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Reshaping Fiscal Federalism: Adaptive Responses in the Era of Polycrisis – Empirical Evidence from European Countries

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Abstract

Fiscal federalism has evolved significantly in response to complex crises affecting the balance between decentralization and centralization in governance. The COVID-19 pandemic, geopolitical conflicts, climate change, financial instability, and demographic shifts have prompted adaptive governance, including temporary recentralization, increased fiscal transfers, and flexible policy responses. This article examines adjustments to fiscal decentralization models in selected European countries, exploring the financial frameworks of subnational governments (SNGs). The study analyses the relationship between the size of the local government sector and economic indicators such as GDP per capita, unemployment, and GDP growth from 1995 to 2023, covering economic disruptions including the 1998 and 2008–2009 global financial crisis and the 2020–2022 COVID-19 pandemic across 25 European countries. A subsequent cluster analysis categorizes countries based on their fiscal federalism models, using SNG fiscal indicators to assess their adaptability to crises. Findings suggest that countries with SNGs that actively invest and moderately redistribute achieve better long-term economic performance.

Keywords: polycrisis, fiscal federalism, decentralization, subnational government finance, governance adaptation

JEL: H11, H12, H70, H77, H83

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Introduction

The concept of fiscal federalism is evolving significantly in response to the contemporary era marked by multiple crises (polycrisis). These include challenges such as the COVID-19 pandemic, climate change, financial instabilities, migration issues, and geopolitical conflicts, all of which have profound implications for the functioning of multilevel public finance systems. Fiscal federalism, traditionally focused on the allocation of roles and responsibilities for public finances and services across different government levels, now requires reevaluation to address the complexities of these crises and the necessary coordination of public policies.

In recent times, many decentralized states have temporarily shifted to centralized management of crises to facilitate quick resource mobilization, efficient aid distribution, and the uniform implementation of large-scale safety measures, especially evident during the COVID-19 pandemic's healthcare responses and economic interventions. Simultaneously, traditional fiscal constraints on deficits and public debt were often relaxed or suspended, enabling increased government spending to address the crisis-related impacts. This flexibility in fiscal policy underscores the need for adaptive fiscal governance during such turbulent times.

Moreover, the structure of public expenditures has shifted significantly, prioritizing public health, unemployment support, and aid for sectors most affected by the crises. This adjustment highlights the crucial role of fiscal federalism in resource allocation during emergencies. The importance of enhanced cooperation among different government levels has also become apparent, as effective coordination is essential for managing public health crises and economic measures. In several instances, these crises have spurred new forms of intergovernmental collaboration.

Additionally, fiscal transfers between government levels have become more critical, with central governments often providing additional funds to lower levels tasked with crisis response measures such as testing, vaccinations, and supporting businesses. While these transfers have bolstered local budgets, they have also prompted concerns over their equitable distribution and efficient use. In the European Union (EU), initiatives like the Recovery Fund (Next Generation EU) played a pivotal role in the fiscal response to the crisis.

The overlapping nature of these crises has further compounded fiscal imbalances and escalated public debt, with governments increasingly relying on borrowing, thus raising concerns over long-term fiscal sustainability and fair financial burden-sharing across regions. Modern crises have also underscored the need for robust, adaptable, and well-managed governmental institutions capable of swiftly responding to changing circumstances, efficiently allocating resources, and maintaining public trust.

The objective of this article is to assess how the era of polycrisis has reshaped the theoretical foundations of fiscal federalism and to analyze how selected European countries have adapted their multilevel public finance systems to address crisis management challenges. We also aim to identify different models of fiscal federalism in the context of the diverse fiscal responses of the subnational government (SNG) sector in the studied countries to emerging crises.

Against this background, the present study contributes to a growing but still fragmented literature on how fiscal federalism systems adapt to multiple, overlapping crises. Existing empirical studies usually focus on single crisis episodes, such as the global financial crisis, the COVID-19 pandemic, or periods of fiscal stress. These analyses are typically conducted over short time horizons or within individual countries or regional settings. Consequently, there is still a lack of long-term comparative research that examines how SNG systems evolve in response to a sequence of interacting crises.

Moreover, the empirical literature rarely uses typological approaches based on cluster analysis to identify models of fiscal federalism that account simultaneously for the size, functional structure, and macroeconomic relevance of the SNG sector. In particular, limited attention has been paid to the relationship between the fiscal orientation of SNGs, especially the balance between redistributive and investment functions, and long-term economic performance across different crisis phases.

This study addresses these gaps by providing a long-term comparative empirical analysis for the period 1995–2023 and by identifying distinct models of fiscal federalism in Europe under conditions of polycrisis. By combining correlation analysis with cluster classification, this article identifies stable empirical patterns and reveals heterogeneous adaptive trajectories of SNGs. In this way, it contributes to a better understanding of fiscal federalism in an environment of heightened and persistent uncertainty.

For the empirical analysis, statistical correlation and cluster analysis methods were employed, based on fiscal indicators from 24 EU member states and Norway between 1995 and 2023. The research aims to provide empirical insights that offer practical recommendations for optimizing fiscal federalism in the context of global crises, contributing to the ongoing debate on the balance between centralization and decentralization, as well as the effectiveness of public governance in an uncertain and dynamically evolving environment.

Literature Review

Fundamental Principles of Fiscal Federalism and Their Evolution in the Scholarly Literature

Fiscal federalism represents a contemporary economic concept that directly challenges centralism, functioning within the framework of multilevel public finances. This concept emphasizes determining the optimal extent of fiscal decentralization, which requires a careful balance of political rights, competencies, tasks, and public funds across various levels of government (Poniatowicz 2018). The decentralization process involves transferring powers, duties, and resources from the central government to lower levels of authority, with local governments acting as the primary agents of this decentralized administration (Poniatowicz, Konopka, and Piekutowska 2024). Fiscal federalism advocates for a systematic division of public authority, highlighting the associated redistribution of public revenues and expenditures, as well as the governance connected to them. Although the term “federalism” might suggest applicability solely to countries with a federal structure, this is not the case. In fact, fiscal federalism is relevant to both federal and unitary states, assuming their public finance systems are decentralized (Poniatowicz 2023).

Building on this framework, the sub-discipline of fiscal federalism explores how the structure of a country’s financial system interacts with the functioning of its public institutions and their intergovernmental relations (IGR). This approach emphasizes the importance of well-coordinated intergovernmental dynamics in enhancing the effectiveness and efficiency of government at all levels.

Literature identifies several positive outcomes of well-formed IGR among different levels of public authority (Heinemann-Grüder et al. 2017):

- The decentralization of the decision-making process and the functional empowerment of local governments through the assignment of competencies and resources suitable for the public tasks they undertake.
- Increased transparency in the public finance sector and enhanced effectiveness in the decision-making processes of public policymakers.
- Ongoing dialogue between various levels of public authority.
- The inclusion of a wider range of perspectives and public objectives in policy-making, facilitated by intergovernmental cooperation and consensus, which consequently strengthens the integration of such policies, as well as acceptance and respect for the rule of law.
- Enhanced coherence of public policy with the federal principle of "unity in diversity," which acknowledges that variations in territorial policies are acceptable and that the role of intergovernmental coordination is to ensure the functionality of the system as a whole.

Another positive aspect that is emphasized in the literature is the impact of fiscal decentralization on economic growth (Mali and Maličká 2021; Makreshanska Mladenovska, and Tashevska 2024). Nonetheless, some authors argue that the lack of appropriate theoretical frameworks undermines the validity of empirical studies on this subject. In their opinion, a fair summary of empirical research on the direct relationship between fiscal decentralization and economic growth indicates that it remains an open question (Martínez-Vazquez and McNab 2001). Other authors, in turn, analyze the positive impact of public investments, including investments by local government units, on economic growth and resilience to external economic shocks (Jarosiński 2023; Danaj and Reçi 2024; Matić 2024).

Fiscal federalism and the associated decentralization of public authority, while offering many advantages, also present significant challenges. The literature frequently highlights the difficulties stemming from the complex structure of multilevel public governance, which can lead to tensions and conflicts between different levels of authority. Such situations are often described as an "intergovernmental tug-of-war" (Ryan 2012; Purnell 2019). This issue becomes particularly evident during crises, when various levels of public authority pass responsibility for decisions, or their absence, back and forth. This phenomenon, known as the "blame game," underscores the challenges in assigning accountability in decentralized systems (Hood 2011; Hinterleitner 2017).

Moreover, decentralization can lead to issues related to inconsistency and inadequate coordination of activities at the regional and local levels. The absence of uniform standards or the duplication of efforts by different territorial units can result in inefficiencies in the execution of public policies (Treisman 2007; Bardhan 2022).

Another challenge is the increase in administrative costs. Distributing competencies across various levels of authority necessitates the creation of additional organizational structures, which can lead to higher operational expenses and an expansion of the public sector (Bodman and Ford 2006).

Decentralization also means forgoing economies of scale. Fragmenting competencies into smaller territorial units often hampers the potential savings that could be achieved from larger administrative structures (Wieliczko 2018).

Decentralization also poses a risk of exacerbating interregional inequalities. Wealthier regions have a greater potential to generate revenue from local taxes, which enables them to better fund public services. Conversely, less affluent areas often remain underfunded, perpetuating disparities in the standard of living among residents (Feld et al. 2021).

Some studies also identify the occurrence of external effects (spillover effects) when decisions made by one administrative unit adversely affect others, such as in environmental protection or infrastructure. The lack of effective cooperation between levels of authority can lead to the neglect of these issues, which in turn reduces the quality of public services (Oates 1999; Boadway and Shah 2009).

