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Fiscal rules, fiscal space and procyclical fiscal policy

Abstract

In this paper we analyse the interaction of fiscal rules and fiscal space. We find strong evidence for fiscal rules being associated with higher fiscal space. Furthermore, the analysis shows that countries with more fiscal space tend to have higher discretionary expenditures, but that this effect is significantly reduced if fiscal rules are in place. A similar effect can be observed for the procyclicality of fiscal policy, which is significantly higher in an environment of ample fiscal space, while this difference is reduced with fiscal rules. Regarding the different types of fiscal rules, we find the strongest results for expenditure rules and to a lesser extent for balanced budget rules, but none for debt rules.

Non-technical summary

In response to the economic and financial crisis, many EU countries have strengthened their fiscal governance frameworks by introducing fiscal rules. Although it is widely acknowledged that fiscal rules, which constrain fiscal policy through numerical limits on fiscal aggregates, are essential for limiting the deficit bias, they are sometimes criticised for increasing the procyclicality of fiscal policy, in particular if defined in nominal terms. More precisely, it is argued that during a boom phase fiscal rules do not prevent fiscal policy from turning expansionary, while at times of a recession fiscal policy is potentially restrictive as governments need to comply with the rules' requirements. This effect is assumed to be particularly pronounced in periods of limited fiscal space, while it might be less obvious in an environment of high fiscal space.

In the paper we address the question whether fiscal rules are indeed procyclical and whether the countries' available fiscal space matters in this respect. Concretely, we test the hypothesis whether fiscal rules in interaction with the countries' fiscal space would be less procyclical. In doing this we first estimate the impact of fiscal rules on fiscal space. We define fiscal space in line with the methodology by Ghosh et al. (2013) as the difference between a debt limit and the actual debt, with the debt limit being calculated by the reaction function of the primary balance to past debt levels. For fiscal rules we use an updated version of the dataset set up in Nerlich and Reuter (2013) to account for the latest improvements of national fiscal frameworks in the EU countries. In a second step we examine how the interaction of fiscal rules and fiscal space is affecting the responsiveness of discretionary fiscal policy. Concretely, we analyse whether fiscal rules help to lower the increase in discretionary measures at times of high fiscal space. Furthermore, our hypothesis is that if fiscal rules help to limit discretionary fiscal policy and discretionary expenditures and revenues move with the cycle, fiscal rules would make fiscal policy less procyclical.

We find strong evidence for fiscal rules being associated with higher fiscal space, i.e. the fiscal room for manoeuvre is higher in those countries which have established fiscal rules. This may not be surprising as fiscal rules are implemented to keep primary balances under control and by fostering credibility they are expected to reduce the country's interest expenditure. Both would help to keep the actual debt level under control and lift the debt limit, beyond which debt turns unsustainable, which in turn should raise the fiscal space of a country.

Furthermore, our analysis shows that higher fiscal space is correlated with increased discretionary expenditures/ lower discretionary revenues, but that this effect is significantly reduced if fiscal rules are in place. This could be interpreted such that fiscal space allows fiscal policy to be more procyclical while fiscal rules seem to counteract this procyclicality by reducing the responsiveness of discretionary expenditures and discretionary revenues. When splitting the results by different types of fiscal rules, we find significant coefficients for expenditure and, to a lesser extent, balanced budget rules, but none for debt rules.

1 Introduction

This paper analyses the impact of fiscal rules on the countries' available fiscal space and how their interaction determines the procyclicality of fiscal policy. Although it is widely acknowledged that fiscal rules - by constraining fiscal policy through numerical limits on budgetary aggregates - are essential for limiting the deficit bias, they are sometimes criticised for increasing the procyclicality of fiscal policy, in particular if defined in nominal terms. More precisely, it is argued that during a boom phase fiscal rules do not prevent fiscal policy to turn expansionary, while at times of a recession fiscal policy is potentially restrictive as governments need to comply with the rules' requirements. This effect is assumed to be particularly pronounced in periods of limited fiscal space, while it might be less obvious in an environment of high fiscal space.

Our paper first estimates the relationship between fiscal rules and fiscal space. Thereby, we follow Ghosh et al. (2013) and define fiscal space as the difference between a so-called debt limit, beyond which (without extraordinary measures) debt would be unsustainable, and the current debt level. Several papers have shown that fiscal rules help to keep primary balances under control and by fostering credibility reduce a country's interest expenditure. This, in turn, would support the view that fiscal space would be higher in countries with credible fiscal rules, as they help to reduce the actual debt level and lift the debt limit.

In a second step we examine the link between the interaction of fiscal rules and fiscal space with discretionary fiscal policy. Among others, it is tested whether fiscal rules limit the responsiveness of discretionary fiscal policy to changes in fiscal space and whether fiscal rules help to lower the increase in discretionary expenditures/ decrease in discretionary revenues in times of high fiscal space. We then analyse the interaction of fiscal rules and fiscal space with the procyclicality of fiscal policy. Our hypothesis is that if fiscal rules help to limit discretionary fiscal policy and if discretionary expenditures and revenues move with the cycle, this would support the view that fiscal rules would help to reduce the cyclicality of fiscal policy rather than to increase it. We also try to address the question whether it matters which kind of fiscal rules are in place. Thus, we estimate different settings for different kinds of fiscal rules.

We use an updated version of the dataset set up in Nerlich and Reuter (2013) to account for the latest improvements of national fiscal frameworks in the EU countries. For fiscal rules we differentiate between different kinds of fiscal rules, namely balanced budget, debt and expenditure rules. We calculate fiscal space using the methodology by Ghosh et al. (2013) for the period 1990 to 2014. To obtain fiscal space the debt limit is calculated by the reaction function of the primary balance to past debt levels and compared with the actual debt level. Thereby, we account for the fact that fiscal space can vary over time, for example due to interest rate changes or institutional settings such as the introduction of fiscal rules.

While the (budgetary) impact of fiscal rules is widely discussed in the literature, to our knowledge the relation between fiscal rules, fiscal space and the interaction of the two with fiscal policy making has not yet been analysed so

far.

The paper finds that fiscal rules are strongly correlated with higher fiscal space, i.e. the fiscal room for manoeuvre seems to be higher in those countries that have fiscal rules in place. Furthermore, the analysis shows that more fiscal space is associated with increased discretionary fiscal policy, but that this effect is significantly reduced if fiscal rules are in place. Regarding the different types of fiscal rules, we find particularly strong coefficients for expenditure rules, possibly reflecting the fact that expenditure rules are easier to monitor and are thereby more credible. Furthermore, we find that fiscal rules in an environment of fiscal space tend to occur together with less procyclical fiscal policy.

The paper is organised as follows. Section 2 describes the data used, i.e. the calculation of the fiscal space and the update of the fiscal framework database. Section 3 estimates the relationship between fiscal rules and fiscal space. In section 4 the link between fiscal rules and discretionary fiscal policy is analysed, with a particular view on the available fiscal space. Section 5 looks at how fiscal rules and fiscal space interact with the procyclicality of fiscal policy.

2 Data

2.1 The definition of fiscal space

Fiscal space, which is a relatively new concept, tries to quantify a country's room for manoeuvre for fiscal policy. The literature offers various ways on how to define and calculate the fiscal space of a country, which range from the reaction of the primary balance to changes of the debt level, (potential) tax revenues to implicit liabilities.

A first attempt to calculate fiscal space goes back to Bohn (1998, 2008) who analysed the dynamics of US debt-to-GDP data. In this approach fiscal space can either be zero or infinite, depending on the reaction of the primary fiscal balance to public debt in the past (controlling for other determinants of the primary balance). It is infinite if the reaction of the primary balance is sufficiently strong and zero otherwise, assuming a linear relationship for any amount of debt. This definition of fiscal space has been extended by Ostry et al. (2010) and Ghosh et al. (2013)[1], by taking into account the work of Abiad and Ostry (2005), and Mendoza and Ostry (2008), who propose to use squared and cubic debt terms when calculating the response term.

Others have chosen a different approach by calculating the fiscal space on the basis of various measures of tax revenues (including potential, maximum or structural tax revenues). Aizenman and Jinjarak (2010) define fiscal space as the number of years of tax revenues that are necessary to repay a country's debt, i.e. the public debt divided by the de facto tax base of a country. Brun et al. (2006) calculate fiscal space as the ratio of the current level of revenues to potential tax revenues, based on structural indicators such as GDP per capita

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[1]This definition of fiscal space has been applied e.g. by Zandi et al. (2011) and Hajnovic and Zeman (2012).

and income sectors. Similarly, Bi (2012) uses a general equilibrium model to derive dynamic Laffer curves of taxation and create country specific (depending on size and degree of countercyclical policy responses) stochastic fiscal limits as a measure of the ability and willingness of governments to service their debts. Park (2012) employs a (standard neoclassical) model to generate a Laffer curve of public revenues. He defines fiscal space as the distance between current tax revenues and the peak of the Laffer curve (i.e. the maximum tax revenues possible) and investigates how population aging trends affect fiscal space.

