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* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

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Fiscal discipline in EMU? Testing the effectiveness of the Excessive Deficit Procedure*

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Abstract

The Excessive Deficit Procedure (EDP), central to the Stability and Growth Pact, is criticized for both its procyclical effects and – in contrast – a perceived lack of enforcement. To test its actual effects, we construct a real-time database of EDP recommendations and estimate augmented real-time and ex-post fiscal reaction functions for a panel of EMU member states. We find that a 1% of GDP larger EDP recommendation leads to close to 1% of GDP of additional fiscal consolidation plans, and around 0.8% of actual consolidation. For countries in financial support programs we find that, while they did implement substantial consolidation measures, required and delivered consolidation efforts are less connected. Overall, our results suggest that EDP recommendations have substantially shaped euro area fiscal policy, especially in the years 2010-2014, when EDP recommendations were both largest and most frequent.

Keywords: EMU; Stability and Growth Pact; fiscal policy; real-time data.
JEL classifications: E02, E62, F45, H30, H68.

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1 Introduction

The European Economic and Monetary Union (EMU) combines centralized monetary policy with fiscal policy at the national level. With monetary policy responding only weakly to the economic circumstances in individual countries, it was recognized early on that this could incentivize countries to run overly expansionary fiscal policies (see EC, 1990). Furthermore, it was suspected that the counterforce against unsustainable fiscal policy provided by market forces "might either be too slow and weak or too sudden and disruptive" (Delors, 1989). For these reasons, the Maastricht Treaty of 1992 introduced supranational fiscal rules in the form of the (in)famous 3% and 60% thresholds for the budget deficit and the debt, respectively.

European fiscal rules were operationalized in 1997 in the Stability and Growth Pact (SGP). As the concerns regarding market discipline proving prescient (Buti and Carnot, 2012; De Grauwe and Ji, 2012), the importance given to EMU's supranational fiscal rules only increased over time. Notwithstanding amendments to the SGP in 2005 and 2011, the 3%-threshold for the government budget deficit has played a pivotal role throughout.[1] In short, countries whose budget deficit exceeds or is projected to exceed 3% of GDP end up in the Excessive Deficit Procedure (EDP), where they receive binding recommendations on the annual fiscal adjustments to be undertaken. Countries failing to live up to these recommendations can, eventually, be fined.

The SGP, in particular the 3%-rule and its focus on cutting back high deficits rapidly, has been criticized from opposite ends. Some view the SGP and its EDP recommendations as an unwelcome restriction, limiting the scope for fiscal stabilization at the national level (e.g. Buiter et al., 1993; Bofinger, 2003; Truger, 2013). Others, however, question whether the SGP and its procedures have any actual disciplining power, as deadlines for reducing deficits below 3% of GDP are regularly missed and fines have never been imposed (Schuknecht et al., 2011).

Remarkably, the effect of EDP recommendations on the fiscal behavior of EMU member states has never been analyzed in a direct manner. Some authors use the 3% threshold to define the applicable fiscal governance regime, generally finding that at least forecasted deficits fall faster when this threshold is exceeded (Beetsma and Giuliodori, 2009; Cimadomo, 2012; Frankel and Schreger, 2013). However, this does not do justice to the fact that EDP recommendations vary in size and timing between countries, depending on e.g. economic circumstances.[2] Other papers infer the effectiveness of European fiscal rules from a comparison of fiscal policy before and after the introduction of the SGP, or between countries in- and outside the euro area.[3] These approaches are also not without complications. The introduction of the SGP was not a standalone event and the run-up to EMU hardly qualifies as neutral benchmark, given that it was characterized by a fiscal push to meet the convergence criteria.

In this paper we take a different route and directly analyze the impact of EDP recommendations on forecasted and actual fiscal policy. On the basis of a simple model of government

[1] The 60%-threshold for government debt effectively was irrelevant before the 2011 reform. Even after this reform, the main focus has been on adherence to budget balance rules. See De Haan et al. (2016).

[2] For example, despite deficits surging to levels well beyond 3% of GDP in 2009 in many European countries, most of them were invited to provide fiscal stimulus in 2009/10 and were not required to consolidate before 2011.

[3] See e.g. Hughes Hallett and Lewis (2008), Ioannou and Stracca (2014) and Caselli and Wingender (2018).

behavior in the face of EDP recommendations, we hypothesize that i) recommendations will induce governments to consolidate, ii) recommendations will induce countries to forecast a larger adjustment than delivered, and iii) medium-sized recommendations will be obeyed best.

To bring these hypotheses to the test, we construct a new real-time database of all country-specific EDP recommendations since the introduction of the euro, taking account of the fact that recommendations are often revised and changed. Additionally, we expand the real-time database of the European Commissions (EC) its fiscal forecasts constructed by Gilbert and De Jong (2017) to include EC Autumn Forecasts, and three additional years of data. We use this to estimate both real-time and ex-post fiscal reaction functions for a panel of EMU member states over the period 1999-2017. To capture the usual determinants of fiscal policy, we allow discretionary fiscal policy to react to the past budget deficit, the debt level, the output gap, and planned elections, to account for potential political business cycles. Then we include EDP recommendations applicable at a specific forecast vintage as an additional explanatory variable, to provide a first indication of whether EDP recommendations affect fiscal policy once regular determinants are controlled for.

Countries in an EDP, however, almost by definition have budget deficits exceeding 3% of GDP. High deficits may be correlated with factors inducing a change in fiscal behavior other than EDP recommendations. We control for such factors in three ways. First, we allow the effect of recommendations to be different for countries in financial support programs. Countries receiving financial support may be subject to a more stringent fiscal governance regime, and generally went through hard economic times. Secondly, we control for interest rate spreads, which have been found to correlate with being in an EDP (Diaz Kalan et al., 2018). Thirdly, to the extent that deficits above 3% might solicit a change in fiscal behavior for any remaining reasons, we allow the shape of the fiscal reaction function to vary with the level of the deficit.

We find that EDP recommendations significantly affect both planned and actual fiscal policy. A 1% of GDP larger EDP recommendation leads to close to 1% of GDP of forecasted additional fiscal consolidation, and 0.8% of actual consolidation. The split between countries in- and out of financial support programs turns out to be important: for the former group we find that, while they implemented substantial consolidation measures, the exact amount was relatively disconnected from the adjustment demanded. Moreover, while we find some evidence of market discipline and of a non-linear reaction of fiscal policy to the level of the deficit, this does not affect our estimated effect of EDP recommendations. Our results are also robust to a number of sample and specification choices.

We then go on to provide suggestive evidence that 'medium-sized' recommendations are lived up better than either small or large recommendations. Non-compliance with small recommendations can arguably be relatively easily set aside as the result of data measurement problems, while large required adjustments are too painful to be carried out in full.

Overall, our results suggest that the SGP cannot be dismissed as being ineffective: EDP recommendations have had a significant effect on fiscal policy in EMU member states. This implies that in particular in the post-2009 period, when a large majority of member states was

subject to an EDP, the SGP has shaped euro area fiscal policy. However, whether the SGP in its current form is a desirable way of disciplining member states requires more research into the effects of the SGP on macroeconomic stabilization as well as into the effectiveness and consequences of the newer elements of the SGP, such as the debt-brake and the preventive arm.

2 Literature review and hypotheses

2.1 The Stability and Growth Pact

A key element in the fiscal framework of the European Union (EU) is the notion of 'excessive deficits'. This was formally introduced in the Maastricht Treaty of 1992, while procedures were further clarified in the Stability and Growth Pact (SGP) of 1997 (see e.g. Artis and Winkler, 1998; Buti et al., 1998). If the planned or actual budget deficit exceeds 3% of GDP, the EC prepares a report in which it amongst others examines whether the transgression is declining and small or exceptional and temporary. If the EC considers that an excessive deficit exists or may occur, it addresses an opinion to the ECOFIN Council (hereafter: Council).[4] In forming its opinion, the EC takes into account all relevant factors, which include the medium-term economic and budgetary position of the member state. On the basis of the EC's opinion, the ministers of finance united in the Council eventually decide whether a deficit is indeed 'excessive' (see also Gilbert and De Jong, 2017).[5]

Countries that are considered to have excessive deficits, are subject to the so-called Excessive Deficit Procedure (EDP), a step-by-step procedure in which they are required to take corrective action to end the excessive deficit. The corrective action to be taken is spelled out in so-called EDP recommendations. Usually, these recommendations are quantified as required changes in the structural budget balance and include a deadline for correcting the excessive deficit.[6] In case countries do not live up to EDP recommendations, they can be sanctioned. EMU member states can be required to make a non-interest bearing deposit consisting of a fixed component of 0.2% of GDP and a variable component equal to a tenth of the difference between the deficit and the 3% threshold (with a combined maximum of 0.5% of GDP). In case of persistent non-compliance, the deposit will be converted into a fine. For non-EMU member states, no forced deposits or fines are possible. However, all EU member states (except for the United Kingdom) potentially face a temporary suspension of assistance from the Cohesion Fund in case of non-compliance.

The SGP has been reformed multiple times since its inception. In 2005 the Pact was changed to enhance the economic rationale underlying the fiscal rules and improve their flexibility (Andrle et al., 2015). A more fundamental revision took place in 2011, in response to the debt crisis in the euro area. Among other things, the debt criterion was operationalized,[7] voting rules on

[4] Treaty establishing the European Community, article 104c - 5.

[5] An excessive deficit can also be identified based on the debt-to-GDP ratio exceeding 60% - unless the ratio is sufficiently diminishing and approaching the reference value at a satisfactory pace. However, prior to the 2011 reforms the debt criterion was not operationalized and effectively played no role in European fiscal governance.

[6] If a Member State is judged to have taken effective action, but misses the deadline due to unexpected adverse economic events, the deadline may be extended (EC, 2018).

[7] Countries with debts exceeding 60% of GDP are supposed to bring down their debt by 1/20th of the excess over

sanctions were changed to increase the likelihood of sanctions actually being imposed if need be, and fiscal rules for countries with deficits below 3% of GDP were strengthened. Finally, in 2013 the 'two-pack' and the Treaty on Stability, Coordination and Governance (TSCG, often referred to as 'fiscal compact', signed by 25 countries) entered into force. Amongst others, it was prescribed that countries should establish independent fiscal councils at the national level and, underlying their fiscal forecasts, should use macroeconomic forecasts produced or endorsed by an independent body. Despite all these changes, the centrality of the 3%-threshold and the importance of the EDP procedure has remained intact.

2.2 Council recommendations and fiscal behavior

Supranational fiscal rules, such as those laid down in the SGP, aim to restrict the policy freedom of national governments. As such, they alter incentives faced by policy makers and likely affect fiscal behavior of incumbent governments. This behavioral response can take several forms, as argued by Alt et al. (2014). Most notably, fiscal rules may alter *actual* fiscal policy (e.g., Bénétrix and Lane, 2013), but also give rise to biasing fiscal forecasts (Frankel and Schreger, 2013) or, concerning realization data, to resort to creative accounting (Milesi-Ferretti, 2004).

To structure thinking about the ways in which EDP recommendations might impact government behavior, we introduce a simple model for euro area member states.[8] Our point of departure is a world without external fiscal rules. In such a setting, a government would follow its preferred fiscal policy path, balancing objectives like fiscal sustainability, macroeconomic stabilization and other political goals. As fiscal rules by definition impose limits on national policy making, we model the government's behavior in the face of these rules as a loss function.[9]

We identify three potential sources of utility loss for a government receiving an EDP recommendation. To the extent that EDP recommendations demand a more restrictive fiscal policy than preferred, implementing the required consolidation measures is politically costly. A government could therefore decide to provide less effort than required, thereby risking sanctions. An alternative way to refrain from implementing the full amount of consolidation would be to *suggest* that consolidation measures are implemented, while in reality they are not. It is likely, however, that misreporting data or biasing forecasts, once discovered, does not go without costs.

Based on the above, we postulate the following illustrative loss function for the government:

$$L^G = \frac{\alpha}{2}(\Delta BBS - \Delta BBS^*)^2 + p * S + \frac{\theta}{2}(\Delta BBS^r - \Delta BBS)^2, \alpha \geq 0, \theta \geq 0 \qquad (1)$$

with ΔBBS denoting actual fiscal adjustment, ΔBBS^* the preferred fiscal adjustment in a world without supranational fiscal rules, p the probability of getting sanctioned by the fixed

60% of GDP each year.

[8] The SGP applies to all EU member states, but incentives for EMU member states differ from those for non member states. Forced deposits or fines do not apply to non member states. In contrast, countries aiming to join EMU have strong incentives to comply: not living up to the rules could mean that accession is delayed.

[9] Of course, countries voluntarily signed up for the supranational rules. Restraint on the fiscal behavior of other eurozone member states could bring them benefits, e.g. in the form of reduced risk of bail-outs. Given other governments' behavior, it could however well be optimal for the individual government not to follow the rules.

amount S, and ΔBBS^r the reported fiscal adjustment. The probability of being sanctioned p depends non-linearly on the reported adjustment:

$$p = \begin{cases} 0 & \text{if } \Delta BBS^r \geq REC - c \\ \frac{\gamma}{2}(1 - \frac{\Delta BBS^r + c}{REC})^2 & \text{if } 0 - c \leq \Delta BBS^r \leq REC - c \\ 1 & \text{if } \Delta BBS^r + c < 0 \end{cases}$$

with $\gamma \geq 0$, $REC > c \geq 0$ and REC denoting the EDP recommendation.

The first term on the right hand side in equation 1 indicates the utility loss for the government from deviating from its preferred fiscal policy. We assume that this loss more than proportionally increases in the size of the deviation from the baseline.

The second term denotes the expected value of the sanction resulting from non-compliance, which is the product of the probability of sanctioning p and the fixed sanction S.[10] We assume p to be zero for deviations of reported fiscal adjustment from the imposed target smaller than c, and to increase continuously in the size of the deviation thereafter. As the structural budget balance is non-observable and, even ex post, measured with great uncertainty (Tereanu et al., 2014), it is likely that small deviations of measured fiscal adjustments from recommended adjustments will go unpunished.[11] The historical hesitance of ministers of finance in the Council to punish each other, also makes it unlikely that sanctions will be imposed for minor violations. Finally, we assume that a country will always be sanctioned if it engages in expansionary fiscal policy while fiscal tightening was demanded.