The risk of increased corruption in decentralized systems cannot be overlooked either. Without adequate monitoring and control mechanisms, local authorities may be more prone to corrupt practices, negatively impacting the efficiency and transparency of public governance (Fisman and Gatti 2002; Shah 2007).

These challenges demonstrate that while decentralization offers many benefits, it also requires thoughtful public management and proper coordination to minimize its potential drawbacks.

Fiscal federalism theory seeks to identify the optimal level of decentralization and the division of financial functions across various levels of authority, from central to local. Richard A. Musgrave (1959) emphasizes that the central government should manage economic stabilization and income redistribution, while local governments should oversee the efficient allocation of resources.

Contemporary concepts like multilevel governance (MLG) stress the importance of optimally matching competencies and resources to functions, as seen in the functional, overlapping, and competing jurisdictions (FOCJ) model. Developed by Bruno Frey and Reiner Eichenberger (1999), this idea posits that decentralization promotes efficiency and competition among territorial units only under these conditions.

Charles M. Tiebout (1956), a pivotal theorist in decentralization and a mainstay of fiscal federalism, promoted "foot voting", arguing that competition among local government units enhances the quality of local public goods. This mechanism allows residents to select local governments offering an optimal balance of public service quality and tax levels.

Fiscal federalism has evolved significantly as a theoretical concept, moving beyond traditional frameworks. First-generation fiscal federalism (FGFF) focused on the decentralization of allocative functions, assuming public authorities' rationality in decision-making. Second-generation fiscal federalism (SGFF) introduced a more complex approach, incorporating factors like institutions, transaction costs, and political interests for a more realistic perspective on public financial management.

Despite these diverse approaches, the core dilemmas of fiscal federalism theory, aptly identified by Richard M. Bird (2003), remain:

- Who should perform which public tasks to optimize public expenditures? – a question about expenditure assignment.
- Who should collect which taxes? – a question about revenue assignment.
- How can vertical disparities in income and public expenditures in the local government sector be mitigated? – addressing vertical fiscal imbalances.
- Should horizontal imbalances between the needs of territorial communities and their varied resource potentials be balanced, and if so, how? – addressing horizontal fiscal imbalances.
- Who should set the principles for limiting or controlling local government debt? – a question about local debt rules.
- What should the institutional system look like to optimally address the issues outlined in questions 1–5? – a question about the institutional aspects of fiscal federalism.

These questions remain central to the debate on fiscal federalism. Each country should analyze and address these dilemmas individually, given that there is no universal model of fiscal federalism (Sorens 2011). Differences in institutional structures, political traditions, levels of decentralization, and regional economic and social conditions mean that effective solutions in one country might be inadequate in another. For instance, the challenges of fiscal federalism in federal states like Germany or the United States differ from those in unitary states like Poland or France. The historical context and political culture also significantly influence cooperation and negotiation among various levels of authority (Bird and Vaillancourt 2006).

An individual approach also requires a detailed analysis of specific challenges arising from dynamically changing global conditions and the simultaneous occurrence of various crises (the concept of global polycrisis to be discussed later). Crisis conditions vary based on geographical location, economic structure, and the social development level of individual countries. For instance, highly developed countries must balance fiscal stability with investments in sustainable development, while developing countries focus on combating regional inequalities and financing essential public infrastructure (Oates 1999; Boadway and Shah 2009).

The absence of a universal fiscal federalism model compels countries to continuously experiment and adapt their systems. This process should be grounded in empirical evidence, enabling the assessment of the effectiveness of actions taken and the identification of best practices.

Conceptual Reshaping of Fiscal Federalism in a Crisis Context

The contemporary world is characterized by a proliferation of crises (Mączyńska 2021), encompassing the following phenomena:

- An increase in the number of crises – modern societies face more frequent crises than in the past, attributed to factors such as globalization, technological advancement, and climate change.
- Interconnections between crises – crises often interconnect (for instance, a climate crisis may lead to a migration crisis, which in turn triggers socio-political tensions and affects the economy).

- The intensification of crisis impacts – crises are not isolated; their effects permeate various aspects of socio-economic life, often exacerbating their impact.
- Complexity of solutions – due to the interplay of crises, resolving them requires more complex, interdisciplinary, and international approaches.

The term "polycrisis," linked to the phenomenon of crisis multiplication in the contemporary world, was first coined by French philosopher and sociologist Edgar Morin (2001) in his book "La Méthode. 5, L'humanité de l'humanité". Morin employed this concept to describe the coexistence and mutual penetration of numerous crises that merge into a global, intricate network of challenges.

In recent years, the term has gained traction and has been elaborated upon by various institutions, such as the International Monetary Fund (2023), and scholars like Adam Tooze (2022). Tooze has become one of the prominent proponents of this term in the English language. His contributions have greatly advanced the application of the concept in the fields of social sciences and public policy. He has redefined "polycrisis" to denote contemporary global crisis challenges, highlighting their complexity and interdependency, as illustrated in Figure 1.

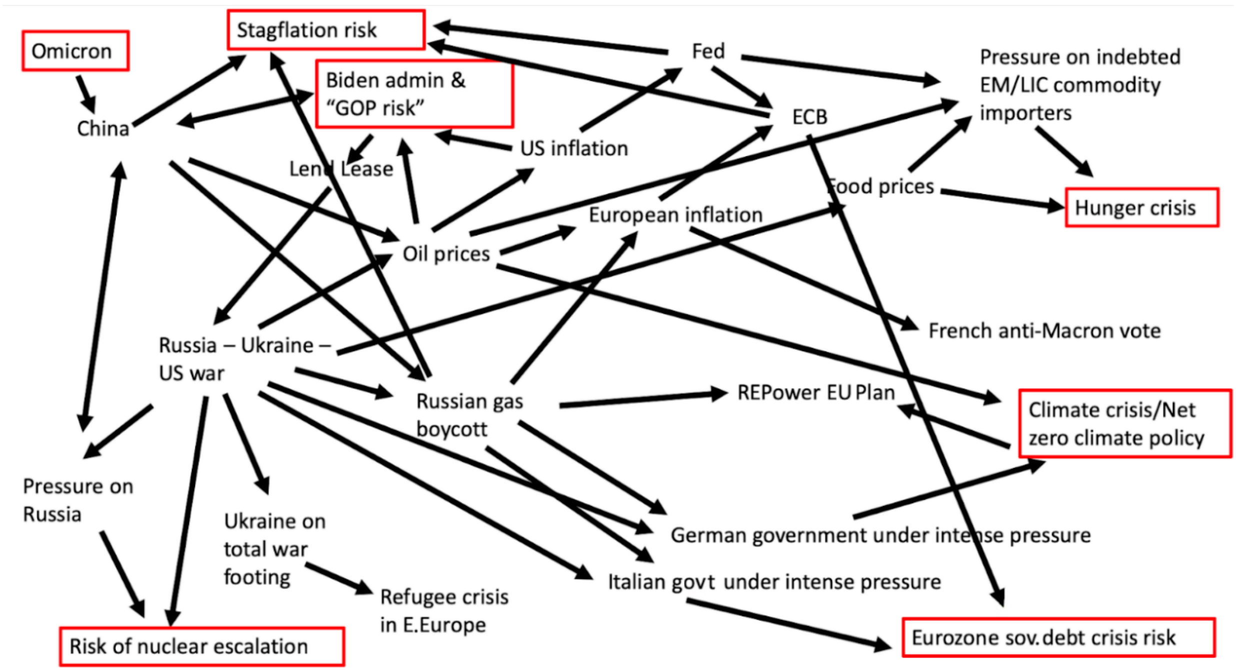

Figure 1. Model of the multifaceted impact of global crises in the context of a polycrisis
Source: adapted from Tooze 2022.

In the context of overlapping crises, recent studies on fiscal federalism move beyond the question of the optimal degree of decentralization and increasingly focus on the resilience, adaptive capacity, and coordination properties of multilevel fiscal systems (see Table 1).

The COVID-19 crisis presented a major challenge to fiscal federalism and public finances worldwide. The pandemic emerged in December 2019, with the first cases reported in Wuhan, China, and quickly spread across the globe, triggering a severe health and economic crisis. This crisis persisted throughout 2020, with its primary economic repercussions extending into 2021 and 2022. The pandemic resulted in a significant deterioration of public finances, marked by increased government spending and declining tax revenues (Wildowicz-Szumarska 2021; Vinhas de Souza 2024). A key characteristic of this period was the "covidization" of public finances, defined by the widespread use of extraordinary economic policy measures, commonly known as stimulus packages (Agrawal and Bütikofer 2022).

Both fiscal and monetary policies played a crucial role in mitigating the crisis. On the monetary side, central banks lowered interest rates, implemented quantitative easing, and engaged in "helicopter money" strategies injecting liquidity directly into the economy to counteract economic downturns. On the fiscal side, governments introduced expansive anti-crisis measures, such as increased public spending and tax reductions, designed to stimulate economic activity and mitigate the adverse effects of the pandemic. These interventions highlighted the benefits of a flexible fiscal approach while also exposing the challenges and risks associated with long-term fiscal instability during global crises.