A third stream of the literature links fiscal space to implicit liabilities, such as aging costs. Mario (2013) uses the S1 indicator[2], which captures the required fiscal adjustment to reach a debt level of 60% of GDP by 2030. A more short-term definition of fiscal space is given by Schick (2009, 2012). He defines fiscal space as the financial resources available to the government for fiscal policy, namely growth-enhancing investment in physical and human capital that governments can finance with borrowed funds without prejudicing the long-run sustainability of its fiscal position.

This paper does not aim to contribute to the discussion about the various definitions of fiscal space, but relies on the approach used in Ghosh et al. (2013) to calculate a time and country dependent variable. Thus we follow the estimation settings and data selection in Ghosh et al. (2013) as closely as possible. Fiscal space is defined as the difference between the debt limit and the current debt level. The debt limit is estimated using historical, but marginal decreasing, responses of the primary balance to increases in debt and by taking various levels of interest-rate growth differentials into account. The debt limit is the point beyond which either extraordinary (i.e. more than historical) efforts are necessary or a country defaults. Appendix A.4 gives a more detailed description of the concept and details of the calculations performed in this paper.

We calculate the fiscal space for the EU27 countries[3] covering the period 1990 to 2014. We account for the fact that fiscal space can vary over time, as can be seen in Figure 1 which shows the development of fiscal space of the EU27 average (country composition varies depending on data availability).

Figure 3 in Appendix A.3 shows the country specific fiscal space, which is different across countries, as well as over time. In particular, some countries (Belgium, Denmark, Finland, France, Italy, the Netherlands, Sweden) had episodes of very low or no fiscal space during the mid-1990s, which in most cases recovered in the run-up to EMU. In fact, the steep decline in interest rates in the run-up to EMU are likely to have contributed to the improvement in fiscal space in the countries joining the Euro Area. With the financial and sovereign debt crisis unfolding, the fiscal space diminished in many countries, in some of them sharply, from 2007 onwards. Seven countries (Cyprus, Spain, Greece, Italy, Ireland, Portugal, Slovenia) had very low or no fiscal space in 2014. Moreover, Italy stands out as the only country which had no or very low fiscal space throughout the whole sample period. In turn, in a number of countries, such as Austria, Germany,

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[2]For the definition of the S1 indicator see European Commission (2012b).
[3]Due to data availability we do not calculate the fiscal space for Croatia.

Figure 1: Average fiscal space (as % of GDP) for EU27 from 1990 to 2014 (country composition per year changes due to data availability, see Figure 3 in Appendix A.3)

Estonia, Luxembourg, Malta, the Netherlands, Sweden and Slovakia, the fiscal space remained relatively stable at a high level throughout the full period, possibly also reflecting the fact that these countries were less affected by the sovereign debt crisis.

2.2 Update of the fiscal rules dataset

We update the dataset on fiscal rules of Nerlich and Reuter (2013) to account for the latest changes in the fiscal frameworks of the EU27. Under fiscal rules we subsume numerical limits on budgetary aggregates which pose a permanent constrain on fiscal policy to ensure fiscal sustainability. The dataset contains information about various characteristics of national numerical fiscal rules and national fiscal councils in the EU27 from 1990 to 2014. It combines data from the European Commission (2012a), the OECD (2003, 2008), the IMF (2013) and an ESCB-internal dataset on national fiscal frameworks (2011, 2012, 2014). Appendix A.2 shows the updated full dataset of national numerical fiscal rules. The updated dataset confirms that the number of fiscal rules, including those in law or constitutions, continued to increase in recent years (see Figure 2). While in 1990 only six out of the 27 EU countries had some kind of fiscal rule in place, the number increased to 25 countries in 2014. By now, most countries anchored
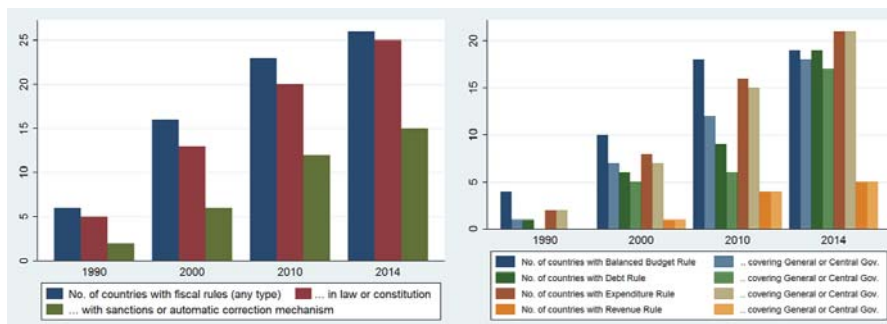
Figure 2: Number of countries having specific kinds of fiscal rules in 1990, 2000, 2010 and 2014

their fiscal rules in law or constitution and in more and more countries are the fiscal rules linked to a sanction or automatic correction mechanism. This is likely to foster the credibility of the fiscal rules. Moreover, most countries have different kind of fiscal rules in place. In particular, balanced budget rules, debt rules and expenditure rules covering the general or central government are wide-spread, while revenue rules continue to be of marginal importance.

3   Fiscal Rules and Fiscal Space

We investigate whether fiscal rules and fiscal space are closely linked with each other, in the sense that the room for manoeuvre would be higher in countries with fiscal rules. There are two main arguments supporting this view: First, fiscal rules, by fostering fiscal discipline, help to decrease public deficits and debt levels (e.g. Debrun et al., 2008). By widening the difference between the actual debt level and the debt limit this would increase the fiscal space of a country. Second, fiscal rules help fostering the trust of investors and financial markets in the soundness of a country's public finances (e.g. Iara and Wolff, 2014). This should have a decreasing impact on the risk premia and interest rates of government bonds, which lifts the debt limit, lowers the actual debt and thereby would increase fiscal space.

We test the effect of fiscal rules on fiscal space in a simple econometric framework (Equation 1) for the EU27 countries covering the period 1990-2013:

$$S_{i,t} = \beta_1 F_{i,t} + X'_{i,t}\gamma + \mu_i + \eta_t + \epsilon_{i,t} \tag{1}$$

where $S_{i,t}$ is the average fiscal space over the past ten years of country i at time t and $F_{i,t}$ is the share of the past 10 years where a (specific) fiscal rule was in place. $X_{i,t}$ captures a set of control variables (also expressed in ten year averages) which could potentially influence fiscal space. These include economic (GDP per capita, financial openness, and trade openness), political (the fragmentation of government, an election year dummy, the ideological position of the

government, the ideological range of government) and demographic (population, current and future age dependency) variables, as well as three EU/EMU/IMF dummy variables (dummies for EU and EMU membership and a dummy for IMF arrangements). Important macroeconomic variables, such as interest rates or the debt level, have not been used as control variables in this setting as they have been already directly included in the calculation of the fiscal space measure. The political control variables capture the potential simultaneous impact of voter preferences on fiscal space and fiscal rules and thus should reduce endogeneity through a potential omitted variable bias. The data sources and definitions of the variables can be found in Appendix A.1.

Furthermore, we include time (η_t) and country (μ_i) fixed effects and $\epsilon_{i,t}$ is the error term. We report standard errors which are robust to heteroskedasticity, panel-specific autocorrelation and contemporaneous cross-sectional dependence (i.e. Parks-Kmenta panel corrected standard errors as proposed in Beck and Katz, 1995). Furthermore, we perform unit root/ stationarity tests on the variables included in the various estimations and take first differences of the variables where the null hypothesis of stationarity was rejected. We use ten year averages, as newly established or strengthened fiscal rules might need some time to have a significant effect on the credibility of public finances or the actual debt level. We also did robustness checks using averages over shorter time periods which however do not change the overall results (see Table A4 in Appendix A.5). The coefficient of the fiscal rule variable becomes smaller for averages with less years. Moreover, shorter time period averages are driven by short-term factors like the business cycle or macroeconomic shocks.

As shown in Table 1, fiscal rules seem to be strongly correlated with the size of the available fiscal space of a country. If a country had a fiscal rule in place for the past ten years the average fiscal space for those years is around 22% of GDP higher. The coefficient is proportional to the number of years in which a fiscal rule has been in place. The coefficients of the control variables are in line with general expectations. In fact, fiscal space seems to be higher in countries that are more open and more conservative, have less fragmented and more politically stable governments. Financial openness is associated with lower fiscal space, which might be the case because governments are e.g. less able to use tools of "financial repression" (see e.g. Reinhart, 2012).