The third term represents the reputational costs of misrepresenting fiscal figures by submitting deliberately overoptimistic fiscal plans to the EC. While small biases may easily go undiscovered, evident cases of fraud may tarnish reputations for years. In practice, this function can be expected to be asymmetric: positive biases likely raise more suspicion than negative biases. As in our set-up a government has no incentive to under-report fiscal figures, we abstract from this asymmetry.

Figure 1 depicts the loss minimizing response for a government to an EDP recommendation.[12] If the adjustment demanded by the EC happens to be less than or in line with the government's desired fiscal stance, the recommendation will be carried out in full or even more, but the marginal adjustment induced by the recommendation is zero. Furthermore, the government will not engage in misreporting of data, as this brings potential reputational costs and no benefits.

The more interesting case occurs when the required adjustment exceeds the government's preferred adjustment. At first, a small recommendation will not invoke any reaction, since the government realizes it will not be punished for deviations smaller than c. But once government effort is sparked, the marginal response is relatively strong. At this stage, minor increases in

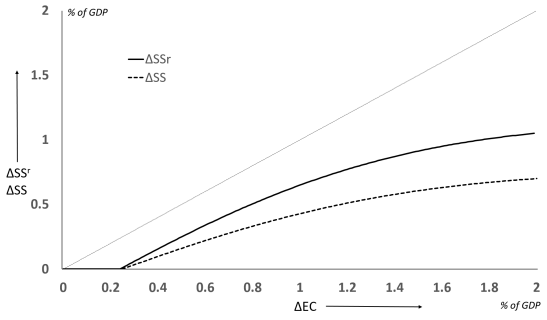
[10] While actual sanctions in the SGP have both a fixed and a variable component, what matters for our analysis is that they have a fixed maximum (0.5% of GDP).

[11] A rationale for the constant term is provided in the description of the monitoring of adherence to the preventive arm of the SGP (see EC, 2018). In the preventive arm, a country is formally allowed to deviate from the targeted change in the structural balance by 0.25% of GDP in two consecutive years or 0.5% of GDP in a single year.

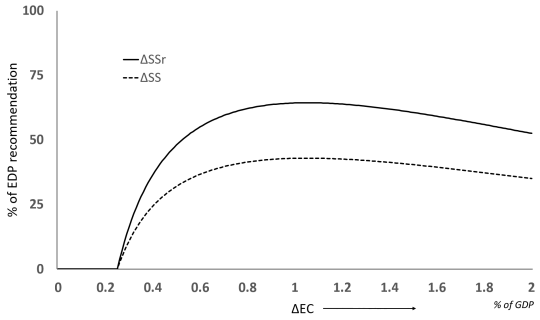
[12] For an analytical derivation of the results, see Appendix A.1.

Figure 1: A government's response to EDP recommendations

(a) Reported and actual fiscal adjustment



(b) Compliance ratio



The figure shows the reported and actual fiscal adjustment for different EDP recommendations. Parameter values: $\alpha = 1$; $\theta = 1$; $S = 1$; $\gamma = 2$; $\Delta BBS^* = 0$ and $c = 0.25$.

(reported) fiscal adjustment give large reductions in the probability of being sanctioned, while the pain of deviating from the preferred fiscal policy stance is still limited. As the recommended adjustment increases, the gains from additional consolidation in terms of reducing the probability of being sanctioned decrease. The pain of deviating from the preferred fiscal policy stance, on the other hand, increases. As a result, the marginal impact of EDP recommendations on fiscal adjustment declines.

Expressing reported and actual fiscal adjustment as a fraction of recommended fiscal adjustment, it follows that for a broad choice of parameters compliance will be between 0 and 100% (figure 1). This holds for reported as well as delivered fiscal adjustment. The impact of EDP recommendations on fiscal adjustment is largest for 'medium-sized' recommendations. Furthermore, the degree to which the recommendation is lived up to, increases in the probability of getting sanctioned and the size of the penalty, and decreases the more politically costly it is to deliver consolidation efforts (not shown).

From our model, conditional on the regular determinants of fiscal policy, we derive the following set of hypotheses:

Hypothesis 1. *EDP recommendations will induce countries to adjust fiscal policy. The recommendations will not be fully lived up to, however.*

Hypothesis 2. *EDP recommendations will induce countries to forecast a larger fiscal adjustment than eventually delivered.*

Hypothesis 3. *The fraction of required fiscal adjustment that is actually (reported to be) delivered, is largest for 'medium-sized' recommendations.*

2.3 Related literature

The restrictions placed on national fiscal policy by the Maastricht Treaty and the SGP sparked a significant theoretical literature. Initial discussions mainly centered around the need for restrictions on national fiscal policy in a monetary union, amongst others debating the likelihood

that a common central bank would come under pressure to bail out an insolvent government, and the specific form they had been given in the European case, for example discussing the constraints these rules imposed on countercyclical policy (see e.g. Buiter et al., 1993; Von Hagen and Eichengreen, 1996; Beetsma and Uhlig, 1999).

With the SGP in place, the discussion shifted to the behavioral effects induced by the 3% threshold. Milesi-Ferretti (2004) derives theoretically that fiscal rules such as those laid down in the SGP, can provide governments with an incentive to resort to creative accounting. Von Hagen and Wolff (2006) show empirically that governments in the EU indeed tend to classify fiscal measures and data in such a way that they help in adhering to the imposed rules. Alt et al. (2014) show that the extent to which European governments resort to creative accounting depends on the degree of transparency in the domestic budget process.

It is also well-documented that the SGP could provide governments with an incentive to bias fiscal forecasts, due to its (partial) focus on ex-ante compliance. Beetsma et al. (2009) focus on the implementation of multi-year fiscal plans in the EU and show that implemented fiscal adjustment indeed falls systematically short of governments' stated objective. Merola and Pérez (2013) show, based on a pre-crisis sample, that average forecast errors are larger for countries that have *ever* been under an EDP than for those that haven't. Frankel and Schreger (2013) find that governments with a budget deficit exceeding 3% of GDP often falsely forecast a rapid deficit reduction. Gilbert and De Jong (2017) show that fiscal forecasts by the EC are more optimistic when fiscal rules threaten to bind. They suspect this might be due to a nationally-induced bias, usurped by the EC given its dependence on information supplied by nationals.

A related literature surveys the effects of the SGP on actual fiscal policy in the EU or the euro area, often comparing pre- and post EMU fiscal outcomes. Mink and De Haan (2006) highlight how the SGP has failed to impede political business cycles in the euro area. Hughes Hallett and Lewis (2008) find that fiscal discipline improved in the run-up to EMU, but deteriorated in the period thereafter. In a comprehensive study, Fatás and Mihov (2010) conclude that fiscal policy in the euro area has not been very different from that observed in other countries. The introduction of the euro also did not spark significant changes. Bénétrix and Lane (2013) show that following the Maastricht Treaty of 1992 euro area fiscal policy became more countercyclical, but that this improvement was largely reversed after countries had actually joined EMU. Ioannou and Stracca (2014) evaluate the effectiveness of both the SGP and the Lisbon strategy by comparing macroeconomic outcomes before and after their application, as well as by comparing EU outcomes against those of a non-EU control group. They conclude that neither has had a beneficial impact. Caselli and Wingender (2018), applying bunching estimation, find that the 3% threshold acts as a 'magnet', increasing the number of observations around the threshold, while significantly reducing the occurrence of large budget deficits.

An important caveat with this literature is that it uses ex post data, which have often been revised significantly and might therefore lead to incorrect inference about policymaking (Croushore, 2011). Golinelli and Momigliano (2006) are the first authors to employ a quasi real-time set-up, combining realization data for the change in the cyclically adjusted budget

balance with real-time output gap data. The authors approximate required fiscal adjustment using the difference between the actual deficit and the 3% threshold. They show that this variable effectively captures the behavior of countries with excessive deficits. The reaction to past debt and budget balance levels does not change significantly pre and post EMU, and the authors also do not find evidence for a procyclical bias resulting from the SGP.

Beetsma and Giuliodori (2009) and Cimadomo (2012) are among the first fully real-time studies of euro area fiscal policy making.[13] Both papers estimate fiscal reaction functions for OECD countries, finding that while fiscal plans are countercyclical, this is less clear for fiscal outcomes. Beetsma and Giuliodori (2009) include separate dummies for budget deficits exceeding 3% in respectively the 'Maastricht' period that preceded EMU, and the EMU period. Cimadomo (2012) includes a single 3% dummy for both time periods. Both studies find that deficits exceeding 3% induce a planned fiscal tightening. In both papers, the dummies loose significance when going from plans to outcomes.

3 Data description and empirical approach

We combine a hand-collected database of the Council's fiscal recommendations with a real-time database of the European Commission's fiscal and economic forecasts. Throughout the remainder of this paper, the following notation will be used:

Subscript i = country
Subscript t = year to which the observation refers
Superscript $x : s$ = forecast vintage, with x denoting the forecast round (Spring forecast, SF, or Autumn forecast, AF) and s the year the forecast is published.

So, for example, $X_{i,t}^{AF:t-1}$ denotes the one year ahead Autumn Forecast for variable X in country i, year t. If X is the budget balance, t is 2009 and i is France, we thus have the 2008 Autumn Forecast for the French budget balance in 2009.

3.1 Fiscal forecasts and realizations

We analyze fiscal forecasts by the EC. These forecasts serve as the baseline against which EDP recommendations are set and, in a later stage, are used to judge compliance. As such, they offer the only forecasts that are fully consistent with the EDP recommendations.

For most of our sample period, official EC forecasts have been published twice a year: in Spring and in Autumn.[14] Gilbert and De Jong (2017) construct a database covering all Spring Forecasts from 1999 until 2014. We extend this database until 2017 and add all Autumn Forecasts from 1999 until 2017. The database contains, among others, the budget balance, the structural budget balance (for 2007 (Spring Forecast) or 2005 (Autumn Forecast) and earlier

[13] For a broader survey of the real-time fiscal policy literature, see Cimadomo (2016).
[14] Since 2007 these have been supplemented by interim forecasts in February/March and September. These served as updates of the more elaborate official forecasts. Since 2013, a full Winter Forecast is presented annually.

years, this is replaced by the cyclically adjusted budget balance), gross public debt, the output gap, and annual GDP growth. The dataset contains some missing observations.[15]

Spring Forecasts are published in April or May. They contain a forecast for the current year, as well as a one-year ahead forecast. As budgets for the next year usually pass parliament in the fall of the year before, the one-year ahead Spring Forecasts generally do not yet include fiscal measures. Spring Forecasts furthermore contain realization data for the past four years. Autumn Forecasts are usually published in November. They contain forecasts up to two years ahead, as well as realization data up to four years back. As fiscal plans for next year in many cases have been approved by the time of publication of the Autumn Forecast, the one year ahead fiscal forecasts do take fiscal plans into account. However, this is not always the case. If plans are not approved before the Autumn Forecast cut-off date, the Spring Forecast for the current year will be the first forecast vintage to fully incorporate fiscal plans.

In our baseline analysis, we focus on one-year ahead and current year forecasts from the Spring and Autumn Forecasts. These are the most interesting vintages from a policy making perspective, as they show the evolvement from no-policy (or at least little policy) to full-policy forecasts and they provide the relevant figures with respect to the monitoring of SGP-rules. Furthermore, we take aboard the first vintages of 'realization' data from the published forecasts, i.e. the year $t+1$ Spring and Autumn Forecasts for year t. The first of these vintages offers the first ex-post estimate of whether a country has complied with the recommendations, and is also used by the EC for those purposes. However, the very fact that this number is used to judge compliance, means that incentives could exist for countries to present overoptimistic fiscal data. The Autumn Forecast realization figures are the first figures that have been published in the National Accounts and should suffer less from this problem.

Apart from EDP recommendations, which will be discussed in the next section, we also use other data. Data on long-term government interest rates are obtained from the European Central Bank (ECB).[16] We use these to calculate interest spreads vis-à-vis German bonds, arguably the safest asset in the euro area.[17] Budget semi-elasticities, used to translate fiscal adjustment defined as changes in the actual budget balance into changes in the structural budget balance, are taken from Girouard and André (2005) and EC (2009). A matrix of trade weights for the EU is obtained from the ECB's Statistical Data Warehouse.[18] We use these in constructing our instruments for the output gap. Data on planned elections, i.e. elections that take place after an incumbent government has completed its term, come from the Döring and Manow (2018) database. Table A.1 in the Appendix provides some descriptive statistics.

[15] The 2000 Autumn Forecast lacks estimates for the output gap in the current or next year. In the Autumn Forecast of 2002 and the Spring Forecast of 2003 no forecasts for the output gap and cyclically adjusted budget balance in Luxembourg were published. In the Autumn Forecast of 2003 data on the output gap in Luxembourg is missing. The Spring Forecasts of 2014 and 2015 lack a forecast for the structural budget balance in Portugal.

[16] Interest data are not available for Estonia, as the relevant sovereign debt securities do not exist.

[17] Dunne et al. (2007) provide evidence for the benchmark role of German Bunds in the ten year segment.

[18] Data are available for the years up to 2013. For later years, unchanged weights are assumed.

3.2 Database of EDP recommendations

Countries subject to an EDP are required to take corrective action. On a proposal from the EC, the Council lays out the size of the fiscal adjustment to be delivered in so-called 'recommendations'. All recommendations are published on the EC's website.

Recommendations can be issued, and revised, throughout the year, though most of the recommendations are issued following either the Spring or Autumn Forecast. We include all recommendations, and updates thereof, in a single database, which we then make consistent with the timing of our real-time fiscal database. That is, we only consider a recommendation relevant to a forecast if the recommendation was adopted by the Council before the forecast date. For example, if the EC in June of year $t-1$ (that is, after publication of the Spring Forecast) recommends country i to improve its structural budget balance by 1% of GDP in year t, this recommendation is taken into account from the Autumn Forecast of year $t-1$ onwards.