Table 1. Recent research on fiscal federalism in the context of polycrisis

Author (year)	Crisis context	Key findings for fiscal federalism	Implications for the analytical framework of this study
Brosio (2024)	Global risks, increasing crisis complexity, erosion of classical theoretical frameworks	Traditional fiscal federalism assumptions based on stable macroeconomic conditions and a clear functional division erode under sequential crises. Central tension arises between fiscal centralization and the preservation of subnational autonomy and accountability.	Offers theoretical justification for moving beyond FFF/SGFF towards an adaptive understanding of fiscal federalism requiring institutional recalibration rather than simple recentralization.
Dougherty and Mota (2024)	Multi-dimensional crises, competence conflicts, fiscal stress	Crises intensify intergovernmental conflicts; the effectiveness of fiscal federalism depends on the quality of institutionalized coordination and co-operation mechanisms across government levels.	Supports the article's focus on intergovernmental relations as a core determinant of system resilience.
Edwards (2024)	Public debt crisis	Excessive centralization contributes to debt accumulation; federal arrangements may serve as a fiscal discipline mechanism.	Provides a theoretical counterpoint highlighting the tension between fiscal stabilization and budgetary discipline in multilevel systems.
Dougherty, Montes Nebreda, and Urrutia (2025)	Post-COVID fiscal consolidation, high public debt	Intergovernmental transfers retain stabilization functions during crises, but their equalization capacity weakens under fiscal consolidation pressures.	Justifies the analysis of the resilience of decentralization models under sequential crises and fiscal constraints.
Herrero-Alcalde, Martín-Román, and Moral-Arce (2025)	COVID-19 pandemic; extraordinary fiscal interventions	Different dimensions of decentralization generate divergent crisis responses: expenditure autonomy constrains the scale of fiscal intervention, whereas borrowing autonomy tends to amplify it.	Provides direct justification for moving beyond aggregate decentralization indicators and focusing on the institutional and financial structure of the SNG sector.

Author (year)	Crisis context	Key findings for fiscal federalism	Implications for the analytical framework of this study
Martínez-Vazquez (2025)	Sequential and overlapping crises (pandemic, climate change, economic shocks); erosion of stable macroeconomic conditions	Classical models of fiscal federalism (FGFF and SGFF) are insufficient under contemporary crisis conditions. The author calls for a "third-generation fiscal federalism" integrating fiscal, administrative, and political dimensions, as well as adaptive and coordination mechanisms.	Provides a strong theoretical foundation for treating fiscal federalism as an evolving and adaptive system, directly legitimizing the analytical framework of the article.
Shrestha and Hankla (2025)	Fiscal crises, COVID-19 pandemic, macroeconomic instability	The effects of decentralization are highly context-dependent; there is no single "optimal" model of fiscal federalism that is universally crisis-resilient.	Reinforces the need for an empirical typology of decentralization models and for analysing their differentiated resilience under polycrisis conditions.
Shafi and Mallinson (2026)	Political crises, party fragmentation, complex decision-making environments	The functioning of federal systems under crisis conditions is strongly shaped by political configurations. System performance depends on interactions between fiscal institutions and party systems rather than on the formal allocation of competences alone.	Supports the argument that fiscal federalism should be analysed as an adaptive system incorporating political and institutional conditions.

Source: own elaboration.

The pandemic had a profound impact on the finances of the SNG sector, creating what is often referred to as the "pandemic scissors effect" (Poniatowicz 2022). This phenomenon resulted from a simultaneous surge in expenditures (due to increased health, social, and economic support measures) and a decline in budget revenues caused by the socioeconomic effects of the crisis. Many local government units experienced severe financial strain as they struggled to balance these opposing fiscal pressures.

In response, numerous countries temporarily shifted fiscal competencies toward centralization, allowing for the rapid mobilization of resources and the implementation of uniform regulations[1]. This shift highlighted the need for effective intergovernmental cooperation and the creation of a resilient financial system capable of adapting to rapidly changing circumstances. The crisis underscored the importance of ensuring that SNGs have the necessary financial tools to respond effectively to future shocks while maintaining fiscal stability.

Financial crises, such as the 1998 financial crisis and the 2008 global financial crisis, along with contemporary challenges related to inflation and rising public debt, highlight the need for a reassessment of public finance management principles. Fiscal transfer mechanisms and consolidation rules must be more adaptable to rapidly changing economic conditions. Fiscal transfers, which involve reallocating

1 Unfortunately, in some countries, such as Poland, the pandemic was used as a pretext to weaken democracy and systematically curtail the financial autonomy of local government units, which is recognized in doctrine as a fundamental pillar of fiscal federalism. The local government finance system became increasingly reliant on earmarked grants distributed by central authorities based on political criteria. This process was characterized by arbitrariness, discretionary decision-making, and a lack of transparency, raising significant controversy and concerns about its fairness and accountability (Poniatowicz 2022).

funds between different levels of government, should be designed with greater flexibility to ensure that local crises can be managed effectively without compromising the stability of the overall public finance system. At the same time, the fiscal consolidation process, aimed at reducing budget deficits and public debt, must be carefully structured to avoid hampering economic growth.

The first of these crises began in July 1997, when a sudden capital outflow and currency depreciation disrupted the economies of Southeast Asia (Krugman 1998). The Asian financial crisis led to a sharp decline in investor confidence in emerging markets, triggering a domino effect across global financial markets. This crisis contributed to widespread financial instability, which also impacted Europe. However, European financial difficulties had additional, distinct causes, including the costs of German reunification, the economic transition in Central and Eastern Europe, financial market tensions related to the introduction of the euro, and the 1998 Russian financial crisis. In the SNG sector, the crisis primarily manifested as an economic slowdown, resulting in declining local tax revenues and increasing restrictions on external financing. The latter was driven by stricter lending conditions imposed by banks, which constrained the ability of local governments to fund public services and infrastructure projects.

The second major crisis, which originated in the United States in 2007 due to turmoil in the mortgage lending market, quickly engulfed global markets (Reinhart and Rogoff 2009). Peaking in 2008 and extending through 2009, its economic repercussions reshaped global economic and financial policies for years. For the SNG sector, the impact was severe and multifaceted. The economic downturn significantly reduced local tax revenues, weakening the capacity of local governments to support public services and infrastructure. Concurrently, the demand for social services, including unemployment support and assistance for low-income individuals, surged, placing additional strain on local budgets. To cope with these challenges amid falling revenues, many local governments were compelled to increase borrowing or restructure existing debts, exacerbating their financial fragility and exposing the vulnerabilities of decentralized public finance systems. This crisis underscored the need for more resilient fiscal frameworks capable of absorbing economic shocks while ensuring long-term financial sustainability.

Amid these economic disruptions, another pressing issue emerged the climate and environmental crises (IPCC 2023) further underscoring the urgent need for a coordinated approach to public policy at the international, national, and subnational levels. The increasing frequency of extreme weather events, rising sea levels, biodiversity loss, and resource depletion are placing growing pressures on public finance systems to fund both adaptation and mitigation efforts. These environmental challenges not only threaten economic stability but also deepen social inequalities, as the most vulnerable populations are disproportionately affected by climate-related disasters. Meeting the Sustainable Development Goals (SDGs) requires effective collaboration between different levels of government to ensure that responsibilities and resources are distributed fairly among national, regional, and local authorities. Policymakers must find a balance between top-down climate policies, which provide strategic direction and funding, and bottom-up initiatives, which allow for regionally tailored solutions that respect local autonomy.

Addressing the financial pressures linked to the climate crisis calls for innovative fiscal instruments, including green bonds, carbon pricing mechanisms, and climate-resilient public investment strategies.

With an increasing emphasis on sustainable finance, there is a growing need for transparency and accountability in how public funds are allocated to climate-related initiatives. In the long run, tackling climate and environmental crises will require a holistic approach to public finance management one that integrates fiscal policies with long-term environmental goals while ensuring economic resilience and social equity in an era of accelerating ecological challenges.

The energy crisis is another formidable challenge that impacts how public finance systems function. Escalating energy prices, resource shortages, and increased reliance on energy imports have become particularly evident in recent years, especially in the context of the conflict in Ukraine. This crisis requires governments to undertake substantial investments in renewable energy development, improvements in energy efficiency, and the pursuit of energy independence through the diversification of resource supplies. In many cases, energy subsidies for households and businesses have also become imperative to alleviate the impact of rising living and operational costs. Simultaneously, governments must carefully balance these expenditures with long-term fiscal objectives to prevent the destabilization of public finances.

Demographic crises, driven by aging populations or uneven population distributions, exert pressure on public budgets. Addressing these issues requires reforming the financing of pension systems, healthcare, and social policies. Amid these challenges, adjusting fiscal transfers is vital both to support regions losing young labor forces and to ensure balanced funding for public services (European Commission 2024).

Migration crises, arising from armed conflicts, climate change, or economic inequalities, further strain public management structures at various levels. These crises necessitate flexible and effective response mechanisms within federal systems (UNHCR 2023).

Geopolitical crises, such as the conflicts involving Russia and Ukraine or Israel and Hamas, necessitate a significant increase in defense spending (Tran and Vo 2024). Strategic investment in border regions, which act as the first line of defense during emergencies, is of paramount importance. Fiscal transfers to these areas are indespensible not only for enhancing their defensive capabilities but also for ensuring the infrastructure and preparedness needed to effectively address geopolitical challenges.

Our empirical research, which will be explored more extensively later in this paper, covers nearly three decades and captures the impacts of three major crises: the 1998 financial crisis, the 2008–2009 global financial crisis, and the economic crisis induced by the COVID-19 pandemic from 2020 to 2022.

Those crises challenged the traditional principles of fiscal federalism. In the literature, the concept of "crisis federalism" has gained increasing attention. It refers to the application of federalism principles in extraordinary crisis situations, where the standard mechanisms for distributing power and responsibilities across different levels of government must be adjusted to respond more effectively to emerging challenges.

