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Effectiveness and counter-cyclicality of fiscal consolidation under compliance regulation: The case of the Stability and Growth Pact

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Abstract

In this study we examine the impact of the European Stability and Growth Pact (SGP) on narratively identified fiscal adjustments whose prime focus is to reduce the budget deficit and compare the effects with those on the primary and the structural budget balance. The cross section of EU and non-EU economies and the sample period 1980–2014 allow for an assessment of the SGP regarding its effectiveness, cyclicality, and the type of fiscal adjustments (tax hikes vs. spending cuts) as compared with counterfactual scenarios. Our findings indicate that the SGP has effectively boosted budget consolidation measures identified by means of the narrative approach, whereas it had no overall impact on the primary and an overall minor impact on the structural budget balance. However, the effectiveness of the SGP has varied considerably over time. All measures indicate that the SGP was particularly effective in the period after the introduction of the Euro, except for the 2 years following the financial crisis in 2008. We find no evidence that fiscal policy has become more procyclical under the SGP. Finally, fiscal consolidation under the

SGP favors spending cuts, whereas the application of tax hikes shows no sizeable differences as compared with the reference group.

KEYWORDS

counter-cyclicality, endogeneity, fiscal consolidation, Heckman two-step estimation, narrative identification, spending cuts, Stability and Growth Pact, tax hikes

1 | INTRODUCTION

The introduction of a common currency and a single monetary policy by sovereign nations under the European Monetary Union (EMU) has triggered the adoption of the Stability and Growth Pact (SGP) to guarantee a certain level of fiscal policy coordination among EMU member states. Although the SGP has been agreed upon rather quickly in 1997, it has also been subject to controversial discussion from the beginning. On the one hand, its weak enforcement has led to questions regarding effectiveness in reducing budget deficits, particularly after the introduction of the Euro (Beetsma & Debrun, 2007; Prammer & Reiss, 2016; Schuknecht et al., 2011). On the other hand, the SGP has been criticized for disregarding fiscal externalities to the extent that the counter-cyclicality of fiscal adjustments has been weakened (Auerbach & Gorodnichenko, 2017; Buiter et al., 1993; Truger, 2013) impairing, thereby, their scope of containing inflationary pressures.

The empirical literature on the effects of fiscal compliance rules on the conduct of fiscal policy under the SGP is yet inconclusive. While some empirical studies indicate that the SGP has a positive impact on the primary balance (e.g., Afonso & Hauptmeier, 2009), others do not find substantial impacts (e.g., Hughes-Hallett & Lewis, 2008; Ioannou & Stracca, 2014). Similarly, the evidence regarding the procyclicality of the (cyclically adjusted) primary balance under the SGP is ambiguous (e.g., Bénétrix & Lane, 2013; Cimadomo, 2012; Fatás & Mihov, 2010; Galí & Perotti, 2003; Ioannou & Stracca, 2014; Wyplosz, 2006). In this study, we reexamine the impact of the SGP on fiscal outcomes under four perspectives. First, as a novelty, we provide a systematic and comparative assessment of the impact of the SGP on three alternative measures of budgetary performance, these being: (i) the primary budget balance, that is, revenues minus public spending excluding interest payments on government debt (as, e.g., in Ioannou & Stracca, 2014), (ii) the cyclically adjusted primary balance (CAPB) or structural budget balance (e.g., Bénétrix & Lane, 2013; Fatás & Mihov, 2010; Galí & Perotti, 2003; Wyplosz, 2006), and (iii) the narratively identified fiscal adjustments with a prime focus on reducing the budget deficit of Devries et al. (2011) and Alesina et al. (2018). Although there is a body of the literature devoted to analyzing the primary budget balance and its cyclically adjusted counterpart, the analysis of narratively identified fiscal adjustments is a novel approach and promises insights into how fiscal compliance regulations affect an important component of the budget (deficit). Second, fiscal adjustment data of Devries et al. (2011) and Alesina et al. (2018) stem from the examination of contemporaneous policy documents approved by governments and parliaments. Hence, these data allow not only for an almost perfect identification of magnitude and timing of those fiscal measures that have primarily been

motivated by the desire to reduce budget deficits, but also for a clear cut categorization of such measures into the broad categories of tax hikes and spending cuts. We take advantage of this particular feature to address an important and novel research question noticing that the insights of previous studies do not allow to extrapolate the impact of the SGP on specific fiscal adjustment policies. Therefore, a further objective of this study is to study whether the SGP had distinct impacts on the implementation of fiscal adjustments through spending cuts or tax hikes. Third, as excessive debt is penalized in financial markets with larger risk spreads and an increasing cost of issuing additional debt, fiscal compliance regulations such as those introduced under the SGP might have only limited additional impact on the level of public debt. Hence, a clear evaluation of the SGP's treatment is difficult and is further complicated by the introduction of the common currency in 1999. Our empirical difference-in-difference (DiD) analysis copes with these issues by means of a thorough definition of interaction effects that distinguishes both EMU members and nonmembers as well as distinct time periods of the monetary unification project. Fourth, as argued powerfully by Ioannou and Stracca (2014) the great financial crisis has questioned the sustainability of public debt. Noticing that the European sovereign debt crisis can be considered a challenge of comparable magnitude, this study includes data for the period after the financial crisis in 2008 and, therefore, enables an assessment of the impact of the SGP on the distinct dimensions of the budget balances for recent years.

Our main findings can be summarized as follows. First, in terms of narratively identified budget consolidation in EMU and SGP member countries both the probability of fiscal adjustments and their magnitude have been significantly larger in comparison with their counterfactuals. Instead, the SGP had no significant overall impact on the primary and an overall minor impact on the structural budget balance. Second, the effectiveness of the SGP has varied considerably over time. Adjustments of the primary and structural balance as well as narratively identified budget consolidation policies under the SGP were particularly effective in the period after the introduction of the Euro with the exception of the two years following the financial crisis in 2008. Third, we cannot confirm that in countries that required corrective action fiscal adjustments were more likely to occur and more sizeable under adverse macroeconomic circumstances, that is, that fiscal policy has become more procyclical under the SGP. Finally, we obtain that fiscal consolidation under the SGP has favored spending cuts, whereas the application of tax hikes shows no sizeable differences as compared with the reference group.

From these results we conclude that the identification of specific budget policies and time periods is core to assessing fiscal impacts under the SGP. For the discrepancy in the fiscal impacts of the SGP detected in this study we find that discretionary policy measures aimed at reducing budget deficits have traded-off other consolidation and stimulus policies through ad-hoc budget execution. Moreover, time periods under which the SGP has been effective cancel out with periods under which it has been ineffective or attenuated. Consequently, the evaluation of the effectiveness of the SGP depends on the specific measure and period that are considered.

The remainder of this study is organized as follows. Section 2 provides some details on the SGP, reviews the empirical literature regarding its fiscal impacts, and introduces the hypotheses that are in the focus of this study. Section 3 describes the data and the empirical estimation strategy. Section 4 provides the empirical results. Section 5 concludes.

2 | RELATED LITERATURE AND HYPOTHESES

In this section we connect our study to the literature on fiscal deficit rules in general before turning to the SGP. We start with the theoretical motivations for the implementation of fiscal deficit rules. Next, we provide the institutional details on the SGP. Finally, we review the empirical evidence on fiscal outcomes under deficit rules and elucidate the relation of our paper to this literature through the (re)examination of four hypotheses.

2.1 | Fiscal deficit rules

The rationale for the implementation of fiscal deficit rules and sanctioning mechanisms lies in the deficit bias that governments eventually introduce in the process of electoral competition (e.g., Besley & Case, 2003; Grilli et al., 1991; Poterba, 1994). The literature has given different explanations for this political process failure. In an early contribution Alesina and Tabellini (1990) show that governments who disagree about the composition of public spending do not fully internalize the cost of future debt in the process of electoral competition with uncertain outcomes. As a result, debt accumulates beyond the social optimum.[1]

Based on such arguments, nowadays, fiscal rules constraining the discretionary powers of budget policymakers are commonly used in developed economies, particularly to limit public spending of sub-central governments. While there are distinct types of rules (e.g., budget balance requirements, borrowing constraints, tax and expenditure limits, transparency and monitoring rules) budget balance requirements are predominantly applied at the country level (Sutherland et al., 2018). Regarding the budget and spending control of central governments, fiscal rules are less common though they are regarded as desirable at the sub-central government level. For instance, in its *Principles of Budgetary Governance* the OECD states that to allow for counter-cyclical or cyclically neutral policies "a sound fiscal policy is one which avoids the build-up of large, unsustainable debts, and which uses favourable economic times to build up resilience and buffers against more difficult times" (OECD, 2014).

