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OCTOBER 2023

Working Paper 230

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Evidence for Advanced Economies

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Research for this paper was financed by the Jubilee Fund of Oesterreichische Nationalbank (Project No. 18699). Financial support provided by Oesterreichische Nationalbank for this research is gratefully acknowledged.

The author would like to thank Mario Holzner, Richard Grieveson and David Zenz for valuable contributions and Robert Stehrer for helpful feedback.

All remaining errors are those of the author.

Abstract

This paper analyses the link between discretionary fiscal policy and interest-growth differentials (r-g). Panel regressions based on a dataset for 20 advanced countries over the years 1990-2019 reveal no evidence of a systematic linear relationship between fiscal policy and r-g. However, more unfavourable r-g differentials are linked more strongly to a tighter fiscal stance when public-debt-to-GDP ratios are higher – but only in the euro area, not in advanced stand-alone countries issuing government debt in their own currency.

Keywords: Public debt, fiscal deficits, interest-growth differentials, fiscal policy

JEL classification: E43, E62, F33

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1. Introduction

Macroeconomists and policy-makers have recently been thinking a lot about the differential between interest rates on long-term government bonds (r) and economic growth rates (g). This is no surprise, given that public debt dynamics depend on the sign and size of r-g (e.g. Escolano 2010; Blanchard 2022). As r-g differentials were clearly in negative territory in many advanced economies in the years running up to the Covid-19 crisis, there is the argument that this r–g<0 constellation made it possible for governments to conduct less restrictive fiscal policies without incurring high public debt costs (e.g. De Grauwe and Ji 2019, Blanchard 2019). Others, however, highlight that the historical record tells us that r-g differentials are volatile and can turn positive rather quickly, thereby complicating the life of policy-makers (e.g. Wyplosz 2019; Rogoff 2020; Heimberger 2023). Furthermore, a decline in r-g differentials may be more than offset by a rising primary fiscal deficit (e.g. Checherita-Westphal and Domingues Semeano, 2020; IMF 2021). When r-g turns negative, the public-debt-to-GDP ratio tends to decline, which may be seen by governments as an opportunity to run a more expansionary fiscal policy, with delayed or misguided government reactions when the sign of r-g again switches from negative to positive (Mauro and Zhou 2021).

This paper contributes to the literature by analysing the response of discretionary fiscal policy to r-g differentials and public debt levels in a large sample of advanced economies over the past decades. A particular contribution is that we provide evidence for answering the question of whether fiscal reactions differ when we compare euro area member countries with 'stand-alone' countries, where the latter issue government debt in their own currency (e.g. Australia, UK). We distinguish between euro area and stand-alone countries for two main reasons. First, the institutional constellation in the euro area is special, as member countries have delegated essential monetary policy competences to the supranational level, where the ECB is responsible for setting interest rates. Second, there is a specific set of fiscal rules in Europe that puts limits on fiscal deficits and public debt levels (e.g. European Commission 2019), which is of special importance for euro area countries since it further restricts the policy scope of national policy-makers that have already delegated monetary policy competences to the ECB (e.g. De Grauwe 2020). Against this background, we investigate whether the fiscal reactions to r-g differentials and initial public-debt-to-GDP ratios in euro area member countries differ from those in "stand-alone" countries.

Specifically, we construct a panel data set for 20 advanced economies – 10 euro area, and 10 stand-alone – over the time period 1990-2019. Panel regressions provide no evidence for a significant systematic response of discretionary fiscal policy to higher r-g differentials. This result is inconsistent with the hypothesis that governments lean towards running more expansionary fiscal policy when the r-g differentials turn more favourable by moving towards r<g. However, we find evidence that higher r-g differentials are more predictive of a tighter fiscal stance as public-debt-to-GDP ratios increase, but this holds only for the euro area sample, not for stand-alone countries.

The rest of the paper is structured as follows. Section 2 explains the contribution of this paper in relation to the existing literature. Section 3 introduces our data and descriptive statistics. Sections 4 presents the econometric results. Section 5 summarises and concludes.

2. Related literature

The insight that r-g differentials are an essential determinant of public debt dynamics is not new (Domar 1944). However, it has gained relevance in the years running up to the Covid-19 crisis: as r – g < 0 constellations emerged in many advanced countries over stretches of several years, there has been a drive towards understanding the implications of r-g for fiscal policy-making.

The equation capturing public debt accumulation can be written as:[1]

$$PDebt_t - PDebt_{t-1} = \frac{1+r_t}{1+g_t} * PDebt_{t-1} + primaryFD_t \approx$$
$$\approx (r_t - g_t) * PDebt_{t-1} + primaryFD \quad (1)$$

where PDebt denotes the public-debt-to-GDP ratio; primaryFD is the primary fiscal deficit (in % of GDP); r is the average long-term government bond yield; and g is the nominal GDP growth rate. The equation indicates that the evolution of public-debt-to-GDP crucially depends on the sign and size of the interest-growth differential (e.g. Escolano 2010). When government bond yields are higher than GDP growth (i.e. r – g > 0), this implies an increasing trend in the public-debt-to-GDP ratio (defined as government gross debt as a percentage of nominal GDP) if the government does not at the same time achieve a primary fiscal surplus (i.e. tax revenues in excess of government expenditures after excluding interest payments) large enough to compensate for the unfavourable r-g constellation. Vice versa, if the long-term government bond yield is lower than nominal GDP growth (r – g < 0), the dynamics of public debt are inherently favourable: the public-debt-to-GDP ratio declines if the primary fiscal deficit is not too large (e.g. Escolano et al. 2017; Di Serio et al. 2021).

