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RESEARCH

The EU fiscal framework and national fiscal rules: effects on budget balance dynamics

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Abstract

The EU fiscal framework represented by the Stability and Growth Pact (SGP) has been an effective tool for improving average government budget balances. This paper studies how EU and national-level fiscal rules have determined the dynamics of general government budget balances during the last 30 years. The results suggest that the SGP has had, on average, a statistically significant positive effect on the development of general government budget balances, which remains robust when controlling for national fiscal rules and across multiple estimation approaches, indicating effects beyond domestic frameworks. The effects for national fiscal rules appear very heterogeneous and dependent on the specifics of the rules as well as the public sector level they apply to. The effectiveness of different forms of rules for various levels of government can differ significantly due to country-level institutional differences, but the results of the study can help policymakers in designing and implementing more efficient and better targeted fiscal rules.

Keywords Stability and growth pact · European fiscal framework · National fiscal rules · International fiscal issues · Fiscal policy

JEL classification E62 · G28 · H6 · H62 · H87

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1 Introduction

The number of fiscal rules at the national level in EU member states has increased rapidly during the first two decades of the 21st century, partly due to EU-level initiatives of aligning country-level legislation with the EU fiscal framework through a balanced budget rule for the general government. The EU fiscal governance framework has recently been reformed to introduce greater flexibility in implementation, and it can now better accommodate country-specific circumstances and economic shocks through a more medium-term approach. However, the ways of achieving public finance targets as well as the detailed design of national fiscal rules is left to member states and is diverse with many rules that target different variables and refer to different subsections of government.

Against that background, the understanding of the potential effects of national fiscal rules and EU fiscal rules becomes highly relevant for conducting fiscal policy. Previous literature largely focuses on the levels of fiscal aggregates such as government debt and primary balances, while research on the dynamics of fiscal adjustment and the effects of fiscal rules across different government levels remains relatively rare. This paper aims at addressing a part of this gap by assessing how EU fiscal rules and national fiscal rules affect the development of general government budget balances in EU member states. It combines in-depth data on EU and national fiscal rules with macroeconomic and fiscal data from EU member states and uses panel estimations with country and time fixed effects, allowing for conclusions from a multi-country perspective. The robustness of findings is verified through other estimation approaches including Average Treatment Effects (ATE) and Generalised Method of Moments (GMM), and across various sample compositions.

The results imply that EU fiscal rules have significantly improved budget balances for all studied time horizons. The effects of national fiscal rules are more diverse. National budget balance rules and revenue rules have been generally insignificant for budget balances whereas national debt rules and expenditure rules have had some positive and some negative significant effects. Debt rules have been more effective in improving budget balances beyond EU fiscal rules and have had a significant effect in the medium- and long-run perspective, particularly when in effect for the central government or social security system. National expenditure rules, on the other hand, appear to work better in further improving budget balances in the social security system when the perspective is short-term, and at the local government in the long run. Some fiscal rules appear to also have significant negative effects for budget balances.

The remainder of the paper is organised as follows: Sect. 2 presents some previous literature on the research done on the effects of fiscal rules on general government budget balances, Sect. 3 introduces the approach of the study and Sect. 4 the data used. Section 5 presents the results of the study, Sect. 6 studies the robustness of the results and Sect. 7 concludes.

2 Previous literature

A growing literature studies the impact and effects of fiscal rules on fiscal performance and other economic variables. This section provides a short summary of previous research on aspects closely related to the questions of this paper. A more comprehensive summary of recent literature can be found, for example, in Brändle and Elsener (2023).

A majority of previous research points towards fiscal rules improving budgetary outcomes and reducing the pro-cyclicality of fiscal policy. Several studies have found that specific fiscal rules are related to improved fiscal performance (Debrun et al. 2008; Nerlich and Reuter 2013; Fall et al. 2015; Caselli and Reynaud 2020), lowered output volatility and, subsequently, lower fiscal volatility (Badinger and Reuter 2017; Reuter et al. 2022) and that stronger and more encompassing fiscal rules are associated with higher cyclically adjusted primary balances (Tapsoba 2012; Cordes et al. 2015). In addition, Caselli and Wingender (2021) found that the EU's deficit limit has increased the number of countries converging towards the threshold and has had a diminishing effect on large government deficits as well as surpluses. De Jong and Gilbert (2020) provide direct evidence on the enforcement mechanism underlying these effects by testing the effectiveness of the Excessive Deficit Procedure (EDP). They find that a deficit-based EDP[1] has a significant disciplining effect on fiscal policy, with countries under EDP improving their budget balances by approximately 1% point more than countries not subject to the procedure. Nerlich and Reuter (2013) find that fiscal rules can assist in reaching lower public expenditure and revenue with an overall improving effect on primary balance, but they can also limit specific sections of expenditure depending on the design of the rules. The effects on public expenditure are confirmed by Vinturis (2023), who concludes that fiscal rules significantly affect the composition of public spending, although the type of fiscal rules and the economic development level of the country can have implications for the magnitude of the effects.

Fiscal rules can also affect other fiscal aspects in addition to fiscal performance and primary balances. For example, Nerlich and Reuter (2015) conclude that fiscal rules correlate strongly with increased fiscal space and, therefore, also increase the prospects of fiscal policymaking. Effects have also been observed for market variables. Some examples are Thornton and Vasilakis (2018) who observe large and significant effects on government borrowing costs in international and domestic financial markets and Afonso and Guimarães (2015) and Afonso and Jalles (2019) who note a lowering effect on sovereign bond yields from (better) fiscal rules.

Historically, the potential pro-cyclicality of fiscal policy has been a major concern for macroeconomic stability. Therefore, it also makes sense that many fiscal rules aim to lower the level of pro-cyclicality and several papers study whether this goal has been reached. Some of the most notable studies include Combes et al. (2017), who find a specific debt-to-GDP threshold of 87% above which fiscal policy turns pro-cyclical and that only some fiscal rules can mitigate the pro-cyclicality of fiscal

[1] A deficit-based EDP is generally triggered when countries breach the 3% deficit threshold and the breach is not considered exceptional, temporary or close to the reference value,

policy in a high-debt environment; Holm-Hadulla et al. (2012) who note a reduction of pro-cyclicality bias from expenditure rules and Gootjes and de Haan (2022) who note that fiscal rules can improve budget balances but institutional factors can also have an effect on the cyclical responses of fiscal policy. They also find that the pro-cyclicality of fiscal policy tends to be higher during economic upswings. A similar effect is observed by Chrysanthakopoulos and Tagkalakis (2024), who also note that the adoption of fiscal policy rules tends to lead to smaller primary balances over the medium term, although there are many different facets, which affect the realised effects.

The positive and constraining effects on fiscal aggregates have also been questioned in some papers. Heinemann et al. (2018) provide a meta-analysis of 30 studies and note that the effects can be subject to strong endogeneity biases if they are not explicitly taken into account and Dorn et al. (2021) conclude that fiscal rules do not always lead to preferable outcomes.

It should also be noted that the design of fiscal rules seems to be an important factor in their effectiveness as well as accounting for institutional aspects and the economic environment. Many such aspects have been identified in previous literature and independent fiscal councils/institutions (Nerlich and Reuter 2013; Fall et al. 2015; Beetsma et al. 2019), investment-friendly fiscal rules (Guerguil et al. 2017) as well as a ”hard” legal basis (Vinturis 2023) may enhance the achievement of desired policy effects. Clements et al. (2025) note that proceeding with fiscal consolidation is often dependent on political aspects as well as the potential consolidation measures and governments in advanced countries tend to be more likely to proceed with fiscal consolidation when fiscal rules are in effect. Additionally, the option of state-contingent fiscal rules to address political economy restrictions has been suggested by Lehtimäki (2026).

In addition, a major aspect is whether fiscal rules are complied with. Empirical studies suggest a mixed performance of the supranational fiscal rules of the EU and historically about half of the member states have failed to comply with at least some of the fiscal rules in effect. Below average performance can be observed in the large euro area (EA) countries and southern EU member states. Eyraud et al. (2017) note that most of the EA countries have failed to comply with the rules to some extent. The reasons for failing to comply are diverse such as economic need (Hansen 2015) or reduced transparency and effectiveness from many coexisting rules (Christofzik et al. 2018). Larch et al. (2021) conclude that, at least for EU countries, compliance with fiscal rules supports counter-cyclical fiscal policy whereas high government debt-to-GDP ratios have a tendency to lead to pro-cyclical policies. Compliance with rules constraining stock (rather than flow) variables, stemming from coalitional agreements and rules, which cover more substantial parts of government finances seems to be higher (Reuter 2015). However, Gootjes and de Haan (2022) note that the improvement of frameworks after the financial crisis have significantly fostered more counter-cyclical policies and Capraru et al. (2025) argue that compliance with the SGP fiscal rules depends on the number of numerical targets and it diminishes after a certain threshold is passed. Fincke and Wolski (2016) examine discretionary fiscal policy in new EU member states after EU accession and find that fiscal rules can be effective even in countries with less developed institutions, though compliance

depends on the credibility of enforcement mechanisms and the political commitment to fiscal discipline.