This perspective includes studies on changes in fiscal relations across government levels during crises (Blöchliger et al. 2010), the temporary recentralization of fiscal competencies in crisis situations (Canavire-Bacarreza, Evia Salas, and Martínez-Vazquez 2021), the management of rising subnational fiscal risks (de Mello and Ter-Minassian 2024), the impact of the COVID-19 pandemic on fiscal governance (OECD 2021; World Bank 2021; Yilmaz and Boex 2021; Franek 2023), multilevel fiscal management of the green transition (Dougherty and Montes Nebreda 2023), geopolitical crises and their effects on changes in intergovernmental fiscal relations (International Monetary Fund 2022), and the resolution of intergovernmental fiscal disputes in times of crisis (Dougherty and Mota 2024). Table 2 summarizes the main challenges and dilemmas of fiscal federalism in the context of the polycrisis.

Table 2. Key challenges and dilemmas of fiscal federalism in the era of polycrisis

Dilemma/challenge	Description
Centralization vs. decentralization	Polycrisis necessitates rapid and coordinated responses, often leading to the centralization of power and resources. Simultaneously, decentralization is essential for effectively addressing local needs, particularly in crises such as natural disasters or migrations. Balancing these approaches is challenging, as too much centralization may curtail local autonomy, while excessive decentralization can cause a lack of policy coordination and coherence.
Resource distribution	Polycrisis aggravates regional disparities. As crises affect regions differently, fiscal federalism confronts the dilemma of allocating resources efficiently to both mitigate regional inequalities and ensure equitable access to resources.
Prioritization of public spending	Crises like the COVID-19 pandemic or armed conflicts necessitate substantial increases in spending on healthcare, armaments, and refugee support. Concurrently, significant investments are needed in sustainable development and infrastructure. Polycrisis complicates the budgetary prioritization, requiring a balance between immediate needs and long-term developmental objectives.
Fiscal transfers	Fiscal transfers are crucial for alleviating crisis effects. The challenge lies in designing transfers that are equitable, proportional to needs, and effective in the most impacted regions.
Intergovernmental coordination	The complexity of modern crises demands robust cooperation across government levels. Polycrisis highlights the need to enhance coordination mechanisms to prevent jurisdictional conflicts and ensure public action coherence. A primary dilemma is aligning the varying interests of local, regional, and central authorities.
Fiscal flexibility vs. fiscal stability	Crises prompt the need for dynamic adjustments in public budgets, calling for fiscal flexibility. Yet, enduring crises, such as the climate crisis, risk financial destabilization. The challenge is to balance swift crisis responses with maintaining long-term fiscal stability.
Economies of scale vs. local conditions	Global crises often necessitate large-scale measures, like mass vaccine purchases or constructing shared energy infrastructure. However, local needs differ greatly due to regional characteristics. The challenge is to blend the efficiency benefits of economies of scale with diverse local conditions and priorities.
Crisis management and public debt	Financing measures for crisis situations, like economic support during pandemics or increased defense spending during geopolitical crises, results in higher public debt. The dilemma is financing these measures without risking long-term financial instability.

Source: own elaboration.

In the context of the crisis challenges outlined in the table, fiscal federalism not only serves as a theoretical concept but also as a practical tool for designing and implementing public policies. Its effectiveness hinges on the ability to adapt to the unique conditions of each country and to respond dynamically to rapidly evolving challenges. Recent global crises have illuminated both the strengths and limitations of this concept, underscoring the importance of balancing decentralization and centralization for effective and sustainable public management.

Methodology and Results

The empirical research covered 24 EU member states and Norway. Cyprus, Luxembourg, and Malta were excluded as they are very small countries with populations below 1 million. Norway was included despite not being a member of the EU primarily due to its distinctive municipal features and the availability of comprehensive statistical data on the SNG sector[2]. Norway's governance system is characterized by a high degree of decentralization and strong local autonomy, making it a compelling case for analysis within the context of fiscal federalism. Including this country in the analysis enhances our understanding of the diversity of governance models in Europe and their impact on local economies and fiscal policies.

The research spanned from 1995 to 2023 and was divided into nine sub-periods, each corresponding to the pre-crisis, crisis, and post-crisis phases of three major economic disruptions: the 1998 financial crisis, the 2008–2009 global financial crisis, and the 2020–2022 pandemic economic crisis. The sub-periods identified for these analyses were:

1) 1995–1997 – the pre-1998 financial crisis period;
2) 1999–2000 – the 1998 financial crisis period;
3) 2001–2004 – a period of economic stabilization and the prelude to the next financial shock;
4) 2005–2007 – the pre-2008 financial crisis period;
5) 2009–2010 – the 2008 global financial crisis period;
6) 2011–2015 – a period of restoring trust in financial institutions and political adjustment post-crisis;
7) 2016–2019 – a period of relative economic stability and growth before the COVID-19 pandemic;
8) 2020–2022 – the global COVID-19 pandemic crisis period;
9) 2023 – the first post-pandemic crisis year.

We justify the exclusion of 1998 and 2008 from certain sub-periods due to the difficulty of classifying these years distinctly as pre-crisis or crisis periods within the context of the SNG sector. We recognized that in these instances, the economic conditions might not have reflected the onset or full impact of the crisis, thus complicating clear categorization.

The empirical research comprised two stages. In the first stage, we conducted correlation analysis using two-sided significance tests for Pearson correlation coefficients. We analyzed the interrelations

2 In the context of empirical analyses, we adopted the definition of the SNG subsector provided by the European System of National Accounts – ESA 2010 (European Commission 2013). This system facilitates the coordination of international macroeconomic accounts within EU member states and forms the basis for decision-making in the public finance sector. According to ESA 2010, in unitary states, the scope of SNG corresponds to that of local government, whereas in federal states, it encompasses two subsectors: state government and local government. This division enables detailed analysis and comparison of fiscal activities at various governmental levels.

between the size of the SNG sector, defined by the indicators presented in Table 3, and specific economic indicators (GDP per capita PPS (Purchasing Power Standards)), unemployment, and real GDP growth) in the countries studied. The analysis was performed both for the entire 1995–2023 period and the nine sub-periods described above. It should be acknowledged that correlation analysis has several limitations, including the possibility of omitted variable bias and the inability to identify causality. Consequently, these results should be treated as supporting evidence.

Table 3. Indicators describing the size of the SNG sector

Indicator Symbol	Description
Rev_GDP	SNG revenues as % of GDP
Rev_GG	SNG revenues as % of total revenues in the public finance sector (General Government, GG)
Exp_GDP	SNG expenditures as % of GDP
Exp_GG	SNG expenditures as % of total expenditures in the public finance sector (GG)
Comp_GDP	SNG employee compensations as % of GDP
Comp_GG	SNG employee compensations as % of total employee compensation expenditures in the public finance sector (GG)
Social_GDP	SNG social protection expenditures as % of GDP
Social_GG	SNG social protection expenditures as % of total social protection expenditures in the public finance sector (GG)
GFCF_GDP	SNG gross fixed capital formation as % of GDP
GFCF_GG	SNG gross fixed capital formation as % of total gross fixed capital formation expenditures in the public finance sector (GG)
Def_GDP	SNG deficit as % of GDP
DebtCH_GDP	Change in SNG debt as % of GDP
Debt_GDP	SNG debt as % of GDP
Debt_GG	SNG debt as % of total public sector debt in the public finance sector (GG)

Note: The consolidated data were used for measuring the total public finance sector size.

Source: own elaboration.

The fiscal indicators presented in Table 3 are employed to ensure a comprehensive and conceptually consistent measurement of the size and functional scope of the SNG sector in the analysed countries. The selection of these indicators is guided by three key considerations: (i) their theoretical relevance within the fiscal federalism literature, (ii) their empirical suitability for capturing both the scale and structural composition of SNG activity, and (iii) their cross-country comparability over a long time horizon.

Revenue and expenditure indicators expressed as a percentage of GDP (Rev_GDP, Exp_GDP) reflect the macroeconomic dimension of SNG activity, while the corresponding indicators measured as shares of the general government sector (Rev_GG, Exp_GG) enable an assessment of the vertical allocation of fiscal resources and competencies within the public finance system, and thus of the degree of fiscal decentralization. In addition, indicators related to employee compensation and social protection expenditures (Comp_GDP, Comp_GG, Social_GDP, Social_GG) capture the functional composition of SNG spending, which is particularly relevant during crises.

Indicators of gross fixed capital formation (GFCF_GDP, GFCF_GG) reflect the investment capacity of SNGs, whereas deficit and debt measures (Def_GDP, DebtCH_GDP, Debt_GDP, Debt_GG) allow for an assessment of fiscal behavior and financial sustainability over the crisis cycle. The use of consolidated general government data ensures measurement consistency and avoids double counting within the public finance sector.

Taken together, the adopted set of indicators provides a multidimensional characterization of the SNG sector, encompassing its scale, structure, functional and investment activity, and fiscal sustainability. This makes the indicator framework particularly well suited for examining the adaptive responses of SNGs under conditions of multiple, overlapping crises.

The results of the correlation analysis provided initial insights and served as input for further empirical investigations in the subsequent phase. For this purpose, we employed cluster analysis, a statistical technique that categorizes objects based on their similarities. This method arranges observations into homogeneous groups such that those within the same cluster exhibit greater similarity to each other than to those in different clusters (Kaufman and Rousseeuw 2005; Everitt et al. 2011; Scitovski et al. 2021).