2.2 | The SGP

A prime example of a fiscal rule at the international level is the SGP.[2] The SGP was created to establish fiscal policy coordination in the EU after the introduction of the Euro and the creation of the EMU. The SGP's reference values for a critical fiscal situation are a primary budget deficit of more than 3% and debt of more than 60% of GDP, that is, the two fundamental pillars of the Maastricht Treaty that entered into force at the end of 1993. To guarantee that governments in EMU member states do not run excessive budget deficits, the SGP consists of two main instruments: "the preventive arm" (prevention) and "the corrective arm" (deterrence).[3] The objective of the "preventive arm" is to bring countries' debt on a sustainable path by requiring a balanced budget or even surplus during economic upturn, and, hence, leaving some room for fiscal stabilization policies under economic downturn. The "corrective arm" consists of the *Excessive Deficit Procedure* (EDP) which encourages governments to quickly correct budget deficits in excess of the 3% threshold, and, as a final resort, imposes economic sanctions.

From the beginning, the SGP has been criticized for being both not strict enough and not flexible enough in its application to national fiscal policy responses to business cycle

fluctuations. In particular, it has been claimed that violations of specific rules are not sufficiently sanctioned, and that the SGP is incomplete insofar as it does not acknowledge the role of fiscal externalities which might be an impediment to successfully coping with severe symmetric shocks. As a result, it has been reformed several times since 1997. The most important reforms were in 2005 and in 2011. The 2005 reform was motivated by the fact that the SGP lost credibility after provisions of the corrective arm were not applied to France and Germany by the end of 2003. The reform introduced differentiated "medium-term objectives" that, while maintaining a safety margin with respect to the 3% deficit limit, also took account of contextual factors such as the debt-to-GDP ratio and potential growth. Moreover, adjustments to reach the 3% deficit limit were targeted to 0.5% of GDP per year and allowed to vary according to the business cycle. The reform of the SGP in 2011, the so-called "six-pack," went back to stricter enforcement and less flexibility at the national level. In particular, the reform (i) reinforced the preventive arm, (ii) put more emphasis on the debt-to-GDP ratio, (iii) strengthened the EDP by means of reverse qualified majority voting, and (iv) implemented a sanctioning mechanism with fines of up to 0.2% of GDP for the case of fiscal noncompliance.[4]

2.3 | Empirical evidence on the effects of fiscal rules

Numerous studies have investigated the impact of deficit rules on fiscal outcomes empirically. Scholars have mainly focused on the effectiveness of deficit rules and on their impact with regard to the counter-cyclicality of fiscal policy.[5] For example, regarding the effectiveness of fiscal rules in EU member countries, Debrun et al. (2008) find that many of these rules have a quantitatively important impact on budget balances and debt levels. Sutherland et al. (2018) conclude that evidence for the United States suggests that fiscal rules are effective, as states with more stringent budget balance requirements tended to have lower levels of debt. According to the meta analysis of Heinemann et al. (2018) "the existing empirical evidence points to a constraining effect of rules on fiscal aggregates." However, Heinemann et al. (2018) attribute this result to the fact that, on the one hand, most of the 30 studies reviewed do not account for the potential endogeneity of fiscal rules. On the other hand those studies associated with on average lower levels of statistical significance of deficit rules were working papers that have not been published. Taking a comprehensive long-run perspective on constitutional fiscal rules, Gründler and Potrafke (2020) find that these have promoted growth in the centuries after the beginning of the Industrial Revolution as well as over recent decades. Moreover, fiscal rules are effective both at the national and the subnational level in boosting per capita GDP in the long-run by, on average, 18%.

With respect to the effectiveness of fiscal rules related to the SGP and the creation of the EMU, Hughes-Hallett and Lewis (2008) find that these were effective before countries entered the EMU but not during the first phase of the SGP until 2002. Ioannou and Stracca (2014) apply a difference-in-difference approach to data from 1980 to 2010 and confirm this result, that is, fiscal rules had a positive impact on EMU members before the introduction of the Euro, but not thereafter. Caselli and Wingender (2021) study the effects of the Maastricht treaty's fiscal criteria on general government deficits in EU countries by combining treatment effect methods with so-called bunching estimation. They find that the three percent deficit rule acts as a "magnet" increasing the number of observations around the threshold, while reducing the occurrence of both large government deficits and surpluses.

It has been stated repeatedly that the effectiveness of fiscal rules comes at the cost of fostering the cyclicality of fiscal policy. For instance, Levinson (1998) has provided empirical evidence that balanced budget rules applied in the US have exacerbated business cycles. In European countries, budget balance and debt rules are also frequently perceived as a source of pro-cyclicality, particularly, those applied at the regional and local level (Debrun et al., 2008). After the introduction of strong budget balance rules in 2001 in Spain, for example, the resulting procyclicity of sub-central fiscal policy led to proposals to amend the General Budget Law in June 2005 (Sutherland et al., 2018).

Regarding the impact of the SGP on the cyclicality of general government fiscal policy, the literature has obtained the following results. Galí and Perotti (2003) find that discretionary fiscal policy in EMU countries became more counter-cyclical between 1992 and 2001, thereby following a trend in other developed economies. Wyplosz (2006) concludes that "the convergence criteria and the SGP have improved the quality of discretionary fiscal policy in the Euro area in the sense of ending pro-cyclicality." By contrast, Fatás and Mihov (2010) obtain that "the adoption of the common currency and the constraints imposed by the SGP have lacked a sizeable impact on the cyclical behavior of the structural balance". Bénétrix and Lane (2013) find that while fiscal cyclicality decreased after the advent of the Maastricht Treaty, it increased after the creation of the EMU. Finally, the results in Ioannou and Stracca (2014) suggest that between 1997 and 2010 fiscal policy had no significant influence on cyclicality of the primary balance for Euro area countries.

2.4 | Hypotheses

In this study, we reexamine the impact of the SGP on the general government budget balance by considering three dependent variables (i) the primary budget balance (as e.g., in Hughes-Hallett & Lewis, 2008; Ioannou & Stracca, 2014), (ii) the cyclically adjusted (or structural) budget balance (e.g., Bénétrix & Lane, 2013; Cimadomo, 2012; Fatás & Mihov, 2010; Galí & Perotti, 2003; Ioannou & Stracca, 2014; Wyplosz, 2006) and, as a new contribution to this literature, (iii) fiscal adjustments with a prime focus on reducing the budget deficit (with data from Alesina et al., 2018; Debrun et al., 2008). Specifically, we test the following hypotheses regarding the fiscal impact of the regulations under the SGP in comparison with countries and periods that do not fall under its regulations:

H1. *The SGP is effective in that it raises the probability and extent of fiscal adjustments under noncompliance.*
H2. *The SGP has lost its effectiveness after the introduction of the Euro.*
H3. *Counter-cyclicality of fiscal policy is weakened under the SGP.*
H4. *The SGP favors spending cuts rather than tax hikes.*

As outlined in the review of the empirical literature, hypotheses H1, H2, and H3 have been discussed in other studies. Our main contribution to these studies is therefore, first, to include as new measures of budget consolidation narratively identified fiscal adjustments whose primary objective is to reduce existing budget deficits. Second, this study is the first to provide a comprehensive comparison of different components of the public budget under supranational fiscal compliance regulation. Third, our study assesses the impact of the EDP under the SGP after the 2008 financial crisis. Finally, narratively identified fiscal adjustments distinguish

between spending cuts and tax hikes. This distinction permits a connection to results from the business cycle and fiscal multiplier literature and guides us to develop the new hypothesis H4 to determine if the SGP has led to a preferential application of spending cuts rather than tax hikes. In particular, early contributions to the related literature suggest that spending cuts are generally preferable to tax hikes from a growth perspective. For instance, using a long time series of quarterly U.S. data, Mountford and Uhlig (2009) show that deficit-financed tax cuts have higher GDP multiplier effects than deficit-spending or a balanced budget-spending expansion. Alesina et al. (2015) and Yang et al. (2015) also find that fiscal adjustments through spending cuts are preferable to the implementation of tax hikes in terms of future output losses. Jha et al. (2014) show that in a sample of ten emerging Asian countries, tax cuts have had a stronger counter-cyclical impact on output than government spending. Reflecting this literature, however, Caldara and Kamps (2017) argue that core results might be biased because of problems in the identification of fiscal shocks and the associated fiscal multipliers. After implementing an identified proxy SVAR model by means of nonfiscal instruments to directly estimate the parameters of the fiscal rules, the authors find for the US that the output stimulus of spending increases has been larger than the one of tax cuts.