The causality between fiscal rules and fiscal space could in principle work in both directions. A country with either low or high fiscal space might have introduced fiscal rules in order to either increase the fiscal space in the future or preserve the good conditions. Nevertheless, the following two reasons let us suggest that the causality is going from fiscal rules to fiscal space. First, there is usually a significant lag of several years between the politician's decision to introduce a fiscal rule and the rule entering into force. The same is true, when strengthening fiscal rules. Like in other studies (e.g. de Haan et al., 2012) with annual data we thus assume the endogeneity bias to be relatively small. Second, the estimated coefficients remain qualitatively the same when accounting for the potential reverse causality of fiscal rules as demonstrated by e.g. Debrun et al. (2008) using an instrumental variable estimation framework or Yeter and Heinemann

Table 1: *Regression results - Determinants of Fiscal Space (10 year averages)*

	(1) All Rules	(2) Balanced Budget Rules	(3) Debt Rules	(4) Expenditure Rules
Fiscal Rule	22.17***	6.91**	−3.13	43.27***
	(3.19)	(3.02)	(5.47)	(3.90)
Δ GDP per Capita	−0.07	−0.13	−0.16	−0.15
	(0.12)	(0.12)	(0.12)	(0.10)
Δ Financial Openness	−0.19***	−0.23***	−0.24***	−0.15***
	(0.05)	(0.05)	(0.05)	(0.06)
Trade Openness	4.35***	4.27***	4.34***	4.39***
	(1.34)	(1.34)	(1.35)	(1.42)
Population	0.02**	0.01	0.01	0.02**
	(0.01)	(0.01)	(0.01)	(0.01)
Age dependency	−0.04	−0.23	−0.19	−0.12
	(0.75)	(0.75)	(0.72)	(0.73)
Future age dependency	1.12	0.95	0.74	1.18
	(0.87)	(0.78)	(0.76)	(0.69)
Election Years	−5.31	−4.22	−4.22	−4.99
	(4.37)	(4.31)	(4.40)	(4.64)
Ideology	2.06***	1.77**	1.90***	1.98***
	(0.73)	(0.71)	(0.70)	(0.71)
Ideological Range	8.39***	8.31***	8.57***	8.22***
	(1.07)	(1.16)	(1.15)	(1.26)
Government Fragmentation	−1.70***	−1.44***	−1.42***	−2.08***
	(0.34)	(0.34)	(0.35)	(0.34)
IMF Arrangement	−0.13	−0.14	−0.15	−0.11
	(0.09)	(0.09)	(0.09)	(0.09)
EU Membership	−0.10	−0.10	−0.09	−0.09*
	(0.07)	(0.07)	(0.07)	(0.06)
Eurozone Membership	0.08*	0.04	0.02	0.07*
	(0.04)	(0.04)	(0.04)	(0.04)
N	482	482	482	482
Groups	26	26	26	26
R^2	0.97	0.97	0.97	0.98

Notes: Dependent Variable is 10 year average of fiscal space. All variables are rolling averages of past 10 years. Columns indicate different definitions of "Fiscal Rule" variable. All regressions include time and country fixed effects. Standard errors which are robust to heteroskedasticity, panel-specific autocorrelation and contemporaneous cross-sectional dependence (i.e. Parks-Kmenta panel corrected standard errors as proposed in Beck and Katz, 1995) are in parentheses. * indicate significance at 10% level, ** at 5% level and *** at 1% level.

(2014) using unexpected shocks as identification strategy.

Moreover, the analysis shows that the coefficient of fiscal rules also depends on the type of fiscal rules in place. The strongest relationship can be attributed to expenditure rules, followed by balanced budget rules, while debt rules seem to be insignificant. Previous studies (e.g. Debrun et al. 2008 or Nerlich and Reuter 2013) already highlighted the significant effect of balanced budget rules

	(1) Fiscal Space	(2) Primary Balance	(3) Debt Level	(4) Interest- Growth-Diff.
Fiscal Rule (Expenditure Rules)	43.27***	1.38***	−10.62***	−1.41***
	(3.90)	(0.30)	(1.74)	(0.20)
Δ GDP per Capita	−0.15	−0.03***	−0.06*	−0.01
	(0.10)	(0.01)	(0.03)	(0.01)
Δ Financial Openness	−0.15***	0.01***	0.02	0.00
	(0.06)	(0.00)	(0.02)	(0.01)
Trade Openness	4.39***	0.02***	−0.12**	−6.08***
	(1.42)	(0.01)	(0.05)	(0.91)
Population	0.02**	−0.57	5.28*	2.22***
	(0.01)	(0.55)	(2.75)	(0.49)
Age dependency	−0.12	0.00	0.00**	0.00***
	(0.73)	(0.00)	(0.00)	(0.00)
Future age dependency	1.18	0.12***	1.53***	−0.15***
	(0.69)	(0.05)	(0.27)	(0.05)
Election Years	−4.99	−0.65*	0.87	0.30
	(4.64)	(0.34)	(1.60)	(0.34)
Ideology	1.98***	0.04	−0.39	−0.12**
	(0.71)	(0.04)	(0.24)	(0.05)
Ideological Range	8.22***	0.14*	−0.74*	−0.19***
	(1.26)	(0.08)	(0.44)	(0.07)
Government Fragmentation	−2.08***	−0.02**	0.39***	0.05**
	(0.34)	(0.01)	(0.07)	(0.02)
IMF Arrangement	−0.11	0.01*	0.09**	−0.02***
	(0.09)	(0.01)	(0.04)	(0.01)
EU Membership	−0.09*	0.02***	0.07***	0.02***
	(0.06)	(0.00)	(0.02)	(0.00)
Eurozone Membership	0.07*	0.01***	−0.03*	0.00
	(0.04)	(0.00)	(0.02)	(0.00)
N	482	548	550	405
Groups	26	26	26	26
R^2	0.98	0.54	0.94	0.92

(and to a lesser extent debt rules) on public finances. Yet, they did not find significant effects for expenditure rules on public deficits. This suggests that while the positive association of balanced budget rules with fiscal space could be mainly driven by their influence on the public balance, the link between expenditure rules and fiscal space might be mainly due to higher credibility (as

usually expenditure ceilings are easier to monitor) and thereby lower interest rate expenditures. To investigate this further, we look at the correlation of expenditure rules with the different components of fiscal space. The measure of fiscal space is influenced by three main variables: the primary balance, the current debt level and the interest-rate-growth-differential. To see how expenditure rules are linked to fiscal space we perform the same regressions as in Equation 1 on the various components of fiscal space separately. As Table 2 shows, expenditure rules seem on the one hand to be associated with a higher primary balance and a lower (average) current debt level and on the other hand with a lower (average) interest-rate-growth-differential. The latter could be assumed to be driven by lower interest rates because of more trust and credibility of fiscal policy. With respect to the relative importance of the three components making up fiscal space, the strongest impact is likely to come from interest-rate-growth-differentials. The reasoning behind is that the mean level of the interest-rate-growth-differential is lower than that of the primary balance and debt level. Thus in relative terms to the mean level the effect of expenditure rules seems to be strongest on the interest-rate-growth-differential.

4 Fiscal Rules, Fiscal Space and Discretionary Fiscal Policy

After we found support for our assumption that fiscal rules are, in the long run, linked to higher fiscal space of a country, we are in a next step interested in the relationship of fiscal rules and discretionary fiscal policy variables in an environment of high or low fiscal space. Both, fiscal space and fiscal rules are often mentioned in relation to discretionary fiscal policy, as low fiscal space or stringent fiscal rules should both set boundaries to the use of discretionary fiscal policy.

To investigate the interplay of fiscal rules and fiscal space with the size of discretionary fiscal policy we estimate Equation (2) for the EU27 from 2004-2013:

$$E_{i,t}^{Disc} = \beta_1 S_{i,t} + \beta_2 F_{i,t} + \beta_3 S_{i,t} \cdot F_{i,t} + X_{i,t}' \gamma + \mu_i + \eta_t + \epsilon_{i,t} \qquad (2)$$

We estimate the effect of fiscal space $S_{i,t}$, fiscal rules $F_{i,t}$, and the interaction between the two $S_{i,t} \cdot F_{i,t}$, on various measures of discretionary fiscal policy $E_{i,t}^{Disc}$ of country i at time t. The latter include discretionary current expenditures, discretionary capital expenditures and discretionary current revenues as published in the AMECO database of the European Commission. Furthermore we look at the aggregated discretionary fiscal effort measure as published by Carnot and de Castro (2015).[4] We also include time (η_t) and country (μ_i) fixed

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[4]Carnot and de Castro (2015) use a 'narrative', bottom-up approach to determine the discretionary revenues which are not associated with the business cycle (new tax measures) and use a top-down approach to calculate discretionary expenditures, by adjusting the traditional structural balance for removing items that are out of government's control in the short term and using a smoother definition of potential growth. Both, discretionary revenues and expenditures, calculated in this way, taken together represent the "discretionary fiscal effort".

effects and calculate errors $\epsilon_{i,t}$ which are robust to heteroskedasticity, panel-specific autocorrelation and contemporaneous cross-sectional dependence (i.e. Parks-Kmenta panel corrected standard errors as proposed in Beck and Katz, 1995).