In our study, we applied the k-means method to classify countries based on specific similarities in the models of fiscal federalism they implemented. For cluster identification, we used the three most significant variables identified by the correlation analysis: SNG revenues, SNG expenditures, and SNG gross fixed capital formation. To capture the relative importance of SNG within the general government sector, we employed the Rev_GG indicator. Additionally, to assess the significance of SNG for the economy, we utilized the Exp_GDP and GFCF_GDP indicators.

The procedure for calculating clusters was as follows. First, we normalized the data for each variable Rev_GG, Exp_GDP and GFCF_GDP according to the formula:

$$\frac{x_i - \overline{x}}{\sigma}, \tag{1}$$

where x_i is the original value for the i-th observation of a given variable, $\overline{x}$ is the mean of all observations for a given variable and σ is the standard deviation for these observations. The normalized variables were denoted as Rev, Exp and GFCF, respectively.

Then we denoted each data point as $\mathbf{z}_i = (\mathrm{Rev}_i, \mathrm{Exp}_i, \mathrm{GFCF}_i)$ for $i = 1, 2, \ldots, n$ (the set of data points consists of n observations for each variable: Rev, Exp, and GFCF), and the centroid for a cluster as $\mu_j = (\mu_{\mathrm{Rev}_j}, \mu_{\mathrm{Exp}_j}, \mu_{\mathrm{GFCF}_j})$ for cluster j.

The Euclidean distance between a data point $\mathbf{z}_i$ and a centroid μ_j is given by:

$$\|\mathbf{z}_i - \mu_j\| = \sqrt{\left(\mathrm{Rev}_i - \mu_{\mathrm{Rev}_j}\right)^2 + \left(\mathrm{Exp}_i - \mu_{\mathrm{Exp}_j}\right)^2 + \left(\mathrm{GFCF}_i - \mu_{\mathrm{GFCF}_j}\right)^2}. \tag{2}$$

The objective function to minimize in k-means clustering, which is the within-cluster sum of squares (WCSS) – based on the Euclidean distance of data points from centroids, becomes:

$$\mathrm{WCSS} = \sum_{j=1}^{k} \sum_{\mathbf{z}_i \in C_j} \|\mathbf{z}_i - \mu_j\|^2, \tag{3}$$

where:
k – the number of clusters;
C_j – the set of points in cluster j;
μ_j – the centroid of cluster j;
$\|\mathbf{z}_i - \mu_j\|$– the Euclidean distance between a point z_i and the centroid μ_j.

The k-means clustering procedure starts with random initialization of k centroids in the 3-dimensional space defined by Rev, Exp, and GFCF. Then, each data point $\mathbf{z}_i$ is assigned to the nearest centroid μ_j based on the Euclidean distance formula above. In the next step, the centroids are recalculated by taking the mean of all data points assigned to each cluster. For cluster j, the new centroid μ_j is calculated as, respectively:

$$\mu_{\mathrm{Rev}_j} = \frac{1}{|C_j|} \sum_{\mathbf{z}_i \in C_j} \mathrm{Rev}_i; \quad \mu_{\mathrm{Exp}_j} = \frac{1}{|C_j|} \sum_{\mathbf{z}_i \in C_j} \mathrm{Exp}_i; \quad \mu_{\mathrm{GFCF}_j} = \frac{1}{|C_j|} \sum_{\mathbf{z}_i \in C_j} \mathrm{GFCF}_i, \tag{4}$$

where $|C_j|$is the number of points in cluster j.

This procedure is iterated until the centroids no longer change significantly.

As the study period for this research spanned almost three decades a duration sufficient to witness systemic shifts in individual countries the clustering procedures were conducted separately for two sub-periods: (A) 1995–2007 and (B) 2009–2023. Despite these divisions, they revealed similar characteristics of distinctive models of fiscal federalism for both sub-periods, as presented in the Results & Discussion section.

The correlation analysis revealed noteworthy relationships between SNG size and the macroeconomic performance of EU countries. Statistically significant correlations were observed between indicators such as a country's wealth and the size of its SNG sector (measured relative to GDP) or its share in total public finance sector. The strongest associations with macroeconomic variables occurred with variables describing SNG revenue, expenditure, and gross fixed capital formation. These findings are presented in Table 3. Notably, excluding 1998 and 2008 does not significantly impact the primary correlation patterns. The correlation results for these two years are provided in the appendix.

Based on the relationships outlined in Table 4, the following observations can be made:

- A long-term positive relationship exists between the size of SNG and the degree of fiscal decentralization, and national wealth measured as GDP per capita in PPS. This is a relatively strong relationship (correlation coefficients approximately 0.3), given the large number of factors that influence GDP.
- A long-term beneficial relationship is evident between SNG size and fiscal decentralization, and the unemployment rate; specifically, a larger SNG sector is negatively correlated with high unemployment. The strength of this relationship is weaker than that between SNG size and GDP.

- Real economic growth rates are slightly negatively correlated with the size of the SNG sector. In the context of the positive relationships mentioned above, this suggests not so much a counter-growth character of large SNGs, but rather their counter-cyclical profile. Namely, an increase in SNG activity is used as a policy instrument to stimulate growth during economic downturns, while SNG resources are relatively reduced during periods of economic prosperity.

Table 4. Correlations for the entire study period

		Rev_GDP	Rev_GG	Exp_GDP	Exp_GG	Comp_ GDP	Comp_GG	Social_ GDP	Social_GG	GFCF_ GDP	GFCF_GG	Def_GDP	DebtCh_ GDP	Debt_ GDP	Debt_GG
GDP per capita PPS	Correlation coef.	.335**	.256**	.334**	.309**	.281**	.267**	.313**	.285**	.176**	.263**	− 0.053	.183**	.428**	.312**
	Significance	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.428	0.009	0.000	0.000
	No. of obs.	225	225	225	225	225	225	225	225	225	225	225	200	206	205
GDP real change	Correlation coef.	− 0.124	− 0.100	-.137*	− 0.054	− 0.098	− 0.074	− 0.101	− 0.053	− 0.130	− 0.068	.202**	-.184**	-.197**	− 0.042
	Significance	0.063	0.136	0.040	0.418	0.145	0.272	0.129	0.425	0.051	0.309	0.002	0.009	0.004	0.550
	No. of obs.	225	225	225	225	225	225	225	225	225	225	225	200	206	205
Unemp-loyment	Correlation coef.	-.210**	− 0.131	-.196**	-.194**	-.181**	-.201**	-.185**	-.172*	-.169*	− 0.103	-.154*	0.097	− 0.071	− 0.134
	Significance	0.002	0.053	0.004	0.004	0.007	0.003	0.006	0.010	0.012	0.128	0.022	0.172	0.313	0.056
	No. of obs.	220	220	220	220	220	220	220	220	220	220	220	198	205	204

Notes: All shaded cells with correlation coefficients depict the results with at least 0.10 significance level (two-sided).

Additionally: * depicts 0.05 significance level (two-sided). ** depicts 0.01 significance level (two-sided).

Definitions of variables are presented in Table 2.

Source: own elaboration.

The next stage of the analysis verified whether the analysis results were stable over time. Based on the results presented in Table 5, the following conclusions can be drawn:

- Among the analyzed macroeconomic variables, the positive relationship between GDP per capita PPS and the size of the SNG remains the most stable over time.
- During the financial crisis of 1998, a large SNG sector appears to have played a significant role in helping economies restore equilibrium. This observation suggests that robust local government structures may have been crucial in implementing effective fiscal measures and providing necessary public services that mitigated the crisis's impact. The ability of these governments to act decisively may have been a key factor in stabilizing their economies more quickly than those with less developed local governmental frameworks.
- Similarly, although with less pronounced effectiveness, the presence of a substantial SNG sector might have also mitigated the impacts of the 2008 financial crisis. While the correlation is not as strong as in 1998, the data still suggest that well-resourced local governments likely contributed to economic resilience. This pattern underscores the potential of local governments to absorb economic shocks, although the degree of impact can vary depending on the specific nature and severity of each crisis.
- During the COVID-19 pandemic, a notable weakening in the relationship between national wealth and SNG sector size was observed. This shift suggests that the unconventional challenges posed by the pandemic, such as the urgent need for healthcare services, economic support measures, and crisis management at the local level, might have fundamentally altered the traditional dynamics between economic prosperity and local governmental capacity. Wealthy nations, typically characterized by more extensive local government structures, may have found that these structures were less effective in responding swiftly to the unique demands of the pandemic. This observation indicates a need to reassess how resources are allocated and managed within local governments, potentially driving a shift toward more flexible, adaptive, and resilient local governance frameworks that are better equipped to respond to sudden and severe societal challenges.