3 | DATA AND EMPIRICAL MODEL

In this section, we introduce our panel data and provide a brief outline of the employed regression models and of the two-step Heckman estimator that takes the censoring of dependent variables into account.

3.1 | Data

The data set comprises annual data from 1980 to 2014 for 17 OECD economies: Australia (AUS), Austria (AUT), Belgium (BEL), Canada (CAN), Denmark (DNK), Finland (FIN), France (FRA), Germany (GER), Ireland (IRL), Italy (ITA), Japan (JPN), the Netherlands (NLD), Portugal (PRT), Spain (ESP), Sweden (SWE), the United Kingdom (UK), and the United States (US).[6]

3.2 | A comparative approach to measure fiscal adjustments

Our analysis consists in a systematic comparison of a total of six dependent variables. More specifically, we analyze conditional profiles of (i) changes of the primary budget balance ($\Delta pb = pb_t - pb_{t-1}$), (ii) changes of the cyclically adjusted primary budget balance ($\Delta capb = capb_t - capb_{t-1}$); and (iii) fiscal adjustments (fa) as identified by the narrative approach of Devries et al. (2011) and Alesina et al. (2018). Unlike the measurement of fiscal adjustments by means of (cyclically adjusted) primary budget balances, identification by the narrative approach has the advantage of avoiding problems of endogeneity and weak identification. This could be of particular merit in our case given that one of the main objectives of the analysis is to trace fiscal adjustments over the business cycle. According to the literature, budget consolidation through spending cuts has different impacts on growth in terms of future output losses as compared with budget consolidation through tax hikes (e.g., Alesina

et al., 2015; Caldara & Kamps, 2017; Mountford & Uhlig, 2009). In this respect, a particular benefit of narrative identification of fiscal adjustments is to enable a separation into spending cuts and tax hikes. On this basis we consider further dependent variables from two angles. On the one hand, we directly investigate fiscal consolidation policies through (iv) spending cuts ($fa^{(G)}$) and (v) tax hikes ($fa^{(T)}$). In this regard it is worth noticing that fiscal adjustments in general are $fa = fa^{(G)} + fa^{(T)}$. On the other hand, we analyze if both types of adjustments differ in terms of effectiveness and counter-cyclicality by means of *vi*) a constructed variable that compares the two types of adjustments, that is,

$$\Delta fa_{it} = \begin{cases} fa_{it}^{(G)} - fa_{it}^{(T)} & \text{if } fa_{it}^{(G)} \neq 0, fa_{it}^{(T)} \neq 0 \quad \text{and} \quad fa_{it}^{(G)} - fa_{it}^{(T)} > 0, \\ 0 & \text{otherwise.} \end{cases} \tag{1}$$

The variables fa, $fa^{(G)}$, $fa^{(T)}$, and Δfa are subject to censoring. More specifically, these variables are zero in periods without budget consolidation and defined as percentage of GDP otherwise. The countries with fewest periods of fiscal adjustments are SWE (20% of sampled years), DNK (23%), AUS (29%) and FRA (29%). The countries that have experienced fiscal adjustments most frequently are CAN (54%), GER (54%), ITA (49%) and the US (49%). With regard to the average size of fiscal adjustments (in percentage points of GDP), these have been strongest in IRL (2.24), PRT (2.01), ITA (1.88), and SWE (1.64) and weakest in the US (0.40), CAN (0.48), AUS (0.49), and JAP (0.54). Both tax hikes and spending adjustments have been executed in 33.9% of the years under observation. The average magnitude of spending cuts has been 0.79 and that of tax hikes 0.49 (both, in percentage points of GDP).

As an uncensored variable the primary budget balance is the general government budget balance (i.e., revenues minus public spending) excluding interest payments on government debt. The cyclically adjusted primary balance measures the structural government balance by eliminating changes in the budget balance that stem from fluctuations in the business cycle. Therefore, *capb* includes fiscal adjustments with the objective to reduce budget deficits (i.e., *fa*), as well as other policy measures such as deliberate consolidation (expansion) of the government budget to curb economic expansion (provide economic stimulus) through budget execution.[7] Hence, from a comparison of *capb* and *fa* we can conclude that the former gives a more complete view of structural budget policies, while the latter has the advantage of allowing the direct identification (without measurement errors) of specific periods of (announced and planned) budget consolidation.[8] To make these considerations more explicit, Figure 1 provides a scatter plot of *fa* and $\Delta capb$. From the figure we observe that narratively identified fiscal adjustments differ markedly from those evaluated in terms of $\Delta capb$ which has been used in the literature to analyze the effects of fiscal compliance regulations such as the SGP. Apart from the fact that *fa* is censored while *capb* is not, the correlation between the cyclically adjusted budget balance and narratively identified (nonzero) fiscal measures is positive but far from complete. Therefore, the comparative approach taken in this study promises important insights with the potential to complement the available empirical evidence on how the SGP affects the timing and the magnitudes of fiscal consolidation measures.

3.3 | Explanatory variables

The set of explanatory variables is largely inspired by the related literature (e.g., Afonso & Hauptmeier, 2009; Caselli & Wingender, 2021; Cimadomo, 2012; Galí & Perotti, 2003; Ioannou

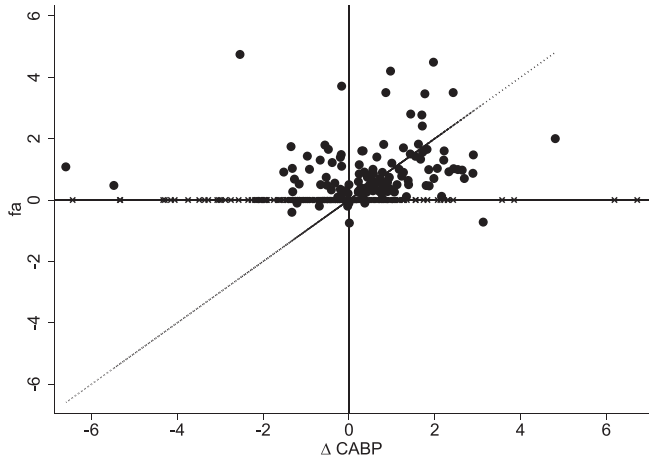

FIGURE 1 Estimates of changes of cyclically-adjusted primary budget balances ($\Delta CAPB$) against narratively identified fiscal adjustments (fa) which are subject to censoring. About 2/3 of all observations are zero (crosses indicate respective quotes of $\Delta CAPB$). The diagonal shows the location of perfect correlation. The unconditional empirical correlation is 23.8%. For further information see Table 2.

& Stracca, 2014), and allows for a classification into four categories. The first group of explanatory variables evolves from the level of public debt and the need to finance it. The group consists of the general government surplus (*surp*), the general government debt-to-GDP ratio (*debt*) and the real long-term interest rate on government bonds (r). A second group of macroeconomic performance measures includes the output gap (*gap*) and an indicator of financial or trade openness (*open*). The variable *open* takes a value of one if both an indicator of financial integration (*fi*) and trade figures (*trade*) are beyond their country-specific average outcomes. Otherwise, *open* is zero. A third group of covariates controls for political factors. In particular, we use government ideology (*ideo*) as the unweighted mean of the ideological position of parties in government on a −5 (rightist) to 5 (leftist) scale and an indicator for election years (*elec*), that is,

$$elec = \frac{(M-1) + d/D}{12}. \tag{2}$$

In (2), M is the month and d is the day of election, and D is the number of days in the month of election. In years without elections, $elec = 0$.[9]