In most recommendations, fiscal adjustment is defined in terms of the required improvement in the cyclically-adjusted or, more recently, structural budget balance.[19] However, in a small number of cases, relating to Greece and Cyprus during the crisis years, targets for the nominal budget balance were provided. In order to express nominal budget balance targets into changes in the structural budget balance, we apply the following simple formula:

$$\widehat{REC_{i,t}} = \Delta BB_{i,t}^{REC} - \epsilon_{i,t} * (OG_{i,t} - OG_{i,t-1}) \tag{2}$$

where $\widehat{REC_{i,t}}$ is the derived EDP recommendation for the change in the structural budget balance, $BB_{i,t}^{REC}$ is the recommended target for the nominal budget balance; $\epsilon_{i,t}$ is the country's budget semi-elasticity, measuring the response of the nominal budget balance to a change in the output gap; and $OG_{i,t}$ is the output gap. We thus correct the implied recommended change in the nominal budget balance for year t for the expected change in the output gap. This leaves us with changes in the cyclically adjusted budget.[20] In as far as possible, we use the projected change of the output gap at the time the recommendation was issued.[21]

The first EDPs were opened in 2003, for France and Germany. Up to 2017, 22 EDPs have been launched for EMU member states. As within an EDP fiscal recommendations can be revised and the adjustment period prolonged, in total 46 (revised) multi-annual recommendations were put in place. These 46 recommendations encompassed 88 targets for individual country-year combinations. As figure 2 shows, the average required fiscal adjustment in the EMU as a whole peaked during the crisis years, reaching almost 1% of GDP in 2012.

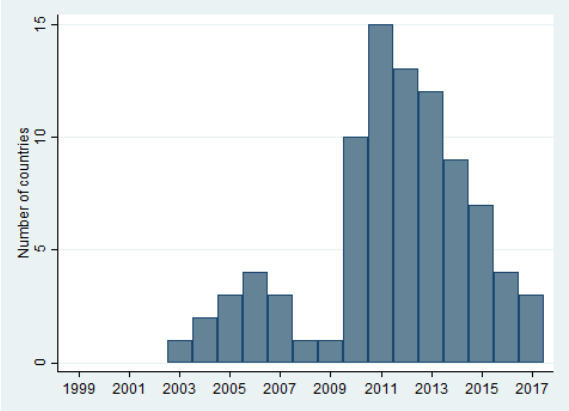
[19] Whereas the cyclically-adjusted budget balance adjusts for cyclical conditions only, the structural budget balance is also corrected for certain one-off expenditures or revenues.

[20] In some cases fiscal adjustment is defined over multiple years, e.g. a 1.5% improvement of the budget balance over three years. In those cases, we divide the adjustment equally between years.

[21] The Spring Forecasts provide one-year ahead forecasts for the output gap, the Autumn Forecast offers two-year ahead forecasts. If, for instance, a recommendation is based on the 2014 Spring Forecast, which prescribes fiscal adjustment for 2014-2016, we use the Spring Forecast to compute the change in the output gap for 2014 and 2015, and the 2014 Autumn Forecast (the nearest available forecast) to compute the change in the output gap in 2016. There are four observations for which we have to apply this approach. In section 4.5, we show that excluding all recommendations based on nominal budget targets does not materially affect our results.

Figure 2: EDP recommendations over time

(a) Number of countries with EDP recommendations



(b) Total recommended fiscal adjustment, EMU

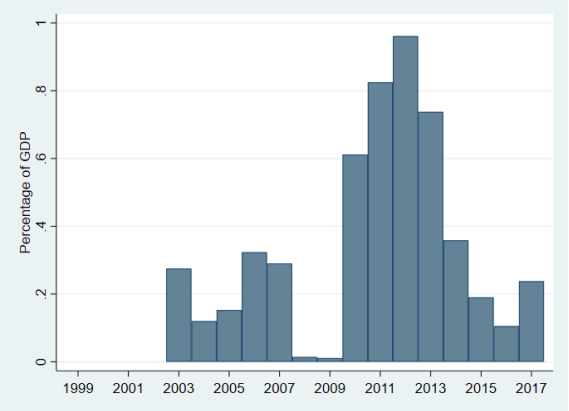
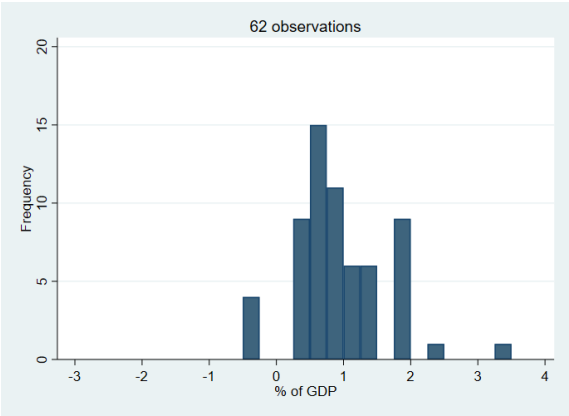


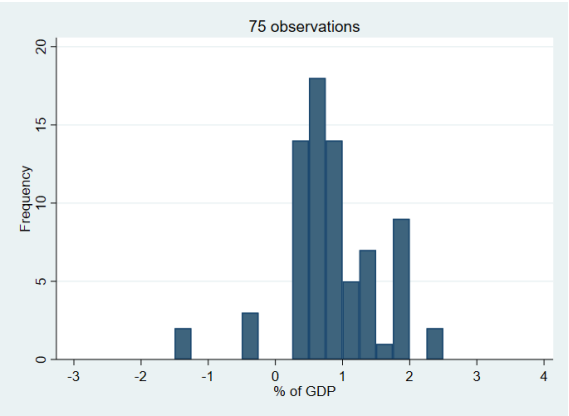
Figure (a) shows the number of countries in EMU that received non-zero EDP recommendations in any given year. Figure (b) shows the total required fiscal adjustment, as a fraction of euro area GDP.

Figure 3: Distribution of EDP recommendations, EMU member states, by forecast vintage

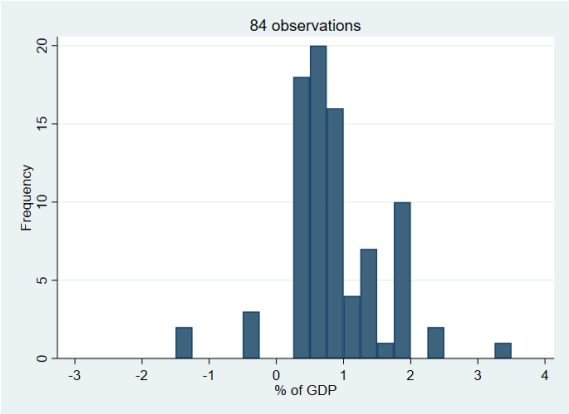
(a) Spring Forecast $t-1$



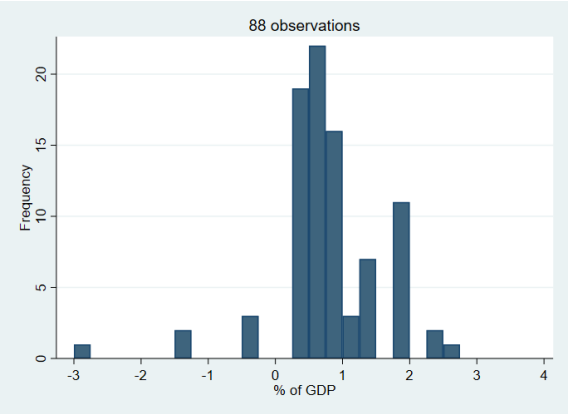
(b) Autumn Forecast $t-1$



(c) Spring Forecast t



(d) Autumn Forecast t



Figures show the EDP recommendation applicable to each vintage (i.e., known at the moment of the forecast).

Most recommendations require annual fiscal adjustment of 0.5-1% of GDP (figure 3). Required adjustments larger than 2% of GDP are scarce. In one case, a recommendation was revised to be slightly larger than 3% of GDP, in four cases the recommended adjustment was negative. These recommendations all relate to countries receiving financial support: in some cases the structural budget balance deteriorated so rapidly (due to, amongst others, revisions to potential output) that limiting the deterioration (i.e. negative effort) was a challenge in itself.

3.3 Empirical approach

The starting point of our analysis is a real-time, but otherwise standard fiscal reaction function. Our dependent variable is the projected or actual change in the structural budget balance, as this is the measure of fiscal adjustment used by the EC. As independent variables we include variables capturing cyclical conditions, government solvency, and the political business cycle. These variables have been found to drive discretionary fiscal policy by amongst others Mink and De Haan (2006), Beetsma and Giuliodori (2009) and Cimadomo (2012) and aim to capture the government's desired fiscal stance (BBS^* in the model presented in 2.2). We then include real-time EDP recommendations as an additional independent variable, initially in a linear form only[22], to see if these recommendations have explanatory power over and above the more usual determinants of discretionary fiscal policy. Our model to be estimated reads:

$$\Delta BBS^x_{i,t} = \beta_1 OG^x_{i,t} + \beta_2 BB^x_{i,t-1} + \beta_3 DBT^x_{i,t-1} + \beta_4 elec_{i,t} + \beta_5 REC^x_{i,t} + \beta_6 ESM_{i,t} + \beta_7 crisis_t + \rho_i \tag{3}$$

Here, $\Delta BBS^x_{i,t}$ is the change in the structural budget balance for country i between year t and year $t-1$, as reported in forecast vintage x. $OG^x_{i,t}$ is the (expected) output gap for country i year t. $BB^x_{i,t-1}$ and $DBT^x_{i,t-1}$ are the country i, year $t-1$ budget balance and debt level as reported in forecast vintage x, with x running from $SF : t-1$ to $AF : t+1$. $elec_{i,t}$ is a dummy variable equal to one if there is a planned election and zero otherwise, included to capture potential political business cycle effects. $REC^x_{i,t}$ is the country i, time t EDP recommendation as known at the time of the forecast. $crisis_t$ is a dummy equal to 1 if the year under consideration is 2008 or 2009, and zero otherwise, capturing the rapid and unexpected fiscal deterioration during those years. Finally, $ESM_{i,t}$ is a dummy indicating whether countries received some form of financial support during the crisis, as these countries typically went through deep recessions and potential output figures (and thereby the structural budget balance) were revised substantially. On top of this, financial support programs generally came with large EDP recommendations, that differed in some aspects from 'regular' recommendations (see section 4.2). As starting point, to test the overall effectiveness of EDP recommendations, we assume homogeneous effects of all EDP recommendations. We will relax this assumption in section 4.2.

Since the output gap is potentially endogenously affected by fiscal policy, we apply a 2SLS approach, instrumenting the output gap with its own lag and the trade-weighted output gap of

[22]We relax this assumption in section 4.6.

the other EU member states. Standard errors are clustered at the country level, allowing for heteroskedasticity and within-country autocorrelation of unknown form.

We estimate our model for a panel of EMU member states over the period 1999-2017. Countries enter the panel as they join EMU.[23] We carry out regressions for six vintages in total. Four of these equations focus on projections, namely the projected change in the structural budget balance in the current year and one year ahead Spring and Autumn Forecasts. The remaining two concern realized data. This allows us to track, first of all, at what moment in time countries start to promise to live up to the fiscal rules, if at all. Secondly, we can see whether the recommendations were actually followed up in reality, rather than only in projections.

If EDP recommendations have any explanatory power in the above regression, this provides initial evidence that they are effective. However, the interpretation of such a result could to some extent be problematic. Any country with a deficit exceeding 3% of GDP is almost by definition in an EDP, effectively leaving us no control group. If high-deficit countries respond more fiercely to changes in their budget balance for reasons other than EDP recommendations, this could be picked up by our EDP variable, inflating the estimated coefficient.

We pursue several routes to avoid such a bias. Firstly, we relax our assumption of a homogeneous response to EDP recommendations. More specifically, the effect of recommendations is allowed to differ between countries in financial support programs and countries that are not. Secondly, since EDP recommendations may take aboard more (recent) information than captured by our other variables, we include interest rate spreads vis-à-vis Germany to control for market pressure. Thirdly, and most fundamentally, to account for any other reasons that deficits above 3% of GDP might induce a change in fiscal behavior, we allow for a different response to deficits above 3%.

4 Results

4.1 First results

Table 1 presents the results of estimating equation 3. The dependent variable in all columns is the annual change in the year t structural budget balance, as reported in the forecast vintage outlined in the top row.

In all vintages, the output gap has a positive and significant effect on the structural budget balance. That is, holding constant all other factors, we find that the discretionary fiscal policy functions countercyclically. The effect is limited in size (a one percentage point worsening of the output gap, leads to a fiscal loosening of 0.1 - 0.2 pp). In contrast to findings by Cimadomo (2012), the countercyclical effect is also present in realization data. A possible explanation is the coordinated fiscal stimulus in 2009/10, which is not included in Cimadomo's dataset.

Concerning the other control variables, the effect of the lagged level of the budget balance is only significant in two vintages, with a higher deficit (marginally) inducing fiscal consolidation.

[23] In order to keep a constant sample between our various specifications Estonia is excluded from the analysis, as interest rate data are missing.

The lagged debt level is only significant in one vintage, in which it has the 'wrong' negative sign. Overall, the evidence that discretionary fiscal policy making in the euro area contributes to maintaining solvency is weak. We do find some evidence of political business cycles. In the regressions using realization data, (planned) elections induce a statistically significant fiscal loosening of about 0.5% of GDP. In the forecast vintages, this effect is not visible.

