second-generation panel unit root tests that account for interdependence among cross-sections.

Table 6. Cross-sectional dependence (CSD) and CADF unit root test results, source: calculated by using Stata

Variables	CSD	CIPS Statistics		
		Level	1st difference	Result
fis	58.162	-2.523	-4.214*	I_1
dem	142.177	-2.265	-3.457*	I_1
ln_sdi	136.681	-1.835	-3.523*	I_1
gdp	105.584	-3.356*	-	I_0
inf	112.109	-3.156*	-	I_0
ln_tra	142.686	-2.511	-3.705*	I_1
inv	60.293	-3.695*	-	I_0
ln_exp	142.622	-2.799*	-	I_0
CV		%1	%5	%10
Constant and trend		-2.72	-2.60	-2.55
Constant		-2.23	-2.11	-2.05

Significance level is denoted as follows: *, **, *** for 1%, 5%, and 10%, respectively.

The CADF (CIPS) test results show that most variables are non-stationary at levels but become stationary after first differencing, implying that they are integrated of order one, I(1). Specifically, variables such as fiscal stance (fis), democracy (dem), sustainable development (ln_sdi), and trade openness (ln_tra) exhibit unit roots at levels but reject the null after first differencing at the 1% significance level. These findings confirm the appropriateness of proceeding with panel cointegration tests to explore long-run equilibrium relationships among the variables. The significance of the cross-sectional dependence test also reinforces the econometric choice of robust estimators that accommodate contemporaneous correlation across countries, such as the dynamic panel threshold GMM model employed later in the analysis.

Table 7. Panel cointegration test results, source: calculated by using Stata

Test statistic	Value	Z-value	p-value (bootstrap)	Decision
G_t	-5.148	-3.772	0.000	Reject H_0
G_a	-11.073	-6.905	0.000	Reject H_0
P_t	-18.639	-3.374	0.000	Reject H_0
P_a	-13.854	-2.284	0.000	Reject H_0

Null hypothesis (H_0): No cointegration. The results are reported with both constant and trend specifications. Bootstrap p-values are obtained from 10000 replications, while asymptotic p-values are derived from the standard normal distribution. The lag and lead lengths are set to 1.

Table 7 presents the results of the Westerlund (2007) panel cointegration test, applied with both constant and trend specifications. Across all test statistics, the null hypothesis of no cointegration is rejected at the 1% significance level, with bootstrap p-values equal to 0.000 in both cases. This finding indicates the existence of a long-run equilibrium relationship between fiscal stance, sustainable development, and the control variables, conditional on democratic institutional quality. The rejection of the null implies that fiscal stance dynamics are not random or transitory but are systematically linked to sustainability and institutional structures. In line with the theoretical expectation, countries with higher democratic maturity appear to maintain fiscal sustainability while pursuing sustainable development goals, whereas less mature democracies experience more volatile and less disciplined fiscal patterns. These results justify the application of the dynamic panel threshold model, as the existence of cointegration ensures that regime-dependent behavior around the democracy threshold can be meaningfully estimated.

Table 8. Dynamic panel threshold estimation results, source: calculated by using Stata

Variables	Dependent Variable: fis
L.fis	0.0589 (0.0195)*
Regime-dependent regressors: The effect of sustainable development on fiscal stance under the democracy threshold	
ln_sdi ($dem \leq 0.888$) -0.3830 (0.5283)** ln_sdi ($dem > 0.888$) 0.3846 (0.6402)**	
Regime-independent regressors: The effect of control variables on fiscal stance	
gdp	-0.1188 (0.0483)**
inf	-0.1445 (0.0192)*
ln_tra	0.9706 (0.1134)*
inv	0.0276 (0.0122)**
ln_exp	-0.0782 (0.0234)*
Constant	0.2533 (0.6950)*
Threshold regime	0.888
90% Confidence interval of the threshold regime	0.887 - 0.888
Bootstrap p-value for linearity test	0.0000
sup-Wald test coefficient/standard error	24.448/5.1224
Sargan test statistics/p- value	24.2472/0.4475
Arellano-Bond AR (1) p-value	0.0090
Arellano-Bond AR (2) p-value	0.3776
Observations	1102
Number of instruments	33

Two-step GMM findings are displayed. Coefficients are reported outside parentheses, with their corresponding standard errors enclosed within parentheses. Significance levels are denoted as follows: * for 1%, ** for 5%, and *** for 10%. The notation "L.fis" refers to the first lag of the dependent variable fis.