This paper is interested in whether there are systematic fiscal reactions to r-g differentials. In particular, we may expect that governments have an incentive to run larger primary fiscal deficits when r-g turns more favourable, with delayed or misguided government reactions when the differential again moves towards unfavourable r<g territory. Vice versa, more unfavourable r-g differentials could push governments towards running tighter fiscal policy. Whether there is indeed a significant fiscal reaction to r-g differentials is, however, an empirical question. It could also be that while the relationship is not linear, public debt levels actually serve to moderate the association of r-g with the fiscal stance: Mauro and Zhou (2021) report evidence for a sample of 55 mixed countries (advanced and developing) according to which the magnitude of fiscal tightening increases with the initial public debt level. Boussard and Mohl (2021) analyse whether r-g differentials affect the fiscal stance and the response of fiscal policy to higher public debt. They report that EU countries with higher debt levels tend to show less of a discretionary fiscal effort when interest-growth differentials turn more favourable. Afonso et al. (2021) use an EU sample over 1995-2021 and report that public debt ratios decrease more following improvements in the primary balance when interest-growth differentials are positive. In what follows, we provide new estimates for a sample of 20 advanced countries, including 10 euro area countries and 10 non-European advanced economies, over the last decades.

[1] Note that the following ignores stock-flow adjustments for brevity (e.g. IMF 2011).

In doing so, we extend the existing literature on so-called “fiscal reaction functions”. This literature is about regressing the (cyclically-adjusted) primary fiscal balance on the public-debt-to-GDP ratio and other covariates to answer the question of whether governments respond to an increase in public debt by tightening the primary fiscal balance (e.g. Bohn 1998; Greiner and Kauermann 2007; Mendoza and Ostry 2008; Ghosh et al. 2013; Mauro et al. 2015). This literature has also been called the “model-based fiscal sustainability approach”. Here, the general intuition is that if there is evidence for a positive conditional response of the primary fiscal balance to a rise in public-debt-to-GDP, the fiscal authorities react to positive changes in public debt by systematically improving the primary fiscal balance. Bohn (1998) argues that the approach of estimating fiscal reaction functions by regressing the primary fiscal balance on public debt levels has sound theoretical foundations. In particular, fiscal policy is consistent with the intertemporal budget constraint[2] if the estimated slope coefficient of the public-debt-to-GDP variable is positive. Furthermore, he shows that the public-debt-to-GDP ratio is stationary if the slope coefficient is positive and r-g is not very unfavourable, which he verifies by means of an empirical analysis with long historical time series data for the USA. In other words, Bohn (1998) suggests that a positive response of the primary fiscal balance to an increase in public debt levels is a sufficient condition for public debt sustainability.[3]

This paper contributes to the existing empirical literature on fiscal reaction functions by including the r-g differential as a major explanatory variable, while looking at a longer time period than previous studies and considering a wider sample of advanced economies instead of focussing only on EU member countries (Boussard and Mohl 2021; Afonso et al. 2021). A further contribution is that we separately look at euro area countries and stand-alone countries, where the latter issue government bonds in their own currency (e.g. Australia, USA). There are two main reasons for this distinction. First, while euro area member countries have delegated monetary policy to the ECB at the supranational level, stand-alone countries retain control over monetary policy at the national level. In other words, the nature of public debt in individual euro area countries is special, because their governments de facto do not have control over the currency in which they issue debt; they are more prone to experiencing rollover crises due to panic-induced bond sell-offs by investors, especially when the ECB does not credibly backstop bond markets (e.g. De Grauwe 2012; Della Posta 2021). Second, fiscal policy-makers in euro area countries face special conditions when setting policy. Macroeconomic spillovers from one member country to other members are a serious concern in the monetary union given the high degree of economic integration; however, these spillovers cannot be offset by monetary policy, which has been delegated to the supranational level (e.g. Kempa and Khan 2017; Blanchard et al. 2021). This constellation brings about special requirements for fiscal policy coordination in the euro area. While Europe’s fiscal rules stipulate limits on fiscal deficits and public debt levels in euro area countries (e.g. European Commission 2019), it has often been pointed out that these rules have not been strictly enforced in the past (e.g. Begg 2017; Afonso and Jalles 2020).

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2 The intertemporal budget constraint states that public debt in period t must be backed by the present value of all future primary fiscal surpluses (e.g. Chen and Wu 2018).

3 However, some shortcomings have been highlighted with regard to this interpretation. In particular, it has been argued that a positive reaction of the primary balance to higher public debt is a sufficient, but not necessary condition for debt sustainability: governments may fail to respond to increases in public debt for longer stretches, but still meet the condition in the long-run by improving the fiscal balance. At the same time, a positive reaction of the primary fiscal balance to higher debt does not ensure that a specific government will fully meet its payment obligations: Bohn (2008) argues that sustainability is conditioned by the confidence of financial market actors that a specific government will implement future policies so as to satisfy the budget constraint.