Table 1: Homogeneous EDP coefficient

	Dependent variable: Change in the structural budget balance					
	(1)	(2)	(3)	(4)	(5)	(6)
	AF: t+1	SF: t+1	AF: t	SF: t	AF: t-1	SF: t-1
Output gap$_{i,t}$	0.13***	0.18***	0.25***	0.16***	0.13***	0.12***
	(0.04)	(0.05)	(0.06)	(0.04)	(0.05)	(0.03)
Budget bal$_{i,t-1}$	0.00	-0.01	-0.05	-0.07*	-0.06**	0.00
	(0.03)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)
Debt$_{i,t-1}$	0.00	0.00	-0.00	-0.00	-0.01**	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Elections$_{i,t}$	-0.60***	-0.47**	-0.24*	-0.10	0.03	-0.00
	(0.18)	(0.19)	(0.15)	(0.10)	(0.09)	(0.09)
EDP rec$_{i,t}$	0.43	0.39	0.63**	0.81***	0.54***	0.16
	(0.30)	(0.31)	(0.26)	(0.24)	(0.13)	(0.12)
ESM$_{i,t}$	2.21**	2.31***	1.88**	0.21	1.40***	0.13
	(0.88)	(0.85)	(0.76)	(0.50)	(0.49)	(0.32)
Crisis$_{i,t}$	-1.89***	-1.87***	-1.22***	-0.57***	-0.19	0.03
	(0.42)	(0.44)	(0.33)	(0.21)	(0.15)	(0.08)
Observations	253	252	249	259	237	248
R-squared	0.39	0.33	0.31	0.36	0.25	0.05
Number of countries	18	18	18	18	18	18
Time period	1999-2016	1999-2016	2001-2017	2000-2017	2002-2017	2001-2017
Hansen-J	0.355	0.364	0.815	0.663	0.834	0.529

The dependent variable is the year t change in the structural budget balance. The top row indicates the forecast vintage. Independent variables are measured in real-time; superscripts are omitted for the sake of readability. Regressions include country fixed effects. Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Our main variable of interest is the EDP recommendation. Right to left, starting from column 6, we do not find an effect of EDP recommendations in the one-year ahead Spring Forecast. This is as expected, as this forecast contains few fiscal policy measures. Moving to column 5, the one-year ahead Autumn Forecast, which in most (but not all) cases already contains the fiscal measures for the upcoming year, we find a positive and significant effect of the recommendations on the structural budget balance. A recommendation for a 1 percentage point improvement in the structural budget balance leads to a forecasted improvement of 0.5 percentage point. In the Spring Forecasts for the running year, which should incorporate all announced policy measures, the coefficient increases to 0.8. This, however, turns out to be the peak: in the Autumn Forecasts for the running year, the compliance ratio falls to 0.6, while in later vintages, the marginal effect of EDP recommendations falls to 0.4 and loses significance.

4.2 Financial support

The EU and its member states established several financial assistance mechanisms in response to the sovereign debt crisis that began in 2010. The first support mechanisms established were the Greek Loan Facility, the European Financial Stabilisation Mechanism, and the European Financial Stability Facility. Since 2012, the European Stability Mechanism (ESM) has been the main provider of financial assistance to euro area member states. The countries that have received assistance via the financial support mechanisms are Cyprus (2013-2016), Greece (2010-2018), Ireland (2010-2013), Spain (2012-2014) and Portugal (2011-2014).[24]

Table 2: Differentiating w.r.t. financial support programs

	Dependent variable: Change in the structural budget balance					
	(1)	(2)	(3)	(4)	(5)	(6)
	AF: t+1	SF: t+1	AF: t	SF: t	AF: t-1	SF: t-1
Output $gap_{i,t}$	0.15***	0.20***	0.27***	0.18***	0.15***	0.12***
	(0.05)	(0.06)	(0.06)	(0.05)	(0.06)	(0.04)
Budget $bal_{i,t-1}$	0.00	-0.01	-0.05	-0.07*	-0.05**	-0.00
	(0.03)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)
$Debt_{i,t-1}$	0.00	-0.00	-0.01	-0.01	-0.01**	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Elections_{i,t}$	-0.58***	-0.46**	-0.23	-0.09	0.03	0.00
	(0.18)	(0.18)	(0.15)	(0.11)	(0.09)	(0.09)
EDP $rec_{i,t}$	0.81***	0.73***	0.81***	0.98***	0.73***	0.19
	(0.15)	(0.15)	(0.14)	(0.10)	(0.16)	(0.12)
EDP $rec_{i,t}$*$ESM_{i,t}$	-0.67	-0.60	-0.33	-0.42	-0.41	-0.13
	(0.50)	(0.54)	(0.49)	(0.50)	(0.29)	(0.16)
$ESM_{i,t}$	3.01***	3.04***	2.30***	0.77	1.91***	0.30
	(0.86)	(0.85)	(0.60)	(0.80)	(0.63)	(0.48)
$Crisis_{i,t}$	-1.83***	-1.82***	-1.19***	-0.54***	-0.20	0.03
	(0.42)	(0.43)	(0.32)	(0.19)	(0.16)	(0.08)
EDP $rec_{i,t}$ | $ESM_{i,t}$ = 1	*0.13*	*0.12*	*0.48*	*0.55*	*0.32*	*0.06*
	(0.58)	*(0.60)*	*(0.51)*	*(0.53)*	*(0.25)*	*(0.17)*
Observations	253	252	249	259	237	248
R-squared	0.39	0.33	0.30	0.36	0.25	0.05
Number of countries	18	18	18	18	18	18
Time period	1999-2016	1999-2016	2001-2017	2000-2017	2002-2017	2001-2017
Hansen-J	0.273	0.316	0.792	0.666	0.760	0.529

The dependent variable is the year t change in the structural budget balance. The top row indicates the forecast vintage. Independent variables are measured in real-time; superscripts are omitted for the sake of readability. Regressions include country fixed effects. Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Financial support comes under conditions. The conditions for receiving financial assistance from the ESM and its predecessors generally include an agreement to cut budget deficits and implement structural reforms. These policy measures aim to help member states stabilize their public finances and regain access to market financing. The policy conditions are negotiated between the member state concerned and the EC, in liaison with the ECB and sometimes the IMF. The conditions are laid down in a memorandum of understanding (MoU), with the fiscal

[24]See the website of the Council (www.consilium.europa.eu).

conditions agreed upon in the MoU also being transposed into EDP recommendations.

The character of fiscal (EDP) recommendations deriving from MoUs differs in multiple ways from other EDP recommendations. Monitoring is tighter, the potential consequences of disobeying with the recommendation are more severe, as this could lead to a suspension of financial assistance, and the requested fiscal adjustment is typically relatively large.[25]

Moreover, the generally very dire economic situation in the countries receiving financial support potentially also affects the (observed) implementation of EDP recommendations. It is arguably more difficult to implement consolidation measures in times of a deep recession.[26] Also, most of the countries receiving support suffered from large revisions to potential output, which renders our measure of fiscal adjustment less reliable.

As a result of the above factors, the coefficient on the effect of EDP recommendations could reflect the particular policy response in countries in financial dire straits, and as a consequence might inadequately reflect the behavior of countries monitored under the lighter, usual EDP-regime. To investigate in what way financial support programs drive or influence our results, we interact our dummy for financial support programs with the EDP recommendations.

The augmented regression shows that the results in table 1 indeed do not carry over to countries receiving financial support. For these countries, fiscal adjustment does not seem to correlate with the size of EDP recommendations (table 2). However, the coefficient on the financial support dummy itself is large and significant in most vintages. Taken at face value, this implies that countries receiving financial support did deliver substantial fiscal consolidation, but that the amount was relatively disconnected from the exact adjustment demanded.

For countries that did not receive financial support, the picture also changes. We now find evidence that these countries actually did implement fiscal measures when asked to do so. Compared to current year Spring Forecasts, the coefficient on EDP recommendations falls somewhat in later vintages, but it remains highly significant. From this table, the conclusion would be that EDP recommendations do affect fiscal policy in the direction desired by the EC.

4.3 Controlling for market pressure

So far, fiscal sustainability concerns are modeled by the lagged deficit and debt level. However, these measures are only available at a low frequency, while market concerns with regard to fiscal sustainability can change swiftly. Moreover, deficit and debt figures do not account for various other factors that affect a government's liquidity or solvency position, such as the maturity structure of the debt and the potential future tax base.

Interest spreads vis-à-vis a safe country provide a comprehensive and timely measure of fiscal sustainability as perceived by market participants. Governments might therefore be more responsive to changes in spreads than to slow-moving indicators such as the debt level, as

[25] On average, the initially recommended annual adjustment for countries in a financial support program amounted to 1.21% of GDP, versus 0.85% of GDP for other countries. However, the fiscal targets for countries in support programs have often been revised downward in updates of the programs. The difference in required annual fiscal adjustment is therefore smaller in final recommendations: 1.01% of GDP versus 0.81% of GDP.

[26] Auerbach and Gorodnichenko (2012) were among the first to find significantly larger fiscal multipliers in recessions, which also makes it more difficult to improve the budget balance through consolidation.

suggested by Dell'Erba et al. (2015) and Debrun and Kinda (2015). If in drawing up EDP recommendations the EC takes into account similar factors as market participants do, EDP recommendations might be closely related to movements in interest spreads. Diaz Kalan et al. (2018) find that EDP recommendations and market pressure indeed correlate positively. This could imply that our EDP variable - at least partly - captures the effect of market pressure.

We therefore additionally control for market pressure in our regressions. We do this by including twelve month changes in the ten year sovereign yield spread vis-à-vis Germany as a regressor. To avoid fiscal actions having an effect on the spreads, and taking into account the lead time in producing forecasts, we apply a cut-off date about three months in advance of the publication date in case of one year ahead forecasts. For current year and realization vintages, we use the change in the spread in the year preceding the year under consideration.

Changes in interest spreads have the expected effect. In four out of six regressions, including the realized data, an increase in spreads significantly induces fiscal adjustment. Market discipline thus seems to play a role in EMU, even though the coefficients are small in economic terms. The effect of including interest spreads on the other estimated coefficients is minimal. In particular, the coefficient and standard errors of EDP recommendations remain virtually unchanged.

4.4 Kink in the fiscal reaction function

According to the rules of the SGP, EU countries with projected or actual budget deficits exceeding 3% of GDP in principle end up in an EDP. Likewise, countries with a deficit smaller than 3% of GDP will usually not be in an EDP. This implies that high deficits and the presence of EDP recommendations almost by definition coincide. If, for other reasons than mentioned before, countries respond more strongly to developments in their budget balance as soon as deficits reach critical levels, this non-linearity in the fiscal reaction function could in our specification be picked up by our EDP variable. We therefore construct a real-time dummy variable equal to one for (projected) deficits exceeding 3% of GDP, and zero otherwise. We include this dummy in our regression and interact it with the lagged level of the budget balance.

As it turns out, for countries with budget deficits below 3% of GDP we now find a stronger and more significant response to past deficits (table 4). A lower budget balance is found to induce an improvement in the structural budget balance in most vintages. The interaction with high deficits, however, has the opposite sign and is significant in the realization vintages. Overall, the response of the structural budget balance to deficits larger than 3% of GDP is more muted than the response to smaller deficits.

In contrast to findings by Beetsma and Giuliodori (2009) and Cimadomo (2012), the dummy for high deficits itself does not have a significant effect in any of the vintages. This underlines that our EDP variable is a more accurate measure of the incentives provided by the SGP than the dummy. Indeed, compared to the previous specifications, our findings on the effectiveness of EDP recommendations are by and large unchanged. We still observe a substantial significant positive effect of EDP recommendations on planned and actual fiscal adjustment.

Table 3: Controlling for market pressure

	Dependent variable: Change in the structural budget balance					
	(1)	(2)	(3)	(4)	(5)	(6)
	AF: t+1	SF: t+1	AF: t	SF: t	AF: t-1	SF: t-1
Output gap$_{i,t}$	0.14***	0.19***	0.26***	0.17***	0.14***	0.12***
	(0.05)	(0.06)	(0.06)	(0.04)	(0.05)	(0.03)
Budget bal$_{i,t-1}$	0.01	-0.00	-0.04	-0.07*	-0.05**	-0.00
	(0.04)	(0.04)	(0.04)	(0.04)	(0.02)	(0.03)
Debt$_{i,t-1}$	0.00	-0.00	-0.00	-0.01	-0.01**	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Elections$_{i,t}$	-0.57***	-0.45**	-0.22	-0.08	0.05	0.00
	(0.18)	(0.18)	(0.14)	(0.11)	(0.08)	(0.09)
EDP rec$_{i,t}$	0.80***	0.72***	0.81***	0.97***	0.69***	0.20
	(0.15)	(0.15)	(0.13)	(0.10)	(0.15)	(0.13)
EDP rec$_{i,t}$*ESM$_{i,t}$	-0.69	-0.61	-0.36	-0.43	-0.63**	0.02
	(0.52)	(0.55)	(0.52)	(0.50)	(0.29)	(0.28)
ESM$_{i,t}$	2.96***	2.96***	2.22***	0.71	1.85***	0.24
	(0.86)	(0.87)	(0.58)	(0.78)	(0.53)	(0.53)
ΔSpread$_{i,t}$	0.06***	0.05*	0.08***	0.06	0.14***	-0.04
	(0.02)	(0.03)	(0.02)	(0.06)	(0.04)	(0.03)
Crisis$_{i,t}$	-1.87***	-1.85***	-1.24***	-0.57***	-0.19	0.02
	(0.42)	(0.43)	(0.32)	(0.20)	(0.16)	(0.08)
EDP rec$_{i,t}$ | ESM$_{i,t}$ = 1	*0.11*	*0.11*	*0.46*	*0.54*	*0.06*	*0.22*
	(0.60)	*(0.61)*	*(0.53)*	*(0.53)*	*(0.20)*	*(0.32)*
Observations	253	252	249	259	237	248
R-squared	0.40	0.34	0.32	0.38	0.33	0.06
Number of countries	18	18	18	18	18	18
Time period	1999-2016	1999-2016	2001-2017	2000-2017	2002-2017	2001-2017
Hansen-J	0.338	0.371	0.863	0.722	0.886	0.471

The dependent variable is the year t change in the structural budget balance. The top row indicates the forecast vintage. Independent variables are measured in real-time; superscripts are omitted for the sake of readability. Regressions include country fixed effects. Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

4.5 Robustness

Controlling for the regular determinants of discretionary fiscal policy and various factors potentially coinciding with high deficits, we consistently find that EDP recommendations affect both projected and actual fiscal adjustments. We test the sensitivity of this result, as displayed in table 4, to a range of specification and sampling choices.