The different effects of national and supranational rules have received less attention in the literature. Kraemer and Lehtimäki (2023) find a debt-constraining effect from national fiscal rules that goes beyond the effect of EU fiscal rules and Lehtimäki (2025) finds that supranational rules tend to outperform national rules, although rules at different levels still act as complements rather than substitutes. This paper aims to fill a gap in the literature by looking at the effects of national and supranational fiscal rules on budget balance dynamics in the EU context.

3 Methodology

The approach taken in this paper combines elements of previous literature on fiscal policy and fiscal rules and is mainly based on Kraemer and Lehtimäki (2023) and Lehtimäki (2025). The aim is to provide a broad picture of the effects on the dynamics of government budget balances by separating between the effects of supranational and national rules as well as between different public sector sublevels. Additionally, different time windows are studied to analyse the dynamics comprehensively: 1-year change for short-term changes, 5-year centered moving average of change for medium-term, and 10-year centered moving average of change for long-term dynamics. The medium-term and long-term forms are also expected to eliminate some of the potential short-term noise and business cycle effects. The empirical specification is a panel data estimation with country and time fixed effects, which has the following form:

$$\overline{\Delta\, BudBal^{C}_{(t\pm x)}} = \alpha^{C} + \alpha^{t} + \beta_1 SGP^{C}_{(t-1)} + \beta_2 BudBal^{C}_{(t-1)} + \beta_3 CONT^{C}_{(t-1)} + \beta_4 \overline{\Delta CONT^{C}_{(t\pm x)}} + \epsilon^{C}_{t} \quad (1)$$

where $\Delta BudBal$ is the change of general government budget balance in country C studied for period t as well as $t\pm x$ for centered moving averages of five-year and ten-year periods, α^{C} country fixed effects, α^{t} time fixed effects, SGP_{t-1} is a dummy for the Stability and Growth Pact, $BudBal_{t-1}$ is the budget balance for the previous year, $CONT_{t-1}$ a set of lagged control variables, and $\Delta CONT$ a set of changes in control variables with the same time periods as the dependent variable. The control variables used in the study consist of government debt, real GDP per capita, general government expenditure, unemployment, real interest rates, public investment, private investment and banking crises. Other control variables such as inflation, the age dependency ratio, trade openness and population were also tested but turned out to be insignificant for all time periods.

The control variables are selected based on standard determinants of budget balance dynamics identified in the fiscal policy literature. Government debt is expected to have a positive effect, reflecting debt-driven consolidation pressures through market discipline and EU surveillance requirements. Real GDP per capita growth is expected to improve budget balances through the automatic stabiliser properties of fiscal systems, as economic expansion increases tax revenues and reduces social expenditure. Changes in general government expenditure are expected to have a negative mechan-

ical relationship with the budget balance, as higher spending directly deteriorates the balance. Unemployment is expected to have a negative effect through reduced tax revenues and increased social transfers, and real interest rates are expected to negatively affect budget balances through higher debt servicing costs. Public investment is expected to deteriorate budget balances directly, while private investment is expected to have a positive effect through the associated increase in economic activity and tax revenues. Finally, banking crises are expected to negatively affect budget balances through their impact on economic activity and the potential fiscal costs of financial sector support.

Unlike much of the prior literature which examines the level of fiscal balances (for example Debrun et al. 2008; Caselli and Reynaud 2020), this paper focuses on the change in budget balances, capturing fiscal adjustment dynamics rather than average fiscal positions. This approach is consistent with the focus on fiscal adjustment in Chrysanthakopoulos and Tagkalakis (2024) and the cyclical dynamics literature (Larch et al. 2021; Holm-Hadulla et al. 2012). The budget balance itself is defined as total revenues minus total expenditures, expressed as a percentage of GDP, following World Bank and Eurostat conventions. Positive values represent fiscal surpluses (revenues exceed expenditures) and negative values represent deficits (expenditures exceed revenues).

The specification is appropriate given the strong mean reversion in fiscal positions during the sample period. Countries with large initial deficits tend to improve their balances, while those with large surpluses may see deterioration, which implies constraints on sustaining extreme fiscal positions. The specification of the paper identifies an intercept effect of fiscal rules. A positive coefficient on a fiscal rule dummy indicates that, for a given initial fiscal position, a rule is associated with a larger improvement (or smaller deterioration) in the budget balance compared to the counterfactual without the rule. This is distinct from a slope effect, which would capture whether fiscal rules also accelerate the speed of mean reversion itself, i.e. whether countries under fiscal rules adjust more rapidly from extreme fiscal positions than they would otherwise. The approach captures whether fiscal rules shift the average trajectory of budget balance adjustment, controlling for the initial fiscal position. The specification allows assessment of whether rules affect the level of fiscal adjustment while controlling for initial fiscal conditions through the lagged budget balance level.

In the second part of the study, the focus is on national fiscal rules, and the following formulation is used:

$$\overline{\Delta\, BudBal^{C}_{(t\pm x)}} = \alpha^{C} + \alpha^{t} + \beta_1 NationalRule^{C}_{t-1,s} + \beta_2 BudBal^{C}_{(t-1)} + \beta_3 CONT^{C}_{(t-1)} + \beta_4 \overline{\Delta CONT^{C}_{(t\pm x)}} + \epsilon^{C}_{t} \quad (2)$$

where everything remains the same as in Eq. 1 except for $NationalRule^{C}_{t-1,s}$ which is a dummy variable for the existence of a fiscal rule of a certain type in country C, government sublevel s at time $t-1$. The effects are studied separately for each type of fiscal rule (budget balance, debt, expenditure and revenue) for all sublevels where the rules exist within the studied sample.

Finally, the effects of national fiscal rules are controlled with the effects of the SGP and the equation becomes:

$$\overline{\Delta\, BudBal^{C}_{(t\pm x)}} = = \alpha^{C} + \alpha^{t} + \beta_1 SGP^{C}_{t-1} + \beta_2 NationalRule^{C}_{t-1,s} + \beta_3 BudBal_{(t-1)} + \beta_4 CONT^{C}_{(t-1)} + \beta_5\, \overline{\Delta CONT^{C}_{(t\pm x)}} + \epsilon^{C}_{t} \quad (3)$$

where everything remains the same as in Eq. 1 and Eq. 2. These effects are also studied separately for each type of fiscal rule (budget balance, debt, expenditure and revenue) as done in the case of Eq. 2.

Dynamic panel models with lagged dependent variables can suffer from Nickell bias (Nickell 1981), which arises from correlation between the within-transformed lagged dependent variable and the error term in finite samples. However, Monte Carlo evidence (Judson and Owen 1999; Alvarez and Arellano 2003) demonstrates this bias diminishes substantially when T exceeds 20–30 periods. The sample of this study consists of a 32-year time period, so the theoretical bias is expected to be small. Moreover, while the lagged dependent variable coefficient may be biased downward, coefficients on other regressors are generally unbiased unless highly correlated with the lagged dependent variable. The fiscal rule dummies have low correlation with lagged budget balances, which implies low bias transmission to the variables of interest. Nevertheless, the findings are verified in Sect. 6 using GMM that explicitly addresses endogeneity.

4 Data

The data used in the study is compiled from the public databases of the World Bank, the International Monetary Fund (IMF), the European Central Bank (ECB) as well as the European Commission (2025) Fiscal Governance in the EU member states database. The full sample runs from 1990 (the first observation of the Fiscal Governance database) to 2021. It includes all 28 countries[2] that have been member states of the EU at any point during the period from 1990 to 2021. Countries are considered to be part of the EU from the year of accession. All sources for the data as well as transformations used are presented in Appendix Table 9.

The SGP entered into effect in 1997 and the SGP dummy variable is coded based on legal obligation to the Stability and Growth Pact:

- 0 = Country-year is not legally bound by the SGP (either because the country has not yet joined the EU, or because the country is an EU member, but the SGP is not yet in effect).
- 1 = Country-year is legally bound by the SGP (from 1997 for the countries that were EU members when the SGP entered into force; from accession year for countries joining the EU after 1997).

National fiscal rules National fiscal frameworks are the collection of specific rules, procedures, arrangements and institutions for budgetary policy in effect in each individual EU member state. All the countries in the sample have adopted some numeri-

[2] Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom (until 2020).