3. Data and hypotheses

This section explains the data set that we use for the empirical analysis and explains the hypotheses to be tested. The data cover 20 advanced countries; one half of them are euro area members, the other half is "stand-alone" in the sense that the governments are issuing sovereign debt in their own currency. The 10 stand-alone countries include: Australia, Canada, Denmark, Japan, Norway, New Zealand, South Korea, Sweden, the UK, and the USA. The 10 euro area countries are: Austria, Belgium, Finland, France, Germany, Greece, Italy, the Netherlands, Portugal, and Spain.

Our main dependent variable in the regression analysis is the cyclically-adjusted primary fiscal deficit (caprimaryfd). The primary deficit excludes interest payments, which is a better measure of overall fiscal policy than the headline fiscal deficit because the government does not have direct control over interest costs. By regressing the overall primary fiscal deficit on explanatory variables, one can obtain useful descriptive insights into the correlates of overall fiscal policy, but one cannot identify the reactions of discretionary fiscal policy to cyclical conditions. The reason is that an important component of the primary fiscal deficit relates to the automatic fiscal stabilisers. Addressing this issue requires us to look at the cyclically-adjusted fiscal deficit, which adjusts the primary fiscal deficit for the impact of swings in the business cycle on government revenues and spending (e.g. Price et al. 2014). We test the hypothesis that governments have an incentive to run larger cyclically-adjusted primary fiscal deficits when r-g turns more favourable (i.e. when it moves towards r<g territory).

We have collected data on long-term government bond yields (r) and nominal GDP growth rates (g) to calculate r-g differentials. In doing so, we rely on data for average market interest rates for government bonds maturing in 10 years.[4] These data provide excellent coverage for our set of 20 advanced countries from the mid-1980s onwards.[5] In moving to the other control variables, we measure government debt in terms of the public-debt-to-GDP ratio (pdebt)[6], which will allow us to control for whether the (initial) level of public debt is systematically related to the fiscal stance, and whether there is

[4] Notably, our choice differs a bit from the concept of the average implicit interest rate on net government debt as in equation (1), as this equation considers interest receipts earned on government assets. The reason is: there is substantial heterogeneity in the size of government asset holdings across the OECD, and data limitations concerning the implicit interest rate on net government debt are substantial. It must further be noted that using the implicit rate on net government debt is not suitable for the regression we want to perform, as the implicit rate easily increases strongly when net government debt levels are low (e.g. Turner and Spinelli 2011).

[5] Blanchard (2019) adjusts the nominal interest rate on long-term governments bonds with US data by using the weighted average of one-year and ten-year interest rates; he computes weights so that they match the average maturity of public debt (which can change over time). However, Wyplosz (2019) explains in detail that it is not clear whether this kind of adjustment is desirable. Furthermore, it must be recognised that in any case the Blanchard (2019) adjustment cannot be performed in a country data set with multiple countries. Therefore, we rely on the choice in previous literature, as we measure r with the marginal rate on government debt, i.e. the market interest rate on new public borrowing or on the secondary market with a residual maturity of around 10 years (e.g. Wyplosz 2019; Lian et al. 2020). Mauro and Zhou (2021) use effective interest rates (i.e. the ratio of interest expenses to government debt), but we prefer average market rates, because they respond less quickly to changes in global and financial conditions, and the data coverage is significantly better for our advanced economies sample.

[6] Notably, we excluded the observation on public-debt-to-GDP for Greece in 2012, because a debt haircut in this year led to an outlier in the sense that the r-g differential was positive but the change in the public debt to GDP ratio was negative.

a significant interaction with r-g differentials. Furthermore, we have collected data on the output gap as an estimate for the amount of economic slack, which can be seen as an assessment of where an economy is in the business cycle (e.g. Carnot and de Castro 2015).[7] We would expect to find a positive and significant coefficient of the output gap variable if there were pro-cyclicality in the fiscal reaction, since this would mean that a move towards a more positive output gap (i.e. less economic slack) is associated with a more expansionary discretionary fiscal stance in terms of higher cyclically-adjusted fiscal deficits (e.g. Combes et al. 2017). Next, we control for the political budget cycle (e.g. Galli and Rossi 2002; Philips 2016). In particular, we construct a proxy for the political cycle by using a dummy variable that is set to 1 in each federal election year. We would expect a negative and significant coefficient of the election variable if the fiscal stance were more expansionary in election years. Finally, we have collected data on the stringency of fiscal rules from the IMF's fiscal rules dataset (Davoodi et al. 2022). We would expect a negative and significant coefficient if more stringent fiscal rules were to reduce fiscal deficits. The possibility of being sanctioned in the future (or at least of being put under tough surveillance by the European Commission) in the case of non-compliance with the fiscal rules may lead fiscal policy-makers in euro area countries to react differently to more unfavourable r-g differentials and public debt levels than the policy-makers in stand-alone countries.

Table 1 summarises the variables and data sources.