The set of control variables $X_{i,t}$ is composed of standard determinants in the literature on fiscal reaction functions. Additionally to the political, demographic and dummy variables[5] already used in Equation 1 in Section 3, we include several economic variables (the debt level of the previous period, the output gap of the previous period, and the unemployment rate of the previous period) to capture annual changes in the data. The data sources and definitions of the variables can be found in Appendix A.1.

The estimation results of Equation (2) are presented in Table 3. The main results are overall in line with intuition: Countries with more fiscal space tend to have higher current discretionary expenditures, less discretionary revenues and thus overall a lower discretionary fiscal effort. Current discretionary expenditures are by 0.91 % of GDP higher if the fiscal space of a country were to be increased by 100 percentage points. However, if governments have fiscal rules in place, the results suggest that governments can no longer fully use their fiscal space and (on average) are even forced to reduce their current expenditures or increase their revenues. Likewise for the fiscal effort, the results show a significant relationship. We do not find any significant link of fiscal rules and fiscal space with discretionary capital expenditures. If the fiscal space is zero, for example following a sharp increase in actual debt or a confidence crisis lowering the debt limit, then countries with fiscal rules would tend to have higher discretionary current expenditures and lower revenues compared to countries without fiscal rules. But as we have in our sample almost no observations with fiscal space that is zero, this is only a theoretical consideration.

As in Section 3 an endogeneity bias can not be excluded, as causality could also run from discretionary public expenditures (revenues) to either fiscal rules or fiscal space. Again, for the reasons mentioned in Section 3 above, we assume the bias to be relatively small regarding fiscal rules. Regarding fiscal space, we recognise that there could be reverse causality, as lower discretionary expenditures (higher discretionary revenues) might lead to higher fiscal space. Thus our results need to be interpreted with caution. Nevertheless, our fiscal space variable is defined in a way that the expenditures (revenues) of one year do only have a very minor impact on the level of the fiscal space variable. In our case, fiscal space is rather determined by averages of growth and interest rates, the reaction of fiscal policy to debt levels, etc. over a longer time period.

To check the robustness of our main findings we perform several additional exercises, some of which are presented in Table A5 in Appendix A.6. Overall the results stay qualitatively the same. For example, we do robustness checks without any control variables, or without fixed effects. When looking at the different types of fiscal rules the strongest association with discretionary fiscal

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[5]We do not use a EU or EMU membership dummy anymore, as those are constant for most countries over the shorter sample period (2004-2013).

Table 3: *Regression results (Dependent variable: measures of discretionary fiscal policy)*

	(1) Fiscal Effort	(2) Discr. Current Expenditures	(3) Discr. Capital Expenditures	(4) Discr. Current Revenues
Fiscal Space	-3.39^{***}	0.91^{**}	-2.01	-1.34^{***}
	(0.42)	(0.43)	(0.01)	(0.44)
Fiscal Rule	-4.50^{***}	3.13^{***}	0.10	-2.77^{**}
	(1.12)	(1.00)	(2.05)	(1.10)
Fiscal Space x Fiscal Rule	1.28^{***}	-1.27^{***}	0.20	0.77^{*}
	(0.37)	(0.40)	(1.16)	(0.43)
Debt (-1)	-0.22	-0.28	-9.65	1.62^{**}
	(1.35)	(0.87)	(7.16)	(0.82)
Output Gap (-1)	0.07	0.01	-0.02	0.06^{*}
	(0.04)	(0.03)	(0.05)	(0.03)
Unemployment (-1)	-0.04	-0.06^{**}	0.07	0.00
	(0.05)	(0.02)	(0.11)	(0.03)
Population	0.13	-0.53^{**}	0.92	0.36
	(0.28)	(0.25)	(0.59)	(0.22)
Age dependency	0.15^{**}	-0.12	-0.12	0.02
	(0.07)	(0.07)	(0.18)	(0.07)
Future age dependency	-0.01	-0.16^{***}	0.43^{**}	0.11^{*}
	(0.11)	(0.04)	(0.21)	(0.06)
Election Year	-0.17	0.20^{**}	-0.20	-0.15^{*}
	(0.16)	(0.08)	(0.31)	(0.08)
Ideology	0.09^{**}	-0.01	-0.14	0.00
	(0.05)	(0.04)	(0.10)	(0.02)
Ideological Range	-0.19^{**}	0.02	0.37	0.00
	(0.08)	(0.08)	(0.25)	(0.06)
Government Fragmentation	4.52	-1.71	-7.51^{*}	2.45
	(3.49)	(2.15)	(4.43)	(1.81)
IMF Arrangement	1.47^{***}	-1.14^{***}	-0.30	0.61^{*}
	(0.40)	(0.35)	(1.03)	(0.35)
N	246	162	162	162
Groups	27	27	27	27
R^2	0.46	0.72	0.23	0.68

Notes: Dependent Variable is discretionary fiscal effort from Carnot and de Castro (2015) (Column 1), discretionary current expenditures (Column 2), capital expenditures (Column 3) and revenues (Column 4) in percentage of GDP. Fiscal Rule variable refers to all fiscal rules. All regressions include time and country fixed effects. Standard errors which are robust to heteroskedasticity, panel-specific autocorrelation and contemporaneous cross-sectional dependence (i.e. Parks-Kmenta panel corrected standard errors as proposed in Beck and Katz, 1995) are in parentheses. * indicate significance at 10% level, ** at 5% level and *** at 1% level.

policy can be attributed to balanced budget rules, followed by expenditure rules (this also underlines that the strong link of expenditure rules with fiscal space found in Section 3 can be attributed mainly to the effect on trust, credibility and lower interest rates). Yet, debt rules again do not seem to yield a significant

coefficient.

As further robustness checks, we performed several tests including squared or cubic versions of the fiscal space variable, but the additions were neither significant nor did they change the baseline results.[6] Moreover, we replicated the exercise with different thresholds of fiscal space and split the fiscal space variable at various levels. Table A6 in the Appendix shows some of the results for the fiscal space and fiscal rule coefficients using the variables split at different fiscal space thresholds. In fact this confirms our main results, as we can see that the correlation with fiscal space becomes stronger the less fiscal space a country has and the correlation with fiscal rules is more significant the higher the fiscal space variable is.

5 Fiscal Rules, Fiscal Space and Procyclicality of Fiscal Policy

In the following section we aim to contribute to the question whether fiscal rules and fiscal space are procyclical. Our results so far showed that discretionary expenditures are associated with higher fiscal space, but that this positive link is reduced if fiscal rules are in place. This could be interpreted as fiscal rules having a dampening impact on discretionary expenditures, which, if those expenditures are used with the cycle, is an indication that they might help to limit the procyclicality of fiscal policy. Therefore, we investigate this further by analysing the relation between fiscal rules and fiscal space with the procyclicality of fiscal policy.

To test this in a controlled environment we estimate the following Equation 3:

$$\hat{\sigma}_{i,t} = \beta_1 S_{i,t} + \beta_2 F_{i,t} + \beta_3 S_{i,t} \cdot F_{i,t} + X'_{i,t}\gamma + \mu_i + \eta_t + \varepsilon_{i,t} \tag{3}$$

where the dependent variable ($\hat{\sigma}_{i,t}$) is a measure of the procyclicality of fiscal policy, explained below in Equation (4), in a ten-year rolling window, $S_{i,t}$ the average fiscal space over the same period and $F_{i,t}$ the percentage of years in which a fiscal rule is in place during the last ten years. Furthermore, we include the interaction between fiscal space and fiscal rules to test for the dampening effect of fiscal rules in a combination of both. A set of control variables $X_{i,t}$ is included, as well as time (η_t) and country (μ_i) fixed effect. The standard errors $\epsilon_{i,t}$ are robust to heteroskedasticity, panel-specific autocorrelation and contemporaneous cross-sectional dependence (i.e. Parks-Kmenta panel corrected standard errors as proposed in Beck and Katz, 1995).

The control variables $X_{i,t}$, all expressed in ten-year averages, are in line with those used in the literature. They consist of the economic, demographic, political and dummy variables already used in Equation 1 in Section 3. The data sources and definitions of the variables can be found in Appendix A.1.

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[6]The results are not reported here, but can be obtained from the authors upon request.