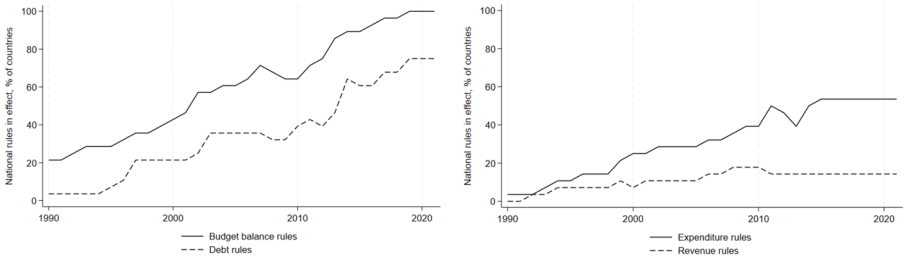

Fig. 1 Share of countries with at least one rule in effect by type (total 28 countries)

cal national fiscal rules, and some were in effect prior to specific countries joining the EU. These rules differ in design and the targeted government sublevels. Despite some similar features, a large majority of the country-specific rules differ from the rules of the EU fiscal framework. The data for national fiscal rules is compiled from the European Commission (2025) fiscal governance database. Some examples of each type of rule for each sector are listed in Appendix Table 9.

The coding of national fiscal rules follows a similar approach as the SGP:

- 0 = A country does not have a fiscal rule of a specific type for a specific sector.
- 1 = A country has set a fiscal rule of a specific type for a specific sector.

Figure 1 presents how many countries in the sample have at least one rule of a specific type in effect for any government sublevel.[3] Budget balance rules have become widespread among EU member states by the end of the sample, rising from around one fifth of countries in 1990 to all by 2021, with the most rapid expansion after the financial crisis. Debt rules have followed a similar trend but from a lower base, with notable acceleration after 2010. Expenditure rules are in effect for over half of the countries by 2021, with steady growth throughout the sample period and a slight decline around 2010 before stabilising. Revenue rules have remained considerably less common.

It is worth noting that the SGP does not set explicit fiscal rules in the operational sense but rather sets binding criteria, most notably the 3% deficit and 60% debt reference values, enforced through multilateral surveillance. The reference values are commonly considered as supranational fiscal rules in the literature, but it is specifically the external enforcement architecture, operating above the level of individual member states, that justifies characterising the SGP as a supranational fiscal rule framework. National fiscal rules, by contrast, are the operational instruments member states use to structure their domestic budgetary processes, whether or not they were introduced to comply with SGP criteria. Especially national expenditure rules,

[3] As an alternative approach, the European Commission (2025) Fiscal Rules Strength Index (FRSI) was also tested but was largely insignificant. The FRSI commonly remains unchanged for several time periods once rules are established with major changes occurring only during significant fiscal reforms, which limits within-country time-series variation.

Table 1 Descriptive statistics of data used in the study, sample from 1990 to 2021

	Unit	Mean	StdDev	Min	Max
Dependent variable					
Δ General government budget balance	pp	-0.04	2.55	-18.20	18.50
Independent variables					
General government budget balance	% of GDP	-2.88	3.50	-32.10	6.70
Real GDP per capita	log	9.95	0.75	8.17	11.63
Government expenditure	% of GDP	19.89	3.06	11.67	30.32
Unemployment	%	8.28	4.53	0.64	27.69
Real interest rate	%	3.55	5.54	-0.60	58.00
Public investment	% of GDP	3.55	1.19	0.33	9.26
Private investment	% of GDP	17.78	4.59	2.41	45.15

debt rules targeting specific government sublevels, and revenue rules are not required by the SGP and represent actual country-level institutional variation. The empirical design of this paper directly addresses the endogeneity concern as Eq. 3 includes both the SGP dummy and national rule dummies simultaneously, allowing each to be identified conditional on the other.

Table 1 lists the data used in the study[4] as well as descriptive statistics and Appendix Table 10 lists the sources used to compile each variable. Additionally, a banking crisis dummy following the coding of Laeven and Valencia (2020, 309) is included, where a crisis is noted if both significant signs of financial distress in the banking system (bank runs, losses in the banking system, and/or bank liquidations) as well as significant banking policy intervention measures in response to significant losses in the banking system are observed. Additionally, the effects of an active EDP were studied, but they were insignificant for all studied cases.

Figure 2 presents how the dynamics of general government budget balances have developed across EU member states from 1990 to 2021. The average level of budget balances remained persistently negative throughout the sample, which is due to the observed prevalence of fiscal deficits across EU member states. Two pronounced deteriorations are visible: the global financial crisis, and the pandemic. The change in budget balances fluctuates around zero for most of the sample, consistent with the expected mean reversions.

5 Results

This section presents the empirical results on how the EU fiscal framework and national fiscal rules have affected general government budget balances in EU member states. The analysis first provides the baseline results to establish the relationship between budget balances and key macroeconomic control variables, followed by an

[4] The centered VIF values for the variables are all below 5.

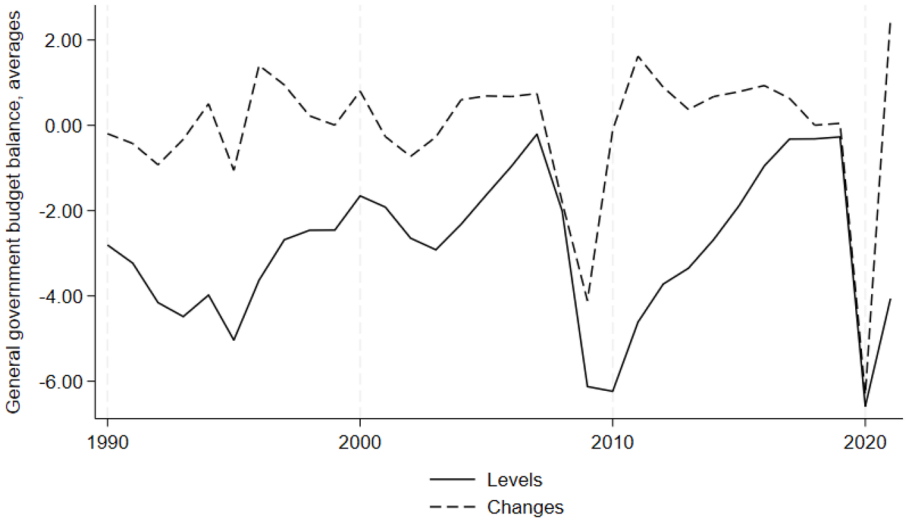

Fig. 2 The level and changes of general government budget balance, the main variable of interest

assessment of the SGP's impact. The subsequent parts examine each type of national fiscal rule and analyse their effects both independently and when controlling for the SGP. For each rule type, the analysis distinguishes between different government levels and three different time horizons. This structure allows for a comprehensive assessment of how fiscal rules operate across different institutional contexts and time perspectives.

Table 2 presents the baseline results. The dependent variable is a flow variable and the unit for the general government budget balance is % of GDP, so in this case the average SGP effect is 0.7 pp (or 0.2 pp in the 10-year time horizon).

The highly significant negative coefficient on the lagged budget balance indicates strong mean reversion in fiscal outcomes, suggesting that countries with fiscal positions below their mean budget balance tend to increase their balances in subsequent periods, while those with the positions above their mean budget balance tend to reduce their balances. This mean reversion effect diminishes substantially over longer horizons, becoming insignificant at the 10-year time window, which suggests that the average annual fiscal improvement becomes lower when the time horizon is expanded.

When it comes to the control variables, the positive coefficient on government debt across all time horizons reflects a debt-driven consolidation mechanism where higher debt levels prompt corrective fiscal action, either through market pressure, compliance with EU consolidation requirements, or political commitment to fiscal sustainability. The effects of real GDP growth on budget balances capture the automatic stabiliser properties of fiscal systems. Economic growth improves budget balances through both increased tax revenues and reduced social spending, with the effect size declining over longer horizons as cyclical components are smoothed out. The highly significant negative relationship between changes in government expenditure and budget balances is due to a direct mechanical relationship, but the higher

Table 2 Results. Baseline and SGP. Dependent variable: change of general government budget balance