Table 1 / Variables and data sources

	Data description	Data source
caprimaryfd	Cyclically-adjusted primary fiscal deficit (i.e. excluding interest payments) as % of potential GDP	OECD Economic Outlook May 2021
r	Nominal market interest rate on 10-year government bonds in %	OECD
g	Annual growth rate of GDP at current USD in %	OECD
rg	r minus g, i.e. differential between bond yield and growth rate (in ppts.)	OECD; own calculations
pdebt	General government debt as % of GDP	IMF Global Debt Database
outputgap	Output gap as % of potential GDP	IMF World Economic Outlook April 2021
election	Dummy variable set to 1 in each federal election year	electionresources.org
fiscalrules	Stringency of fiscal rules (national and supranational) proxied by the number of all rules	Davoodi et al. (2022)

Source: own illustration.

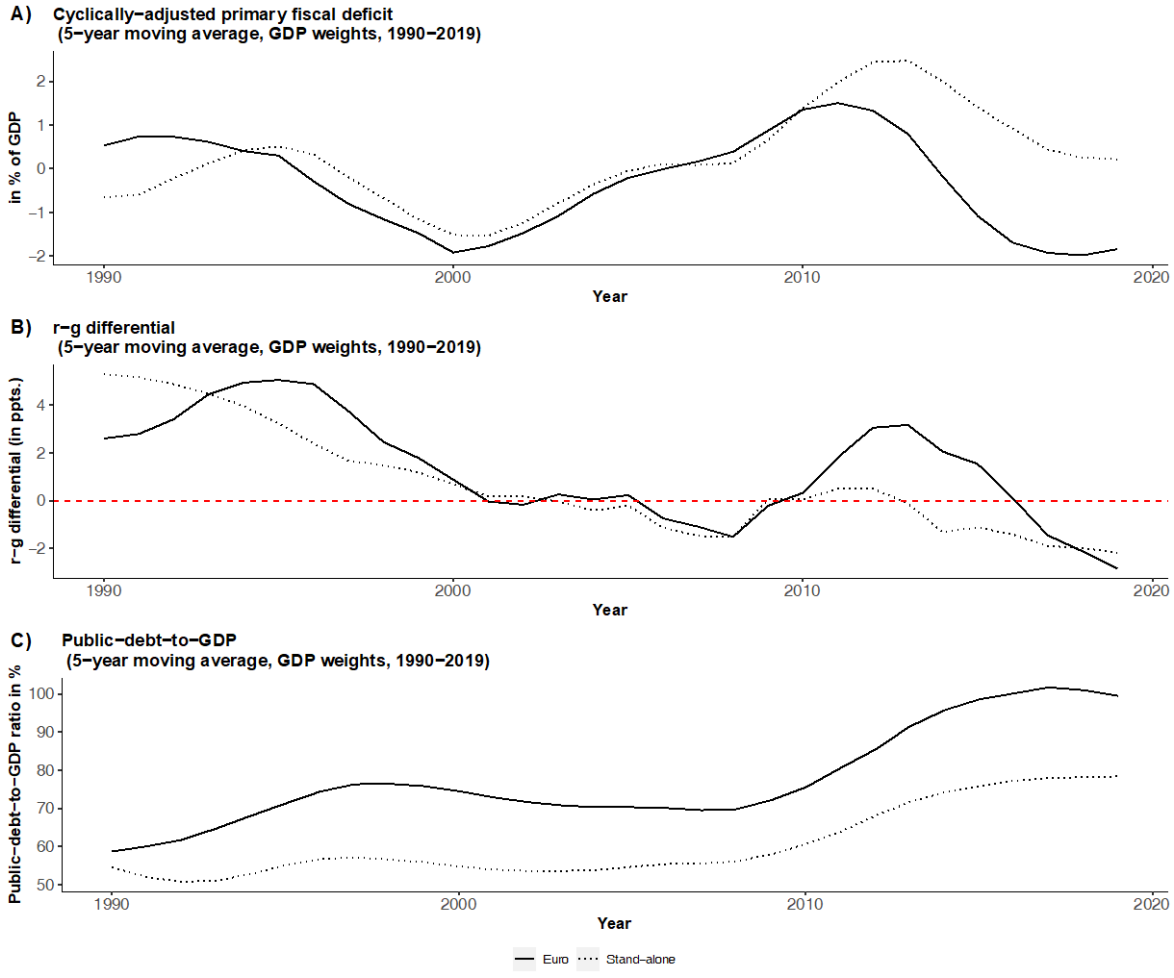
Panel A) of Figure 1 plots the 5-year moving average of the cyclically-adjusted primary fiscal deficit over the time period 1990-2019. Cyclically-adjusted primary fiscal deficits were quite similar in euro and stand-alone countries from the early 1990s up to 2010. However, over the course of the euro crisis, major fiscal consolidation efforts in euro area countries pushed down the deficits considerably, which did not happen to the same extent in the stand-alone countries (e.g. Schmidt and Weigert 2013; Heimberger 2017).