To unravel overall effects of *excessive deficit sanctioning* (EDS) mechanisms under (the preparation of) the EMU and the SGP, a fourth group of covariates identifies the treatment group. Specifically, we define the dummy variable

$$EDS_{it}^{(\underline{t}-\bar{t})} = \begin{cases} 1 & \text{if } i \in \text{EMU} \cap t \in \{\underline{t}, ..., \bar{t}\} \\ 0 & \text{otherwise,} \end{cases} \tag{3}$$

where EMU = {AUT, BEL, ESP, FIN, FRA, GER, IRL, ITA, NLD, PRT}.[10] Apart from the entire period under which the EDS was in place (i.e., $EDS_{it}^{(94-14)}$), we distinguish four subperiods to detect potential time variation of the functioning of fiscal compliance regulation. Specifically,

we use indicators $EDS_{it}^{(94-98)}$, $EDS_{it}^{(99-08)}$ and $EDS_{it}^{(11-14)}$ to analyze potential changes of the effects of the SGP for periods dating before and after the creation of the EMU and before and after the financial crisis in 2008. Moreover, we consider the 2-year period directly after the financial crisis $EDS_{it}^{(09-10)}$ to account for the observation that the EDS was not effectively applied in these years (Schuknecht et al., 2011). These variables are interacted with the (lagged) budget surplus, the key variable in the application of the EDS mechanism.[11]

As in almost all of the related literature, our data is ex-post data.[12] As such, it should be acknowledged that, for instance, preliminary deficit data releases are biased in the sense that later vintages of data tend to show larger deficits on average. While Castro et al. (2013) show that in 15 EU countries during the period 1995–2008 the bias on average is rather small with a surplus corrected by −0.04 percentage points of GDP, they also indicate that particular corrections were considerable for some countries in specific years (e.g., in Austria with a maximum adjustment of −2.5 and Belgium with −2.4). We take account of these issues by interacting $EDS_{it}^{(t-\tilde{t})}$ with lagged surplus irrespective of whether it lies below or above the 3% deficit threshold. In any case, as large corrections are exceptional and, due to corrections, data is almost accurate after two years when the possible required adjustments had to take place in any case, we do not expect the use of ex-post data to induce a substantial bias in the assessment of the effectiveness of the SGP. Nevertheless, this caveat in using ex-post data should be kept in mind.

Table 1 provides an overview of variable definitions, measurement, and data sources. Descriptive statistics are displayed in Table 2.

3.4 | Empirical models

For the conditional analysis of Δpb and $\Delta capb$, we use pooled regression models of the following type:

$$y_{it} = \tilde{\mathbf{x}}_{it}^{'}\boldsymbol{\gamma} + u_{it}, \tag{4}$$

where $y \in \{\Delta pb, \Delta capb\}$, u_{it} is an uninformative model residual and $\boldsymbol{\gamma}$ a parameter vector. Moreover, the variables in $\tilde{\mathbf{x}}$ consist of a constant, lagged information (by one year) on *surp*, *debt*, *r* and *open*, as well as current information with regard to the output gap (*gap*), political indicators (*elec*, *ideo*) and the measure of the stance of the SGP (EDS dummy variables interacted with lagged surplus and eventually with the sign of the output gap). Importantly, to account for unobserved heterogeneity, metric variables enter $\tilde{\mathbf{x}}$ after centering around country-specific means (i.e., after so-called within transformations). Unreported results show that all empirical results are quantitatively equivalent if the within transformation is also applied to the dependent variables Δpb and $\Delta capb$ (see also respective between and within variation statistics documented in Table 2).

As fiscal adjustments with the primary purpose of budget consolidation are discretionary, the observations for fiscal adjustments (*fa*), spending cuts ($fa^{(G)}$), and tax hikes ($fa^{(T)}$) are mostly zero. On average, about 38.7% of all sample observations are characterized by nonzero fiscal adjustments. The empirical frequencies of both subcategories, spending and tax adjustments, are 34.5%.[13] Conditioning on the cross section of EMU economies, fiscal adjustments *fa* occur with a frequency of 41.15% which slightly exceeds the corresponding full

TABLE 1 Data definitions and sources

Variable	Definition	Measurement	Source
pb	Primary budget balance	General government budget balance (i.e., revenues minus spending) excluding interest payments on government debt	OECD (2021b)
capb	Cyclically adjusted primary budget balance	Structural part of *pb* identified by eliminating changes stemming from fluctuations in the business cycle	OECD (2021b)
$fa^{(G)}$	Fiscal spending adjustment	Share of GDP in adjustment period, zero else	Alesina et al. (2018)
$fa^{(T)}$	Fiscal tax adjustment	Share of GDP in adjustment period, zero else	Alesina et al. (2018)
fa	Fiscal adjustment	Share of GDP in adjustment period, zero else ($fa = fa^{(G)} + fa^{(T)}$)	Alesina et al. (2018)
Δfa	Difference between spending and tax adjustments	$\Delta fa = fa^{(G)} - fa^{(T)}$ if $fa^{(G)} \neq 0, fa^{(T)} \neq 0, fa^{(G)} - fa^{(T)} > 0$; zero else	Own calculations
surp	General government surplus (net lending)	Percentage of GDP	OECD (2021b); AUS 1980-88, GER 1980-90, IRE 1980-89 from World Bank (2018)
debt	General government debt	Percentage of GDP	IMF (2018)
r	Long-term interest rate on 10-year government bonds	Percentage points	World Bank (2018); IRL 1980-87 and JAP 1989-98 from OECD (2021a); JAP 1980-88 from FRED (2018)
gap	Output gap	GDP minus potential GDP over potential GDP in percentage points	IMF (2020)
open	Dummy for international openness	One if $trade > 0$ and $\mathit{fi} > 0$, zero else	Own calculations
fi	International financial openness	Foreign assets plus liability holdings as a percentage of GDP	Lane and Milesi-Ferretti (2018)
trade	Sum of exports and imports	Percentage of GDP	OECD (2021b)
ideo	Government ideology	Between −5 (extreme left) and 5 (extreme right)	Döring and Manow (2020)
elec	Dummy for election years	In election years $elec = \frac{(M-1)+d/D}{12}$, else $elec = 0$.	Own calculations

(Continues)

TABLE 1 (Continued)

Variable	Definition	Measurement	Source
$EDS^{(\underline{t}-\bar{t})}$	Dummy for the Excessive Deficit Procedure under the SGP	$EDS^{(\underline{t}-\bar{t})} = 1$ for EMU member countries over the period $\underline{t} - \bar{t}$, else $EDS^{(\underline{t}-\bar{t})} = 0$	Own calculations
imr	Inverse Mills ratio		Own calculations

Note: Missing values for *r*: FIN (1980–1986). Missing values for *debt* have been imputed for: BEL (1980, 1981, and 1989); FIN (1980); DEN (1997), and SWE (2003). Missing values for *pb* and *capb*: AUS (1980–1988), GER (1980–1990), IRL (1980–1989). For the remaining countries (except CAN and UK) *capb* starts in 1985.

sample average. Interestingly, conditioning the event of fiscal adjustments on the EMU economies and the time period starting in 1994, the respective frequency of nonzero statistics increases further to 44.19%. For Δfa, that is, spending adjustments in excess of tax hikes (which allows testing H4), we have nonzero quotes for 19.16% of all observations. As an important data characteristic, the testing of our hypotheses with regard to fiscal adjustments identified by the narrative approach deserves specific estimation techniques that cope with censoring. In particular, apart from modeling instances of adjustments by means of probit models, the two-step Heckman (Heckit) estimator (Heckman, 1979) has become an established model framework for the conditional analysis of censored dependent variables $y \in \{fa, fa^{(G)}, fa^{(T)}, \Delta fa\}$. The Heckit estimator consists of *i*) a first-step probit regression to determine estimated probabilities of nonzero (or uncensored) observations, that is,

$$\widehat{\text{Prob}}\,[y \neq 0] = \Phi\left(\tilde{\mathbf{x}}_{it}'\hat{\boldsymbol{\beta}}\right), \tag{5}$$

where Φ is the Gaussian distribution function, $\hat{\boldsymbol{\beta}}$ is an estimated parameter vector, and $\tilde{\mathbf{x}}_{it}$ has been defined in (4); and of *ii*) a second-step regression for noncensored observations, namely,

$$\begin{aligned} y_{it} &= E\left[y_{it}|y_{it} > 0, \tilde{\mathbf{x}}_{it}\right] + \eta_{it} \\ &= \tilde{\mathbf{x}}_{it}'\boldsymbol{\beta} + \sigma\lambda\left(\tilde{\mathbf{x}}_{it}'\boldsymbol{\beta}/\sigma\right) + \eta_{it}. \end{aligned} \tag{6}$$

In (6), $\lambda(c) = \phi(c)/\Phi(c)$ is the inverse of Mills ratio and η_{it} is a model residual. The first-step probit model obtains a feasible counterpart of (6), that is, an estimate of $\boldsymbol{\beta}/\sigma$.[14] Testing for significance of the constructed regressor $\lambda(\tilde{\mathbf{x}}_{it}'\boldsymbol{\beta}/\sigma)$ in (6) provides an implicit assessment of whether regression models explaining magnitudes of fiscal adjustment measures ($y_{it} \neq 0$) are subject to estimation biases resulting from censoring.