Table 4: *Regression results - Procyclicality of fiscal policy (10 year rolling window)*

	(1) All Rules	(2) Balanced Budget Rules	(3) Debt Rules	(4) Expenditure Rules
Fiscal Space	0.30***	0.22**	0.16**	0.24**
	(0.09)	(0.09)	(0.07)	(0.11)
Fiscal Rule	0.03***	0.03**	−0.02	0.04***
	(0.01)	(0.01)	(0.03)	(0.01)
Fiscal Space x Fiscal Rule	−0.27***	−0.14**	0.01	−0.30***
	(0.09)	(0.06)	(0.15)	(0.11)
Δ GDP per Capita	−0.13**	−0.12**	−0.13**	−0.12**
	(0.05)	(0.06)	(0.06)	(0.06)
Δ Financial Openness	−0.01	−0.01	−0.01	0.02
	(0.20)	(0.20)	(0.20)	(0.20)
Trade Openness	0.14***	0.15***	0.15***	0.15***
	(0.03)	(0.03)	(0.03)	(0.03)
Population	−0.15	−0.18	−0.05	−0.27
	(0.20)	(0.22)	(0.19)	(0.19)
Age dependency	−0.33***	−0.27**	−0.31**	−0.33***
	(0.13)	(0.13)	(0.13)	(0.12)
Future age dependency	−0.29	−0.19	−0.17	−0.27
	(0.22)	(0.21)	(0.21)	(0.22)
Election Years	−0.03	−0.03	−0.03	−0.03
	(0.02)	(0.02)	(0.02)	(0.02)
Ideology	0.16	0.11	0.14	0.14
	(0.11)	(0.11)	(0.11)	(0.11)
Ideological Range	0.30	0.15	0.23	0.15
	(0.32)	(0.30)	(0.34)	(0.31)
Government Fragmentation	−1.10	−1.27	−1.13	−1.28
	(0.79)	(0.80)	(0.78)	(0.79)
IMF Arrangement	0.05	0.10	0.04	0.10
	(0.13)	(0.14)	(0.16)	(0.14)
EU Membership	−0.09	−0.09	−0.09	−0.13
	(0.14)	(0.14)	(0.15)	(0.14)
Eurozone Membership	−0.13	−0.11	−0.10	−0.10
	(0.10)	(0.09)	(0.10)	(0.09)
N	374	374	374	374
Groups	26	26	26	26
R^2	0.352	0.343	0.335	0.348

Notes: Dependent Variable is procyclicality of fiscal policy. Columns indicate different definitions of "Fiscal Rule" variable. Standard errors which are robust to heteroskedasticity, panel-specific autocorrelation and contemporaneous cross-sectional dependence (i.e. Parks-Kmenta panel corrected standard errors as proposed in Beck and Katz, 1995) are in parentheses. All regressions include time and country fixed effects. * indicate significance at 10% level, ** at 5% level and *** at 1% level.

To calculate the procyclicality of fiscal policy we rely on a framework similar to the one used in Fatás and Mihov (2003), Alesina et al. (2002) and Blanchard

and Perotti (2002):

$$log(G)_{i,t} = \alpha_i + \sigma_i \Delta log(Y_{i,t}) + \psi_i log(G_{i,t-1}) + \delta_i W_{i,t} + \nu_{i,t} \qquad (4)$$

where $G_{i,t}$ are the real general government total expenditures, $Y_{i,t}$ the real GDP, and $W_{i,t}$ includes several control variables (current and lagged oil price, current inflation rate and linear time trend). The current real output growth is instrumented by past values of output growth to avoid the potential endogeneity. The estimates of σ_i represent the procyclicality of fiscal policy.

The results for estimating Equation (3) are presented in Table 4: the regression results for our measure of procyclicality ($\hat{\sigma}_{i,t}$ in Equation 3) show that an increase in fiscal space indeed seems to be associated with fiscal policy being more procyclical. Yet if fiscal rules are in place, this positive link seems to be significantly smaller. Moreover, we estimated Equation (3) for different kinds of fiscal rules, with the results shown in the columns (2) to (4) of Table 4. We find that both, balanced budget rules (Column 2) and expenditure rules (Column 4), are correlated with a lower coefficient for fiscal space on procyclicality. This is in line with our findings above that expenditure rules might restrict discretionary expenditures. We do not find significant results for debt rules.

To check the robustness of our findings we conducted various robustness checks, such as estimating Equation (3) without control variables (see Table A7 in Appendix A.8), excluding country and time fixed effects, and using 15-year instead of 10-year averages. Overall we find qualitatively the same results independently of the econometric setting used.

6 Conclusions

This paper analyses the interaction of fiscal rules and fiscal space. We calculate the fiscal space, based on the definition of Ghosh et al. (2013), for 27 EU member states for the period 1990-2014. In different econometric settings we estimate the link between fiscal rules and fiscal space as well as their interaction with discretionary fiscal policy and its procyclicality.

We find that fiscal rules are significantly linked to higher fiscal space, which suggests that fiscal rules help to increase fiscal space. Furthermore, the analysis shows that high fiscal space is associated with increased discretionary expenditures, but that this positive link is significantly reduced if fiscal rules are in place. This could be interpreted such that fiscal space makes fiscal policy more procyclical while fiscal rules seem to counteract this procyclicality. The results indeed suggest that the link between fiscal space and procyclical fiscal policy is lower if fiscal rules are in place. Regarding the different types of fiscal rules, we find strong results for expenditure rules and to a lesser extent for balanced budget rules, but none for debt rules.

This paper should be seen as a start of a more in-depth investigation into the interplay of fiscal space and fiscal rules. Further research could concentrate on the various channels driving our overall results and a more detailed analysis of the specifics of fiscal rules which drive these results. Another potential avenue

of future research could be to estimate the uncertainty around the fiscal space measure, as demonstrated in Ghosh et al. (2013), and how this would affect the overall results.

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A   Appendix

A.1   Data Sources

<div align="center">

Table A1: *Data Sources*

</div>

Variable Name	Description	Source
Age dependency	Ratio of population below 15 plus population above 64 to population between 15 and 64	UN (dependency ratio, medium variant)
Debt	General government gross debt	AMECO (UDGGL)
Discr. capital expenditures	Discretionary measures capital expenditure	AMECO (UDMGKE)
Discr. current expenditures	Discretionary measures current expenditure	AMECO (UDMGCE)
Discr. current revenues	Discretionary measures current revenue	AMECO (UDMGCR)
Election Year	1 if there was election of legislative in respective year	DPI (legelec)
EU Membership	1 if country is member state of the EU in respective year	Authors input
Eurozone Membership	1 if country is member state of the Eurozone in respective year	Authors input
Financial Openness	Chinn-Ito index measuring capital account openness	Chinn and Ito (2006), updated version
Fiscal effort	Discretionary measures (expenditures and revenues)	Carnot and de Castro (2015)
Fiscal Rule	1 if fiscal rule of specific type was in place in respective year	Authors database, Table A2
Future age dependency	Same as age dependency, but projections for 20 years ahead	UN (dependency ratio, medium variant)
GDP per Capita	Ratio of nominal GDP to population	AMECO (UVGD, NPTN)
Gov. expenditure gap	Difference between actual real government consumption and potential (calculation using HP filter)	Author calculations using AMECO (UCTG0)
Government Fragmentation	probability that two randomly picked members of government are of different parties	DPI (govfrac)
Ideology	Sum of two main parties in government: 4 points for right party, 2 points for middle party and 0 for left	Author calculations using DPI (gov1rlc, gov2rlc)
Ideological Range	Coding as in "Ideology" but difference between maximum and minimum score in government	Author calculations using DPI (gov1rlc, gov2rlc, gov3rlc)
IMF Arrangement	1 if country had IMF support program in given year	IMF History of Lending Arrangements database
Inflation (Average)	Three year average of past inflation rates	Author calculations using AMECO (ZCPIN)
Oil Price	Average of monthly oil price, only for oil exporters	IMF Primary Commodity Prices
Output Gap	Difference between actual real GDP and potential (calculation using HP filter)	Author calculations using AMECO (OVGD)
Population	Total population	AMECO (NPTN)
Trade Openness	Share of exports plus imports to nominal GDP	AMECO (DMGT, DXGT, UVGD)

Notes: AMECO: Annual macro-economic database of the European Commission, Vintage Autumn 2014; DPI: World Bank, Database of Political Institutions, Beck et al. (2001); UN: United Nations Population Divisions, World Population Prospects.