Panel B) of Figure 1 plots the 5-year moving average for r-g differentials, which declined substantially from positive territory (r>g) in 1990 to negative territory before the financial crisis in 2007/2008 ($r - g < 0$). Average GDP-weighted r-g levels in euro and stand-alone countries were quite similar when the crisis hit,

[7] One strand of the literature points to the difficulties in estimating output gaps (e.g. Orphanides and van Norden 2002; Heimberger and Kapeller 2017). While we are aware that measuring cyclical conditions by using output gaps is not an exact science, the model estimates produced by international organisations such as the OECD remain a prominent cycle indicator, which is also essential in assessing the fiscal stance.

but r-g differentials increased substantially more in the euro sample from 2008 onwards, as interest rates on government bonds in euro periphery countries surged during the euro crisis and their growth rates slumped (e.g. De Grauwe and Ji 2013). However, there was again a strong decline in r-g in the years running up to the Covid-19 crisis, as differentials fell well below zero (r<g); this period has been referred to in arguing that the r – g < 0 constellation allowed governments to run more expansionary fiscal policies without incurring high debt costs (e.g. De Grauwe and Ji 2019, Blanchard 2019). The mean r-g differential for the whole sample is positive at 0.49 (and the median is lower at -0.01) – with a standard deviation of 4.04, which indicates substantial volatility.

Figure 1 / Descriptive statistics



Source: OECD, IMF; own calculations (see Table 1 for details on the data sources).

Panel C) of Figure 1 shows the evolution of GDP-weighted public debt levels. Public-debt-to-GDP ratios increased in the euro area from 1990 to the early 2000s, before declining in the years running up to the financial crisis. The development in public debt in the stand-alone sample was more stable, as we even see a decline during the 1990s. The impact of the crisis led to another rise in public-debt-to-GDP ratios. The euro area – and especially its periphery countries – already went into the crisis with higher public debt levels than in stand-alone countries, but public-debt-to-GDP increased further and more strongly over the course of the euro crisis than in stand-alone countries.

4. Panel regressions

Do policy-makers respond to a move towards r–g < 0 by increasing the primary fiscal deficit, i.e. do they lean more towards an expansionary fiscal stance? To answer this question, we use the cyclically-adjusted primary fiscal deficit as the dependent variable (where an increase in the dependent variable would indicate a more expansionary discretionary fiscal stance). Notably, the cyclically-adjusted primary fiscal deficit was tested for panel unit roots and confirmed to be stationary; cointegration test results show that our variables are cointegrated.[8] We start by estimating the following static "fiscal reaction function":

$$ca\_primaryFD_{i,t} = \alpha + \delta\, ca\_primaryFD_{i,t-1} + \beta\, PDebt_{i,t-1} + \gamma\, rg_{it} + \sigma\, X_{i,t} + \zeta_i + \zeta_t + \varepsilon_{i,t} \quad (2)$$

where $ca\_primaryFD_{i,t}$ denotes the cyclically-adjusted primary fiscal deficit in country i in year t. $PDebt_{i,t-1}$ is the lag of the public-debt-to-GDP ratio, and rg_{it} is the differential between long-term interest rates on government bonds and GDP growth. If policy-makers responded to a move towards more favourable r-g with a more expansionary fiscal stance (i.e. higher primary fiscal deficits), we would expect $rg_{i,t}$ to have a negative (and significant) coefficient. ζ_i represents country-fixed effects, ζ_i denotes time-fixed effects, and X is a vector with additional control variables, which will be introduced below. In several specifications, we will also include an interaction term between public debt and the r-g differential. This allows us to assess whether the impact of a change in r-g on the fiscal policy variable is stronger with a higher initial public-debt-to-GDP ratio.

We then continue by estimating a dynamic version of equation (2). As the cyclically-adjusted primary deficit is rather persistent over time (see Figure 1), we include a lagged term of the dependent variable as an additional control ($ca\_primaryFD_{i,t-1}$), where all other variables are defined as explained above, which leads to the following specification:

$$ca\_primaryFD_{i,t} = \alpha + \delta\, ca\_primaryFD_{i,t-1} + \beta\, PDebt_{i,t-1} + \gamma\, rg_{it} + \sigma\, X_{i,t} + \zeta_i + \zeta_t + \varepsilon_{i,t} \quad (3)$$

Since the dynamic panel model in equation (3) embodies country-fixed effects, using OLS could lead to biased estimation results (Nickell 1981). In using a GMM estimator instead of OLS for the dynamic models, we avoid estimation bias. We deal with concerns about potential endogeneity between the dependent variable (discretionary fiscal policy) and r-g differentials. We use a system-GMM estimator to tackle endogeneity. Arellano and Bover (1995) argue that a GMM estimator might perform better than an IV2SLS-estimator in the case of dynamic panel models. System-GMM is potentially less affected by the weak instrument problem than difference-GMM; prior studies point to the preference of system-GMM in the context of fiscal reaction functions with persistent data (e.g. Celasun and Kang 2006; Golinelli and Momigliano 2009; Bernoth et al. 2015). Therefore, we provide results based on a one-step system-GMM approach (Blundell and Bond 1998), where we use the t-2 and t-3 lags of the fiscal policy variable and the public-debt-to-GDP ratio as well as two lags of the r-g differential and the output gap as

[8] We conducted unit root tests and cointegration tests before running the regressions. The Maddala-Wu panel cointegration test results suggest that the variables are cointegrated.

instruments. The validity of the GMM estimates rests on the condition that there is no second-order autocorrelation. Therefore, the lower parts of the regression tables report the p-values of the Arellano–Bond test that the average autocovariance of the residuals of order two is zero. The null hypothesis of no second-order autocorrelation cannot be rejected. To test for overidentification restrictions (instrument validity), we perform a Hansen test. The relevant p-values are always larger than 0.5, which suggests that we cannot reject the null hypothesis that the instruments are valid.