	(1)	(2)	(3)	(4)	(5)	(6)
Period horizon	1y	5y	10y	1y	5y	10y
General government	-0.345***	-0.031***	0.011	-0.361***	-0.038***	-0.015**
budget balance(-1)	(0.067)	(0.012)	(0.007)	(0.067)	(0.013)	(0.007)
Stability and Growth				0.007***	0.004***	0.002***
Pact(-1)				(0.002)	(0.001)	(0.000)
Controls						
Government debt(-1)	0.010***	0.008***	0.004***	0.010***	0.008***	0.004***
	(0.003)	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)
ΔReal GDP p.c.	0.072**	0.060***	0.031**	0.074**	0.061***	0.032**
	(0.032)	(0.022)	(0.015)	(0.032)	(0.022)	(0.014)
ΔGeneral government	-0.237**	-0.622***	-0.511***	-0.229**	-0.634***	-0.545***
expenditure	(0.110)	(0.084)	(0.065)	(0.110)	(0.085)	(0.065)
ΔUnemployment	-0.081**	-0.049	-0.131***	-0.077**	-0.042	-0.121***
	(0.035)	(0.036)	(0.033)	(0.034)	(0.035)	(0.032)
ΔInterest rate	0.000	-0.088***	-0.113***	-0.002	-0.097***	-0.122***
	(0.017)	(0.023)	(0.018)	(0.017)	(0.024)	(0.017)
ΔPublic investment	-0.387***	-0.694***	-0.711***	-0.375***	-0.653***	-0.676***
	(0.109)	(0.146)	(0.118)	(0.106)	(0.145)	(0.116)
ΔPrivate investment	0.068*	0.255***	0.228***	0.072*	0.266***	0.239***
	(0.041)	(0.054)	(0.036)	(0.041)	(0.055)	(0.037)
Banking crisis(-1)	-0.006**	-0.001	-0.001***	-0.006**	-0.001	-0.001***
	(0.003)	(0.001)	(0.000)	(0.003)	(0.001)	(0.000)
Constant	-0.017***	-0.007***	-0.003***	-0.022***	-0.010***	-0.005***
	(0.002)	(0.001)	(0.001)	(0.003)	(0.002)	(0.001)
N	868	784	672	868	784	672
adj. R^2	0.52	0.58	0.50	0.52	0.58	0.51
F-statistic	15.1***	18.8***	14.1***	15.1***	19.1***	14.6***

Notes: Fixed Effect (country and year) estimates of the relationship of the change of General Government budget balance, the Stability and Growth Pact and control variables. 1y = 1-year change, 5y (10y) = 5-year (10-year) change, centered moving average. White diagonal standard errors and covariance (degrees of freedom corrected) in parentheses. *** significant at 1% level, ** significant at 5%, * significant at 10%

coefficients over long time horizons suggests that expenditure increases tend to be persistent rather than temporary. The different effects of public and private investment are notable, as public investment deteriorates budget balances, while increases of private investment lead to better fiscal outcomes.

The SGP has a consistent and statistically significant positive effect across all time horizons in regressions 4–6. This suggests that the EU fiscal framework has effects through multiple channels, i.e. immediate compliance pressures affecting annual budgeting decisions, medium-term structural reforms to fiscal institutions and processes, and long-term changes in fiscal operating environment and political economy. The effect of the SGP indicates that it is not simply capturing countries' underlying fiscal trajectories or economic conditions. Rather, the supranational framework appears to impose actual constraint on fiscal behaviour as well as fiscal improvements.

The diminishing coefficient over longer horizons could be due to the SGP's disciplining effect being stronger in the short run, for instance through immediate com-

pliance pressures around annual budget cycles and diminishes over longer periods as governments find ways to accommodate the framework without structural fiscal improvement. The centered moving averages used for the medium- and long-term horizons smooth some short-term fluctuations, but a more detailed analysis of the reasons would require additional assumptions about the average cyclicality of fiscal policy.

Table 3 presents the results for national budget balance rules, which appear insignificant across time horizons and sectors, and this remains unchanged when the effects of the SGP are included. Almost none of the budget balance rules show statistically significant effects, and this observation persists when controlling for the SGP. This could be due to the SGP's general government balance requirements already being more binding than most national rules, rendering the latter largely redundant for countries already under supranational surveillance. Many national budget balance rules, especially the ones at subnational levels, are embedded within intergovernmental transfer frameworks that soften the effective constraint, as higher tiers of government can accommodate temporary imbalances through transfers.

The consistency of insignificant results across all time horizons also rules out the possibility that budget balance rules simply require more time to take effect. This distinguishes them from debt rules examined in Table 4, where significant effects can be observed particularly at the medium- and long-term horizons, suggesting that stock-based rules targeting debt levels may provide clearer and more binding constraints than flow-based budget balance rules, possibly due to more straightforward measurement and stronger enforcement mechanisms.

Table 4 presents the results for national debt rules, which are heterogeneous depending on the government level at which they are implemented and the time horizon examined. The effects are almost unchanged when the effects of the SGP are included.

The positive and statistically significant coefficients for central government rules and social security rules indicate that they have successfully improved fiscal consolidation beyond the effects of the SGP. This effectiveness is likely due to the clear assignment of debt management responsibilities at these levels as central governments are the primary issuers of sovereign debt and face direct market discipline, while social security systems in many EU countries manage substantial reserve funds and face demographic pressures that make debt sustainability particularly important. The absence of short-term effects suggests that these rules work through gradual adjustment mechanisms rather than immediate fiscal shocks.

The negative coefficients for general government debt rules are potentially due to endogenous adoption, i.e. countries may introduce such rules precisely during periods of fiscal stress, with rule adoption signalling underlying challenges rather than causing deterioration, or conflicting targets across government subsectors that incentivise debt shifting without improving the general government balance.

The differential effectiveness of debt rules across government levels implies important design principles for fiscal frameworks. Central government debt rules are effective because they target the level with clearest fiscal sovereignty and where financial markets provide additional disciplining pressure through sovereign spreads. Social security debt rules work well because they apply to systems with dedicated

Table 3 Results. National budget balance rules and SGP. Dependent variable: change of general government budget balance

	(1)	(2)	(3)	(4)	(5)	(6)
Period horizon	1y	5y	10y	1y	5y	10y
General government	-0.351***	-0.029**	-0.009	-0.368***	-0.037***	-0.014*
budget balance(-1)	(0.066)	(0.012)	(0.007)	(0.066)	(0.013)	(0.007)
Stability and Growth				0.007***	0.004***	0.002***
Pact(-1)				(0.002)	(0.001)	(0.000)
Budget balance rules						
General government(-1)	0.001	-0.000	-0.000	0.001	-0.000	-0.001*
	(0.002)	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)
Central government(-1)	-0.002	-0.000	0.000	-0.003	-0.000	-0.000
	(0.003)	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)
Local government(-1)	0.001	0.002	0.001	0.000	0.001	0.000
	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)
Regional government(-1)	0.004	-0.001	-0.000	0.004	-0.001	-0.000
	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)
Social security(-1)	0.002	0.001	0.000	0.004	0.002	0.001
	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)
Controls						
Government debt(-1)	0.010***	0.008***	0.004***	0.011***	0.009***	0.004***
	(0.003)	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)
ΔReal GDP p.c.	0.071**	0.059***	0.033**	0.073**	0.061***	0.035**
	(0.032)	(0.022)	(0.015)	(0.032)	(0.022)	(0.015)
ΔGeneral government	-0.239**	-0.624***	-0.501***	-0.230**	-0.635***	-0.535***
expenditure	(0.111)	(0.087)	(0.068)	(0.110)	(0.087)	(0.067)
ΔUnemployment	-0.082**	-0.044	-0.121***	-0.079**	-0.038	-0.113***
	(0.035)	(0.037)	(0.033)	(0.034)	(0.036)	(0.033)
ΔInterest rate	-0.000	-0.088***	-0.111***	-0.002	-0.097***	-0.119***
	(0.017)	(0.023)	(0.017)	(0.017)	(0.024)	(0.017)
ΔPublic investment	-0.387***	-0.664***	-0.677***	-0.377***	-0.632***	-0.662***
	(0.110)	(0.146)	(0.124)	(0.107)	(0.146)	(0.121)
ΔPrivate investment	0.067	0.251***	0.225***	0.070*	0.261***	0.236***
	(0.041)	(0.054)	(0.037)	(0.041)	(0.054)	(0.037)
Banking crisis(-1)	-0.007**	-0.001	-0.001***	-0.006**	-0.001	-0.001***
	(0.003)	(0.001)	(0.000)	(0.003)	(0.001)	(0.000)
Constant	-0.018***	-0.008***	-0.003***	-0.023***	-0.010***	-0.005***
	(0.003)	(0.002)	(0.001)	(0.004)	(0.002)	(0.001)
N	868	784	672	868	784	672
adj. R^2	0.52	0.58	0.50	0.52	0.58	0.51
F-statistic	14.1***	17.5***	13.2***	14.1***	17.8***	13.7***

Notes: Fixed Effect (country and year) estimates of the relationship of the change of General Government budget balance, national budget balance rules, the Stability and Growth Pact and control variables. 1y = 1-year change, 5y (10y) = 5-year (10-year) change, centered moving average. White diagonal standard errors and covariance (degrees of freedom corrected) in parentheses. *** significant at 1% level, ** significant at 5%, * significant at 10%

Table 4 Results. National debt rules and SGP. Dependent variable: change of general government budget balance