A.2 Dataset on national numerical fiscal rules

Table A2: *National numerical fiscal rules*

Ctry	Numerical Fiscal Rule	Ctry	Numerical Fiscal Rule	Ctry	Numerical Fiscal Rule
AT	BBR, GG, LC, NSCM (08-10)	FI	BBR, RLG, LC, NSCM (95-13)	LV	BBR, GG, LC, NSCM (12)
	BBR, GG, LC, SCM (11-14)		BBR, GG, LC, NSCM (14)		BBR, GG, LC, SCM (13-14)
	BBR, CG, LC, NSCM (99-04)		BBR, CG, PC, NSCM (99-13)		RR, CG, LC, NSCM (12-14)
	BBR, CG, LC, SCM (05-12)		RR, CG, PC, NSCM (14)		DR, GG, LC, NSCM (12-14)
	BBR, RLG, LC, NSCM (99-07)		DR, CG, PC, NSCM (95-07)	NL	RR, GG, PC, NSCM (94-14)
	BBR, RLG, LC, SCM (05-12)		DR, CG, PC, NSCM (11-14)		BBR, GG, LC, NSCM (14)
	DR, GG, LC, SCM (14)		ER, CG, PC, NSCM (03-14)		ER, GG, PC, NSCM (94-14)
	ER, GG, LC, NSCM (09-14)	FR	BBR, RLG, LC, NSCM (83-13)	PL	BBR, CG, PC, SCM (06-07)
BE	BBR, RLG, LC, NSCM (82-14)		BBR, GG, LC, SCM (13-14)		DR, GG, LC, SCM (97-14)
	DR, GG, PC, NSCM (14)		RR, CG, LC, NSCM (06-14)		ER, GG, LC, NSCM (14)
	RR, CG, PC, NSCM (95-99)		DR, GG, LC, SCM (14)		ER, CG, LC, SCM (11-13)
	ER, CG, PC, NSCM (93-98)		DR, SS, LC, NSCM (08-12)	PT	BBR, GG, LC, NSCM (12-14)
BG	BBR, GG, LC, NSCM (12-14)		ER, CG, PC, NSCM (98-10)		BBR, CG, LC, NSCM (02-11)
	BBR, GG, LC, NSCM (14)		ER, CG, LC, NSCM (11-14)		BBR, RLG, LC, NSCM (03-06)
	BBR, GG, PC, NSCM (06-11)		ER, SS, LC, NSCM (06-12)		BBR, RLG, LC, SCM (07-11)
	DR, GG, LC, NSCM (03-14)		ER, SS, PC, NSCM (97-05)		ER, CG, LC, NSCM (12-14)
	RR, GG, LC, NSCM (14)	HU	BBR, GG, LC, NSCM (04-09)	RO	BBR, GG, LC, NSCM (10-14)
	ER, GG, LC, NSCM (12-14)		BBR, CG, LC, NSCM (10-11)		DR, GG, LC, NSCM (14)
	ER, GG, PC, NSCM (06-11)		BBR, SS, LC, NSCM (10-11)		ER, GG, LC, SCM (10-14)
CY	ER, GG, LC, NSCM (14)		ER, CG, LC, NSCM (10-11)	SE	BBR, GG, LC, NSCM (07-14)
	DR, GG, LC, NSCM (14)		ER, SS, LC, NSCM (10-11)		BBR, LRG, LC, NSCM (00-14)
	BBR, GG, LC, NSCM (14)		DR, GG, LC, NSCM (10-14)		BBR, GG, PC, NSCM (00-06)
CZ	ER, CG, LC, NSCM (05-14)		DR, CG, LC, NSCM (09-11)		ER, CG, LC, NSCM (10-14)
DE	BBR, CG, LC, NSCM (69-10)		DR, SS, LC, NSCM (09-11)		ER, CG, PC, SCM (97-09)
	BBR, CG, LC, SCM (11-14)	IE	BBR, RLG, PC, SCM (04-12)		ER, SS, LC, SCM (10-12)
	BBR, GG, LC, SCM (13-14)		BBR, GG, LC, SCM (13-14)		ER, SS, PC, SCM (97-09)
	BBR, LRG, LC, SCM (90-14)		DR, GG, LC, SCM (13-14)	SI	DR, RLG, LC, NSCM (-90-14)
	BBR, SS, LC, SCM (09-12)		ER, GG, LC, NSCM (14)		DR, GG, PC, NSCM (00-04)
	ER, CG, PC, NSCM (82-12)		ER, CG, LC, NSCM (00-09)		BBR, GG, LC, NSCM (14)
	ER, RLG, PC, NSCM (82-12)		ER, CG, LC, NSCM (10-13)		ER, GG, LC, NSCM (11-14)
DK	BBR, GG, PC, NSCM (92-13)	IT	BBR, RLG, LC, SCM (01-14)	SK	BBR, RLG, LC, SCM (02-08)
	BBR, GG, LC, NSCM (14)		BBR, GG, LC, NSCM (14)		BBR, RLG, LC, NSCM (09-13)
	RR, GG, PC, NSCM (01-11)		DR, GG, LC, NSCM (14)		BBR, GG, LC, NSCM (14)
	ER, GG, PC, NSCM (94-12)		ER, CG, LC, NSCM (01-07)		DR, GG, LC, NSCM (12-14)
	ER, CG, LC, SCM (14)		ER, GG, LC, NSCM (14)		DR, RLG, LC, SCM (02-14)
EE	BBR, GG, LC, NSCM (14)		ER, RLG, LC, NSCM (99-14)		ER, CG, LC, SCM (02-14)
	BBR, GG, PC, NSCM (93-13)	LT	BBR, RLG, LC, SCM (90-12)	UK	BBR, GG, LC, SCM (97-08)
	DR, RLG, LC, NSCM (97-12)		BBR, GG, LC, NSCM (14)		BBR, GG, LC, NSCM (10-14)
	DR, RLG, LC, SCM (13-14)		RR, CG, LC, SCM (08-12)		DR, GG, LC, SCM (97-08)
ES	BBR, GG, LC, SCM (03-05)		DR, CG, LC, NSCM (97-14)		DR, GG, LC, NSCM (10-14)
	BBR, GG, LC, NSCM (06-09)		ER, CG, LC, NSCM (08-14)	GR	None
	BBR, GG, LC, SCM (10-14)	LU	DR, GG, PC, NSCM (04-14)	MT	None
	ER, CG, LC. NSCM (11-14)		ER, CG, PC, NSCM (90-14)		
	ER, RLG, LC, NSCM (11-14)				

Notes: BBR: Balanced Budget Rule, DR: Debt Rule, ER: Expenditure Rule, RR: Revenue Rule; GG: General Government, CG: Central Government, RLG: Regional or Local Government, SS: Social Security; LC: Law or Constitution, PC: Political or Coalitional Agreement; [N]SCM: [no] (possibility of) sanctions and/or automatic correction mechanism. Years the rule has been in place are stated in brackets.