According to the dynamic panel estimation findings (Table 8), the internal validity of the model is confirmed, as instrument validity is not rejected by the Sargan test (p = 0.448), and second-order autocorrelation AR (2) is found to be absent (p = 0.378), while first-order autocorrelation AR (1) is detected as expected in first-differenced equations (p = 0.009). When considered together with the strong sup-Wald statistic and the rejection of linearity, these results indicate that a well-identified dynamic panel threshold GMM specification has been achieved, in which issues of endogeneity and unobserved heterogeneity are effectively addressed in accordance with contemporary empirical practices in institutional macroeconomics.

5.1. Discussion related to SDG 8: Decent work and economic growth

A sharp democracy (dem) threshold (Figure 3) is identified at 0.888 (90% CI: 0.887-0.888), and linearity is decisively rejected (bootstrap p = 0.0000), indicating that fiscal behaviour changes discretely with democratic quality. This aligns with the institutional political economy view (Persson & Tabellini, 2003; North et al., 2009; Rodrik, 2021) that macroeconomic performance – including employment dynamics, growth sustainability, and intertemporal budget paths – depends on institutional configurations. Recent analyses of public financial management (Tran, 2018; Qiao et al., 2019; Banik, 2022; Lee et al., 2023; Riblier, 2023; Morales-Casetti et al., 2024; Luo et

al., 2025) also highlight the dynamic interactions reshaped by the temporal budget discipline. Therefore, this finding is consistent with the democracy threshold discussed in the theoretical section and empirically confirms two distinct regimes for OECD economies. The lagged dependent variable (L.fis = 0.059) may evidence modest fiscal persistence, reflecting administrative routines and political adjustment cycles typical in advanced economies (Persson & Tabellini, 2003; North et al., 2009; Haggard & Kaufman, 2021). In the context of SDG 8, these dynamics show how democratic quality shapes fiscal reactions to sustainability-oriented policies that also affect growth trajectories. Below the threshold, the negative (ln_sdi) coefficient (-0.38) suggests that improvements in sustainability impose short-run fiscal pressure, consistent with front-loaded investment needs that may temporarily tighten fiscal space. Above the threshold, the positive (ln_sdi) coefficient (0.38) indicates that more mature democracies integrate sustainability investments into their growth models more efficiently, enabling complementary effects between ecological well-being and long-term fiscal capacity. Both the 2008 global financial crisis and the COVID-19 recession sharply altered growth and employment dynamics across the OECD, widening fiscal deficits and intensifying the short-run trade-offs between sustainability efforts and budgetary constraints. These crises widened the gap between regimes. Countries below the democracy threshold saw deeper and more persistent fiscal deterioration, while high-democracy economies recovered more quickly and stayed more closely aligned with SDG 8 goals. The result suggests that countries face short-run fiscal pressure as they shift toward more sustainable and lower-impact economic models. However, this pressure is weaker in high-democracy regimes because these countries are better able to manage environmental costs through credible taxation, effective regulation, and transparent budget rules (Foremny, 2014; Badinger & Reuter, 2017; Beqiraj et al., 2018; Qiao et al., 2019; Debrun & Jonung, 2019; Hui & Martinez-Vazquez, 2021; Aaskoven, 2023; Ciaffi et al., 2024; Afonso et al., 2025). Control variables also reinforce these dynamics: The negative growth coefficient (-0.119) points to procyclical fiscal expansions during upswings – often election-driven or coalition-driven – while the positive investment effect (0.028) reflects productivity-enhancing channels that broaden the future tax base and support SDG 8 objectives of productive employment and sustainable economic expansion. It is also consistent with composition effects; growth phases coincide with public investment or social priorities that are politically salient in OECD democracies (Rodrik, 2021; OECD, 2022; 2023; Riblier, 2023).