	(1)	(2)	(3)	(4)	(5)	(6)
Period horizon	1y	5y	10y	1y	5y	10y
General government	-0.351***	-0.031***	-0.011*	-0.367***	-0.038***	-0.016**
budget balance(-1)	(0.067)	(0.012)	(0.007)	(0.068)	(0.013)	(0.007)
Stability and Growth				0.007***	0.003***	0.002***
Pact(-1)				(0.002)	(0.001)	(0.000)
Debt rules						
General government(-1)	-0.000	-0.002***	-0.002***	-0.000	-0.002***	-0.002***
	(0.002)	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)
Central government(-1)	0.002	0.003**	0.002**	0.002	0.003**	0.002**
	(0.003)	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)
Local government(-1)	-0.001	0.001	0.000	-0.002	0.001	0.000
	(0.002)	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)
Regional government(-1)	0.002	-0.002	-0.001	0.003	-0.001	-0.000
	(0.005)	(0.002)	(0.001)	(0.005)	(0.002)	(0.001)
Social security(-1)	0.015	0.009**	0.008***	0.014	0.008**	0.007***
	(0.012)	(0.004)	(0.001)	(0.012)	(0.004)	(0.001)
Controls						
Government debt(-1)	0.010***	0.008***	0.004***	0.010***	0.008***	0.004***
	(0.004)	(0.002)	(0.001)	(0.004)	(0.002)	(0.001)
ΔReal GDP p.c.	0.074**	0.069***	0.045***	0.076**	0.071***	0.046***
	(0.032)	(0.023)	(0.015)	(0.032)	(0.023)	(0.015)
ΔGeneral government	-0.231**	-0.613***	-0.507***	-0.223**	-0.624***	-0.540***
expenditure	(0.110)	(0.084)	(0.066)	(0.110)	(0.085)	(0.065)
ΔUnemployment	-0.080**	-0.043	-0.121***	-0.077**	-0.037	-0.114***
	(0.036)	(0.035)	(0.033)	(0.034)	(0.035)	(0.032)
ΔInterest rate	-0.001	-0.085***	-0.107***	-0.003	-0.094***	-0.115***
	(0.017)	(0.022)	(0.017)	(0.016)	(0.023)	(0.017)
ΔPublic investment	-0.390***	-0.676***	-0.680***	-0.378***	-0.641***	-0.652***
	(0.111)	(0.148)	(0.120)	(0.107)	(0.147)	(0.117)
ΔPrivate investment	0.070*	0.257***	0.222***	0.073*	0.266***	0.233***
	(0.042)	(0.054)	(0.037)	(0.042)	(0.054)	(0.037)
Banking crisis(-1)	-0.007**	-0.001	-0.001***	-0.007**	-0.001	-0.001***
	(0.003)	(0.001)	(0.000)	(0.003)	(0.001)	(0.000)
Constant	-0.017***	-0.007***	-0.003***	-0.022***	-0.010***	-0.005***
	(0.002)	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)
N	868	784	672	868	784	672
adj. R^2	0.52	0.58	0.52	0.52	0.59	0.53
F-statistic	14.1***	18.1***	14.2***	14.1***	18.3***	14.7***

Notes: Fixed Effect (country and year) estimates of the relationship of the change of General Government budget balance, national debt rules, the Stability and Growth Pact and control variables. 1y = 1-year change, 5y (10y) = 5-year (10-year) change, centered moving average. White diagonal standard errors and covariance (degrees of freedom corrected) in parentheses. *** significant at 1% level, ** significant at 5%, * significant at 10%

revenue streams, clear liability projections, and often constitutional protection that enhances credibility. Local and regional government debt rules show no significant effects, consistent with these levels typically operating under borrowing constraints imposed by higher tiers of government that already limit debt accumulation.

Table 5 presents the results for national expenditure rules, which have the most varied pattern of effects among the fiscal rule types studied, with both positive and negative significant coefficients depending on government level and time horizon. The effects are almost unchanged when the SGP is accounted for, although the significance of central government rules is slightly lower.

Regional expenditure rules show consistently negative effects on general government budget balances, likely due to fiscal displacement in federal systems. When regional governments face binding expenditure ceilings, central governments may respond by increasing intergovernmental transfers or expanding their own programs, eliminating any consolidation gains at the regional level and preventing net improvement at the general government level. This effect is concentrated in countries with substantial fiscal federalism, consistent with the soft budget constraint literature on subnational governments (Rodden 2006), and its consistency across different specifications indicates a robust structural issue. Rules restricting regional expenditure are, therefore, unlikely to improve general government budget balances unless matched by corresponding expenditure discipline at the central government level.

The positive short-term effect for social security expenditure rules likely is due to structural reforms to healthcare and pension systems implemented during the sample period, though the absence of longer-term significance suggests these generate one-time rather than sustained consolidation gains. The positive long-term effects of expenditure rules at central and local government levels indicate that sustained expenditure discipline can gradually improve budget balances, though the delayed materialisation of effects reflects the political economy of expenditure control where actual restraint typically emerges only after several years.

The results for national revenue rules in Table 6 imply limited and mostly insignificant effects on budget balance dynamics, which aligns with both their typical design features and their more peripheral role in EU fiscal frameworks. Revenue rules, by their nature, often target specific aspects of taxation or how windfall gains can be used, so they are somewhat smaller in scale and generally do not impose strong binding constraints on overall fiscal outcomes.

Unlike expenditure or debt rules that directly limit fiscal aggregates, revenue rules operate more as procedural safeguards or automatic stabilisers, making their impact on budget balances more context dependent. The slight positive coefficient for central government revenue rules at the 10-year horizon suggests some modest long-term benefit, potentially through enhanced revenue collection efficiency or reduced pro-cyclical tax policy, but the economic effect is negligible.

The robustness of the insignificance of results across specifications and time horizons, including when controlling for the SGP, indicates that revenue rules neither meaningfully complement nor interfere with other fiscal instruments in determining budget balances. This pattern suggests revenue rules serve distinct functions in fiscal frameworks in protecting against pro-cyclical tax cuts, ensuring adequate financing for social insurance, or maintaining political commitment to revenue targets. These

Table 5 Results. National expenditure rules and SGP. Dependent variable: change of general government budget balance

	(1)	(2)	(3)	(4)	(5)	(6)
Period horizon	1y	5y	10y	1y	5y	10y
General government	-0.357***	-0.030**	-0.009	-0.379***	-0.038***	-0.014*
budget balance(-1)	(0.065)	(0.012)	(0.007)	(0.066)	(0.013)	(0.008)
Stability and Growth				0.008***	0.003***	0.002***
Pact(-1)				(0.002)	(0.001)	(0.000)
Expenditure rules						
General government(-1)	-0.001	0.000	0.000	-0.002	0.000	0.000
	(0.002)	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)
Central government(-1)	0.000	0.003**	0.002***	-0.002	0.003*	0.0012*
	(0.004)	(0.001)	(0.001)	(0.004)	(0.001)	(0.0006)
Local government(-1)	0.003	0.003**	0.003***	0.002	0.003*	0.003***
	(0.004)	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)
Regional government(-1)	-0.006	-0.006***	-0.005***	-0.004	-0.006***	-0.004***
	(0.005)	(0.002)	(0.001)	(0.005)	(0.002)	(0.001)
Social security(-1)	0.013**	0.001	0.001	0.016***	0.002	0.001
	(0.006)	(0.003)	(0.001)	(0.006)	(0.003)	(0.001)
Controls						
Government debt(-1)	0.012***	0.008***	0.004***	0.012***	0.008***	0.004***
	(0.004)	(0.002)	(0.001)	(0.004)	(0.002)	(0.001)
ΔReal GDP p.c.	0.074**	0.066***	0.032**	0.075**	0.066***	0.033**
	(0.031)	(0.023)	(0.015)	(0.031)	(0.022)	(0.015)
ΔGeneral government	-0.229**	-0.662***	-0.571***	-0.215**	-0.665**	-0.593***
expenditure	(0.110)	(0.088)	(0.068)	(0.109)	(0.088)	(0.068)
ΔUnemployment	-0.082**	-0.035	-0.110***	-0.079**	-0.031	-0.104***
	(0.035)	(0.038)	(0.033)	(0.034)	(0.037)	(0.032)
ΔInterest Rate	0.000	-0.089***	-0.117***	-0.002	-0.097***	-0.125***
	(0.017)	(0.022)	(0.018)	(0.016)	(0.023)	(0.017)
ΔPublic investment	-0.374***	-0.630***	-0.624***	-0.361***	-0.595***	-0.595***
	(0.108)	(0.142)	(0.119)	(0.103)	(0.142)	(0.117)
ΔPrivate investment	0.064	0.250***	0.226***	0.067	0.256***	0.232***
	(0.041)	(0.051)	(0.038)	(0.041)	(0.052)	(0.038)
Banking crisis(-1)	-0.006**	-0.001	-0.001***	-0.006**	-0.001	-0.001**
	(0.003)	(0.001)	(0.000)	(0.003)	(0.001)	(0.000)
Constant	-0.018***	-0.008***	-0.004***	-0.025***	-0.010***	-0.005***
	(0.003)	(0.001)	(0.001)	(0.003)	(0.002)	(0.001)
N	868	784	672	868	784	672
adj. R^2	0.52	0.58	0.52	0.53	0.59	0.53
F-statistic	14.3***	18.1***	14.0***	14.4***	18.3***	14.4***