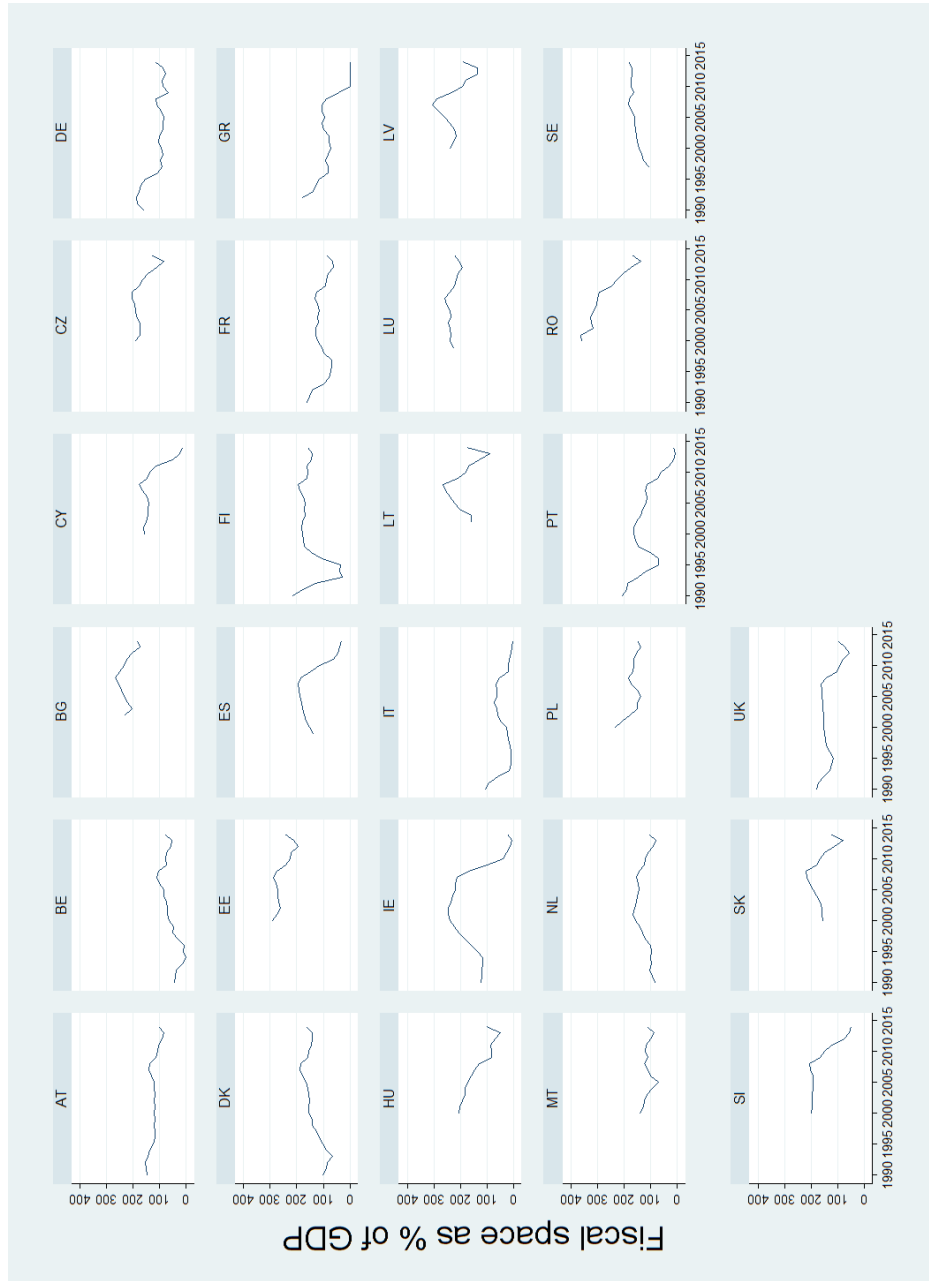## A.3 Fiscal space over time

Figure 3: Fiscal space (as % of GDP) across EU27 from 1990 to 2014

A.4 Calculation of fiscal space

When calculating the fiscal space of a country we follow almost exactly the approach described in Ghosh et al. (2013). As this paper should not be about the definition of fiscal space, we refrain from changing the estimation setting or data and try to replicate the calculations as closely as possible. For Ghosh et al. (2013) fiscal space is defined as the scope for further increases in public debt without undermining the sustainability of debt. They calculate a debt limit assuming that the public balance reacts to different levels of debt differently. Fiscal space is then the difference between the current debt level and the debt limit. Ghosh et al. (2013) calculate the fiscal space for 23 advanced countries for the year 2015.

As Ghosh et al. (2013) we first estimate a fiscal reaction function for our sample of 27 EU member states (1985-2013) of the following form:

$$PB_{i,t} = \beta_1 D_{i,t-1} + \beta_2 D_{i,t-1}^2 + \beta_3 D_{i,t-1}^3 + X_{i,t}' \gamma + \mu_i + \epsilon_{i,t} \qquad (5)$$

where the primary balance $PB_{i,t}$ of country i at time t is the dependent variable and the main focus is to estimate the reaction of this primary balance on the debt level of the previous period ($D_{i,t-1}$). To allow for different shapes of the reaction curve also the squared and cubic terms are included, as well as country fixed effect μ_i. The error term $\epsilon_{i,t}$ is assumed to follow an AR(1) process.

To control for other influences on the primary balance the following set of control variables $X_{i,t}$ is included: i) output gap; ii) government expenditure gap; iii) trade openness; iv) inflation (as average over the past three years); v) age dependency; vi) future age dependency; vii) oil price (only for oil exporters); viii) political stability; ix) IMF arrangement and x) fiscal rules (as published in the IMF data set and being one if country had at least any of the different national rules[7]). The original study by the IMF (Ghosh et al., 2013) also included nonfuel commodity price for non-oil commodities exporters, but exclude this variable as the countries in our sample (EU27) are not big exporters of nonfuel commodities and those exports do not make up a large share of tax revenues.

Table A3 shows the respective results (Column 1) and for comparison the results published in Ghosh et al. (2013) (Column 3). Overall the significance and size of the coefficients of various variables is comparable to the IMF estimations, but differences emerge. In the IMF estimation the oil price is significant and future age dependency is not, which is the opposite in our case. The same is true for the variables political stability and IMF arrangements. Furthermore, the debt coefficients have a higher significance in our estimations, but the size of the lagged debt squared variable decreased a bit. Overall our significantly higher R^2 suggests that the estimation has a better fit in our more homogenous sample of EU27 countries.

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[7]We do not use our data set of fiscal rules in this calculations to recreate the estimations of (Ghosh et al., 2013) as closely as possible. Nevertheless, as a robustness check (see Column 2 in Table A3), we used our fiscal rules data instead of the IMF data and received quantitatively almost exactly the same results.

	(1) Own estimation (1985-2013) EU27	(2) Own estimation (1985-2013) EU27	(3) Ghosh et al. (2013) (1985-2007) 23 countries
Lagged debt	−0.009	−0.005	−0.086
	(0.042)	(0.042)	(0.070)
Lagged debt squared	0.0012**	0.0012**	0.0017*
	(0.001)	(0.001)	(0.001)
Lagged debt cubic	−0.00001**	−0.00001**	−0.00001**
	(2.2e−06)	(2.2e−06)	(3.0e−06)
Output Gap	0.317***	0.320***	0.441***
	(0.022)	(0.022)	(0.053)
Gov. Expenditure Gap	−0.354***	−0.355***	−0.183***
	(0.013)	(0.013)	(0.047)
Trade Openness	0.011	0.011	0.146***
	(0.006)	(0.008)	(0.054)
Inflation (Average)	−1.526	−1.881	4.620**
	(3.660)	(3.660)	(2.008)
Age dependency	0.124**	0.124**	−0.072
	(0.060)	(0.060)	(0.101)
Future age dependency	−0.218***	−0.197***	−0.015
	(0.034)	(0.036)	(0.067)
Oil price (for oil exporters)	0.003	0.003	9.529***
	(0.006)	(0.006)	(3.244)
Political Stability	3.847	3.757	0.068**
	(2.735)	(2.735)	(0.030)
IMF arrangement	−1.109***	−1.103***	−1.142
	(0.328)	(0.328)	(0.999)
Fiscal Rules (IMF dataset)	0.346		0.300
	(0.290)		(0.347)
Fiscal Rules (Own dataset)		0.305	
		(0.309)	
Nonfuel Commodity price			3.005
			(8.362)
N	591	591	491
Groups	27	27	23
R² (within)	0.619	0.618	0.405
AR(1) coefficient	0.673	0.672	0.749

Notes: Dependent Variable is general government primary public balance in percentage of GDP. Country fixed effects are included but not reported. Error term assumed to follow AR(1) process. Heteroscedasticity robust standard errors are in parentheses. * indicate significance at 10% level, ** at 5% level and *** at 1% level.

After obtaining the coefficients of the fiscal reaction function, we calculate the interest rate-growth rate differentials for each of the countries and years. As in one of the "historical market approaches" by Ghosh et al. (2013) we calculate the average of the implied nominal interest rate on government debt (share of

interest expenditures to debt at end of period), $i_{i,t}$, and the average of the growth rate of nominal GDP (over the past ten years), $g_{i,t}$.

To calculate the debt limit, $\bar{D}_{i,t}$, for each country i and time period t, we calculate the largest root of the following equation:

$$(i_{i,t} - g_{i,t})\bar{D}_{i,t} = \beta_1\bar{D}_{i,t} + \beta_2\bar{D}_{i,t}^2 + \beta_3\bar{D}_{i,t}^3 + \phi_i \tag{6}$$

where β_1, β_2 and β_3 are the coefficients estimated by Equation 5. ϕ_i is the part independent from the debt level and time (including the country fixed constant) for each country from Equation 5 assuming that the output gap and government expenditure gap are closed.

Finally fiscal space $S_{i,t}$ for country i at time period t is defined as the difference between the debt limit at time t and the actual level of debt in the same time period. If this difference is negative then fiscal space is assumed to be zero:

$$S_{i,t} = \max\left(\bar{D}_{i,t} - D_{i,t}, 0\right) \tag{7}$$

Ghosh et al. (2013) also report estimates of fiscal space (based on the "historical market approach") for the countries in their sample for the year 2015. When comparing those values with the last observations of our fiscal space estimates (14 countries are included in both samples) we find a convincingly high correlation of 0.83 and an average absolute deviation of 22% of GDP.