Table 5. Summary of correlation results (correlation coefficients only) for sub-periods

	Rev _GDP	Rev _GG	Exp _GDP	Exp _GG	Comp _GDP	Comp _GG	Social _GDP	Social _GG	GFCF _GDP	GFCF _GG	Def _GDP	DebtCh _GDP	Debt _GDP	Debt _GG
1995–1997														
GDPpc_PPS	.703**	.626**	.699**	.634**	.634**	.597**	.475*	.438*	.593**	.537**	0.081	0.212	0.728	.888*
GDP_change	−0.033	−0.066	−0.036	−0.005	0.011	−0.146	−0.075	−0.039	0.195	0.051	0.020	−0.032	−0.374	−0.362
Unempl.	−0.212	−0.058	−0.206	−0.106	−0.196	−0.164	−0.252	−0.204	0.050	0.085	−0.075	.795**	0.260	0.634
1999–2000														
GDPpc_PPS	.645**	.559**	.639**	.632**	.557**	.598**	.438*	.419*	.582**	.563**	0.111	−0.335	.624**	0.363
GDP_real_ch	0.244	0.347	0.241	0.390	0.201	0.288	0.078	0.158	.641**	.587**	0.046	−0.226	0.086	0.173
Unempl.	-.406*	−0.327	−0.395	−0.380	−0.335	−0.361	−0.319	−0.307	−0.359	−0.351	−0.272	0.519	−0.296	−0.178
2001–2004														
GDPpc_PPS	.596**	.492*	.603**	.553**	.514**	.509**	.441*	.422*	.572**	.590**	−0.291	0.339	.599**	0.310
GDP_real_ch	-.534**	−0.374	-.544**	−0.375	−0.385	−0.357	-.425*	−0.319	-.431*	-.503*	0.334	−0.364	-.621**	−0.145
Unempl.	−0.385	−0.298	−0.388	−0.341	−0.332	−0.297	−0.323	−0.325	-.421*	−0.314	0.173	−0.213	−0.289	−0.184
2005–2007														
GDPpc_PPS	.451*	0.303	.447*	0.386	0.395	0.340	0.373	0.334	0.192	.509**	0.080	0.102	.535**	0.141
GDP_real_ch	-.442*	−0.307	-.443*	−0.298	−0.316	−0.220	-.414*	−0.351	−0.113	-.484*	0.094	−0.022	-.495*	0.218
Unempl.	−0.191	−0.096	−0.193	−0.198	−0.201	−0.083	−0.263	−0.288	−0.070	−0.062	0.089	−0.190	−0.038	−0.207

	Rev _GDP	Rev _GG	Exp _GDP	Exp _GG	Comp _GDP	Comp _GG	Social _GDP	Social _GG	GFCF _GDP	GFCF _GG	Def _GDP	DebtCh _GDP	Debt _GDP	Debt _GG
2009–2010														
GDPpc_PPS	.492*	0.320	.486*	.415*	.442*	0.393	.420*	0.384	− 0.083	0.346	− 0.085	0.376	.539**	0.282
GDP_real_ch	0.248	0.180	0.254	0.235	0.168	0.226	0.180	0.149	− 0.013	0.259	− 0.146	0.287	0.265	− 0.078
Unempl.	− 0.272	− 0.066	− 0.238	− 0.185	− 0.198	− 0.209	− 0.234	− 0.194	0.311	0.007	− 0.274	− 0.068	− 0.217	0.038
2011–2015														
GDPpc_PPS	.471*	0.332	.476*	.419*	.475*	.403*	.412*	0.379	− 0.137	0.250	− 0.264	0.323	.523**	.529**
GDP_real_ch	− 0.147	− 0.068	− 0.144	− 0.047	− 0.110	− 0.035	− 0.120	− 0.079	0.132	− 0.082	0.024	− 0.117	− 0.129	0.110
Unempl.	− 0.359	− 0.265	− 0.332	− 0.345	− 0.329	− 0.384	− 0.217	− 0.200	-.424*	− 0.280	− 0.212	0.180	− 0.155	− 0.390
2016–2019														
GDPpc_PPS	0.369	0.278	0.375	0.323	0.305	0.260	0.383	0.356	0.156	0.188	− 0.245	0.314	.429*	.421*
GDP_real_ch	-.486*	− 0.365	-.485*	− 0.386	-.426*	-.396*	− 0.337	− 0.261	− 0.294	− 0.356	0.129	− 0.260	-.554**	− 0.383
Unempl.	− 0.148	− 0.129	− 0.146	− 0.170	− 0.155	− 0.205	− 0.101	− 0.101	− 0.330	− 0.045	0.000	− 0.001	0.079	− 0.205
2020–2022														
GDPpc_PPS	0.209	0.140	0.214	0.229	0.147	0.140	0.294	0.298	− 0.095	0.045	− 0.139	0.282	0.295	.430*
GDP_real_ch	− 0.383	− 0.358	− 0.378	− 0.320	− 0.392	-.420*	− 0.123	− 0.051	-.471*	− 0.391	0.010	− 0.126	− 0.365	− 0.285
Unempl.	0.002	0.010	0.012	− 0.034	0.017	− 0.065	− 0.046	− 0.056	− 0.083	0.121	− 0.197	0.013	0.206	− 0.036

	Rev _GDP	Rev _GG	Exp _GDP	Exp _GG	Comp _GDP	Comp _GG	Social _GDP	Social _GG	GFCF _GDP	GFCF _GG	Def _GDP	DebtCh _GDP	Debt _GDP	Debt _GG
2023														
GDPpc_PPS	0.182	0.109	0.190	0.215	0.121	0.111	0.292	0.288	− 0.254	0.084	− 0.197	0.301	0.323	.406*
GDP_real_ch	0.158	0.170	0.139	0.145	0.159	0.124	0.141	0.144	0.296	0.253	0.220	− 0.190	0.056	− 0.077
Unempl.	0.067	0.075	0.082	0.056	0.078	− 0.004	0.020	0.019	0.045	0.189	− 0.258	0.088	0.232	0.038

Notes: All shaded cells depict the results with at least 0.10 significance level (two-sided).

Additionally: * depicts 0.05 significance level (two-sided). ** depicts 0.01 significance level (two-sided).

Number of observations (for correlations between each pair of variables) amounts to 25 for each period with the exception of 1995–1997 when it varies from 4 to 25. Limited number of observations (from 4 to 12) is for variables DebtCh_GDP, Debt_GDP and Debt_GG in this period. Definitions of variables are presented in Table 2.

Source: own elaboration.

These evolving patterns of the relationship between the economy and SNGs prompt a search for the most growth-promoting models of fiscal federalism. At the same time, the impact of SNG sector on the economy may not be uniform across different countries. Its strength may derive from the diverse national models of federalism. Therefore, we conducted a cluster analysis using the k-means method.

This analysis identified three distinctive models of the SNG sector's role in the economy. These models remained stable over time despite the clustering being performed separately for 1995–2007 (period A) and 2009–2023 (period B). The methodology for this division is described in the Data and Methodology section, while detailed information about the estimations (ANOVA results, elbow curves) is presented in the appendices. The clusters exhibit the following characteristics (see also Table 6):

- Cluster 1: SNGs with high revenues and expenditures but moderate investments: this represents the "redistributive model".
- Cluster 2: A relatively small SNG sector across all criteria: this represents the "minimalist model".
- Cluster 3: SNGs where revenues and expenditure are relatively moderate, yet investments made by the SNG are disproportionately high: this represents the "pro-investment decentralization model".

Table 6. Summary of cluster characteristics

	(A) 1995–2007			(B) 2009–2023		
	Cluster 1	Cluster 2	Cluster 3	Cluster 1	Cluster 2	Cluster 3
Rev_GG	1.435	− 0.933	− 0.025	1.489	− 0.967	− 0.193
Exp_GDP	1.499	− 0.914	− 0.066	1.508	− 0.957	− 0.209
GFCF_GDP	0.302	− 1.053	0.548	0.479	− 1.164	0.413
No. of observations	21	31	48	30	34	61
Missing observations	0	0	0	0	0	0

Source: own elaboration.

The three cluster profiles are similar for both sub-periods. However, this does not mean that a country will always be assigned to the same cluster. On the contrary, over the years and with the evolution of their fiscal federalism models, some countries have changed their cluster assignments. This can be observed in Figures 2 and 3. These charts also illustrate how individual countries have evolved within the respective clusters with regard to their GDP per capita PPS. In the appendix, the following supplementary figures are presented for periods A and B:

- GDP per capita PPS vs. SNG GFCF as a percentage of GDP,
- Real GDP change vs. SNG revenues as a percentage of GDP,
- Unemployment rate vs. SNG revenues as a percentage of GDP.

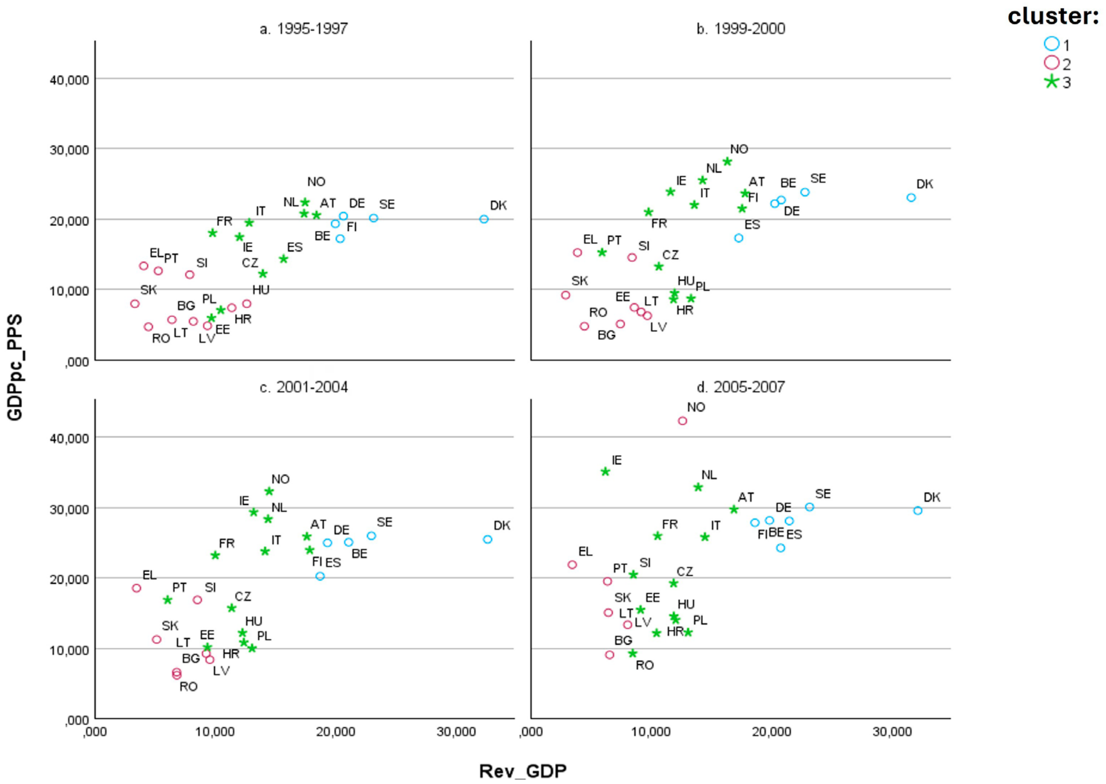

Figure 2. Evolution of GDP per capita PPS vs. SNG revenues as % of GDP, clustered, 1995–2007
Source: own elaboration.