Notes: Fixed Effect (country and year) estimates of the relationship of the change of General Government budget balance, national expenditure rules, the Stability and Growth Pact and control variables. 1y = 1-year change, 5y (10y) = 5-year (10-year) change, centered moving average. White diagonal standard errors and covariance (degrees of freedom corrected) in parentheses. *** significant at 1% level, ** significant at 5%, * significant at 10%

Table 6 Results. National revenue rules and SGP. Dependent variable: change of general government budget balance

	(1)	(2)	(3)	(4)	(5)	(6)
Period horizon	1y	5y	10y	1y	5y	10y
General government	-0.349***	-0.032***	-0.011	-0.365***	-0.039***	-0.015**
budget balance(-1)	(0.067)	(0.012)	(0.007)	(0.068)	(0.013)	(0.007)
Stability and Growth				0.007***	0.003***	0.002***
Pact(-1)				(0.002)	(0.001)	(0.000)
Revenue Rules						
General government(-1)	0.005	0.001	-0.001	0.005	0.001	0.000
	(0.004)	(0.002)	(0.002)	(0.004)	(0.002)	(0.001)
Central government(-1)	-0.000	0.001	0.001**	-0.001	0.000	0.001*
	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)	(0.000)
Social security(-1)	0.008	0.002	0.001	0.008*	0.003	0.001
	(0.005)	(0.003)	(0.001)	(0.005)	(0.003)	(0.001)
Controls						
Government debt(-1)	0.011***	0.008***	0.003***	0.011***	0.008***	0.004***
	(0.004)	(0.002)	(0.001)	(0.004)	(0.002)	(0.001)
ΔReal GDP p.c.	0.074**	0.061***	0.031**	0.075**	0.062***	0.032**
	(0.032)	(0.023)	(0.015)	(0.032)	(0.022)	(0.015)
ΔGeneral government	-0.236**	-0.630***	-0.526***	-0.228**	-0.641***	-0.557***
expenditure	(0.110)	(0.086)	(0.066)	(0.109)	(0.086)	(0.065)
ΔUnemployment	-0.082**	-0.050	-0.133***	-0.078**	-0.042	-0.122***
	(0.036)	(0.036)	(0.032)	(0.035)	(0.036)	(0.032)
ΔInterest Rate	-0.001	-0.091***	-0.117***	-0.003	-0.100***	-0.125***
	(0.017)	(0.023)	(0.017)	(0.017)	(0.024)	(0.016)
ΔPublic investment	-0.385***	-0.688***	-0.696***	-0.373***	-0.650***	-0.667***
	(0.109)	(0.146)	(0.118)	(0.106)	(0.146)	(0.116)
ΔPrivate investment	0.066	0.252***	0.227***	0.070*	0.262***	0.237***
	(0.041)	(0.054)	(0.036)	(0.041)	(0.054)	(0.037)
Banking crisis(-1)	-0.006**	-0.001	-0.001***	-0.006**	-0.001	-0.001***
	(0.003)	(0.001)	(0.000)	(0.003)	(0.001)	(0.000)
Constant	-0.018***	-0.007***	-0.003***	-0.023***	-0.010***	-0.005***
	(0.003)	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)
N	868	784	672	868	784	672
adj. R^2	0.52	0.58	0.50	0.52	0.58	0.51
F-statistic	14.5***	18.1***	13.7***	14.5***	18.3***	14.1***

Notes: Fixed Effect (country and year) estimates of the relationship of the change of General Government budget balance, national revenue rules, the Stability and Growth Pact and control variables. 1y = 1-year change, 5y (10y) = 5-year (10-year) change, centered moving average. White diagonal standard errors and covariance (degrees of freedom corrected) in parentheses. *** significant at 1% level, ** significant at 5%, * significant at 10%

aspects operate independently of the primary consolidation and stabilisation objectives reflected in budget balance changes.

For policymakers, these findings imply that revenue rules serve distinct functions, such as protecting against pro-cyclical tax cuts or ensuring adequate financing for social insurance, that are better evaluated against those specific objectives rather than expected contributions to fiscal consolidation.

6 Robustness checks

To address potential selection bias in fiscal rule adoption and to verify the robustness of the FE results, the paper employs two complementary estimation strategies: ATE and GMM. The primary concern is that rule adoption is non-random, i.e. countries may adopt rules precisely when facing fiscal challenges, creating selection bias that could lead to misinterpreting effectiveness. Additionally, the FE specifications include a lagged dependent variable, which can introduce Nickell bias in finite samples.

The ATE approach treats rule adoption as a treatment and explicitly models the selection process through inverse probability weighting, providing unbiased estimates when adoption depends on observable characteristics. The GMM approach addresses endogeneity through instrumental variables, using second and third lags of fiscal aggregates as instruments while treating rule dummies as predetermined, reflecting that adoption is a political decision determined by medium-term factors, not short-term balance fluctuations. Both methodologies provide distinct perspectives on whether the FE findings imply actual causal effects.

Table 7 presents the robustness checks using ATE and GMM for the SGP and all national fiscal rule types. They have aspects of convergence and divergence with the main results, which are most likely due to the nature of fiscal rule effects and the role of selection bias.

The SGP is consistently statistically significant across all three methodologies. This convergence provides strong evidence that the EU fiscal framework has actual causal effects on budget balance dynamics, not just due to selection bias, reverse causality, or dynamic panel bias. For national fiscal rules, results are more heterogeneous. Central government debt rules show consistently positive effects across all methodologies, providing robust evidence of effectiveness. Regional government expenditure rules demonstrate consistently negative effects across all three approaches, confirming that fiscal displacement through intergovernmental transfers is an actual structural issue, rather than only a statistical observation. Budget balance rules show the largest divergence: largely insignificant in FE, but strongly positive in ATE, suggesting rule effects may be obscured by adoption circumstances that ATE's selection modelling corrects for.

Where results converge across all three methodologies, the SGP's positive impact, the positive effect from central government debt rules, and the negative effects of regional government expenditure rules, there is high confidence in causal interpretation. Where results diverge substantially, the results suggest different selection biases operate for different rule types.

The sample of the study includes some notable outliers where general government budget balances changed substantially during the financial crisis. These countries are Greece, Ireland and Slovenia, where the change was over 10 pp in a single year. Table 8 presents a restricted sample where these outliers are removed to ensure that they do not fundamentally affect the results. Additionally, the main study includes the pandemic despite the extraordinary fiscal circumstances. This is due to fiscal crises being precisely when fiscal frameworks matter the most and understanding how fiscal rules perform during stress is policy relevant. Although the EU's activation of the general escape clause did not prevent fiscal surveillance action, it demonstrated

that crisis response is an integral part of the SGP framework. Additionally, the 5-year and 10-year time windows smooth the impact of single years. However, it cannot be excluded that the pandemic years substantially affect the results.

Table 8 presents the results for restricted samples. In columns 1 to 3, the outlier countries are removed, and the results remain qualitatively unchanged. The same holds for regressions 4 to 6, that exclude the years 2020 and 2021 from the sample, confirming that the results are not significantly affected by the pandemic. These robustness checks demonstrate that the findings are not driven by specific countries or time periods but reflect systematic effects of fiscal frameworks operating across diverse contexts. The SGP's consistent coefficient across all provides particularly strong evidence of robust causal effects.

Columns 7 to 9 present results for the interaction between the SGP dummy and the lagged general government budget balance to provide an additional element of study of whether the SGP affects the speed of mean reversion in addition to its level effect. The interaction term is positive and statistically significant at both the 5-year and 10-year horizons, though insignificant at the 1-year horizon. A positive interaction coefficient indicates that the SGP moderates the speed of mean reversion. Member states with more negative starting fiscal positions adjust more gradually under the SGP than the baseline mean reversion coefficient would imply. This is consistent with the SGP operating as a medium-term surveillance framework that supports a sustained and gradual adjustment path rather than forcing immediate sharp corrections from extreme fiscal positions. Importantly, the effect of the SGP remains positive and significant across all horizons even when the interaction is included, confirming that the level effect identified in the main results is robust to allowing for position-dependent adjustment dynamics.