4.5.1 Sample selection

Between 2007 and 2016 seven countries acceded the euro area. As a consequence, we have an unbalanced panel with only few observations for some countries. We therefore re-estimate our model on a panel comprising just the twelve founders of the euro. Table A.2 reports the - largely unchanged - results. The coefficient on EDP recommendations slightly increases.

Due to gaps in some forecast vintages, the sample size differs per vintage. To make sure that this does not drive the differences in results between vintages, we rerun the regressions with a

Table 4: Kink in the reaction function

	Dependent variable: Change in the structural budget balance					
	(1)	(2)	(3)	(4)	(5)	(6)
	AF: t+1	SF: t+1	AF: t	SF: t	AF: t-1	SF: t-1
Output gap$_{i,t}$	0.16***	0.21***	0.27***	0.18***	0.15***	0.13***
	(0.06)	(0.07)	(0.06)	(0.05)	(0.05)	(0.04)
Budget bal$_{i,t-1}$	-0.07	-0.11**	-0.11***	-0.10***	-0.08**	-0.01
	(0.05)	(0.05)	(0.03)	(0.03)	(0.04)	(0.03)
Budget bal$_{i,t-1}$*High$_{i,t-1}$	0.12***	0.14***	0.10	0.07*	0.04	0.07
	(0.05)	(0.05)	(0.07)	(0.04)	(0.04)	(0.05)
High$_{i,t-1}$	0.25	0.23	0.23	0.32	0.12	0.31
	(0.29)	(0.29)	(0.39)	(0.26)	(0.17)	(0.25)
Debt$_{i,t-1}$	0.00	-0.00	-0.01	-0.01*	-0.01**	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Elections$_{i,t}$	-0.59***	-0.47**	-0.22	-0.07	0.05	0.01
	(0.20)	(0.19)	(0.14)	(0.11)	(0.09)	(0.09)
EDP rec$_{i,t}$	0.87***	0.82***	0.86***	0.96***	0.70***	0.25*
	(0.19)	(0.21)	(0.21)	(0.13)	(0.14)	(0.13)
EDP rec$_{i,t}$*ESM$_{i,t}$	-0.72	-0.67	-0.38	-0.40	-0.65**	0.03
	(0.45)	(0.52)	(0.54)	(0.48)	(0.29)	(0.28)
ESM$_{i,t}$	3.23***	3.31***	2.46***	0.85	1.92***	0.29
	(0.86)	(0.85)	(0.51)	(0.73)	(0.51)	(0.52)
ΔSpread$_{i,t}$	0.06***	0.05	0.08***	0.06	0.14***	-0.04
	(0.02)	(0.03)	(0.02)	(0.06)	(0.04)	(0.03)
Crisis$_{i,t}$	-1.81***	-1.79***	-1.20***	-0.55***	-0.17	0.04
	(0.43)	(0.43)	(0.32)	(0.21)	(0.16)	(0.08)
EDP rec$_{i,t}$ | ESM$_{i,t}$ = 1	*0.15*	*0.14*	*0.58*	*0.56*	*0.05*	*0.28*
	(0.58)	*(0.61)*	*(0.53)*	*(0.52)*	*(0.22)*	*(0.35)*
Observations	253	252	249	259	237	248
R-squared	0.40	0.34	0.32	0.38	0.33	0.07
Number of countries	18	18	18	18	18	18
Time period	1999-2016	1999-2016	2001-2017	2000-2017	2002-2017	2001-2017
Hansen-J	0.295	0.310	0.899	0.869	0.909	0.456

The dependent variable is the year t change in the structural budget balance. The top row indicates the forecast vintage. The variable $High$ is a dummy variable equal to one if (projected) deficits exceed 3% of GDP, and zero otherwise. Independent variables are measured in real-time; superscripts are omitted for the sake of readability. Regressions include country fixed effects. Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

constant sample for all vintages. As a result, the sample size decreases to 214 observations for all vintages, implying that we drop up to 15% of our sample. Results are similar to our baseline findings, with the coefficient on EDP recommendations increasing somewhat (table A.3).

Greece, Ireland, Italy, Spain, Portugal (the 'GIIPS') and Cyprus were arguably hit hardest by the financial crisis. All of these came under increased market pressure at some point. Furthermore, fiscal data for Greece turned out to have been tampered with (which, incidentally, supports hypothesis 2). As this might make these countries non-representative for the functioning of EMU in more 'normal' times, we drop them from our sample. Without these countries, fiscal policy is estimated to have been much more anticyclical (table A.4). This makes sense, as the GIIPS plus Cyprus carried out large consolidations amidst a deep recession. Concerning EDP recommendations, our main findings are unaffected.

Although forced deposits or fines in case of non-compliance do not apply to non member states, the SGP formally applies to all EU member states. For those non-member countries aspiring to join EMU, incentives to comply could even be very strong: not living up to the rules could mean that access to EMU is delayed or denied. Estimating our regressions for the EU as a whole, we find coefficients on EDP recommendations comparable to those in the regression for EMU member states alone (table A.5).

The focus on fiscal sustainability arguably increased with the outbreak of the crisis in 2009. Reflecting this, the SGP has been reformed with the aim of strengthening fiscal discipline. Comparing the effect of recommendations before and after the crisis does, however, not uncover a structural break in *actual* fiscal behavior (table A.6). Interestingly, the effect of EDP recommendations significantly increases in three out of four forecast vintages. To some extent, this might be explained by the introduction of the European Semester in 2010, which obliges Member States to submit budgetary plans before the one year ahead Autumn Forecast.

4.5.2 Empirical specification

EDP recommendations are sometimes updated along the road. To the extent that these revisions reflect ongoing fiscal developments, they are endogenous. To prevent such endogenous adjustments of recommendations from driving our results, we re-run our estimations using only the initial recommendation for any given year. As table A.7 shows, results are virtually unchanged.

Our baseline regressions contain a single crisis dummy to capture the rapid fiscal deterioration in 2008/09. In table A.8 we instead include a full set of year dummies. For computational reasons, this forces us to use standard (heteroskedasticity only) robust standard errors. The main change is the increased coefficient on the output gap. By controlling for all common shocks, the interpretation of this coefficient is somewhat different from before however. It now effectively only captures the fiscal response to idiosyncratic shocks. The increased coefficient suggests that fiscal policy has been more countercyclical following idiosyncratic shocks than following common shocks. This fits with the idea that the common monetary policy is there to respond to common shocks, while fiscal policy is best suited to respond to national shocks.

Not all EDP recommendations are defined in terms of the cyclically adjusted or structural budget balance. For some of the ESM countries, targets haves at times been set in terms of the nominal budget balance. We converted the requested improvement in the budget balance into structural adjustment using equation 2. This conversion might have induced measurement error. Moreover, it is possible that the nature of the recommendations defined in actual terms differs from those defined in structural terms.[27] In table A.9, we therefore exclude all such recommendations. Our earlier findings are confirmed, with the link between requested and delivered fiscal adjustment somewhat strengthening for ESM countries.

[27] In the case of Greece it has for instance occurred that disappointing GDP growth caused it to miss its nominal targets, so that further adjustment was needed, even though in structural terms Greece had more than delivered. In our regressions this could lead to a coefficient larger than one in some of the vintages.

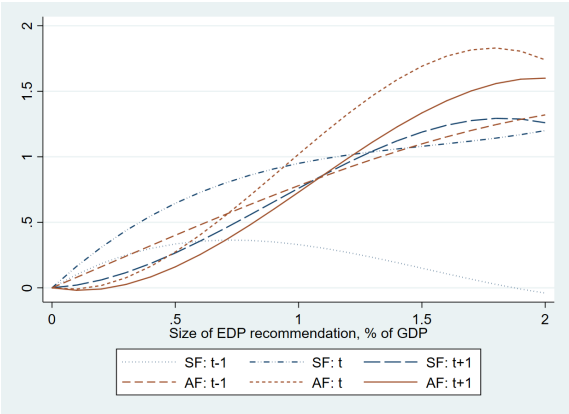
4.6 Size of the recommendation

According to hypothesis 3, the fraction of the recommendation that is implemented is highest for 'medium-sized' recommendations. A small recommendation will not invoke any reaction, since the government realizes it will not be punished for minor deviations. Once government effort is sparked, the response is relatively strong, as minor increases in fiscal adjustment strongly reduce the probability of being sanctioned. For large recommendations, the demanded deviation from the preferred fiscal policy becomes politically costly, with sanctions not increasing proportionally.

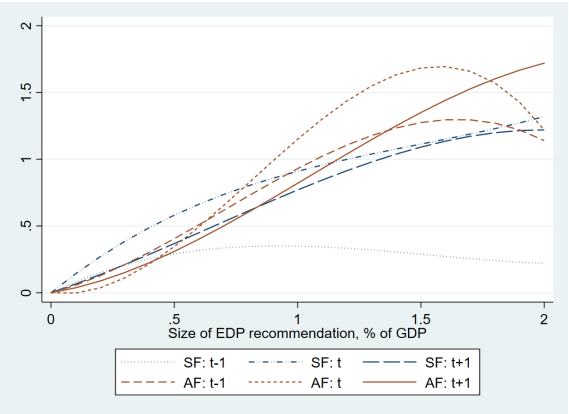
To allow for these two inflexion points in the government's response, we include squares and cubes of EDP recommendations as additional regressors.[28] Given the relatively small number of EDP recommendations for ESM countries, we do not include interaction terms between our three EDP variables and ESM support. Rather, we estimate the regression both for the full sample and for a sample excluding all ESM observations.

Figure 4: Response to EDP recommendations

(a) Full sample



(b) No ESM observations



Figures show the response to EDP recommendations, as estimated in table A.11 and A.10.

Table A.10 in the appendix presents estimation results for the full sample. The signs and magnitude of the linear, squared and cubic terms differ between vintages. This might be due to multicollinearity between the series. Joint significance tests of the squared and cubic terms do show they are jointly (if only marginally) significant in most vintages, and therefore add explanatory power to the model.

To facilitate interpretation, figure 4a plots the estimated response to EDP recommendations over the relevant range of recommendation sizes. In all vintages, the propensity to live up to EDP recommendations declines as recommendations become large. For small recommendations the picture is less clear, although the three vintages closest to realization data do show a low adherence propensity for very small recommendations. Leaving out ESM observations entails a sizable reduction in the number of large recommendations, meaning that the squared and cubed coefficients effectively have to be estimated over a rather small range. The implied response is similar (figure 4b), but the nonlinear terms lose much of their explanatory power (table A.11).

[28] To this end, we exclude negatively signed recommendations from the sample.

5 Concluding remarks

From the moment the broad outlines of the European fiscal framework began to take shape, the framework has been the subject of frequent debate. Criticism of the SGP comes both from those who abhor the particular form or even existence of fiscal rules in the EMU and from those who support the rules in themselves, but question their effectiveness. Remarkably, direct evidence on the effectiveness of the procedures laid down in the SGP was so far largely absent.

In this paper, we fill this gap by analyzing the effect of EDP recommendations on national fiscal policy. We estimate real-time fiscal reaction functions, including EDP recommendations and a series of control variables. The real-time nature of our analysis aligns with the information set of policy makers at subsequent moments in time. Taken at face value, our results imply that an EDP recommendation to improve the budget balance by 1% of GDP, induces countries to take consolidation measures of about 0.8% of GDP. For countries receiving financial assistance, such a relation cannot be established. Our results confirm, and expand on, the more reduced-form evidence provided on the effects of the 3%-threshold by Caselli and Wingender (2018), Beetsma and Giuliodori (2009) and Cimadomo (2012). We finally provide suggestive evidence that 'medium-sized' recommendations are lived up to best. All in all, although identifying purely causal effects in a relatively small macro-panel is difficult, we believe that we can argue with confidence that EDP recommendations affect fiscal behavior.

In interpreting the size of the effects, some nuance remains warranted. First, even absent any EDP recommendation, most governments would - at least to some extent - eventually correct large deficits. As such, the effect of EDP recommendations may partly reflect a forward shift of fiscal adjustment rather than an additional effect. Second, EDP recommendations may be tailored to countries' own plans. This risk is most evident for revisions of recommendations, which could be driven by looming non-compliance and which we therefore exclude in a robustness check. Initial recommendations should be less sensitive to endogeneity, as they generally cover a multi-year period. However, to the extent that they still represent a compromise between governments and the EC, even full compliance with the EDP recommendations could represent a smaller improvement of the budget balance than deemed desirable by the EC.

Overall, our findings suggest that, with a large majority of member states subject to an EDP for multiple years in the post-2009 period, the SGP has in recent years, for better or worse, been an important driver of the fiscal stance in the euro area. Inherently, this had procyclical effects. An important element to counteract procyclicality is the preventive arm of the SGP, which aims to create a safety margin to the 3% threshold in good times, so as to allow automatic stabilizers to function in times of recession. The preventive arm has been amended significantly in 2011, the effectiveness of which is an important topic for future research.

References

Alt, J., Dreyer Lassen, D., and Wehner, J. (2014). It isn't just about Greece: domestic politics, transparency and fiscal gimmickry in Europe. *British Journal of Political Science*, 44(4):707–716.

Andrle, M., Bluedorn, J., Eyraud, L., Kinda, T., Koeva Brooks, P., Schwartz, G., and Weber, A. (2015). *Reforming fiscal governance in the European Union*. IMF Staff Discussion Note 09.

Artis, M. and Winkler, B. (1998). The stability pact: safeguarding the credibility of the European Central Bank. *National Institute Economic Review*, 163(1):87–98.

Auerbach, A. J. and Gorodnichenko, Y. (2012). Measuring the output responses to fiscal policy. *American Economic Journal: Economic Policy*, 4(2):1–27.

Beetsma, R. and Giuliodori, M. (2009). Fiscal adjustment to cyclical developments in the OECD: An empirical analysis based on real-time data. *Oxford Economic Papers*, 62(3):419–441.

Beetsma, R., Giuliodori, M., and Wierts, P. (2009). Planning to cheat: EU fiscal policy in real time. *Economic Policy*, 24:753–804.

Beetsma, R. and Uhlig, H. (1999). An analysis of the Stability and Growth Pact. *The Economic Journal*, 109(458):546–571.