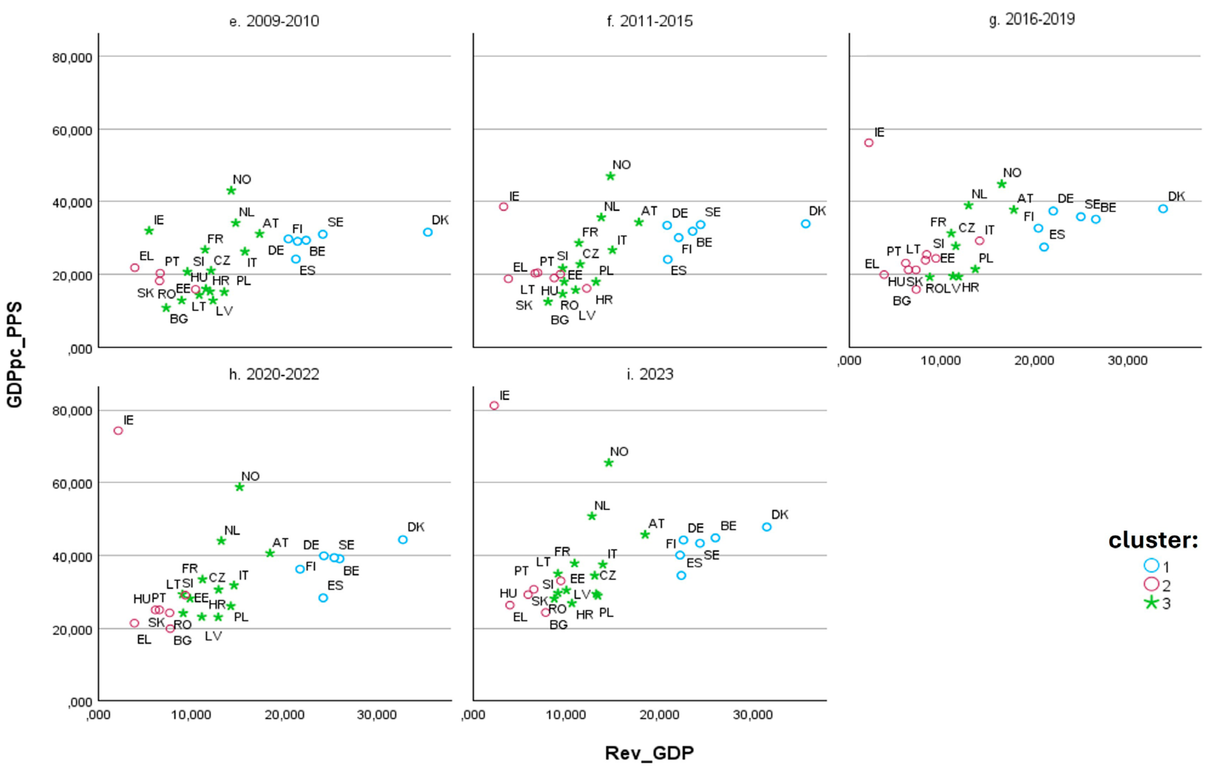

Figure 3. Evolution of GDP per capita PPS vs. SNG revenues as % of GDP, clustered, 2009–2023
Source: own elaboration.

Grouping countries enabled a comparison of their economic performance based on the SNG clusters they belong to. The results of this analysis are presented for countries that did not change their cluster assignment in the sub-periods. This allows for the calculation of comparable average values to assess how these economies performed in terms of GDP per capita PPS, real GDP change, and unemployment rate, in relation to the SNG model of their respective cluster. A summary of these calculations is provided in Table 7, and the findings are reviewed in the Discussion section.

Table 7. Economic performance comparison of various clusters

		GDP pc PPS; thsd.	Real GDP change; %	Unemploy-ment; %		GDP pc PPS; thsd.	Real GDP change; %	Unemploy-ment; %
	1995–2007:				2009–2023:			
Cluster 1	1995–1997	20.05	2.76	9.28	2009–2010	29.57	− 1.20	8,33
	1999–2000	22.86	3.49	7.10	2011–2015	32.66	1.18	8,04
	2001–2004	25.27	1.51	6.61	2016–2019	35.50	2.13	6,74
	2005–2007	28.86	2.70	7.52	2020–2022	39.24	1.22	6,65
					2023	43.80	0.51	6,35
CAGR for GDPpc PPS; median GDP change and Unemployment:		+12.91%	2.6%	7.7%		+10.32%	1.2%	7.3%
Cluster 2	1995–1997	6.83	4.15	12.20	2009–2010	21.09	− 2.80	11,63
	1999–2000	8.00	0.66	16.15	2011–2015	19.54	− 2.43	19,72
	2001–2004	10.27	5.24	14.84	2016–2019	21.53	2.10	14,73
	2005–2007	14.21	7.79	8.90	2020–2022	23.23	1.59	10,80
					2023	28.53	2.43	8,80
CAGR for GDPpc PPS; median GDP change and Unemployment:		+27.64%	4.8%	13.1%		+7.86%	1.4%	11.6%
Cluster 3	1995–1997	18.02	2.18	11.20	2009–2010	23.91	− 0.97	7,85
	1999–2000	22.00	3.77	8.80	2011–2015	25.73	1.69	8,11
	2001–2004	23.78	1.70	7.90	2016–2019	29.54	2.59	5,58
	2005–2007	25.96	3.15	6.80	2020–2022	32.02	1.82	4,93
					2023	36.16	0.31	4,35
CAGR for GDPpc PPS; median GDP change and Unemployment:		+12.95%	3.1%	7.4%		+10.89%	1.5%	5.7%

Note: Cluster compositions for 1995–2007: Cluster 1: BE, DK, DE, SE; Cluster 2: BG, EL, LT, SK; Cluster 3: CZ, IE, FR, IT, NL, AT, PL. Cluster compositions for 2009–2023: Cluster 1: BE, DK, DE, ES, FI, SE; Cluster 2: EL, PT; Cluster 3: CZ, FR, LV, NL, AT, PL, RO, NO.

Source: own elaboration.

Discussion

While the empirical analysis relies on relatively parsimonious methods namely correlation analysis and k-means clustering the results gain analytical depth when interpreted in light of institutional heterogeneity, crisis-specific contexts, and country-level fiscal practices. In this sense, the adopted methodological approach should be understood as exploratory rather than causal, aimed at identifying stable empirical regularities and meaningful patterns across different models of fiscal federalism. The cluster-based framework enables a comparative interpretation of how structurally distinct SNG models translate into divergent macroeconomic outcomes, particularly during periods of economic stress.

Importantly, the observed differences between clusters do not merely represent statistical artifacts but reflect underlying institutional configurations, policy priorities, and fiscal capacities of SNGs. For example, the superior performance of the pro-investment decentralization model (Cluster 3) during both crisis and post-crisis periods can be interpreted as evidence of the countercyclical role of subnational public investment, which tends to be more flexible and territorially targeted than central-level interventions. Conversely, the weaker performance of the minimalist model (Cluster 2) highlights the limited shock-absorbing capacity of under-resourced SNG sectors, particularly in the face of large-scale economic disruptions.

By embedding the quantitative findings within this broader institutional and crisis-oriented perspective, the Discussion mitigates the inherent limitations of simple correlation-based methods and enhances the robustness and interpretability of the results. This interpretative layer is particularly relevant in the context of multiple, overlapping crises, where the structural characteristics and policy orientation of fiscal decentralization models may matter as much as, or more than, their sheer size. Nevertheless, it is important to point out that the variables used in the clustering are significantly correlated, particularly in the case of revenues and expenditure, with a correlation coefficient of approximately 0.9. The correlation coefficients are lower with respect to investment and revenues or expenditures, ranging from 0.3 to 0.4. Although we normalized the data to mitigate this problem, such a data profile still suggests that these results should be used to identify general patterns rather than for strict modeling applications. Therefore, the investment component should be treated as the primary differentiating factor.

The analysis allowed us to identify a broad nexus between SNG models and economic stability and growth. Findings for the period 1995–2007 include the following:

- The comparison between Cluster 1 and Cluster 3 reveals that Cluster 3 (“pro-investment decentralization model”), with its stronger investment focus and lesser involvement in redistribution and routine tasks, performs slightly better across all economic parameters.
- Cluster 2 (“minimalist model”) experienced the fastest GDP per capita PPS growth. However, it also had significantly higher unemployment. This cluster, which solely comprises developing countries, was notably poorer than others and exhibited a faster real convergence due to macroeconomic factors. Yet, this cluster experienced the most severe negative impacts during the 1998 financial crisis.