Table 2 / Baseline results

	(1) OLS all	(2) S-GMM all	(3) S-GMM Euro	(4) S-GMM stand-alone
caprimaryfd		0.856***	0.790***	0.898***
		(0.023)	(0.038)	(0.024)
rg	−0.016	−0.004	−0.030	0.061***
	(0.035)	(0.034)	(0.052)	(0.013)
pdebt	−0.008	0.007	0.019	0.022*
	(0.042)	(0.024)	(0.050)	(0.012)
outputgap	0.205	0.109***	0.163***	0.024
	(0.214)	(0.042)	(0.052)	(0.035)
election	0.226**	0.433***	0.556***	0.182
	(0.097)	(0.149)	(0.199)	(0.162)
fiscalrules	−0.684***	−0.040**	−0.049*	0.001
	(0.210)	(0.017)	(0.026)	(0.019)
Countries	20	20	10	10
Arellano-Bond p-value		0.444	0.450	0.442

Notes: The dependent variable is the cyclically-adjusted primary fiscal deficit. ‘all’ indicates that all 20 advanced countries were included; ‘euro’ is the abbreviation for the sub-sample of 10 euro countries only; and ‘stand-alone’ stands for the 10 stand-alone countries only. See Table 1 for a detailed description of all the variables and their sources. Standard errors (in parentheses) were clustered at the country level. The regressions include country-fixed effects and time-fixed effects; estimates are not shown for brevity. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 2 reports the main regression results without including an interaction of r-g differentials with public debt levels. Columns (1) and (2) show estimations for the full sample of 20 advanced countries, based on the static and the dynamic model, respectively. Columns (3) and (4) then provide an extension to the dynamic model in column (2) by using the euro area country sample and the stand-alone country sample, respectively. We start by discussing the results for the other control variables before moving to our findings on r-g differentials. We do not find evidence that higher initial public debt levels are consistently and significantly associated with lower cyclically-adjusted primary fiscal deficits, i.e. a tighter discretionary fiscal stance. The only significant coefficient of the lagged public-debt-to-GDP ratio stems from the stand-alone country sample in column (4), but the sign of the coefficient is positive instead of negative. This suggests that the fiscal effort does not systematically increase with the public debt level. The estimated rg coefficient for the stand-alone is even positive, but only significant at the 10% level. However, when we exclude Denmark, Sweden and the UK – countries that were members of the EU

(but not of the euro area) over (most of) the sample period – from the stand-alone sample, the rg coefficient turns insignificant; and the other regression results remain robust.[9]

Furthermore, the output gap variable is positively associated with the fiscal stance: an increase in the output gap, i.e. a move towards a booming economy, tends to increase the cyclically-adjusted primary fiscal deficit, which indicates pro-cyclicality. However, the coefficient is only significant in the dynamic panel when we include the euro area countries, as the output gap coefficient is insignificant for the stand-alone country sample. This finding is consistent with other studies that find evidence for procyclical budgetary outcomes in euro countries (e.g. Benetrix and Lane 2013; Gootjes and de Haan 2022). As we find evidence for procyclicality even when controlling for fiscal rules, there may be something special about the broader institutional design of the euro area that makes governments lean more towards pro-cyclical fiscal policies than stand-alone countries. We will discuss this issue further below.

Table 3 / Substituting rg with a dummy variable for negative r-g episodes

	(1) OLS all	(2) S-GMM all	(3) S-GMM Euro	(4) S-GMM stand-alone
caprimaryfd		0.853***	0.780***	0.885***
		(0.024)	(0.041)	(0.025)
rgnegatived	−0.092	0.041	−0.063	−0.014
	(0.272)	(0.116)	(0.235)	(0.103)
pdebt	−0.013	0.004	0.002	0.038**
	(0.048)	(0.018)	(0.033)	(0.016)
outputgap	0.217	0.101**	0.176***	−0.003
	(0.205)	(0.051)	(0.062)	(0.033)
election	0.222**	0.368***	0.528***	0.201
	(0.097)	(0.139)	(0.182)	(0.150)
fiscalrules	−0.681***	−0.043	−0.034	−0.008
	(0.210)	(0.027)	(0.048)	(0.029)
Countries	20	20	10	10
Arellano-Bond p-value		0.517	0.486	0.492

Notes: The dependent variable is the cyclically-adjusted primary fiscal deficit. 'all' indicates that all 20 advanced countries were included; 'euro' is the abbreviation for the sub-sample of 10 euro countries only; and 'stand-alone' stands for the 10 stand-alone countries only. See Table 1 for a detailed description of all the variables and their sources. rgnegatived is a dummy set to 1 when r-g<0 in a given year. Standard errors (in parentheses) were clustered at the country level. The regressions include country-fixed effects and time-fixed effects; estimates are not shown for brevity. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

When it comes to the election variable, we find that it is significantly associated with the fiscal stance in the euro sample: in election years, discretionary fiscal policy tends to be more expansionary. Our results suggest that the political cycle has a stronger impact on fiscal policy in the euro area than in advanced countries issuing debt in their own currency (e.g. Mink and de Haan 2006; Efthyvoulou 2012).[10] With regard to the fiscal rules variable, we obtain the expected sign: more stringent fiscal rules are related to

[9] Results are available upon request.