Bénétrix, A. and Lane, P. (2013). Fiscal cyclicality and EMU. *Journal of International Money and Finance*, 34:164–176.

Bofinger, P. (2003). Should the European Stability and Growth Pact be changed? *Intereconomics*, 38(1):4–7.

Buiter, W., Corsetti, G., and Roubini, N. (1993). Excessive deficits: sense and nonsense in the Treaty of Maastricht. *Economic Policy*, 8(16):57–100.

Buti, M. and Carnot, N. (2012). The EMU debt crisis: early lessons and reforms. *Journal of Common Market Studies*, 50(6):899–911.

Buti, M., Franco, D., and Ongena, H. (1998). Fiscal discipline and flexibility in EMU: The implementation of the Stability and Growth Pact. *Oxford Review of Economic Policy*, 14(3):81–97.

Caselli, F. and Wingender, P. (2018). Bunching at 3 Percent: The Maastricht Fiscal Criterion and Government Deficits. *IMF Working Paper*, 18(–).

Cimadomo, J. (2012). Fiscal policy in real time. *The Scandinavian Journal of Economics*, 114(2):440–465.

Cimadomo, J. (2016). Real-time data and fiscal policy analysis: A survey of the literature. *Journal of Economic Surveys*, 30(2):302–326.

Croushore, D. (2011). Frontiers of real-time data analysis. *Journal of Economic Literature*, 49(1):72–100.

De Grauwe, P. and Ji, Y. (2012). Mispricing of sovereign risk and macroeconomic stability in the eurozone. *Journal of Common Market Studies*, 50(6):866–880.

De Haan, J., Hessel, J., and Gilbert, N. (2016). Reforming the architecture of EMU: Ensuring stability in Europe. In Badinger, H. and Nitsch, V., editors, *Routledge Handbook of the Economics of European Integration*, chapter 25, pages 408–432. Routledge.

Debrun, X. and Kinda, T. (2015). That Squeezing Feeling: The Interest Burden and Public Debt Stabilization. *International Finance*, 19(2):147–178.

Dell'Erba, S., Mattina, T., and Roitman, A. (2015). Pressure or prudence? Tales of market pressure and fiscal adjustment. *Journal of International Money and Finance*, 51:196–213.

Delors, J. (1989). Report on economic and monetary union in the European Community. Luxembourg: Office for Official Publications of the EC.

Diaz Kalan, F., Popescu, M. A., and Reynaud, J. (2018). Thou Shalt Not Breach: The Impact on Sovereign Spreads of Noncomplying with the EU Fiscal Rules. *IMF Working Paper*, 18(87).

Döring, H. and Manow, P. (2018). Parliaments and governments database (ParlGov): Information on parties, elections and cabinets in modern democracies. Development version.

Dunne, P., Moore, M., and Portes, R. (2007). Benchmark status in fixed-income asset markets. *Journal of Business, Finance and Accounting*, 34:1615–1634.

EC (1990). One market, one money - an evaluation of the potential benefits and costs of forming an economic and monetary union. *European Economy*, 44.

EC (2009). The cyclically-adjusted budget balance in EU fiscal policymaking: A love at first sight turned into a mature relationship. *European Economy*, 374.

EC (2018). *Vade Mecum on the Stability and Growth Pact - 2018 edition*. Institutional Paper 075.

Fatás, A. and Mihov, I. (2010). The euro and fiscal policy. In Alesina, A. and Giavazzi, F., editors, *The First Ten Years of the Euro*, chapter 8, pages 287–324. University of Chicago Press.

Frankel, J. and Schreger, J. (2013). Over-optimistic official forecasts and fiscal rules in the eurozone. *Review of World Economics (Weltwirtschaftliches Archiv)*, 149(2).

Gilbert, N. and De Jong, J. (2017). Do European fiscal rules induce a bias in fiscal forecasts? Evidence from the Stability and Growth Pact. *Public Choice*, 170(1-2):1–32.

Girouard, N. and André, C. (2005). Measuring Cyclically-adjusted Budget Balances for OECD Countries. *OECD Economics Department Working Paper*, 344.

Golinelli, R. and Momigliano, S. (2006). Real-time determinants of fiscal policies in the euro area. *Journal of Policy Modeling*, 28(9):943–964.

Hughes Hallett, A. and Lewis, J. (2008). European fiscal discipline before and after EMU: Crash diet or permanent weight loss? *Macroeconomic Dynamics*, 12(03):404–424.

Ioannou, D. and Stracca, L. (2014). Have the euro area and EU governance worked? Just the facts. *European Journal of Political Economy*, 34:1–17.

Merola, R. and Pérez, J. (2013). Fiscal forecast errors: Governments versus independent agencies? *European Journal of Political Economy*, 32:285–299.

Milesi-Ferretti, G. (2004). Good, bad or ugly? On the effects of fiscal rules with creative accounting. *Journal of Public Economics*, 88:377–394.

Mink, M. and De Haan, J. (2006). Are there political budget cycles in the euro area? *European Union Politics*, 7(2):191–211.

Schuknecht, L., Moutot, P., Rother, P., and Stark, J. (2011). The Stability and Growth Pact: Crisis and Reform. *ECB Occasional Paper No. 129*.

Tereanu, E., Tuladhar, A., and Simone, A. (2014). Structural balance targeting and output gap uncertainty. *IMF Working Paper*, 14(107).

Truger, A. (2013). Austerity in the euro area: the sad state of economic policy in Germany and the EU. *Institute for International Political Economy Berlin Working Paper*.

Von Hagen, J. and Eichengreen, B. (1996). Federalism, fiscal restraints, and European monetary union. *American Economic Review*, 86(2):134–138.

Von Hagen, J. and Wolff, G. (2006). What do deficits tell us about debt? Empirical evidence on creative accounting with fiscal rules in the EU. *Journal of Banking and Finance*, 30(12):3259–3279.

A Annex

A.1 Model

The government's optimization problem can be split in two parts. Depending on its choice of BBS^r, the probability of a sanction is 0, $\frac{\gamma}{2}(1 - \frac{\Delta BBS^r + c}{REC})^2$, or 1. We first compute the government's optimal response to an EDP recommendation given the regime in place. Then, given that the regime in place itself depends on the government's policy, we select the optimal regime for all values of REC.

Conditional on $\Delta BBS^r \geq REC - c$, the probability of a sanction is 0. Minimization of the loss function w.r.t. to both ΔBBS and ΔBBS^r shows that in this case the optimal actual and reported fiscal adjustment are equal to the government's preferred fiscal adjustment:

$$\Delta BBS^r = \Delta BBS = \Delta BBS^* \tag{4}$$

For any $\Delta BBS^r + c < 0$, the probability of a sanction is fixed as well, this time at 1. Given that a sanction is unavoidable, the government would again stick to its preferred fiscal policy, without any attempts to cover up its deficit:

$$\Delta BBS^r = \Delta BBS = \Delta BBS^* \tag{5}$$

Having covered the corner solutions, the most relevant regime is the intermediate one. For $0 - c \leq \Delta BBS^r \leq REC - c$, the probability of a sanction increases nonlinearly in the deviation of reported fiscal adjustment from the required one, and is given by $\frac{\gamma}{2}(1 - \frac{\Delta BBS^r + c}{REC})^2$. Minimization of the loss function 1 shows that the reported adjustment is given by:

$$\Delta BBS^r = \frac{\frac{\gamma S}{REC} - \frac{\gamma S c}{REC^2} + \theta \Delta BBS}{\frac{\gamma S}{REC^2} + \theta} \tag{6}$$

and actual fiscal adjustment by:

$$\Delta BBS = \frac{\alpha BBS^* + \theta \Delta BBS^r}{\alpha + \theta} \tag{7}$$

Equation 7 shows that the actual fiscal adjustment is a weighted average of the preferred fiscal adjustment in a situation without supranational rules and the reported consolidation.

By substituting equation 6 in equation 7, we can obtain the optimal levels of actual and reported fiscal adjustment from the government's perspective.

A.2 Tables

Table A.1: Descriptive statistics

Variable	Vintage	Mean	Std. dev.	Obs.	Min	Max
ΔStructural balance	AF, t+1	0.18	1.46	260	-5.4	6.4
(% of GDP)	SF, t+1	0.16	1.43	258	-5.7	5.4
	AF, t	-0.03	1.23	278	-5.2	6.5
	SF, t	0.00	1.02	266	-3.0	4.5
	AF, t-1	0.20	0.77	278	-1.7	4.4
	SF, t-1	0.01	0.60	255	-2.4	2.3
Output gap	AF, t+2	-0.79	2.89	240	-13.6	6.9
(% of potential GDP)	SF, t+2	-0.88	2.82	241	-12.6	6.6
	AF, t+1	-1.06	2.64	259	-13.8	5.7
	SF, t+1	-1.22	2.40	260	-12.6	4.7
	AF, t	-1.36	2.33	256	-13.0	4.0
	SF, t	-1.47	2.13	268	-13.2	3.4
	AF, t-1	-1.49	2.06	244	-14.4	2.2
	SF, t-1	-1.27	1.90	257	-10.2	3.5
Budget balance	AF, t+2	-2.63	4.06	242	-30.9	7.0
(% of GDP)	SF, t+2	-2.60	4.06	242	-31.2	7.0
	AF, t+1	-2.44	4.01	261	-31.3	9.8
	SF, t+1	-2.44	3.89	261	-32.4	6.7
	AF, t	-2.36	3.53	280	-32.3	10.5
	SF, t	-2.22	2.68	279	-12.0	5.3
Gross debt	AF, t+2	69.45	34.34	242	5.5	179.7
(% of GDP)	SF, t+2	69.53	34.26	242	5.6	180.1
	AF, t+1	70.20	34.83	261	5.3	180.8
	SF, t+1	70.55	34.80	261	4.9	179.0
	AF, t	71.12	35.75	269	4.6	194.8
	SF, t	70.95	35.29	269	4.1	182.8
EDP Recommendation	AF, t+1	0.86	0.80	88	-2.9	2.7
(% of GDP)	SF, t+1	0.86	0.80	88	-2.9	2.7
	AF, t	0.86	0.80	88	-2.9	2.7
	SF, t	0.94	0.73	84	-1.4	3.5
	AF, t-1	0.92	0.70	75	-1.4	2.5
	SF, t-1	1.02	0.69	62	-0.4	3.5
Output gap, other countries	AF, t+1	-0.79	1.20	261	-4.0	2.2
(% of potential GDP)	SF, t+1	-0.93	1.12	261	-4.0	2.2
	AF, t	-0.99	0.95	258	-4.3	0.9
	SF, t	-1.10	0.89	269	-4.0	0.6
	AF, t-1	-1.08	0.78	246	-4.2	0.2
	SF, t-1	-0.95	0.84	258	-3.3	0.6
ESM	AF, t+1	0.07	0.26	280	0	1
	SF, t+1	0.07	0.26	280	0	1
	AF, t	0.07	0.25	280	0	1
	SF, t	0.06	0.23	280	0	1
	AF, t-1	0.05	0.22	280	0	1
	SF, t-1	0.04	0.19	280	0	1
Elections	–	0.17	0.38	280	0	1
ΔSpread (vis-à-vis DE, %-point)	–	0.05	1.69	273	-14.50	15.38

Figures refer to the years 1999-2017. Data are for EMU member states. Output gap of other countries refers to the trade weighted output gap in other EU countries than the country under consideration. Elections contain only those that took place at the end of a full governments term. ΔSpread is defined in annual changes.

Table A.2: Only EA12

	Dependent variable: Change in the structural budget balance					
	(1)	(2)	(3)	(4)	(5)	(6)
	AF: t+1	SF: t+1	AF: t	SF: t	AF: t-1	SF: t-1
Output gap$_{i,t}$	0.13**	0.18**	0.24***	0.14***	0.14***	0.14***
	(0.06)	(0.07)	(0.06)	(0.04)	(0.05)	(0.03)
Budget balance	-0.05	-0.08**	-0.07***	-0.08***	-0.08**	-0.01
	(0.04)	(0.04)	(0.02)	(0.03)	(0.03)	(0.03)
Budget bal$_{i,t-1}$*High$_{i,t-1}$	0.10***	0.12***	0.06	0.07*	0.05	0.10
	(0.03)	(0.04)	(0.07)	(0.04)	(0.04)	(0.06)
High$_{i,t-1}$	-0.10	-0.13	-0.11	0.10	0.14	0.33
	(0.27)	(0.25)	(0.40)	(0.24)	(0.16)	(0.27)
Debt$_{i,t-1}$	0.01	0.00	0.00	-0.00	-0.01**	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Elections$_{i,t}$	-0.58***	-0.48**	-0.19	-0.04	0.11	0.00
	(0.22)	(0.22)	(0.15)	(0.11)	(0.10)	(0.11)
EDP rec$_{i,t}$	1.06***	1.01***	1.04***	1.17***	0.75***	0.38***
	(0.20)	(0.20)	(0.19)	(0.13)	(0.19)	(0.12)
EDP rec$_{i,t}$*ESM$_{i,t}$	-0.44***	-0.39*	-0.15	-0.09	-0.65	0.28**
	(0.09)	(0.22)	(0.35)	(0.31)	(0.40)	(0.14)
ESM$_{i,t}$	2.29***	2.32***	1.72***	0.11	2.11***	-0.05
	(0.87)	(0.86)	(0.51)	(0.55)	(0.68)	(0.45)
ΔSpread$_{i,t}$	0.06***	0.05*	0.06***	0.05	0.14***	-0.06***
	(0.02)	(0.03)	(0.01)	(0.06)	(0.04)	(0.02)
Crisis$_{i,t}$	-1.82***	-1.84***	-1.24***	-0.53***	-0.26	0.05
	(0.47)	(0.48)	(0.34)	(0.20)	(0.17)	(0.10)
EDP rec$_{i,t}$ | ESM$_{i,t}$ = 1	*0.62****	*0.61***	*0.89****	*1.07****	*0.10*	*0.66****
	(0.20)	*(0.26)*	*(0.21)*	*(0.22)*	*(0.28)*	*(0.15)*
Observations	212	211	202	212	190	201
R-squared	0.45	0.39	0.41	0.45	0.36	0.16
Number of countries	12	12	12	12	12	12
Time period	1999-2016	1999-2016	2001-2017	2000-2017	2002-2017	2001-2017
Hansen-J	0.928	0.823	0.197	0.570	0.882	0.822