Findings for the period 2009–2023 include the following:

- The comparison between Cluster 1 and Cluster 3 for this period shows that Cluster 3 ("pro-investment decentralization model"), which maintains a strong investment character and reduced role in redistribution, social policy implementation, and current tasks, consistently outperformed in all economic parameters.
- Cluster 2 ("minimalist model") recorded the poorest economic performance overall and was most adversely affected by the 2008–2009 global financial crisis, confirming our hypothesis that a larger SNG sector provides a stabilizing influence on the economy.

These findings align with the results of numerous scholarly works that explore the positive impact of public investments, including those by local government units, on economic growth and resilience to external economic shocks (Jarosiński 2023; Danaj and Reçi 2024; Matić 2024). Our results confirm the important value of the investment activities of local authorities. In a similar context, namely foreign direct investments, this positive relationship is also demonstrated by Rodríguez-Pose and Ganau's (2025) study of 159 regions across all EU countries.

The results presented in this study indicating that Cluster 1 and Cluster 3 have significantly higher economic growth are also consistent with Rodríguez-Pose and Muštra (2022), who show that regional GDP per capita growth in PPS is positively correlated (lagged relationship) with the degree of decentralization at the micro level. Rodríguez-Pose and Muštra further demonstrate that the quality of governance is also an important pro-growth factor.

To some extent, our findings diverge from those of Lago-Peñas, Martínez-Vazquez, and Sacchi (2020), who studied the exposure of EU countries to the exogenous macroeconomic shocks and the subsequent economic responses from 1995 to 2014. Their study demonstrated that more decentralized countries performed better in terms of fiscal balances and fiscal policies during and after crisis periods. While this is a strong argument for decentralized fiscal systems, it does not align with our findings, which show the superior macroeconomic performance of countries that are not only decentralized but also have a strong investment focus on SNG policies. This SNG profile typically translates into larger budget deficits, especially when investment is used as a countercyclical instrument.

To place these empirical findings within the broader evolution of the literature, the discussion draws on recent contributions that conceptualize fiscal federalism as an adaptive system operating under conditions of sequential and overlapping crises, as summarised in Table 1. The interpretation of the clustering results can thus be further strengthened by referring to recent studies that frame fiscal federalism not as a static institutional arrangement, but as a system whose performance depends on its capacity to adapt to compound and recurrent shocks. Rather than repeating the detailed literature discussion presented in the review section, this discussion selectively uses the studies synthesized in Table 1 as an interpretative framework for the empirical findings. These contributions consistently indicate that the effectiveness of fiscal federalism amid crisis conditions depends less on the aggregate degree of decentralization and more on institutional design, coordination mechanisms, and the functional orientation of SNG activity (Brosio 2024; Dougherty, Montes Nebreda, and Urrutia 2025; Herrero-Alcalde, Martín-Román, and Moral-Arce 2025; Martínez-Vazquez 2025; Shrestha and Hankla 2025; Shafi and Mallinson 2026).

From this perspective, the stronger performance observed in Clusters 1 and 3 can be interpreted as evidence that decentralization supports macroeconomic stability and economic growth primarily when embedded in mature institutional environments and backed by sufficient fiscal capacity at the subnational level. This interpretation is consistent with arguments emphasizing that decentralised systems are not inherently stabilizing, but become so only when they combine investment capacity, effective intergovernmental coordination, and credible fiscal frameworks (Brosio 2024; Martínez-Vazquez 2025). By contrast, the weak performance of the minimalist decentralization model (Cluster 2) highlights the limited shock-absorbing capacity of an under-resourced SNG sector, particularly in countries at lower levels of economic development, where decentralization may increase vulnerability to external shocks rather than mitigate it (Shrestha and Hankla 2025).

The results also allow for policy-relevant conclusions. First, fiscal decentralization remains a viable and appropriate institutional arrangement for developed and highly developed economies, including current EU member states, provided that it is accompanied by effective coordination and fiscal risk-sharing mechanisms. The experience of Clusters 1 and 3 suggests that decentralization can enhance economic resilience amid polycrisis, whereas poorly designed or fiscally constrained decentralization frameworks fail to deliver stabilizing effects.

Second, the findings underscore the importance of shifting investment-related decision-making and implementation to the subnational level. While many redistributive and stabilization policies can increasingly be administered centrally, supported by technological progress and integrated fiscal systems, the identification of investment needs, project selection, and oversight appear more effective at the local and regional level. SNGs are better positioned to tailor investment strategies to territorial characteristics and to respond countercyclically to asymmetric shocks, as evidenced by the strong performance of the pro-investment decentralization model (Cluster 3). From a policy perspective, this suggests that strengthening the investment capacity of SNGs, rather than expanding their redistributive functions, constitutes a key channel through which fiscal federalism can enhance system resilience in the current era of polycrisis, particularly within the EU's multilevel governance framework.

Finally, it should be acknowledged that this study has several limitations that should be taken into account when interpreting the results. From a methodological perspective, the analysis relies on correlation analysis and k-means clustering, which are exploratory tools and do not allow for causal inference. While suitable for identifying stable associations and structural patterns across countries, the results should therefore be interpreted with caution. In addition, data availability and cross-country comparability impose constraints on the analysis. Although the use of consolidated general government data ensures internal consistency, it may conceal important within-country institutional heterogeneity of SNGs. Finally, cross-country comparisons necessarily abstract from legal, political, and institutional differences shaping fiscal decentralization in practice. Despite these limitations, the adopted framework provides a coherent basis for comparative analysis and offers meaningful insights into the role of SNGs amid multiple, overlapping crises.

Conclusions

The analysis of the theoretical frameworks of fiscal federalism, combined with an empirical examination of EU countries, enabled the identification of three distinct models that reflect the diverse roles of subnational governments (SNGs) in the economy, especially within the context of crisis-driven challenges and the consequent shifts in SNG financing. Cluster 1, which features SNGs with significant revenues and expenditures but lower local government investments, is termed the "redistributive model." A key aspect of this model is the prioritization of stable local government current policies, even at the cost of reduced developmental investment. Cluster 2, characterized by relatively small SNGs in all aspects, is defined as the "minimalist model." Meanwhile, Cluster 3, with SNGs that have moderate revenues and expenditures but comparatively high local government investments, is termed the "pro-investment decentralization model."

Interestingly, although a general correlation was found whereby a larger SNG sector is positively associated with GDP per capita in PPS terms, the analysis at the level of individual models revealed variations in this relationship. Cluster 2, which features a small SNG sector, consistently exhibited considerably weaker results during the crisis periods and over the entire 2009–2023 period. In contrast, over the longer term, Cluster 3 ("pro-investment decentralization model"), characterized by its focus on investments and a moderate role in redistribution and operational tasks, emerged as the most developmentally favorable. Importantly, the cluster profiles remained consistent across both sub-periods, and most countries retained stable cluster assignments throughout these two more than decade-long sub-periods. The minor changes in cluster composition, due to a few countries migrating between clusters, indicate an evolution rather than a revolution in financial and adaptive strategies in response to shifting economic conditions and crises.

A blurring of previously distinct differences between clusters occurred in the final year of the analysis, 2023. This phenomenon can be interpreted in several ways. First, a one-year period is too brief to adequately assess enduring changes and their impact on the public sector of various countries. Second, the differences might be attributed to the varied impacts of the war in Ukraine on individual EU countries and their differing economic resilience to external shocks. Third, these observations could indicate a paradigm shift in public financial management, involving a reassessment of priorities and strategies in response to escalating geopolitical risks. These findings highlight the need for future comprehensive scientific research. Understanding and identifying these factors will be essential for forecasting future trends in SNG model changes and predicting responses to similar crises.

The cluster analysis results confirmed the diversity of public financial management models across various EU countries and the differential impacts of external economic shocks on the unique fiscal profiles of SNG sectors. The results also demonstrated that the "pro-investment decentralization model" exhibits the highest efficiency among the analyzed models. This may stem from a more precise analysis of needs at the local level, as opposed to the central level, which, in combination with improved oversight of investment projects, enhances the effectiveness of public policy and bolsters crisis adaptation capabilities.

In summary, the findings indicate that completely remodeling or radically changing the theoretical foundations of fiscal federalism is unnecessary. Instead, it is advisable to progressively adjust existing theoretical assumptions and principles to align with current realities, thereby more effectively addressing the dynamically changing needs of both central and local governments during an era of multiple crises. The concept of fiscal federalism should remain a fundamental reference in designing fiscal relationship systems across various countries, providing a robust framework for financial stability and responsible public management. Furthermore, it should enhance adaptability and flexibility in resource management, which is essential for rapid responses to local challenges. The incorporation of modern data management tools and economic analysis can further bolster the forecasting and operational capabilities at various levels of public administration, improving the prediction of fiscal decision impacts and the adaptation of policies to rapidly evolving economic and social conditions. Our research underscores the critical role of adaptability and flexibility in models of fiscal federalism, which are responsive to the dynamically changing economic and social conditions in EU countries. Transforming these models towards more investment-oriented and locally focused approaches may lead to better crisis management and long-term economic development.

Finally, the exploratory nature of the empirical approach adopted in this study points to several promising directions for further research. Future studies could extend the present analysis by applying more advanced empirical methods, such as panel data models, to control for unobserved heterogeneity and dynamic effects over time. Moreover, crisis-focused causal designs, including difference-in-differences or event-study approaches, could be employed to more precisely identify the impact of specific crisis episodes on SNG behavior and macroeconomic outcomes. Such extensions would help deepen the understanding of causal mechanisms underlying the relationships identified in this study and further strengthen research on fiscal federalism amid multiple, overlapping crises.

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