5.2. Discussion related to SDG 12: Responsible consumption and production

SDG 12 emphasizes resource efficiency, sustainable production patterns, and responsible public expenditure. The fiscal stance findings demonstrate that sustainability transitions (captured through Hickel's ecological efficiency index) carry measurable fiscal implications. Under the threshold, the (ln_sdi) coefficient is negative and significant (-0.38). Above the threshold, the coefficient is positive and significant (0.38). These results imply that stronger sustainability performance is associated – on impact – with tighter (under the threshold)/wider (above the threshold) fiscal space (lower/upper net lending/higher borrowing). Upon reviewing Table 4, the fiscal stance variable fluctuates between -32.1 and 25.5 over the designated period. For example, Norway's net lending/borrowing variable value in 2022 is 25.5. All indicators for Norway in the panel are positive, except in 1993 and 2020. A positive value indicates that the country is a lender, while a negative value indicates that it is a borrower. For Norway, these values, -1.6 in 1993 and -2.6 in 2020, indicate that it was a borrower only in those two years. In other terms, Norway is a creditor nation. According to the 38 countries' lending/borrowing values from 1993 to 2023, no other OECD country (save Switzerland) is in a lender position. The values for most years are negative for almost every country. This means most OECD members are debtors. That is, all OECD countries except Norway follow a narrower fiscal path. Moreover, both the 2008 global financial crisis and the COVID-19 shock amplified these fiscal pressures, as sustainability expenditures became harder to sustain when fiscal deficits deepened across almost all OECD members. The sharp deterioration in sustainable development and fiscal balances during these periods can highlight how crisis episodes intensify the short-run trade-off between ecological efficiency and fiscal space, particularly for countries below the democracy threshold. This pattern matches the idea that ecological efficiency and sustainability transitions carry front-loaded fiscal costs, especially where administrative capacity and credibility are weaker. Above the threshold, however, the positive (ln_sdi) effect indicates that stronger institutions enable more efficient sequencing of sustainability expenditures, reducing risks of rent-seeking, delivery failures, or politically motivated slippages (Söderbaum, 2006; North et al., 2009; Bojanic, 2018; Acemoglu & Robinson, 2019; Haggard & Kaufman, 2021; Jahn & Suda, 2022). In terms of control variables, trade openness (0.971) reinforces this relationship by broadening tax bases and allowing access to greener technologies, helping countries internalize environmental costs through credible regulatory and fiscal frameworks. The negative (ln_exp) coefficient (-0.079) may show that government consumption pressures fiscal balances unless expenditure governance – such as medium-term expenditure frameworks, audits, and fiscal rules – is strong (Foremny, 2014; Acemoglu & Robinson, 2019; Ballard-Rosa et al., 2021; Haggard & Kaufman, 2021; Lee et al., 2023; Riblier, 2023; Ciaffi et al., 2024; Beyala & Owoundi, 2025). These institutional conditions define whether sustainability and fiscal responsibility can be pursued jointly, thus shaping progress on SDG 12.