The dependent variable is the year t change in the structural budget balance. The top row indicates the forecast vintage. Independent variables are measured in real-time; superscripts are omitted for the sake of readability. Regressions include country fixed effects. Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.3: Constant samples

	Dependent variable: Change in the structural budget balance					
	(1)	(2)	(3)	(4)	(5)	(6)
	AF: t+1	SF: t+1	AF: t	SF: t	AF: t-1	SF: t-1
Output gap$_{i,t}$	0.17***	0.22***	0.28***	0.18***	0.15***	0.14***
	(0.06)	(0.06)	(0.07)	(0.05)	(0.06)	(0.05)
Budget bal$_{i,t-1}$	-0.03	-0.05	-0.05	-0.05	-0.06	-0.03
	(0.07)	(0.07)	(0.06)	(0.04)	(0.05)	(0.03)
Budget bal$_{i,t-1}$*High$_{i,t-1}$	0.09	0.08	0.05	0.02	0.02	0.06
	(0.07)	(0.07)	(0.08)	(0.05)	(0.05)	(0.07)
High$_{i,t-1}$	0.19	0.10	0.05	0.22	0.09	0.24
	(0.34)	(0.30)	(0.39)	(0.27)	(0.17)	(0.29)
Debt$_{i,t-1}$	-0.00	-0.01	-0.01	-0.01	-0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)
Elections$_{i,t}$	-0.63**	-0.54**	-0.29*	-0.06	0.04	0.02
	(0.26)	(0.23)	(0.17)	(0.14)	(0.10)	(0.10)
EDP rec$_{i,t}$	0.94***	0.92***	0.97***	1.04***	0.58***	0.20
	(0.21)	(0.21)	(0.19)	(0.15)	(0.15)	(0.16)
EDP rec$_{i,t}$*ESM$_{i,t}$	-0.81*	-0.79	-0.56	-0.55	-0.52*	-0.04
	(0.45)	(0.52)	(0.47)	(0.45)	(0.29)	(0.32)
ESM$_{i,t}$	3.65***	3.64***	2.99***	1.21**	1.62***	0.28
	(0.96)	(0.93)	(0.65)	(0.61)	(0.57)	(0.58)
ΔSpread$_{i,t}$	0.04	0.04	0.06**	0.05	0.15***	-0.04
	(0.03)	(0.03)	(0.03)	(0.07)	(0.05)	(0.04)
Crisis$_{i,t}$	-1.85***	-1.88***	-1.26***	-0.57***	-0.17	0.03
	(0.43)	(0.43)	(0.32)	(0.21)	(0.16)	(0.09)
EDP rec$_{i,t}$ | ESM$_{i,t}$ = 1	*0.13*	*0.13*	*0.41*	*0.48*	*0.06*	*0.16*
	(0.59)	*(0.61)*	*(0.54)*	*(0.52)*	*(0.24)*	*(0.42)*
Observations	214	214	214	214	214	214
R-squared	0.42	0.36	0.35	0.38	0.32	0.09
Number of countries	18	18	18	18	18	18
Time period	2002-2016	2002-2016	2002-2016	2002-2016	2002-2016	2002-2016
Hansen-J	0.229	0.287	0.933	0.973	0.749	0.789

The dependent variable is the year t change in the structural budget balance. The top row indicates the forecast vintage. Independent variables are measured in real-time; superscripts are omitted for the sake of readability. Regressions include country fixed effects. Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.4: Excl. GIIPS and Cyprus

	Dependent variable: Change in the structural budget balance					
	(1)	(2)	(3)	(4)	(5)	(6)
	AF: t+1	SF: t+1	AF: t	SF: t	AF: t-1	SF: t-1
Output gap$_{i,t}$	0.18***	0.27***	0.41***	0.34***	0.26***	0.10
	(0.06)	(0.08)	(0.08)	(0.08)	(0.06)	(0.06)
Budget bal$_{i,t-1}$	-0.07	-0.12***	-0.15***	-0.16***	-0.17***	-0.05*
	(0.05)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)
Budget bal$_{i,t-1}$*High$_{i,t-1}$	0.09	0.09	0.11	0.05	-0.06	0.04
	(0.09)	(0.09)	(0.07)	(0.06)	(0.06)	(0.06)
High$_{i,t-1}$	0.35	0.09	0.14	0.19	-0.60*	0.03
	(0.30)	(0.34)	(0.39)	(0.29)	(0.32)	(0.26)
Debt$_{i,t-1}$	0.01	0.00	0.00	0.00	-0.00	-0.01**
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Elections$_{i,t}$	-0.22	-0.12	0.04	0.17	0.10	0.14***
	(0.16)	(0.12)	(0.11)	(0.11)	(0.09)	(0.05)
EDP rec$_{i,t}$	0.85***	1.07***	1.15***	1.02***	1.09***	0.42**
	(0.28)	(0.28)	(0.29)	(0.23)	(0.17)	(0.21)
ΔSpread$_{i,t}$	0.24*	0.25*	0.14	0.09	-0.15	-0.11
	(0.13)	(0.13)	(0.19)	(0.14)	(0.12)	(0.08)
Crisis$_{i,t}$	-0.84***	-0.84***	-0.46**	-0.22	0.04	0.08
	(0.21)	(0.26)	(0.20)	(0.21)	(0.10)	(0.09)
Observations	156	157	154	162	147	155
R-squared	0.29	0.26	0.28	0.34	0.27	0.10
Number of countries	12	12	12	12	12	12
Time period	1999-2016	1999-2016	2001-2017	2000-2017	2002-2017	2001-2017
Hansen-J	0.378	0.181	0.859	0.035	0.264	0.040

The dependent variable is the year t change in the structural budget balance. The top row indicates the forecast vintage. Independent variables are measured in real-time; superscripts are omitted for the sake of readability. Regressions include country fixed effects. Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.5: Whole European Union

	Dependent variable: Change in the structural budget balance					
	(1)	(2)	(3)	(4)	(5)	(6)
	AF: t+1	SF: t+1	AF: t	SF: t	AF: t-1	SF: t-1
Output gap$_{i,t}$	0.13***	0.15***	0.25***	0.21***	0.18***	0.13***
	(0.05)	(0.05)	(0.05)	(0.04)	(0.06)	(0.03)
Budget bal$_{i,t-1}$	-0.04	-0.04	-0.05	-0.08**	-0.02	-0.00
	(0.05)	(0.04)	(0.04)	(0.03)	(0.05)	(0.02)
Budget bal$_{i,t-1}$*High$_{i,t-1}$	-0.05	0.04	0.01	0.04	-0.03	0.04
	(0.11)	(0.05)	(0.07)	(0.05)	(0.06)	(0.03)
High$_{i,t-1}$	-0.17	0.08	0.16	0.47**	-0.03	0.32**
	(0.34)	(0.22)	(0.31)	(0.22)	(0.21)	(0.16)
Debt$_{i,t-1}$	0.00	-0.00	-0.00	-0.01*	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Elections$_{i,t}$	-0.70***	-0.58***	-0.29**	-0.17*	-0.17*	-0.15
	(0.19)	(0.20)	(0.14)	(0.10)	(0.10)	(0.09)
EDP rec$_{i,t}$	0.67**	0.90***	0.96***	0.85***	0.57***	0.22*
	(0.28)	(0.22)	(0.14)	(0.09)	(0.17)	(0.13)
EDP rec$_{i,t}$*ESM$_{i,t}$	-0.59	-0.69	-0.47	-0.30	-0.44	-0.10
	(0.45)	(0.49)	(0.48)	(0.48)	(0.28)	(0.29)
ESM$_{i,t}$	1.83***	2.32***	1.99***	0.73	1.72***	0.25
	(0.66)	(0.55)	(0.42)	(0.59)	(0.42)	(0.52)
ΔSpread$_{i,t}$	0.04*	0.06**	0.10***	0.08	0.11***	-0.01
	(0.02)	(0.03)	(0.03)	(0.05)	(0.03)	(0.03)
Crisis$_{i,t}$	-1.86***	-1.84***	-1.02***	-0.43**	-0.29**	0.07
	(0.31)	(0.32)	(0.23)	(0.18)	(0.12)	(0.07)
EDP rec$_{i,t}$ | ESM$_{i,t}$ = 1	*0.08*	*0.21*	*0.49*	*0.55*	*0.13*	*0.11*
	(0.51)	*(0.53)*	*(0.50)*	*(0.49)*	*(0.20)*	*(0.28)*
Observations	407	399	395	401	368	374
R-squared	0.31	0.32	0.27	0.33	0.22	0.08
Number of countries	27	27	27	27	27	27
Time period	1999-2016	1999-2016	2001-2017	2000-2017	2002-2017	2001-2017
Hansen-J	0.884	0.142	0.349	0.368	0.937	0.220

The dependent variable is the year t change in the structural budget balance. The top row indicates the forecast vintage. Independent variables are measured in real-time; superscripts are omitted for the sake of readability. Regressions include country fixed effects. Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.6: Pre-crisis versus post-crisis

	Dependent variable: Change in the structural budget balance					
	(1)	(2)	(3)	(4)	(5)	(6)
	AF: t+1	SF: t+1	AF: t	SF: t	AF: t-1	SF: t-1
Output gap$_{i,t}$	0.14**	0.19***	0.26***	0.17***	0.16**	0.13***
	(0.06)	(0.07)	(0.05)	(0.05)	(0.06)	(0.03)
Budget bal$_{i,t-1}$	-0.07	-0.11**	-0.12***	-0.12***	-0.09**	-0.02
	(0.05)	(0.05)	(0.03)	(0.03)	(0.04)	(0.03)
Budget bal$_{i,t-1}$*High$_{i,t-1}$	0.12**	0.14***	0.11	0.09**	0.05	0.08
	(0.05)	(0.05)	(0.07)	(0.04)	(0.04)	(0.05)
High$_{i,t-1}$	0.23	0.22	0.28	0.46*	0.18	0.39
	(0.29)	(0.28)	(0.37)	(0.26)	(0.17)	(0.25)
Debt$_{i,t-1}$	0.00	-0.00	-0.00	-0.00	-0.01*	-0.00
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Elections$_{i,t}$	-0.57***	-0.46**	-0.21	-0.06	0.04	0.00
	(0.19)	(0.18)	(0.13)	(0.11)	(0.09)	(0.09)
EDP rec (pre)$_{i,t}$	1.25***	1.09***	0.64**	0.47***	0.20	-0.34
	(0.33)	(0.40)	(0.31)	(0.18)	(0.14)	(0.22)
EDP rec (post)$_{i,t}$	0.79***	0.77***	0.89***	1.03***	0.79***	0.28*
	(0.20)	(0.22)	(0.24)	(0.16)	(0.21)	(0.15)
EDP rec$_{i,t}$*ESM$_{i,t}$	-0.63	-0.61	-0.40	-0.45	-0.74**	-0.00
	(0.49)	(0.56)	(0.55)	(0.48)	(0.37)	(0.30)
ESM$_{i,t}$	3.06***	3.16***	2.40***	0.78	2.03***	0.34
	(0.96)	(0.90)	(0.54)	(0.78)	(0.62)	(0.51)
ΔSpread$_{i,t}$	0.06***	0.05*	0.08***	0.06	0.14***	-0.04
	(0.02)	(0.03)	(0.02)	(0.06)	(0.03)	(0.03)
Pre$_{i,t}$	0.10	0.10	0.18	0.30*	0.07	0.04
	(0.21)	(0.19)	(0.20)	(0.16)	(0.11)	(0.13)
Crisis$_{i,t}$	-1.80***	-1.77***	-1.16***	-0.48**	-0.17	0.06
	(0.41)	(0.41)	(0.31)	(0.20)	(0.18)	(0.09)
Diff. pre vs post	*0.45*	*0.32*	*-0.25*	*-0.56****	*-0.59***	*-0.62***
	(0.33)	*(0.43)*	*(0.33)*	*(0.13)*	*(0.25)*	*(0.26)*
Observations	253	252	249	259	237	248
R-squared	0.41	0.35	0.33	0.39	0.33	0.07
Number of countries	18	18	18	18	18	18
Time period	1999-2016	1999-2016	2001-2017	2000-2017	2002-2017	2001-2017
Hansen-J	0.143	0.149	0.655	0.500	0.870	0.386

The dependent variable is the year t change in the structural budget balance. The pre-crisis period covers 1999-2008, the post-crisis period 2009-2017. The top row indicates the forecast vintage. Independent variables are measured in real-time; superscripts are omitted for the sake of readability. Regressions include country fixed effects. Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.7: Initial recommendations