[10] Notably, our result only established an average link between elections and higher primary fiscal deficits in the euro area. Political budget cycles could still differ across euro area countries (e.g. de Haan and Klomp 2013).

lower (discretionary) primary deficits, i.e. tighter fiscal policy. However, this only seems to be significant in the euro area sample, not for stand-alone advanced economies issuing their own currency.

Importantly, we fail to find evidence for a consistently significant response of the cyclically-adjusted primary fiscal deficit to r-g. This result is inconsistent with the hypothesis that governments lean towards increasing the primary fiscal deficit with a move towards r < g, which would require a negative and significant r-g coefficient. However, the r-g coefficients in the first three columns are quite imprecise given the large standard errors. This suggests that there is no strong evidence for a systematic linear relationship of r-g differentials with cyclically-adjusted primary fiscal deficits. This is also consistent with previous findings reported in Mauro and Zhou (2021) and in Boussard and Mohl (2021); both papers, however, use different country samples compared to our sample, as we zoom in on advanced countries from within and outside the euro area. As a robustness check, we also ran the regressions using a dummy variable set to one in all years when r-g<0 (rgnegatived). Table 3 shows the regression results, where we substitute the dummy on negative r-g episodes for the rg variable. The results are highly robust, as we do not find any significant coefficient estimate for the r-g dummy – which suggests that there is no evidence for either euro or stand-alone countries that they tend to run more expansionary fiscal policy when r-g is favourable.

Table 4 / Results with an interaction term of rg and lagged public debt levels

	(1) OLS all	(2) S-GMM all	(3) S-GMM Euro	(4) S-GMM stand-alone
caprimaryfd		0.857***	0.789***	0.896***
		(0.024)	(0.040)	(0.026)
rg	−0.018	0.011	−0.016	0.061***
	(0.037)	(0.027)	(0.054)	(0.015)
pdebt	−0.010	0.018	0.026	0.018*
	(0.042)	(0.026)	(0.050)	(0.010)
outputgap	0.206	0.097**	0.157***	0.024
	(0.217)	(0.040)	(0.054)	(0.034)
election	0.225**	0.438***	0.560***	0.182
	(0.096)	(0.148)	(0.199)	(0.163)
fiscalrules	−0.684***	−0.030*	−0.042	−0.002
	(0.211)	(0.017)	(0.027)	(0.021)
rg*pdebt	0.001	−0.005***	−0.003*	0.003
	(0.003)	(0.001)	(0.002)	(0.003)
Countries	20	20	10	10
Arellano-Bond p-value		0.465	0.449	0.650

Notes: The dependent variable is the cyclically-adjusted primary fiscal deficit. 'all' indicates that all 20 advanced countries were included; 'euro' is the abbreviation for the sub-sample of 10 euro countries only; and 'stand-alone' stands for the 10 stand-alone countries only; 'OLS'… Ordinary Least Squares; 'S-GMM'… System-GMM. See Table 1 for a detailed description of all the variables and their sources. Standard errors (in parentheses) were clustered at the country level. The regressions include country-fixed effects and time-fixed effects; estimates are not shown for brevity. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

In table 4, we further test whether the association of r-g with the fiscal stance is moderated by the level of public debt. We do so by including an interaction term between the initial public-debt-to-GDP ratio and

the r-g differential. We find that the estimated coefficient of this interaction term is negative and significant only in the dynamic panel models when we account for the euro area countries. This implies that the magnitude of fiscal tightening in euro area countries (in terms of a move towards a lower primary fiscal deficit) increases with the initial public debt level. These findings support previous results reported in Mauro and Zhou (2021). However, our results suggest that this finding does not hold for all advanced economies, but may be specific to the euro area, although the coefficient estimate for the euro sample is only significant at the 10% level. The reaction of fiscal policy to the public debt level may, however, only hold up to a certain threshold. Some have argued that this calls for the introduction of a quadratic and cubic term of the public-debt-to-GDP ratio (e.g. Ghosh et al. 2013; Everaert and Jansen 2018). Table 5 in the appendix does just that, but the results show that our findings prove robust. Only in euro area countries, the magnitude of fiscal tightening increases with the initial public debt level.

Table 5 / Including public debt squared and public debt cubic

	(1) OLS all	(2) S-GMM all	(3) S-GMM Euro	(4) S-GMM stand-alone
caprimaryfd		0.864***	0.762***	0.872***
		(0.025)	(0.044)	(0.036)
rg	0.005	0.045**	0.065**	0.064***
	(0.036)	(0.018)	(0.033)	(0.022)
pdebt	−0.020	−0.020	−0.049*	0.009
	(0.051)	(0.022)	(0.029)	(0.021)
outputgap	0.201	0.116**	0.209***	−0.003
	(0.252)	(0.055)	(0.062)	(0.038)
pdebtsquared	−0.004	0.003	0.004	0.003**
	(0.008)	(0.002)	(0.005)	(0.001)
pdebtcubic	0.0002	0.0003**	0.0004*	0.00000
	(0.0003)	(0.0001)	(0.0002)	(0.0003)
rg*pdebt	0.001	−0.013***	−0.014***	0.004
	(0.005)	(0.003)	(0.002)	(0.003)
Countries	20	20	10	10
Arellano-Bond p-value		0.619	0.725	0.371