5.3. Discussion related to SDG 13: Climate Action

SDG 13 requires governments to undertake climate mitigation and adaptation policies that often necessitate substantial public investment. The threshold estimation reveals that the fiscal consequences of sustainability improvements differ sharply across institutional regimes. Below the threshold, environmental and climate-related investments intensify fiscal pressure, reflecting both the ecological efficiency trade-offs and the limited administrative capacity to internalize environmental externalities. This is particularly relevant in the context of major global shocks such as the 2008 financial crisis and the COVID-19 pandemic, when fiscal balances deteriorated sharply and environmental components of sustainability declined simultaneously. COVID-19 and the 2008 global financial crisis weakened countries' fiscal stances, leading to declining environmental performance and increased debt requirements. For countries below the democratic threshold, this may have made pursuing climate action more costly, while for countries above the threshold, it may have led to more effective implementation of climate commitments through coordination and credible policy channels. Additionally, above the threshold, the positive effect suggests that democratic consolidation facilitates climate action through more credible taxation, regulation, green budget tagging, and public-private partnerships (Wurster, 2015; Tran, 2018; Zheng et al., 2025). Open economies and investment-driven growth can reinforce climate-compatible fiscal strategies, as shown by the positive (ln_tra) and (inv) coefficients. It can also strengthen medium-term fiscal capacity by raising the tax base and improving productivity (Badinger & Reuter, 2017; Beqiraj et al., 2018; El-Shagi & von Schweinitz, 2021; Obeng, 2021; Rodrik, 2021; Marquardt et al., 2025). The negative effect of the inflation variable (inf) (-0.145) is also relevant for SDG 13, as inflation episodes weaken the credibility of climate-related taxes and green financing, elevating the fiscal cost of climate initiatives. The results indicate that democratic quality moderates the fiscal cost of climate action and enhances the feasibility of SDG 13 implementation (Qiao et al., 2019; Sakuragawa & Sakuragawa, 2020).

5.4. Discussion related to SDG 16: Peace, justice, and strong institutions

SDG 16 is the conceptual anchor of the empirical model, as democracy serves directly as the threshold variable determining the fiscal impact of sustainability transitions. The precisely estimated cutoff at 0.888 empirically validates a two-regime structure in OECD public finances. Below the threshold, the fiscal stance may be more prone to inefficiencies, procyclicality, rent seeking, and slippages, which magnify the fiscal burden of sustainability actions. Above the threshold, however, democratic consolidation can improve policy sequencing, strengthen administrative capacity, enhance budget transparency, and mitigate the short-run fiscal pressure of sustainability programs.

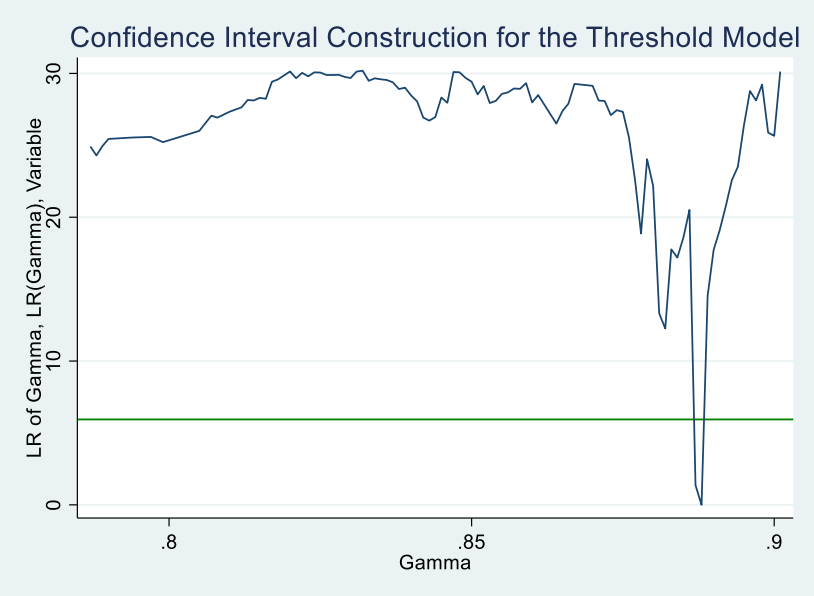

Figure 3. Likelihood ratio statistics graph of the democracy threshold, source: Graphed by the author(s) using Stata