The robustness checks collectively suggest that endogeneity concerns do not fundamentally undermine the core conclusions of the study. The most robust findings, that the SGP improves budget balances and that certain national fiscal rules have heterogeneous effects depending on government level and rule type, are consistent across methodologies. The coefficients of the effects vary, but the direction and significance patterns for key results are largely preserved. The GMM results, despite generally receiving smaller or different coefficients than ATE, generally align with the FE findings in terms of which rules appear effective (central government debt rules, some expenditure rules) and which are problematic (regional expenditure rules, general government debt rules). This suggests that the main analysis captures actual fiscal rule effects rather than only spurious correlations driven by endogeneity bias.

7 Conclusions

This paper examines how the EU and national country-specific fiscal rules have affected general government budget balance dynamics during the last 30 years, controlling for natural mean reversion in fiscal positions whereby countries with extreme fiscal positions tend to adjust toward equilibrium. It provides a broad view into how fiscal frameworks improve fiscal discipline by using panel estimations with country and time FEs, verified through ATE and GMM approaches. The analysis focuses

Table 7 Results for ATE and GMM. Dependent variable: (change of) general government budget balance

	SGP only	Budget balance rules		Debt rules		Expenditure rules		Revenue rules	
	ATE	ATE	GMM	ATE	GMM	ATE	GMM	ATE	GMM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
General government			-0.261***		-0.279***		-0.257***		-0.281***
budget balance(-1)			(0.027)		(0.038)		(0.039)		(0.043)
Stability and Growth	0.014***		0.007**		0.011***		0.007*		0.004*
Pact(-1)	(0.002)		(0.003)		(0.002)		(0.004)		(0.002)
General government(-1)		0.014***	-0.007	0.001	-0.000	0.006*	0.003	0.009	0.011**
		(0.002)	(0.004)	(0.002)	(0.006)	(0.003)	(0.004)	(0.008)	(0.004)
Central government(-1)		0.009**	-0.002	0.021***	0.005***	0.006	-0.001	0.008	0.001
		(0.004)	(0.004)	(0.006)	(0.001)	(0.004)	(0.003)	(0.007)	(0.001)
Local government(-1)		0.010***	0.002	-0.003	-0.006	-0.008*	0.008		
		(0.002)	(0.007)	(0.003)	(0.005)	(0.005)	(0.006)		
Regional government(-1)		0.001	-0.013	-0.006	0.015*	-0.009**	-0.021**		
		(0.003)	(0.014)	(0.009)	(0.008)	(0.004)	(0.010)		
Social security(-1)		0.027***	0.015***	-0.019***	0.005	0.019***	0.011**	0.018*	0.002
		(0.004)	(0.004)	(0.002)	(0.020)	(0.003)	(0.005)	(0.011)	(0.024)
Controls									
Government debt(-1)			0.017		-0.008		-0.009		-0.005
			(0.017)		(0.013)		(0.007)		(0.007)
ΔReal GDP p.c.			0.219***		0.230***		0.203***		0.237***
			(0.023)		(0.029)		(0.027)		(0.018)
ΔGeneral government			-0.484***		-0.536***		-0.674***		-0.067***
expenditure			(0.104)		(0.120)		(0.104)		(0.103)
ΔUnemployment			-0.087*		-0.025		-0.098*		-0.041
			(0.051)		(0.053)		(0.051)		(0.043)
ΔInterest Rate			0.032*		0.017		0.030*		0.020
			(0.016)		(0.013)		(0.017)		(0.015)
ΔPublic investment			-0.492***		-0.491***		-0.474***		-0.424***

Table 7 (continued)

	SGP only	Budget balance rules		Debt rules		Expenditure rules		Revenue rules	
	ATE	ATE	GMM	ATE	GMM	ATE	GMM	ATE	GMM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			(0.089)		(0.080)		(0.093)		(0.089)
ΔPrivate investment			0.108*		0.157***		0.057		0.062
			(0.055)		(0.052)		(0.054)		(0.054)
Banking crisis(-1)			-0.003		-0.008*		-0.004		-0.006*
			(0.004)		(0.004)		(0.003)		(0.004)
Constant			-0.024**		-0.014		-0.011*		-0.012**
			(0.009)		(0.009)		(0.006)		(0.005)
N	896	896	868	896	868	896	868	896	868
AR(1)			-3.28***		-3.47***		-3.31***		-3.34***
AR(2)			1.25		1.26		1.44		1.38
Sargan test			14.2		11.3		13.9		15.0
Hansen J-test			13.5		14.5		14.0		8.5

Notes: Average treatment effects with augmented inverse-probability weighting (logit treatment and linear by maximum likelihood outcome) for 1-year changes. ATE run individually for time period t for each type of rule on the level of general government budget balances. GMM estimates use two-step system GMM with second and third lags of endogenous variables as instruments (general government budget balance, government debt, real GDP per capita, government expenditure, unemployment, interest rates, public investment and private investment). Fiscal rule dummies treated as predetermined. Sargan test and Hansen J-test p-values>0.10 in all cases (instrument validity not rejected). AR(2) test p-values>0.10 in all cases (no second-order autocorrelation). *** significant at 1%, ** at 5%, * at 10%

Table 8 Panel FE results for the SGP without sample outliers, excluding the pandemic and the interaction between SGP and lagged general government budget balances. Dependent variable: change of general government budget balance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Period horizon	1y	5y	10y	1y	5y	10y	1y	5y	10y
General government	-0.347***	-0.039***	-0.015**	-0.359***	-0.040***	-0.016**	-0.421***	-0.074***	-0.039***
Budget balance(-1)	(0.039)	(0.014)	(0.007)	(0.070)	(0.013)	(0.007)	(0.052)	(0.019)	(0.009)
SGP(-1)	0.007***	0.004***	0.003***	0.007***	0.003***	0.002***	0.010***	0.005***	0.004***
	(0.002)	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)	(0.003)	(0.001)	(0.001)
General government							0.097	0.059***	0.040***
Budget balance(-1) x SGP(-1)							(0.076)	(0.020)	(0.010)
Controls									
Government debt(-1)	0.007*	0.008***	0.005***	0.013***	0.009***	0.005***	0.012***	0.009***	0.004***
	(0.004)	(0.002)	(0.001)	(0.004)	(0.002)	(0.001)	(0.004)	(0.002)	(0.001)
ΔReal GDP p.c.	0.064**	0.049**	0.028**	0.057*	0.056**	0.041***	0.073**	0.062***	0.038***
	(0.032)	(0.020)	(0.014)	(0.031)	(0.022)	(0.015)	(0.032)	(0.022)	(0.014)
ΔGeneral government	-0.285***	-0.532***	-0.427***	-0.183*	-0.607***	-0.445***	-0.226**	-0.651***	-0.549***
Expenditure	(0.104)	(0.081)	(0.060)	(0.111)	(0.075)	(0.015)	(0.110)	(0.085)	(0.064)
ΔUnemployment	-0.079**	-0.065*	-0.133***	-0.092***	-0.061*	-0.139***	-0.074**	-0.039	-0.105***
	(0.035)	(0.034)	(0.029)	(0.035)	(0.035)	(0.031)	(0.034)	(0.034)	(0.031)
ΔInterest rate	0.003	-0.098***	-0.116***	-0.001	-0.092***	-0.108***	-0.001	-0.094***	-0.115***
	(0.016)	(0.025)	(0.017)	(0.017)	(0.022)	(0.017)	(0.016)	(0.024)	(0.017)
ΔPublic investment	-0.371***	-0.729***	-0.679***	-0.376***	-0.646***	-0.756***	-0.369***	-0.653***	-0.650***
	(0.101)	(0.141)	(0.117)	(0.107)	(0.143)	(0.122)	(0.108)	(0.145)	(0.115)
ΔPrivate investment	0.076*	0.284***	0.215***	0.089*	0.274***	0.252***	0.071*	0.266***	0.232***
	(0.046)	(0.063)	(0.037)	(0.049)	(0.054)	(0.038)	(0.041)	(0.053)	(0.036)
Banking crisis(-1)	-0.004*	-0.001	-0.001***	-0.006**	-0.001	-0.001***	-0.006**	-0.001	-0.001***
	(0.002)	(0.001)	(0.000)	(0.003)	(0.001)	(0.000)	(0.003)	(0.001)	(0.000)
Constant	-0.019***	-0.009***	-0.005***	-0.021***	-0.010***	-0.005***	-0.025***	-0.012***	-0.006***
	(0.003)	(0.001)	(0.001)	(0.003)	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)

Table 8 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Period horizon	1y	5y	10y	1y	5y	10y	1y	5y	10y
N	775	700	625	812	728	612	868	784	672
Adj. R^2	0.57	0.61	0.54	0.39	0.58	0.53	0.52	0.59	0.53
F-statistic	16.8***	19.5***	15.5***	8.9***	18.3***	15.1***	15.1***	19.4***	15.3***

Notes: Fixed Effect (country and year) estimates of the relationship of the change of General Government budget balance, the Stability and Growth Pact and control variables. Columns 1–3: outlier countries (Greece, Ireland, Slovenia) removed, full time sample. Columns 4–6: full country sample, pandemic years (2020–2021) excluded. Columns 7–9: full country and time sample, including interaction of SGP(-1) and lagged general government budget balance. 1y = 1-year change, 5y (10y) = 5-year (10-year) change, centered moving average. White diagonal standard errors and covariance (degrees of freedom corrected) in parentheses. *** significant at 1% level, ** significant at 5%, * significant at 10%

on the EU fiscal framework and the different fiscal rules set by public sector entities in EU member states for different public sector levels and the results suggest fundamental asymmetries in the effectiveness of supranational versus national rules and demonstrates that rule design and institutional context critically determine fiscal outcomes.