	Dependent variable: Change in the structural budget balance					
	(1)	(2)	(3)	(4)	(5)	(6)
	AF: t+1	SF: t+1	AF: t	SF: t	AF: t-1	SF: t-1
Output gap$_{i,t}$	0.16***	0.21***	0.29***	0.22***	0.15***	0.13***
	(0.05)	(0.06)	(0.05)	(0.04)	(0.05)	(0.03)
Budget bal$_{i,t-1}$	-0.07**	-0.11***	-0.12***	-0.11***	-0.08**	-0.02
	(0.04)	(0.03)	(0.03)	(0.02)	(0.04)	(0.03)
Budget bal$_{i,t-1}$*High$_{i,t-1}$	0.10**	0.13***	0.09	0.05	0.03	0.06
	(0.05)	(0.05)	(0.07)	(0.05)	(0.04)	(0.05)
High$_{i,t-1}$	0.12	0.13	0.18	0.28	0.09	0.29
	(0.30)	(0.29)	(0.40)	(0.29)	(0.16)	(0.25)
Debt$_{i,t-1}$	-0.00	-0.01	-0.01*	-0.01**	-0.01**	-0.00
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Elections$_{i,t}$	-0.61***	-0.49**	-0.24	-0.06	0.05	0.00
	(0.20)	(0.20)	(0.16)	(0.11)	(0.09)	(0.09)
EDP rec$_{i,t}$	0.89***	0.84***	0.87***	0.92***	0.67***	0.25*
	(0.22)	(0.21)	(0.21)	(0.16)	(0.14)	(0.14)
EDP rec$_{i,t}$*ESM$_{i,t}$	-1.17**	-0.99	-0.37	-0.43	-0.46**	0.07
	(0.51)	(0.61)	(0.62)	(0.38)	(0.22)	(0.18)
ESM$_{i,t}$	3.77***	3.71***	2.55***	0.83	1.69***	0.22
	(0.83)	(0.84)	(0.59)	(0.72)	(0.48)	(0.44)
ΔSpread$_{i,t}$	0.07***	0.06*	0.07**	0.05	0.14***	-0.03*
	(0.02)	(0.03)	(0.03)	(0.07)	(0.03)	(0.01)
Crisis$_{i,t}$	-1.83***	-1.81***	-1.21***	-0.56***	-0.18	0.03
	(0.43)	(0.44)	(0.32)	(0.21)	(0.16)	(0.08)
EDP rec$_{i,t}$ | ESM$_{i,t}$ = 1	*-0.28*	*-0.15*	*0.51*	*0.49*	*0.21*	*0.32*
	(0.65)	*(0.70)*	*(0.68)*	*(0.42)*	*(0.15)*	*(0.23)*
Observations	253	252	249	259	237	248
R-squared	0.40	0.34	0.30	0.33	0.33	0.07
Number of countries	18	18	18	18	18	18
Time period	1999-2016	1999-2016	2001-2017	2000-2017	2002-2017	2001-2017
Hansen-J	0.173	0.116	0.577	0.479	0.984	0.438

The dependent variable is the year t change in the structural budget balance. The variable EDP rec. only includes the initial recommendation for any given year. The top row indicates the forecast vintage. Independent variables are measured in real-time; superscripts are omitted for the sake of readability. Regressions include country fixed effects. Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.8: Including year dummies

	Dependent variable: Change in the structural budget balance					
	(1)	(2)	(3)	(4)	(5)	(6)
	AF: t+1	SF: t+1	AF: t	SF: t	AF: t-1	SF: t-1
Output gap$_{i,t}$	0.31**	0.32**	0.30***	0.18***	0.14***	0.13***
	(0.14)	(0.14)	(0.11)	(0.07)	(0.05)	(0.04)
Budget bal$_{i,t-1}$	-0.09	-0.10	-0.09*	-0.11***	-0.08***	-0.03
	(0.05)	(0.06)	(0.05)	(0.03)	(0.03)	(0.03)
Budget bal$_{i,t-1}$*High$_{i,t-1}$	0.13*	0.13*	0.08	0.05	0.04	0.12*
	(0.07)	(0.07)	(0.07)	(0.05)	(0.04)	(0.07)
High$_{i,t-1}$	0.21	0.17	0.18	0.32	0.19	0.39
	(0.35)	(0.35)	(0.35)	(0.25)	(0.16)	(0.26)
Debt$_{i,t-1}$	0.01	0.00	-0.00	-0.01	-0.01	0.00
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Elections$_{i,t}$	-0.69***	-0.55***	-0.25	-0.13	-0.02	-0.02
	(0.21)	(0.20)	(0.15)	(0.10)	(0.09)	(0.09)
EDP rec$_{i,t}$	0.91***	0.73***	0.61***	0.83***	0.43***	0.15
	(0.25)	(0.24)	(0.23)	(0.21)	(0.13)	(0.15)
EDP rec$_{i,t}$*ESM$_{i,t}$	-0.92*	-0.72	-0.21	-0.50	-0.47**	0.07
	(0.48)	(0.45)	(0.40)	(0.39)	(0.22)	(0.25)
ESM$_{i,t}$	3.89***	3.61***	2.08**	0.33	1.55***	0.13
	(1.14)	(1.08)	(0.90)	(0.63)	(0.53)	(0.50)
ΔSpread$_{i,t}$	0.09	0.07	0.11	0.06	0.14***	-0.03
	(0.12)	(0.13)	(0.10)	(0.10)	(0.05)	(0.03)
EDP rec$_{i,t}$ | ESM$_{i,t}$ = 1	*-0.01*	*0.01*	*0.40*	*0.33*	*-0.04*	*0.22*
	(0.39)	*(0.37)*	*(0.33)*	*(0.31)*	*(0.15)*	*(0.26)*
Observations	253	252	249	259	237	248
R-squared	0.40	0.34	0.36	0.51	0.47	0.15
Number of countries	18	18	18	18	18	18
Time period	1999-2016	1999-2016	2001-2017	2000-2017	2002-2017	2001-2017
Hansen-J	0.182	0.656	0.502	0.218	0.338	0.174

The dependent variable is the year t change in the structural budget balance. The top row indicates the forecast vintage. Independent variables are measured in real-time; superscripts are omitted for the sake of readability. Regressions include country fixed effects and a full set of year dummies. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.9: Only recommendations defined in terms of structural budget balance

	Dependent variable: Change in the structural budget balance					
	(1)	(2)	(3)	(4)	(5)	(6)
	AF: t+1	SF: t+1	AF: t	SF: t	AF: t-1	SF: t-1
Output gap$_{i,t}$	0.13**	0.19***	0.25***	0.16***	0.15***	0.12***
	(0.06)	(0.07)	(0.06)	(0.05)	(0.05)	(0.03)
Budget bal$_{i,t-1}$	-0.06	-0.10**	-0.08**	-0.08**	-0.09**	-0.01
	(0.05)	(0.04)	(0.03)	(0.04)	(0.03)	(0.03)
Budget bal$_{i,t-1}$*High$_{i,t-1}$	0.10	0.13**	0.09	0.07*	0.05	0.09
	(0.06)	(0.06)	(0.07)	(0.04)	(0.04)	(0.05)
High$_{i,t-1}$	0.17	0.19	0.09	0.17	0.07	0.35
	(0.37)	(0.34)	(0.38)	(0.25)	(0.19)	(0.25)
Debt$_{i,t-1}$	0.00	-0.00	-0.00	-0.00	-0.01***	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Elections$_{i,t}$	-0.58***	-0.47**	-0.21	-0.04	0.06	0.03
	(0.19)	(0.19)	(0.15)	(0.10)	(0.09)	(0.08)
EDP rec$_{i,t}$	0.89***	0.85***	1.09***	1.19***	0.82***	0.33***
	(0.20)	(0.21)	(0.20)	(0.13)	(0.12)	(0.11)
EDP rec$_{i,t}$*ESM$_{i,t}$	-0.21	-0.30	-0.46	-0.39	-0.91	0.08
	(0.84)	(0.93)	(0.77)	(0.65)	(0.56)	(0.32)
ESM$_{i,t}$	2.08	2.38*	2.38***	0.85	2.45***	0.41
	(1.42)	(1.44)	(0.73)	(1.11)	(0.94)	(0.57)
ΔSpread$_{i,t}$	0.07**	0.07*	0.08**	0.05	0.15**	-0.05
	(0.03)	(0.04)	(0.03)	(0.06)	(0.06)	(0.03)
Crisis$_{i,t}$	-1.74***	-1.69***	-1.08***	-0.56***	-0.20	0.03
	(0.40)	(0.42)	(0.31)	(0.21)	(0.15)	(0.08)
EDP rec$_{i,t}$ | ESM$_{i,t}$ = 1	*0.68*	*0.55*	*0.62*	*0.80*	*-0.09*	*0.40*
	(0.95)	*(1.01)*	*(0.75)*	*(0.64)*	*(0.53)*	*(0.35)*
Observations	246	245	241	252	230	244
R-squared	0.42	0.36	0.38	0.42	0.35	0.09
Number of countries	18	18	18	18	18	18
Time period	1999-2016	1999-2016	2001-2017	2000-2017	2002-2017	2001-2017
Hansen-J	0.189	0.102	0.779	0.514	0.916	0.677

The dependent variable is the year t change in the structural budget balance. The top row indicates the forecast vintage. Independent variables are measured in real-time; superscripts are omitted for the sake of readability. Regressions include country fixed effects. Observations in which a country received an EDP recommendation defined in terms of the nominal budget balance are excluded from the regression. Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.10: Size of the recommendations

	Dependent variable: Change in the structural budget balance					
	(1)	(2)	(3)	(4)	(5)	(6)
	AF: t+1	SF: t+1	AF: t	SF: t	AF: t-1	SF: t-1
Output gap$_{i,t}$	0.13**	0.18***	0.24***	0.12**	0.17***	0.11***
	(0.06)	(0.07)	(0.06)	(0.06)	(0.05)	(0.04)
Budget bal$_{i,t-1}$	-0.05	-0.09*	-0.08**	-0.07**	-0.08**	-0.01
	(0.05)	(0.05)	(0.03)	(0.03)	(0.04)	(0.03)
Budget bal$_{i,t-1}$*High$_{i,t-1}$	0.10*	0.12***	0.10**	0.04	0.06*	0.05
	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.05)
High$_{i,t-1}$	0.27	0.20	0.21	0.18	0.16	0.14
	(0.35)	(0.30)	(0.32)	(0.28)	(0.18)	(0.25)
Debt$_{i,t-1}$	0.00	-0.00	-0.00	-0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Elections$_{i,t}$	-0.57***	-0.45**	-0.22	-0.08	0.05	-0.01
	(0.19)	(0.19)	(0.14)	(0.11)	(0.09)	(0.09)
EDP rec$_{i,t}$	-0.34	0.12	-0.29	1.74***	0.80	1.12***
	(0.81)	(0.94)	(1.07)	(0.42)	(0.60)	(0.33)
EDP rec squared$_{i,t}$	1.57	1.04	2.04	-1.02**	0.03	-1.01***
	(1.20)	(1.41)	(1.46)	(0.47)	(0.91)	(0.30)
EDP rec cubed$_{i,t}$	-0.50	-0.39	-0.73*	0.22**	-0.05	0.22***
	(0.35)	(0.41)	(0.41)	(0.11)	(0.30)	(0.06)
ESM$_{i,t}$	2.02***	2.30***	2.09***	0.56	0.49	0.62***
	(0.71)	(0.72)	(0.60)	(0.44)	(0.39)	(0.15)
ΔSpread$_{i,t}$	0.05**	0.05	0.07***	0.06	0.25***	-0.03
	(0.02)	(0.03)	(0.03)	(0.06)	(0.05)	(0.03)
Crisis$_{i,t}$	-1.84***	-1.79***	-1.20***	-0.55***	-0.18	0.06
	(0.43)	(0.43)	(0.32)	(0.21)	(0.15)	(0.08)
Joint significance (p-val) of EDP rec squared and cubed	0.18	0.09	0.00	0.09	0.54	0.00
Observations	248	247	243	254	232	244
R-squared	0.42	0.35	0.36	0.36	0.33	0.10
Number of countries	18	18	18	18	18	18
Time period	1999-2016	1999-2016	2001-2017	2000-2017	2002-2017	2001-2017
Hansen-J	0.319	0.432	0.787	0.748	0.735	0.584

The dependent variable is the year t change in the structural budget balance. The top row indicates the forecast vintage. Independent variables are measured in real-time; superscripts are omitted for the sake of readability. Regressions include country fixed effects. Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.11: Size of the recommendations (excl. ESM observations)

	Dependent variable: Change in the structural budget balance					
	(1)	(2)	(3)	(4)	(5)	(6)
	AF: t+1	SF: t+1	AF: t	SF: t	AF: t-1	SF: t-1
Output gap$_{i,t}$	0.17***	0.26***	0.37***	0.24***	0.25***	0.11**
	(0.06)	(0.08)	(0.09)	(0.06)	(0.08)	(0.06)
Budget bal$_{i,t-1}$	-0.09**	-0.15***	-0.15***	-0.13***	-0.13***	-0.01
	(0.04)	(0.05)	(0.04)	(0.03)	(0.04)	(0.03)
Budget bal$_{i,t-1}$*High$_{i,t-1}$	0.13**	0.10	0.11	-0.02	0.08**	0.06
	(0.06)	(0.08)	(0.07)	(0.06)	(0.04)	(0.07)
High$_{i,t-1}$	0.32	-0.04	0.06	-0.27	0.15	0.19
	(0.34)	(0.39)	(0.47)	(0.33)	(0.18)	(0.31)
Debt$_{i,t-1}$	0.00	-0.00	-0.00	-0.00	-0.01**	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Elections$_{i,t}$	-0.57***	-0.44**	-0.17	-0.01	0.06	-0.01
	(0.20)	(0.20)	(0.14)	(0.11)	(0.10)	(0.09)
EDP rec$_{i,t}$	0.31	0.64	-0.25	1.50***	0.49	0.89***
	(0.68)	(0.66)	(0.68)	(0.46)	(0.70)	(0.34)
EDP rec squared$_{i,t}$	0.76	0.29	2.37**	-0.76*	0.84	-0.69**
	(0.68)	(0.94)	(0.96)	(0.42)	(0.99)	(0.33)
EDP rec cubed$_{i,t}$	-0.24	-0.15	-0.97***	0.17*	-0.40	0.15**
	(0.19)	(0.31)	(0.32)	(0.09)	(0.30)	(0.07)
ΔSpread$_{i,t}$	0.09	0.09	0.11	0.30***	0.04	-0.01
	(0.12)	(0.13)	(0.13)	(0.09)	(0.09)	(0.07)
Crisis$_{i,t}$	-1.75***	-1.74***	-1.06***	-0.60***	-0.21	0.06
	(0.38)	(0.39)	(0.29)	(0.21)	(0.15)	(0.08)
Joint significance (p-val) of EDP rec squared and cubed	0.42	0.77	0.00	0.18	0.00	0.10
Observations	233	233	229	243	223	237
R-squared	0.38	0.31	0.33	0.47	0.26	0.07
Number of countries	18	18	18	18	18	18
Time period	1999-2016	1999-2016	2001-2017	2000-2017	2002-2017	2001-2017
Hansen-J	0.189	0.107	0.828	0.225	0.313	0.697

The dependent variable is the year t change in the structural budget balance. The top row indicates the forecast vintage. Independent variables are measured in real-time; superscripts are omitted for the sake of readability. Regressions include country fixed effects. Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

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