5.5. Discussion related to the country and time-specific outcomes

Table 9 reports, for each OECD country, the proportion of years during the sample period in which its democracy index lies above the estimated threshold level (0.888), thereby indicating whether countries predominantly operate in the lower or upper democracy regime over time. Countries are classified into three groups based on the percentage of years above the threshold: High (≥70%), medium (30-70%), and low (< 30%). Twenty of the 38 OECD nations are observed to have maintained above-the-threshold levels of democracy during the analysis period. 12 of these countries have at least ten observations above the threshold level throughout the selected period. Costa Rica performed totally democratically, consistently exceeding the threshold level with 31 observations. This is

consistent with Costa Rica having the highest sustainability score among the 163 OECD nations, as indicated in the second paragraph of the introduction. As a result, this study supports the allegation that increasing well-being alone is insufficient for sustainable development and that enhancing welfare achieved by minimizing ecological damage will advance sustainability. Denmark, Germany, Switzerland, and Sweden all perform close to the fully democratic level with 24 or more observations above the threshold level.

Table 9. Distribution of OECD countries by the share of years above the estimated democracy threshold, source: edited by the author(s) using Stata computations

country	observation count (above threshold)	percent (above threshold)	Category
Australia	9	0.2903226	Low (<30%)
Austria	0	0	Low (<30%)
Belgium	17	0.5483871	Medium (30–70%)
Canada	0	0	Low (<30%)
Chile	10	0.3225806	Medium (30–70%)
Colombia	0	0	Low (<30%)
Costa Rica	31	0.9354839	High (≥70%)
Czech Republic	15	0.483871	Medium (30–70%)
Denmark	29	1	High (≥70%)
Estonia	9	0.2903226	Low (<30%)
Finland	2	0.0645161	Low (<30%)
France	4	0.1290323	Low (<30%)
Germany	24	0.7741935	High (≥70%)
Greece	12	0.3870968	Medium (30–70%)
Hungary	0	0	Low (<30%)
Iceland	0	0	Low (<30%)
Ireland	17	0.5483871	Medium (30–70%)
Israel	0	0	Low (<30%)
Italy	0	0	Low (<30%)
Japan	0	0	Low (<30%)
Korea	0	0	Low (<30%)
Latvia	0	0	Low (<30%)
Lithuania	0	0	Low (<30%)
Luxembourg	0	0	Low (<30%)
Mexico	0	0	Low (<30%)
Netherlands	0	0	Low (<30%)
New Zealand	5	0.1612903	Low (<30%)
Norway	19	0.6129032	Medium (30–70%)
Poland	8	0.2580645	Low (<30%)
Portugal	9	0.2903226	Low (<30%)
Slovak Republic	0	0	Low (<30%)
Slovenia	0	0	Low (<30%)
Spain	14	0.4516129	Medium (30–70%)
Sweden	30	0.9677419	High (≥70%)
Switzerland	27	0.8709677	High (≥70%)
Turkiye	0	0	Low (<30%)
United Kingdom	0	0	Low (<30%)
United States	9	0.2903226	Low (<30%)

The results reveal substantial cross-country heterogeneity. For at least 70% of the sample, a group of nations – including the Nordic economies (Denmark, Sweden, and Norway), Germany, Switzerland, and Costa Rica – remains above the threshold, demonstrating robust institutional frameworks, excellent governance, and enduring democratic traditions. For these nations, upper-regime dynamics predominate, indicating that higher levels of democracy consistently have a greater impact on sustainable development and fiscal sustainability. A second group, which includes nations like Belgium, the Czech Republic, Chile, Ireland, Spain, and Greece, spends between 30% and 70% of the time above the threshold. This suggests that they switch regimes over time, frequently during times of political or economic stress (such as the European sovereign debt crisis, the 2008 global financial crisis, and COVID-19). For these countries, the effects of democracy are likely more heterogeneous and context-dependent. Finally, a sizable group – including Mexico, Colombia, Turkey, Hungary, and several Baltic economies – remains below the threshold for more than 70% of the sample, indicating weaker institutional capacity, higher political fragility, and more limited governance effectiveness; in these cases, lower-regime dynamics are dominant, implying that the impact of democracy on fiscal balances or sustainability operates more weakly or through different channels. These regime classifications are based on the relative share of years spent above the estimated threshold and follow standard practice in interpreting nonlinear panel threshold models.