Apart from the consideration of the two-step estimator in (5) and (6) the censoring of narratively identified fiscal adjustments with the prime purpose of budget consolidation provides an interesting perspective on regression models to explain Δpb or $\Delta capb$, since the continuous quotes of budget consolidation ($\Delta pb, \Delta capb$), on the one hand, and narratively identified measures (fa), on the other hand, might not agree with regard to timing issues of budget conduct. In addition, narratively identified measures might show up in current output and thereby invoke issues of reverse causality. In this context, it is worth noticing that nonzero quotes of fa could be interpreted to signal particular periods of fiscal stress. Hence, to critically

TABLE 2 Descriptive statistics

		Mean	SD	Min	Max		Mean	SD	Min	Max
ov	Δpb	0.011	2.19	−17.4	19.5	$\Delta capb$	0.013	1.91	−16.7	19.0
be			0.111	−0.189	0.142			0.130	−0.190	0.274
wi			2.19	−17.2	19.7			1.91	−16.6	19.1
ov	fa	0.422	0.838	−0.750	5.23	$fa^{(G)}$	0.256	0.550	−0.290	3.76
be			0.237	0.141	0.911			0.144	0.080	0.489
wi			0.806	−1.02	4.96			0.532	−0.524	3.63
ov	$fa^{(T)}$	0.166	0.439	−0.750	3.01	Δfa	0.112	0.346	0	2.91
be			0.119	0.034	0.422			0.062	0.023	0.221
wi			0.424	−0.996	2.87			0.341	−0.109	2.82
ov	*debt*	66.35	34.02	9.710	246.2	*surp*	−3.340	3.948	−30.86	7.024
be			26.19	21.10	128.6			1.930	−6.593	1.227
wi			22.60	−9.475	183.9			3.475	−29.10	6.517
ov	r	3.47	2.41	−6.88	10.5	$\text{EMU}^{(94-14)}$	0.353	0.478	0	1
be			0.598	1.90	4.30			0.304	0	0.6
wi			2.34	−6.07	9.67			0.376	−0.247	0.753
ov	*gap*	−0.451	2.60	−8.75	11.0	*open*	0.400	0.490	0	1
be			0.936	−2.09	2.06			0.057	0.286	0.457
wi			2.43	−9.26	8.52			0.487	−0.057	1.11
ov	*ifi*	363.5	496.4	28.21	4067.9	*trade*	67.3	35.6	16.0	208.2
be			314.7	118.9	1359.3			33.9	22.8	139.7
wi			391.1	−830.4	3072.1			13.5	21.4	135.7
ov	*elec*	0.160	0.294	0	0.997	*ideo*	5.62	1.77	2.60	8.80
be			0.053	0.071	0.232			0.816	4.24	8.00
wi			0.290	−0.072	1.01			1.58	2.72	8.50

Note: Mean, standard deviation (SD), minimum (min), and maximum (max) for three data dimensions, tht is, "ov" (overall), "be" (between), and "wi" (within). The number of available observations is at most 595 (17 countries, 35 years). For variable definitions and further information see Table 1.

revisit pooled regression outcomes (and the potential of reversed causality), it is interesting to run regressions for Δpb and $\Delta capb$ conditional on such periods of fiscal stress ($fa \neq 0$).

3.5 | Details on generalized method of moments (GMM) regressions

Fiscal adjustments likely reduce current GDP and, hence, the output gap. Reversely, an increase in the output gap is likely to show up in an increase of GDP growth which, in turn, increases public revenues and thereby improves the primary balance. To account for potential

endogeneity of the output gap for current fiscal adjustments, we employ instrumental information inherent in predictors of the output gap and additional internal data-based instruments in the spirit of Lewbel (2012). We next briefly sketch the generation of the external and internal instruments.

An instrumental variable for the output gap obtains in the form of in-sample estimates from a regression of the (within transformed) output gap on a trend and lagged values of (within transformed) real interest rates, real GDP per capita, unemployment, budget surplus and debt. The degree of explanation from this regression is 64.43% and the correlation between output gap and its predictor is 0.80. Seeing that valid instrumentation with purely external information is difficult to obtain in many realistic model frameworks, Lewbel (2012) suggests to develop internal instruments in a data based manner from specific higher order orthogonality conditions. In our case, model residuals u_{it} (η_{it}) might share common unobserved factors with residuals inherent in conditioning schemes for the output gap. Let v_{it} denote approximation errors that apply to regression designs for gap_{it}. The coefficient attached to gap_{it} in (4) (or similarly in (6)) is identified if instruments $\mathbf{w}_{it}$ are available such that $\mathrm{Cov}[\mathbf{w}_{it}, u_{it}^2] \neq 0$, $\mathrm{Cov}[\mathbf{w}_{it}, v_{it}^2] \neq 0$ and $\mathrm{Cov}[\mathbf{w}_{it}, u_{it}v_{it}] = 0$. These assumptions allow to generate $(\mathbf{x}_{it} - E[\mathbf{x}_i])v_{it}$ as (additional) instruments for regression models in the form of (4) (or similarly for (6) when replacing u_{it} by η_{it}) where the vector $\mathbf{x}_{it}$ collects the exogenous regressors.[15] We consider the described predictor of the output gap as a further suitable external instrument and use the Stata module "ivreg2h" (Baum & Schaffer, 2012) for IV estimation using the additional generated instruments (with options "gmm2s" and "robust").

4 | RESULTS

As documented in columns 2–5 of Table 3, changes in the (cyclically adjusted) primary budget balance in period t ($\Delta(ca)pb$) respond negatively and with high significance to the occurrence of a budget surplus in the period before ($t-1$). Mostly significant effect estimates imply that budget balance adjustments are counter-cyclical. The primary balance deteriorates in election years (for similar findings see Afonso & Hauptmeier, 2009; Ioannou & Stracca, 2014), while the corresponding result is insignificant for the cyclically adjusted budget balance. Government ideology has no impact on the magnitude of changes in primary public balances which is in line with results in Herwartz and Theilen (2021). With few exceptions, the analysis of the unconditional models for Δpb and $\Delta capb$ obtains quite similar results to that of the models with subsampling periods for which $fa \neq 0$. This indicates that the analysis of these measures is hardly subject to (strong) endogeneity biases.

Probit regression results are displayed in column six of Table 3. The probability of fiscal adjustments with the prime purpose of budget consolidation increases significantly in response to the realization of a budget deficit and to high levels of public debt. Unlike its relevance for the adjustments of primary budget balances, the current state of the business cycle has no impact on the occurrence of fiscal measures of budget consolidation. With regard to their magnitude, fiscal adjustments with the prime purpose of budget consolidation increase significantly with the degree of integration in international good markets and are larger when real interest rates are relatively high. Surprisingly, fiscal adjustments have been of smaller magnitude in more indebted countries indicating that fiscal adjustments have been primarily used to consolidate the budget balance in the short and mid-run and not to reduce public debt in the long-run. Moreover, data censoring could be a source of potential estimation bias, since the inverse Mills ratio obtains a parameter estimate that is highly significant.