A.5 Robustness: Fiscal Space and Fiscal Rules

Table A4: *Regression results (All fiscal rules, Dependent variable: Fiscal Space)*

	(1) 10 year averages	(2) 7 year averages	(3) 5 year averages	(4) 3 year averages
Fiscal Rule	22.17***	22.86***	18.36***	14.00***
	(3.19)	(3.72)	(4.58)	(3.90)
Δ GDP per Capita	−0.07	0.30***	0.29***	0.18**
	(0.12)	(0.10)	(0.09)	(0.08)
Δ Financial Openness	−0.19***	−0.15***	−0.16***	−0.09***
	(0.05)	(0.04)	(0.04)	(0.03)
Trade Openness	4.35***	43.62***	57.10***	35.36***
	(1.34)	(7.26)	(14.22)	(12.16)
Population	0.02**	0.02***	0.03***	0.03***
	(0.01)	(0.01)	(0.01)	(0.01)
Age dependency	−0.04	−0.61	−1.43	−0.79
	(0.75)	(0.96)	(1.05)	(1.13)
Future age dependency	1.12	−0.69	1.52	3.28**
	(0.87)	(0.86)	(1.06)	(1.33)
Election Years	−5.31	−4.72	−1.14	−1.73
	(4.37)	(4.04)	(3.16)	(2.18)
Ideology	2.06***	1.35***	0.28	−0.06
	(0.73)	(0.49)	(0.44)	(0.39)
Ideological Range	8.39***	6.63***	4.67***	4.37***
	(1.07)	(0.92)	(0.81)	(0.68)
Government Fragmentation	−1.70***	−1.37***	−0.53**	−0.09
	(0.34)	(0.28)	(0.24)	(0.19)
IMF Arrangement	−0.13	−0.13*	−0.22***	−0.23***
	(0.09)	(0.07)	(0.06)	(0.05)
EU Membership	−0.10	−0.11	−0.10	−0.04
	(0.07)	(0.07)	(0.071)	(0.07)
Eurozone Membership	0.08*	0.03	0.11**	0.14***
	(0.04)	(0.05)	(0.05)	(0.05)
N	482	482	482	482
Groups	26	26	26	26
R^2	0.97	0.96	0.93	0.91

Notes: Dependent Variable is fiscal space. All variables are rolling averages of past years as indicated on top of columns. Fiscal Rule variable referes to all fiscal rules. All regressions include time and country fixed effects. Standard errors which are robust to heteroskedasticity, panel-specific autocorrelation and contemporaneous cross-sectional dependence (i.e. Parks-Kmenta panel corrected standard errors as proposed in Beck and Katz, 1995) are in parentheses. * indicate significance at 10% level, ** at 5% level and *** at 1% level.

A.6 Robustness: Fiscal Rules, Fiscal Space and Discretionary Fiscal Policy

Table A5: *Regression results (dependent variable: discretionary fiscal effort)*

	(1) All Rules	(2) No controls	(3) No fixed effects	(4) Balanced Budget R.	(5) Debt Rules	(6) Expenditure Rules
Fiscal Space	−3.39***	−2.96***	−2.70***	−3.09***	−2.12***	−3.03***
	(0.42)	(0.50)	(0.52)	(0.31)	(0.34)	(0.49)
Fiscal Rule	−4.50***	−3.97***	−2.47***	−3.49***	0.21	−2.20*
	(1.12)	(1.50)	(0.89)	(1.02)	(0.96)	(1.20)
Fiscal Space x Fiscal Rule	1.28***	1.07**	0.92**	1.67***	−0.35	1.07*
	(0.37)	(0.49)	(0.40)	(0.42)	(0.36)	(0.55)
Debt (-1)	−0.22		−2.45**	0.35	−1.06	−0.63
	(1.35)		(1.14)	(1.67)	(1.33)	(1.42)
Output Gap (-1)	0.07		−0.02	0.08	0.05	0.08
	(0.04)		(0.03)	(0.06)	(0.06)	(0.06)
Unemployment (-1)	−0.04		0.02	0.02	−0.02	−0.01
	(0.05)		(0.03)	(0.07)	(0.06)	(0.07)
Population	0.13		0.01***	0.22	0.18	0.05
	(0.28)		(0.00)	(0.27)	(0.26)	(0.31)
Age dependency	0.15**		0.03	0.07	0.10	0.13
	(0.07)		(0.03)	(0.08)	(0.08)	(0.10)
Future age dependency	−0.01		−0.03	0.04	0.03	0.05
	(0.11)		(0.02)	(0.10)	(0.11)	(0.10)
Election Year	−0.17		−0.08	−0.16	−0.14	−0.14
	(0.16)		(0.15)	(0.18)	(0.17)	(0.20)
Ideology	0.09**		0.07**	0.11**	0.09*	0.11**
	(0.05)		(0.03)	(0.05)	(0.05)	(0.05)
Ideological Range	−0.19**		−0.21***	−0.15*	−0.20**	−0.16*
	(0.08)		(0.07)	(0.08)	(0.08)	(0.09)
Government Fragmentation	4.52		−8.55***	2.37	4.56	2.82
	(3.49)		(1.27)	(2.78)	(3.59)	(3.51)
IMF Arrangement	1.47***		2.29***	1.67***	1.74***	1.94***
	(0.40)		(0.32)	(0.28)	(0.35)	(0.35)
Time fixed effects	Yes	Yes	No	Yes	Yes	Yes
Country fixed effects	Yes	Yes	No	Yes	Yes	Yes
N	246	247	246	246	246	246
Groups	27	27	27	27	27	27
R^2	0.46	0.41	0.28	0.47	0.44	0.46

Notes: Dependent Variable is discretionary effort from Carnot and de Castro (2015). Columns indicate different settings regarding control variables and fixed effects, as well as different types fiscal rules (if not otherwise mentioned the fiscal rule variable refers to all fiscal rules). Regressions include time and country fixed effects according to rows. Standard errors which are robust to heteroskedasticity, panel-specific autocorrelation and contemporaneous cross-sectional dependence (i.e. Parks-Kmenta panel corrected standard errors as proposed in Beck and Katz, 1995) are in parentheses. * indicate significance at 10% level, ** at 5% level and *** at 1% level.

A.7 Robustness: Thresholds, Fiscal Rules, Fiscal Space and Discretionary Fiscal Policy

Table A6: *Regression results - thresholds of fiscal space (dependent variable: discretionary effort)*

	(1)
Fiscal Rule	−7.539***
	(2.856)
Fiscal Space < 50%	−16.910**
	(6.911)
Fiscal Space < 50% x Fiscal Rule	1.146
	(7.317)
Fiscal Space >= 50% < 150%	−7.726***
	(1.755)
Fiscal Space >= 50% < 150% x Fiscal Rule	5.678***
	(1.849)
Fiscal Space >= 150%	−5.007***
	(1.113)
Fiscal Space >= 150% x Fiscal Rule	2.736***
	(0.938)
N	236
Groups	27
R^2	0.515

Notes: Dependent Variable is discretionary effort from Carnot and de Castro (2015). All regressions include control variables, time and country fixed effects. Fiscal Rule variable refers to all fiscal rules. Standard errors which are robust to heteroskedasticity, panel-specific autocorrelation and contemporaneous cross-sectional dependence (i.e. Parks-Kmenta panel corrected standard errors as proposed in Beck and Katz, 1995) are in parentheses. * indicate significance at 10% level, ** at 5% level and *** at 1% level.

A.8 Robustness: Fiscal Rules, Fiscal Space and Procyclicality of Fiscal Policy

Table A7: *Regression results (rolling window, dependent variable: procyclicality of fiscal policy)*

	(1) All Rules	(2) No controls	(3) 15-year averages
Fiscal Space	0.30***	0.41***	0.32**
	(0.09)	(0.09)	(0.16)
Fiscal Rule	0.03***	0.05***	0.05*
	(0.01)	(0.01)	(0.02)
Fiscal Space x Fiscal Rule	−0.27***	−0.29***	−0.35**
	(0.09)	(0.09)	(0.17)
Δ GDP per Capita	−0.13**		−0.07
	(0.05)		(0.07)
Δ Financial Openness	−0.01		−0.56**
	(0.20)		(0.28)
Trade Openness	0.14***		0.14***
	(0.03)		(0.03)
Population	−0.15		−0.06
	(0.20)		(0.18)
Age dependency	−0.33***		−0.29***
	(0.13)		(0.10)
Future age dependency	−0.29		−0.39
	(0.22)		(0.30)
Election Years	−0.03		−0.01
	(0.02)		(0.03)
Ideology	0.16		0.25
	(0.11)		(0.19)
Ideological Range	0.30		0.20
	(0.32)		(0.48)
Government Fragmentation	−1.10		0.33
	(0.79)		(0.59)
IMF Arrangement	0.05		0.03
	(0.13)		(0.22)
EU Membership	−0.09		0.19
	(0.14)		(0.13)
Eurozone Membership	−0.13		−0.11
	(0.10)		(0.12)
N	374	389	260
Groups	26	27	26
R^2	0.352	0.195	0.369

Notes: Dependent Variable is procyclicality of fiscal policy. Columns indicate different settings definitions of "Fiscal Rule" variable. Standard errors which are robust to heteroskedasticity, panel-specific autocorrelation and contemporaneous cross-sectional dependence (i.e. Parks-Kmenta panel corrected standard errors as proposed in Beck and Katz, 1995) are in parentheses. All regressions include time and country fixed effects. * indicate significance at 10% level, ** at 5% level and *** at 1% level.

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