Notes: The dependent variable is the cyclically-adjusted primary fiscal deficit. 'all' indicates that all 20 advanced countries were included; 'euro' is the abbreviation for the sub-sample of 10 euro countries only; and 'stand-alone' stands for the 10 stand-alone countries only; 'OLS'… Ordinary Least Squares; 'S-GMM'… System-GMM. See Table 1 for a detailed description of all the variables and their sources. Standard errors (in parentheses) were clustered at the country level. The regressions include country-fixed effects and time-fixed effects; estimates are not shown for brevity. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Although fiscal policy practice in Europe points to a mixed record of rules compliance by governments (Larch and Santacroce 2020), there is the threat of increased surveillance of national public finances by the European Commission if it is in a position to open an 'excessive deficit procedure'. Therefore, a plausible explanation for our result that euro area governments lean more towards tightening their fiscal stance at higher public debt levels lies in the special institutional architecture of the euro area. Euro area countries with higher public-debt-to-GDP ratios are fragile in the sense that they are subject to being singled out by financial market investors by self-fulfilling panic-induced government bond sell-offs, thereby threating the governments concerned with liquidity crises – especially when the ECB does not

credibly backstop the sovereign debt market as was the case in the early stages of the euro area crisis (e.g. Bianchi and Mondragon 2022). Against this background, there are incentives for fiscal tightening even in the face of low r-g differentials for euro area governments facing higher initial public debt levels. These incentives may be much weaker in advanced 'stand-alone' countries issuing debt in their own currency. However, gaining a better understanding of the differences in the fiscal responses of stand-alone and euro area countries to r-g differentials at higher levels of public debt requires further research efforts; conducting case studies may help to gain further insights.

5. Conclusions

The historical record points to swings in the differential between interest rates on long-term government bonds (r) and economic growth rates (g) over time. This paper has analysed the fiscal reactions to r-g differentials. In doing so, we have used a panel data set for 20 advanced countries over the period 1990-2019 – where ten countries are euro area members and the other ten countries in the sample are 'stand-alone' in the sense that governments issue debt in their own currency. The distinction between euro area and stand-alone is motivated by the specific institutional set-up in the euro area, which changes the nature of the public debt issued by individual member countries, making them more fragile to experiencing panic-induced government bond sell-offs (e.g. De Grauwe 2012); and it increases the requirements for fiscal policy coordination against the background of the EU's fiscal regulation framework (e.g. European Commission 2019).

Our main findings highlight that there is no evidence for systematic fiscal responses to more favourable r-g differentials. Therefore, we do not find support for the hypothesis that governments lean towards more expansionary fiscal policy when interest-growth differentials turn more favourable. However, we do find that the initial public debt level moderates the impact of r-g on the fiscal stance: the magnitude of fiscal tightening increases with higher public debt levels, but only if we consider the euro area country sample. This result indicates that higher public debt levels are more of a restriction in terms of pushing governments towards more contractionary fiscal policy in the euro area. Weichenrieder and Zimmer (2014) report evidence for the 1970-2011 period, and they find that euro membership increased fiscal responsiveness to changes in public debt levels compared to the period before the Maastricht Treaty. However, they do not consider the role of r-g differentials and their potential interaction with public debt levels.

Future research efforts could focus on a more in-depth analysis of the political and economic factors that are shaping the fiscal reactions to the r-g environment. One promising research avenue could be an analysis of longer historical time series for individual countries (e.g. Mauro et al. 2015; Di Iorio and Fachin 2021) to answer the question of whether a country's fiscal response to changes in r-g and public debt is constant throughout history, and especially whether the response was different for countries in the era before and after joining the euro area. Another promising avenue for future research could be a more detailed analysis of the role played by fiscal rules setting limits on fiscal deficits and public debt in influencing fiscal reactions to r-g across advanced countries. Finally, the empirical analysis put forward in this paper has dealt with advanced (OECD) countries only; there are also open questions about the fiscal reactions to r-g and public debt in developing countries.

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Herausgeber, Verleger, Eigentümer und Hersteller:
Verein „Wiener Institut für Internationale Wirtschaftsvergleiche' (wiiw),
Wien 6, Rahlgasse 3

ZVR-Zahl: 329995655

Postanschrift: A 1060 Wien, Rahlgasse 3, Tel: [+431] 533 66 10, Telefax: [+431] 533 66 10 50
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Offenlegung nach § 25 Mediengesetz: Medieninhaber (Verleger): Verein 'Wiener Institut für Internationale Wirtschaftsvergleiche', A 1060 Wien, Rahlgasse 3. Vereinszweck: Analyse der wirtschaftlichen Entwicklung der zentral- und osteuropäischen Länder sowie anderer Transformationswirtschaften sowohl mittels empirischer als auch theoretischer Studien und ihre Veröffentlichung; Erbringung von Beratungsleistungen für Regierungs- und Verwaltungsstellen, Firmen und Institutionen.

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