TABLE 3 Effectiveness of the SGP

	Δpb	Δpb $fa \neq 0$	$\Delta capb$	$\Delta capb$ $fa \neq 0$	p $(fa \neq 0)$	fa
Output gap	0.089	0.234**	0.217***	0.315***	−0.003	−0.040
	(1.630)	(2.562)	(3.953)	(2.879)	(−0.122)	(−1.133)
Lagged surplus	−0.228***	−0.298***	−0.209***	−0.278***	−0.158***	−2.1E-4
	(−6.887)	(−4.768)	(−6.722)	(−4.099)	(−7.030)	(−0.010)
Lagged debt-to-GDP	0.007	0.015	0.007	0.013	0.007**	−0.008***
	(1.578)	(1.378)	(1.558)	(0.914)	(2.242)	(−2.817)
Lagged real interest rate	0.017	0.086	0.009	0.171	−0.010	0.106***
	(0.278)	(0.791)	(0.137)	(1.638)	(−0.336)	(2.599)
Lagged openness	−0.053	0.606	0.099	1.186**	−0.275	0.623***
	(−0.179)	(1.042)	(0.352)	(2.198)	(−1.644)	(3.160)
Election year	−0.586***	−0.399	−0.724***	−0.617*	−0.281	0.056
	(−3.129)	(−1.206)	(−4.190)	(−1.853)	(−1.393)	(0.279)
Government ideology	−0.038	−0.067	−0.002	0.014	−0.013	0.008
	(−0.950)	(−1.208)	(−0.053)	(0.241)	(−0.345)	(0.241)
$EDS^{(94-14)} \times$ lagged surplus	−0.067	−0.072	−0.096*	−0.088	−0.145***	−0.040**
	(−1.099)	(−1.007)	(−1.895)	(−1.420)	(−4.942)	(−2.353)
Inverse Mills ratio						−0.963***
						(−4.438)
Constant	0.013	−0.053	−0.118	−0.334	−0.380***	1.494***
	(0.078)	(−0.144)	(−0.764)	(−1.066)	(−4.353)	(6.774)
R^2	23.37	22.50	21.78	15.58	20.25	33.43
# obs.	525	205	481	186	569	215

Note: Columns labeled with $\Delta(ca)pb$ document GMM estimation results for pooled regression models. In columns 3 and 5 ($fa \neq 0$) pooling applies to observation indices with nonzero observations for fa. Probit estimates (first step of Heckit estimation) are provided in Column 6. Column 7 documents GMM estimates for second-step Heckman regressions applied to narratively identified fiscal adjustments. t-ratios in parentheses. R^2 indicates the degree of explanation in regression models and the pseudo for probit models.

Abbreviations: GMM, generalized method of moments; SGP, Stability and Growth Pact.

Significant estimates are indicated by means of stars, that is, *$p < .10$, **$p < .05$, ***$p < .01$.

In sum, we can conclude that the informationally rich set of control variables show sound effect directions on budget balance changes or fiscal adjustments. Unreported diagnostic results that are available from the authors upon request support the selection of external and internal instruments. Specifically, instruments do not suffer from endogeneity (Hansen test) with conventional significance and hypotheses of weak instrumentation (Kleibergen test) can be rejected with high significance throughout. We next turn to the assessment of the hypotheses raised in Section 2, that is, effect estimates for the EDS variable and its interactions with the business cycle.

4.1 | Effectiveness of the SGP (H1)

Estimation results documented in Table 3 permit a first assessment of Hypothesis H1. Owing to the definition of the EDS variable (i.e., SGP membership interacted with budget surplus lagged by one period) the negative coefficient estimates signify that, on average, stronger budgetary adjustments have taken place under the SGP. A consideration of the adjustment measures Δpb and $\Delta capb$ reveals that EDS under the SGP regulation lacks a significant impact on the former (Δpb) while it exerts a negative impact on the latter ($\Delta capb$) with minor significance. These results largely align with findings of Ioannou and Stracca (2014). Instead, fiscal measures whose primary motive is to reduce budget deficits (*fa*) increased under the SGP with 5% significance. This holds for both the frequency and the magnitude of fiscal adjustments.

The inconclusiveness of effect estimates might explain that while some authors believe that the SGP has effectively led to more budget discipline (e.g., Buiter et al., 1993; Truger, 2013), others maintain by contrast that it had no significant impacts (e.g., Beetsma & Debrun, 2007; Schuknecht et al., 2011). Our results point to a possible explanation for this discrepancy in the assessment of the effectiveness of the SGP by indicating that it has effectively increased the scope for discretionary policy measures which, however, has traded off other consolidation and stimulus policies through ad-hoc budget execution. Therefore, fiscal adjustments have considerably augmented under the SGP while the structural and the primary budget balance have remained mostly unaffected by the EDS rules. Another possible explanation for our result would be that the CAPB approach is not precise enough to identify fiscal adjustments. In this line of reasoning, Guajardo et al. (2014) argue that an important drawback of the CAPB approach is that it suffers from weak identification and endogeneity bias as "changes in cyclically-adjusted fiscal variables often include nonpolicy changes correlated with other developments affecting output," which makes the CAPB approach prone to overstate expansionary effects. However, and noticing that measurement errors in the identification of the CABP do not outweigh ad-hoc fiscal stimulus policies that distinguish the CAPB from *fa*, we consider the first explanation as more relevant. Therefore, we confirm H1 in that the SGP has effectively raised the scope for policy measures of budget consolidation as identified by the narrative approach. In contrast, considering the full time period 1994-2014, the SGP has been largely ineffective regarding adjustments of the structural and the primary budget balance ($\Delta capb$ and Δpb).

4.2 | Effectiveness of the SGP over time (H2)

The results shown in Table 4 provide insights about the evolution of the effectiveness of the SGP over time, that is, an assessment of Hypothesis H2. As it turns out the former assessment of the overall, that is, time-invariant, effectiveness of the SGP has to be revised for particular episodes of fiscal or monetary policies. For the period before the establishment of the EMU (1994–1998) we do not find any impact of the EDS mechanism on $\Delta capb$ or *fa* with 5% significance, while adjustments of the primary budget balance (Δpb) have been stronger under SGP regulations. Unsurprisingly, adjustments of the primary and the structural budget balance (Δpb, $\Delta capb$) and discretionary fiscal measures (*fa*) do not reflect effectiveness of the SGP during the 2 years following the great financial crisis (i.e., 2009 and 2010) as the EDS was not effectively applied in these years (Schuknecht et al., 2011). Regarding the narratively identified fiscal measures *fa*, the results in Table 4 indicate that the effectiveness of the SGP observed in

TABLE 4 Effectiveness of the SGP over time

	Δpb	Δpb $fa \neq 0$	$\Delta capb$	$\Delta capb$ $fa \neq 0$	p ($fa \neq 0$)	fa
Output gap	0.079	0.255***	0.181***	0.310***	0.012	−0.082**
	(1.579)	(3.661)	(3.896)	(4.104)	(0.400)	(−2.248)
Lagged surplus	−0.240***	−0.332***	−0.198***	−0.243***	−0.174***	−0.020
	(−8.604)	(−7.607)	(−7.678)	(−4.999)	(−7.181)	(−0.833)
Lagged debt-to-GDP	0.003	0.011	0.004	0.009	0.006*	−0.006**
	(0.901)	(1.567)	(1.225)	(1.114)	(1.860)	(−2.270)
Lagged real interest rate	0.054	0.093	0.070	0.109	0.018	0.153***
	(1.217)	(1.431)	(1.595)	(1.530)	(0.545)	(3.690)
Lagged openness	0.095	0.352	0.215	0.470	−0.652***	0.699***
	(0.432)	(0.861)	(1.149)	(1.173)	(−3.365)	(3.747)
Election year	−0.616***	−0.133	−0.662***	−0.461	−0.220	−0.068
	(−3.013)	(−0.361)	(−3.642)	(−1.294)	(−1.044)	(−0.372)
Government ideology	−0.044	−0.101*	0.001	−0.003	−0.010	0.015
	(−1.008)	(−1.704)	(0.032)	(−0.059)	(−0.251)	(0.499)
EDS $^{(94-98)}$ × lagged surplus	−0.103**	−0.017	−0.043	−0.020	−0.029	−0.055*
	(−2.283)	(−0.402)	(−0.985)	(−0.463)	(−0.754)	(−1.730)
EDS $^{(99-08)}$ × lagged surplus	−0.120***	−0.159**	−0.100***	−0.084	−0.259***	−0.057
	(−2.760)	(−2.187)	(−2.626)	(−1.166)	(−3.964)	(−1.190)
EDS $^{(09-10)}$ × lagged surplus	0.309	0.215	0.237	0.220	−0.131*	−0.017
	(1.504)	(0.995)	(1.295)	(1.045)	(−1.804)	(−0.462)
EDS $^{(11-14)}$ × lagged surplus	−0.261***	−0.270***	−0.346***	−0.326***	−3.233**	−0.038
	(−4.413)	(−4.420)	(−7.232)	(−5.975)	(−2.027)	(−1.497)
Inverse Mills ratio						−0.611***
						(−4.212)
Constant	−0.065	−0.078	−0.182*	−0.084	−0.365***	1.029***
	(−0.590)	(−0.411)	(−1.749)	(−0.443)	(−4.051)	(6.470)
R^2	35.88	43.40	40.66	43.86	28.41	32.91
# obs	525	205	481	186	569	215

Note: For further notes see Table 3.