The SGP has had a consistent, statistically significant positive effect on budget balance development across all time horizons, and this finding is robust across all estimation approaches. The framework's effectiveness appears to derive from multilateral surveillance, potential sanctions, and reputational costs of breaching EU-level commitments that exceed those from violating domestic rules. It operates through immediate compliance pressures, medium-term institutional reforms, and long-term changes to the political economy of fiscal policymaking. The effects persist when controlling for national fiscal rules and macroeconomic conditions, suggesting that external enforcement provides disciplining mechanisms that domestic institutions cannot individually replicate. National fiscal rules, by contrast, have highly varied effectiveness depending on rule type, targeted government level, and time horizon.

Budget balance and revenue rules generate largely insignificant effects across all specifications. The insignificant results for national budget balance rules can potentially be explained by the structural factors such as the SGP's requirements being more binding than most national rules, rendering the latter largely redundant for countries under supranational surveillance. Additionally, many subnational budget balance rules are embedded within intergovernmental transfer frameworks that soften the effective constraint. The change-based specification also captures fiscal adjustment dynamics and may not fully reflect rules whose primary design objective is stabilisation around a target level rather than consolidation. This is a limitation of the empirical design.

Debt rules demonstrate the importance of institutional context. Central government debt rules show consistent positive effects across all methodologies, providing robust evidence of fiscal improvement beyond the SGP's impact. This effectiveness might be due to the clear assignment of debt management responsibilities at the central level, where governments face direct market discipline and possess actual fiscal sovereignty. Social security debt rules display more mixed results, likely due to varying institutional arrangements across countries. Conversely, general government debt rules exhibit negative effects. This finding is likely due to conflicting targets across government subsectors or the use of general government rules as crisis responses that signal fiscal stress rather than solving underlying problems. When rules cover multiple government levels simultaneously, they may create opportunities for creative accounting or debt shifting that technically satisfies sector-specific requirements while worsening overall outcomes.

Expenditure rules present the most complicated effects. Regional government expenditure rules consistently worsen budget balances across all methodologies, and this finding is very robust, so it should be carefully considered by policymakers. The mechanism potentially operates through intergovernmental transfers. When regional governments face binding expenditure ceilings, central governments frequently increase transfers or expand their own programs, which erase any consolidation gains. This implies a fundamental challenge in multi-level governance systems

where fiscal responsibilities are shared, and revenues are largely determined by transfers from higher tiers. Central and local government expenditure rules show positive long-term effects, indicating that sustained expenditure discipline gradually improves fiscal outcomes but requires extended periods to overcome political resistance and implementation challenges. Social security expenditure rules prove effective in the short term, reflecting successful healthcare cost containment and pension reforms, though effects do not persist over longer horizons.

The differential effectiveness of fiscal rules across government levels suggests some key design principles. Rules work best when applied to levels with real fiscal autonomy and clear accountability, i.e. central government for overall fiscal policy, social security for demographically driven spending, and local government for service expenditure. Rules prove less effective or even counterproductive at intermediate levels where responsibilities are shared, revenues depend on transfers, and accountability is diffused. Finally, the coordination between supranational and national frameworks matters substantially, with well-designed national rules potentially enhancing EU-level discipline and (perhaps more importantly) fiscal outcomes, when properly aligned.

The limited substitutability between SGP and national rules, evidenced by the SGP's persistent effects when controlling for national frameworks, suggests that supranational and national rules operate through different channels rather than merely duplicating constraints. However, the risk of creating excessive complexity through complicated rules at multiple levels remains a constant challenge. Member states should prioritise a smaller number of well-targeted rules with strong legal foundations and credible enforcement mechanisms rather than comprehensive but potentially conflicting systems.

The findings have some clear policy implications. Supranational frameworks provide disciplining mechanisms that domestic institutions alone cannot replicate, and external commitment through multilateral surveillance and credible sanctions remains valuable. At the national level, rule design must match institutional context. Debt rules work best at the central government level where fiscal sovereignty and market discipline are strongest, while expenditure rules are effective at the local level but counterproductive at the regional level where intergovernmental transfers soften the constraint. More broadly, quality matters more than quantity. The insignificant effects of some rules suggest that adopting rules without strong legal foundations, independent surveillance, and credible correction mechanisms is insufficient for achieving fiscal discipline.

The results of this study point to different avenues for potential future research. More granular and country-specific analysis of individual national fiscal rules would enhance understanding of how specific design features (numerical targets, adjustment mechanisms, enforcement, and legal basis) affect outcomes. Explicit modelling of interaction effects between supranational and national rules, and between different types of national rules across government levels, could reveal whether certain combinations are more complementary than others. Finally, the potential for applying state-contingent fiscal rules would be important to study for the EU as Europe is facing large structural changes, such as ageing (Kotamäki and Lehtimäki 2025) in the near future.

Appendix

Examples of Fiscal Rules for each government subsector

Table 9 Examples of fiscal rules (European Commission 2025)

	Budget Balance rules	Debt rules	Expenditure rules	Revenue rules
General government	- The medium-term budgetary objective for the structural deficit shall not exceed X per cent of the GDP. - General government deficit must not exceed 3% of GDP. - Structural budget surpluses in the interval X.X - X.X pct of GDP.	- The growth of debt-to-GDP ratio must level off during the electoral cycle. - Public debt must not exceed X pct of GDP.	- Ceiling on the size of the general government sector: X pct of GDP. - Windfalls cannot be used to finance new expenditures. - Expenditure (excluding X) shall not increase faster than growth of potential GDP.	- Direct or indirect tax rates can not be raised. - Windfalls are automatically used to lower the debt. - If a multi-year surplus is observed, X pct is allocated to debt repayment.
Central government	- Public borrowing is only allowed if it does not exceed public investment. - The central government deficit should not exceed X pct of GDP. - Target of structural surplus of X pct by the end of the parliamentary term.	- Central Government debt must be reduced over the legislative period. - The growth of the central government debt-to-GDP ratio must level off during the electoral period.	- Nominal expenditure ceiling. - At the beginning of the electoral period, central government sets a ceiling for expenditure over this period. - Central government real growth of primary expenditure equal or lower than X pct.	- Growth of fiscal revenues has to be in line with GDP growth. - Any unexpected tax revenues are to be used to reduce the budget deficit.
Local government	- Local authorities should only prepare balanced annual budgets. - Local government deficit should not exceed X.X pct of GDP.	- For each local government unit total debt at end of fiscal year is not allowed to be higher than X pct of the revenue for year. - Stabilizing the nominal budget balance by capping local government net debt growth at X pct.	- The average growth rate of expenditure for local activities shall not exceed the average growth rate of the reported expenditure for the past X years.	

Table 9 (continued)

	Budget Balance rules	Debt rules	Expenditure rules	Revenue rules
Regional government	- Numerical targets set on the budget balance. - Total liabilities should not be higher than X.X times the average of the current net revenue.	- For each regional government, indebtedness must be same at the beginning and at the end of each year. - End of year liabilities at most X.X times the average of the current net revenue.	- Expenditure ceilings for specific products. - The annual growth of expenditure cannot exceed the average medium-term growth rate of GDP.	
Social security	- Balanced budget rule for the social security sector. - Social security funds should have a surplus of X.X pct of GDP.	- Budget act to determine the primary balance target.	- Real growth of health care expenditure equal or lower than X pct.	- Counter-cyclical regulation of unemployment security contributions and earnings-related pension contributions.

Notes: Selected examples for each type of fiscal rule for each government subsector in the fiscal governance database (European Commission 2025)

Data Description and Sources

Table 10 Variables

Variable	Unit/Transformation	Source
General government budget balance	% of GDP	World Bank
Government debt	% of GDP	IMF
Real GDP per capita	log	World Bank
Government expenditure	% of GDP	World Bank
Unemployment	%	World Bank
Real interest rate	%	ECB, IMF
Public investment	% of GDP	IMF
Private investment	% of GDP	IMF
Banking crises		Laeven and Valencia (2020)

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Declarations

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