6. Conclusions and policy implications

The results of this study provide compelling evidence that democratic quality plays a decisive role in shaping the fiscal stance and sustainability trajectories of OECD countries. By applying a dynamic panel threshold regression model to annual data from 1993 to 2023, it has been shown that fiscal stance varies systematically across regimes defined by a democracy threshold. Sustainability pressures may weaken fiscal stance under a certain democracy threshold. Countries below this critical level experience fiscal imbalances as sustainability-oriented expenditures amplify borrowing pressures, while those above it exhibit more robust fiscal reaction functions, allowing proactive adjustments to debt and cyclical fluctuations, and the negative effect diminishes or turns positive, widening the fiscal stance and enabling governments to accommodate sustainability-related investments. These findings demonstrate that democratic maturity strengthens fiscal responsiveness, transparency, and long-term credibility, thereby aligning macro-fiscal policy with the principles of sustainable development. In this context, fiscal stance emerges not only as an indicator of budgetary health but also as a reflection of institutional quality and democratic resilience. Thus, the interdependence between democracy, fiscal responsibility, and sustainability reinforces progress toward SDG 8 (Decent Work and Economic Growth), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 16 (Peace, Justice, and Strong Institutions), illustrating how inclusive governance enhances fiscal and developmental sustainability in tandem.

Policy implications derived from these findings are particularly relevant for OECD economies undergoing fiscal adjustment and green transformation in the post-pandemic era. For countries operating below the democracy threshold, institutional strengthening should be prioritized to enhance fiscal credibility and resilience. Measures such as establishing independent fiscal councils, adopting multi-year budgeting frameworks, expanding tax compliance mechanisms, and reinforcing anti-corruption safeguards are essential to reduce fiscal fragility. In higher-democracy contexts, where accountability frameworks are already entrenched, policy efforts should focus on mainstreaming sustainability into fiscal institutions through instruments like green budgeting, carbon-adjusted debt ceilings, and SDG-linked fiscal rules. Moreover, OECD-level cooperation could foster policy harmonization and capacity-building through shared fiscal data, joint climate-finance mechanisms, and cross-country peer reviews. In this way, democracies can leverage their institutional depth to integrate environmental and social objectives within a stable macro-fiscal framework, promoting not only debt sustainability but also intergenerational equity and policy coherence.

This study advances the existing literature by demonstrating that the fiscal consequences of sustainable development are regime-dependent rather than uniform. Unlike previous works that examine sustainability or fiscal policy in isolation, our results show that sustainability pressures narrow fiscal space only below the democracy threshold, whereas strong institutional frameworks can transform these pressures into a widening fiscal stance. By employing the Sustainable Development Index (SDI), the analysis captures the SDG principle of achieving social well-being within planetary boundaries, providing a more comprehensive and policy-relevant perspective than GDP-based environmental indicators commonly used in earlier studies. Future research should build on these findings by expanding the temporal and methodological scope of analysis. First, asymmetric or time-varying threshold models could examine whether the democracy–fiscal stance nexus changes during crises or major institutional transitions. Second, spatial econometric and network-based approaches could capture policy spillovers among OECD members, as fiscal behaviors are often influenced by regional governance standards and trade interdependencies. Third, incorporating alternative democracy indicators – such as electoral integrity, media freedom, or participatory governance – would allow a multidimensional assessment of institutional quality. Finally, extending the sample beyond OECD countries to include emerging and developing economies would enable a comparative analysis of how institutional maturity interacts with fiscal sustainability under different governance systems. Such empirical

advancements would not only refine the democracy threshold hypothesis but also contribute to designing adaptive fiscal frameworks capable of supporting sustainable development across diverse institutional realities.

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