Table 3 for the probability of fiscal adjustments stems mainly (and significantly) from the period after the introduction of the Euro (1999–2008) and from the period after recovery from the great financial crisis (2011–2014). Interestingly, both periods are also characterized by significant and sizeable adjustments of the primary and the structural budget balance.

From these findings two conclusions can be derived. First, considering that the CAPB approach yields a sufficiently precise measurement of the structural balance, we can conclude that the overall insignificant results documented in Table 3 hide important time-specific characteristics. In this regard the unconstrained inclusion of post crisis budget adjustments appears crucial for the overall evidence documented in Table 3 for all model specifications (i.e., for Δpb, $\Delta capb$, and fa). A second conclusion of our results is that the 2011 reform of the SGP has indeed been effective in imposing stricter enforcement and less flexibility with regard to budget consolidation measures. Under this perspective, the coincidence of this time span with long-lasting recession periods after the financial crisis in 2008 in most EU economies explains some of the recent criticisms of the SGP (e.g., Auerbach & Gorodnichenko, 2017). Summarizing these insights, we cannot confirm Hypothesis H2 stating that the SGP has lost its effectiveness since the introduction of the Euro. Instead, budget consolidation policies were particularly effective after 2011.

4.3 | Counter-cyclicality of fiscal adjustments under the SGP (H3)

With the results in Table 5 we test Hypothesis H3 and examine the question whether the EDP under the SGP has contributed to make fiscal policy more or less counter-cyclical. For this

TABLE 5 Counter-cyclicality of fiscal adjustments under the SGP

	Δpb	Δpb $fa \neq 0$	$\Delta capb$	$\Delta capb$ $fa \neq 0$	p $(fa \neq 0)$	fa
Output gap	0.120**	0.255***	0.153***	0.305***	0.013	−0.114***
	(2.456)	(3.661)	(3.489)	(4.214)	(0.431)	(−3.553)
Lagged surplus	−0.253***	−0.317***	−0.195***	−0.238***	−0.175***	−0.035
	(−9.250)	(−7.169)	(−7.717)	(−4.818)	(−7.213)	(−1.351)
Lagged debt-to-GDP	0.003	0.010	0.003	0.007	0.006*	−0.004
	(0.834)	(1.398)	(0.960)	(0.848)	(1.739)	(−1.468)
Lagged real interest rate	0.044	0.037	0.062	0.069	0.016	0.139***
	(0.998)	(0.650)	(1.392)	(1.018)	(0.480)	(3.335)
Lagged openness	0.097	−0.034	0.212	0.250	−0.673***	0.542***
	(0.449)	(−0.109)	(1.135)	(0.688)	(−3.434)	(2.886)
Election year	−0.610***	−0.179	−0.690***	−0.475	−0.276	−0.083
	(−3.002)	(−0.497)	(−3.814)	(−1.389)	(−1.290)	(−0.435)
Government ideology	−0.034	−0.074	−0.003	−0.001	−0.012	0.005
	(−0.783)	(−1.319)	(−0.077)	(−0.019)	(−0.294)	(0.180)
EDS $^{(94-98)}$ × lagged surplus	0.019	0.104	−0.061	−0.004	−0.003	−0.076***
	(0.203)	(0.344)	(−0.655)	(−0.013)	(−0.042)	(−3.132)
EDS $^{(99-08)}$ × lagged surplus	−0.114***	−0.143*	−0.110***	−0.025	−0.259***	−0.106**
	(−2.712)	(−1.866)	(−2.817)	(−0.323)	(−3.923)	(−2.213)

TABLE 5 (Continued)

	Δpb	Δpb $fa \neq 0$	$\Delta capb$	$\Delta capb$ $fa \neq 0$	p $(fa \neq 0)$	fa
EDS $^{(09-10)}$ × lagged surplus	0.274	0.268	0.294	0.211	−0.134*	−0.025
	(1.358)	(1.228)	(1.620)	(0.992)	(−1.837)	(−0.671)
EDS $^{(11-14)}$ × lagged surplus	−0.204***	−0.231***	−0.309***	−0.297***	−17.969	−0.073
	(−3.854)	(−3.636)	(−5.222)	(−4.007)	(−0.040)	(−1.249)
EDS $^{(94-98)}$ × lagged surplus × sign (output gap)	0.134	0.137	−0.008	0.012	0.033	−0.026
×	(1.427)	(0.454)	(−0.083)	(0.041)	(0.494)	(−1.438)
EDS $^{(99-08)}$ × lagged surplus × sign (output gap)	0.013	0.055	0.003	0.089	−0.013	−0.065*
×	(0.325)	(0.984)	(0.070)	(1.550)	(−0.225)	(−1.725)
EDS $^{(11-14)}$ × lagged surplus × sign (output gap)	0.078*	0.075	0.029	0.041	−16.045	−0.030
×	(1.707)	(1.285)	(0.508)	(0.601)	(−0.036)	(−0.571)
Inverse Mills ratio						−0.423**
						(−2.472)
Constant	−0.030	0.139	−0.162	0.057	−0.363***	0.867***
	(−0.277)	(0.836)	(−1.550)	(0.326)	(−4.004)	(4.679)
R^2	37.46	47.64	41.48	44.39	28.99	32.27
# obs	525	205	481	186	567	215

Note: Due to the lack of variation in "sign(output gap)" during the period 2009–2010, EDS $^{(09-10)}$ is not interacted with this variable. For further notes see Table 3.

purpose, we use the interaction terms of the sign of the output gap with the EDS variable (i.e., SGP membership interacted with lagged surplus). Owing to this definition of interaction effects, positive coefficient estimates indicate that budgetary adjustments are counter-cyclical (pro-cyclical) in models with Δpb or $\Delta capb$ (fa) as dependent variable.

We find that, generally, adjustments to the primary and the structural budget balance as well as the magnitude of fiscal adjustments have been counter-cyclical with 5% significance. Moreover, the EDS mechanism under the SGP has no significant influence on this. With 10% significance, two mild exceptions of counter-cyclical effects show up for fiscal adjustments in the period from 1999 until 2008 and changes of the primary budget balance after 2010.

As such, our results are consistent with the findings in Galí and Perotti (2003), who find that budget deficits have actually become more counter-cyclical in all industrialized countries (and not only in EMU member countries) and those of Cimadomo (2012) and Ioannou and Stracca (2014), who attest nonsignificant effects of fiscal deficit rules in the EU on the cyclicality of fiscal adjustment. While these findings reconfirm the importance of identifying the specific budget adjustment policies that are in the focus of the analysis, the evidence with

TABLE 6 Spending cuts and tax hikes under the SGP

	$P(fa \neq 0)$	fa	$P(fa^{(G)} \neq 0)$	$fa^{(G)}$	$P(fa^{(T)} \neq 0)$	$fa^{(T)}$	$P(\Delta fa \neq 0)$	Δfa
Output gap	−0.003	−0.040	−0.030	−0.049**	0.008	0.056**	−0.069**	0.015
	(−0.122)	(−1.133)	(−1.063)	(−2.312)	(0.293)	(2.100)	(−2.244)	(0.397)
Lagged surplus	−0.158***	−2.1E-4	−0.143***	−0.019*	−0.129***	0.010	−0.088***	0.027
	(−7.030)	(−0.010)	(−6.401)	(−1.737)	(−5.957)	(0.657)	(−3.774)	(1.470)
Lagged debt-to-GDP	0.007**	−0.008***	0.007**	−0.005***	0.008***	−0.008***	0.008**	−0.004
	(2.242)	(−2.817)	(2.253)	(−2.589)	(2.607)	(−3.321)	(2.463)	(−1.252)
Lagged real interest rate	−0.010	0.106***	−0.017	0.091***	−0.046	0.041	−0.014	0.080***
	(−0.336)	(2.599)	(−0.554)	(4.263)	(−1.512)	(1.643)	(−0.420)	(3.700)
Lagged openness	−0.275	0.623***	−0.207	0.267**	−0.323*	0.470***	−0.228	0.228
	(−1.644)	(3.160)	(−1.220)	(2.357)	(−1.946)	(3.766)	(−1.225)	(1.492)
Election year	−0.281	0.056	−0.096	0.019	−0.468**	0.137	−0.108	−0.084
	(−1.393)	(0.279)	(−0.475)	(0.148)	(−2.294)	(0.894)	(−0.484)	(−0.660)
Government ideology	−0.013	0.008	−0.011	−0.009	0.008	−0.009	−0.054	0.027
	(−0.345)	(0.241)	(−0.303)	(−0.479)	(0.211)	(−0.392)	(−1.321)	(1.093)
$EDS^{(94-14)} \times$ lagged surplus	−0.145***	−0.040**	−0.150***	−0.016	−0.129***	−0.001	−0.062**	−0.031***
	(−4.942)	(−2.353)	(−5.124)	(−1.636)	(−4.740)	(−0.057)	(−2.351)	(−3.531)
Inverse Mills ratio		−0.963***		−0.509***		−0.814***		−0.711*
		(−4.438)		(−4.259)		(−3.710)		(−1.727)
Constant	−0.380***	1.494***	−0.533***	0.967***	−0.469***	1.082***	−0.967***	1.341**
	(−4.353)	(6.774)	(−6.007)	(7.242)	(−5.392)	(4.706)	(−10.015)	(2.284)
R^2	20.25	33.34	19.62	41.78	16.54	9.18	13.34	31.85
# obs	569	215	569	194	569	190	569	109

Note: For further notes see Table 3.

regard to H3 is weak. Hence, the regulations of the SGP cannot be considered to have contributed to a pro-cyclical fiscal policy conduct.

4.4 | Spending cuts versus tax hikes (H4)

In Table 6 regression results for fiscal adjustments are disaggregated into those for spending cuts and tax hikes. For all probit specifications (fa, $fa^{(G)}$, and $fa^{(T)}$) the estimated interaction effects reveal that both spending cuts and tax hikes are more likely to be applied under the SGP as compared with the control group of countries that do not fall under its regulations. Assessing the magnitude of fiscal measures, the evidence is largely in line with H4. We observe that spending cuts have been more efficient in reducing budget deficits than tax hikes although both effect estimates (−1.6% for spending cuts and −0.1% for tax hikes) lack significance. From the results shown in the two rightmost columns of Table 6 we observe that spending adjustments in excess of tax hikes (Δfa) are highly significant with regard to both the likelihood and the magnitude of adjustment differences. This result leads us to confirm Hypothesis H4. Accordingly, EDS under the SGP favors spending cuts while tax hikes have not contributed significantly to achieve sizeable budget adjustments.

5 | CONCLUSIONS

Complementing the introduction of the Euro, the European SCP has become a prime example of a supranational fiscal compliance framework with the aim to guarantee the stability of the EMU. We analyze the effects of the SGP's Excessive Deficit Procedure in a cross section of 17 OECD economies over the period 1980 to 2014. The use of countries and periods that do not fall under the SGP as a "control group" allows us to assess the EDP "treatment" under the SGP by means of a difference-in-difference analysis. We provide a comprehensive view on the impact of the SGP on the budget balance by considering four different measures, namely, the primary budget balance, the cyclically adjusted or structural (primary) budget balance and, for the first time in this context, (narratively identified) budget adjustments whose prime focus is to reduce the budget deficit either through spending cuts or tax hikes. With these measures at hand, we examine the impact of the SGP with regard to (i) its effectiveness, (ii) the evolution of its effectiveness after the introduction of the Euro in 1999 and after the 2008 financial crisis, (iii) the cyclicality of fiscal adjustments, and (iv) its relative propensity for spending cuts as compared with tax hikes.

Our findings can be summarized as follows. First, while the SGP has effectively boosted those budget consolidation measures identified by means of the narrative approach, an impact on the structural and the primary budget balance can neither be confirmed nor rejected. Second, the effectiveness of the EDS under the SGP is characterized by considerable time heterogeneity. All measures indicate that budget consolidation policies under the SGP were particularly effective during the period 1999–2008 and after 2011. Third, we obtain that all of our measures (with some heterogeneity in the identification of specific time periods) indicate that the regulations of the SGP have not contributed to make fiscal policy more pro-cyclical. Finally, fiscal consolidation under the SGP favors spending cuts, which, until recently, were considered less costly in terms of future growth prospects in comparison with tax hikes of equivalent magnitude. As a general insight, our analysis has highlighted the importance of

distinguishing and identifying specific measures of the budget balance in the assessment of fiscal consolidation regulation. New identification tools such as narratively identified budget consolidation policies targeted in this study or in line with proposals by Yang et al. (2015) enable a deeper understanding of the fiscal outcomes of fiscal compliance regulation.

With regard to policy implications, our analysis points out that the SGP as an example of an international fiscal compliance regulation has had positive and negative aspects. Positive are its effectiveness in targeting specific fiscal consolidation measures to limit excessive deficits. Negative aspects are a possible trade-off with other budget stimulus and contraction policies. The SGP is neutral as regards to the future growth impact of the attested shift from less tax hikes to more spending cuts and the nonattested increase of counter-cyclicality of fiscal policy. These aspects in particular will require the attention of policy-makers in the aftermath of upcoming recessions caused by the Coronavirus pandemic, when fiscal stimulus will come into serious conflict with budget consolidation targets.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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ENDNOTES

[1] Alesina and Perotti (1995) classify available approaches into (i) models based upon opportunistic policy makers and naive voters with "fiscal illusion"; (ii) models of intergenerational redistributions; (iii) models of debt as a strategic variable, linking the current government with the next one; (iv) models of dispersed interests either within coalition governments or across regions; and (v) models emphasizing the effects of budgetary institutions.

[2] For details on the SGP, see European Commission (2019).

[3] The SGP was approved in 1997. The "preventive arm" and the "corrective arm" entered into force on July 1, 1998, and January 1, 1999, respectively.

[4] A minor reform of the SGP in 2013, the so-called "two-pack," aimed to improve budgetary coordination and surveillance as achieved by the six-pack. For example, countries that had received money from the macroeconomic financial assistance program were obliged to submit quarterly reports for corrective actions until the repayment of at least 25% of borrowed money.

[5] In the case of the SGP, other aspects that have been analyzed are its impact on accounting practices (Alt et al., 2014; von Hagen & Wolff, 2006; Milesi-Ferretti, 2004) or the political economy of the SGP (e.g., Baerg & Hallerberg, 2016).

[6] The country and time period selection is due to data availability for narratively identified fiscal adjustments.

[7] Specifically, the relationship between *capb*, *pb* and *fa* is

$$\begin{aligned} capb &= pb/GDP - \epsilon \cdot gap \\ &= fa + fp + \nu, \end{aligned}$$

where ϵ is the (estimated) semi-elasticity of the budget balance to the business cycle, *gap* is the output gap, *fp* are other fiscal consolidation and stimulus policies affecting the structural budget balance, and ν are measurement errors.

[8] Notice, that inappropriately scored or unannounced consolidation and expansion measures are not considered in *fa* but form part of the *capb*.

[9] Election dates refer throughout to parliamentary elections, except for the United States where the election date refers to presidential elections.

[10] Denmark, Sweden, and the UK formally also belong to the SGP. However, the Treaty Protocol No. 15 exempts the UK from the obligation to avoid excessive general government deficits, as it does not belong to the EMU. For the same reason, Denmark and Sweden also have received a specific treatment under the SGP as these countries were not subjected to possible fines and, consequently, did not have the same incentives to comply with the debt and deficit rules of the SGP. Therefore, we do not consider these countries to belong to the EDS group.

[11] It has been widely recognized that a large budget deficit is far more problematic than exceeding the 60% debt mark. In practice, a debt above 60% was considered as "admissible" as long as the debt ratio was sufficiently diminishing (see e.g., European Commission, 2019). Therefore, we consider only the interaction with the budget deficit to test the effectiveness of the EDS mechanism.

[12] For a study based on ex-ante data see, for instance, Cimadomo (2012).

[13] Some fiscal measures are net expansive. Throughout small negative quotes for *fa*, $fa^{(G)}$, and $fa^{(T)}$ occur with frequencies of 1.51%, 1.17%, and 4.37%, respectively.

[14] In comparison with the Tobit model, the two-step Heckman estimator is considered less sensible to violations of the strong distributional assumptions (conditional Gaussianity, homoskedasticity) which are hardly reasonable in pooled panel data. For the second step model in (6) one might use generalized least squares estimation, however, we evaluate the model by means of robust ordinary least squares estimation.

[15] See Lewbel (2012) for a detailed discussion of identification via heteroskedasticity.

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