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Government Borrowing Cost and Budget Deficits: Is Investment Spending Different?

Jemima Peppel-Srebrny

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Manor Road Building, Oxford OX1 3UQ

Government borrowing cost and budget deficits: is investment spending different?

Jemima Peppel-Srebrny*

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Abstract

The reasons for and underlying composition of government budget deficits are often disregarded both by the academic literature about the links between fiscal policy and interest rates and by the policy debate about fiscal sustainability. However, we show that, from the perspective of financial markets, not all budget deficits are created equal: bond markets do discriminate between deficits that are the result of higher government current spending and those that stem from higher government investment, penalising the former significantly more than the latter. To do so, we apply a reduced-form regression approach to a panel of 31 OECD economies from 1960 to 2014 with data from the European Commission on the decomposition of the government budget deficit into its current spending, investment spending and revenue components. Quantitatively, based on our preferred specifications, a higher deficit solely due to higher government investment would in fact decrease long-term government bond yields. These findings suggest that austerity policies should focus more on current spending than investment spending and that fiscal rules in individual countries and monetary unions should distinguish budget deficits that are the result of investment from those that are not.

JEL codes: E44, E62, H54, H62

Keywords: Government budget deficits, government investment, fiscal policy, long-term interest rates, OECD countries

*jemima.peppel-srebrny@economics.ox.ac.uk. Department of Economics and Nuffield College, University of Oxford. I am greatly indebted and extremely grateful to my advisers Steve Bond, John Muellbauer and the late Sir Tony Atkinson for their guidance, inspiration and support. I gratefully acknowledge financial support from the Economic and Social Research Council, UK.

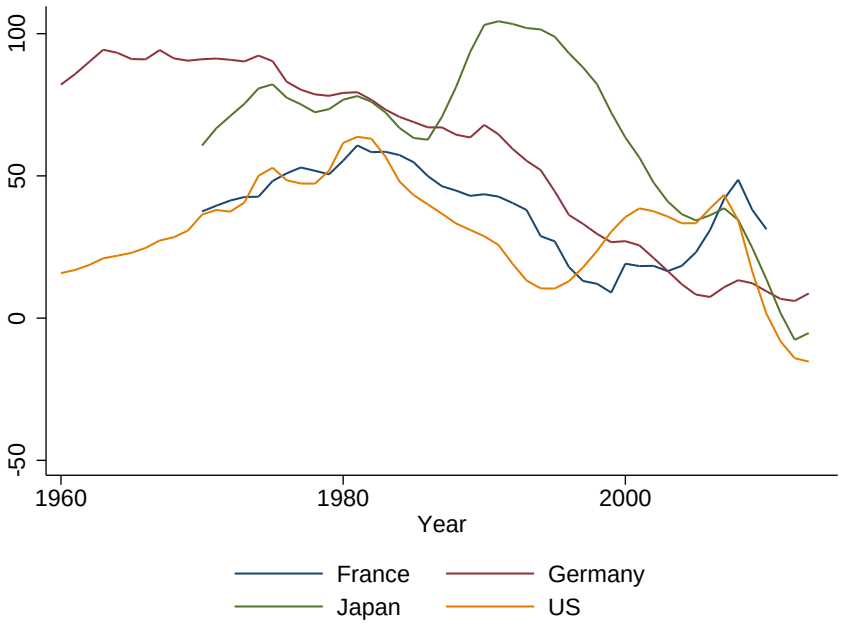
1 Introduction

In the aftermath of the Great Recession and the ensuing sovereign debt crisis, troubled countries in Europe such as Greece, Ireland, Portugal and Spain slashed not only government current expenditure – say, on wages – but also government investment dramatically, with, seemingly, little distinction being made between these two types of government spending. Furthermore, even countries that were not directly embroiled in the sovereign debt crisis – such as Germany and the UK – have since tried to commit, politically or legally, to balanced budgets irrespective of economic circumstance. Since there is no plausible economic theory according to which an always-balanced-budget would constitute "good economic policy", it could be that these countries were hoping to avoid contagion from the sovereign debt crisis by sending a signal to financial markets that they were serious about maintaining a tight fiscal grip. This paper principally seeks to investigate the appropriateness of such indiscriminate approaches to the management of government budgets and borrowing cost. In a nutshell, our findings – which reflect the perspective of bond markets – provide evidence against such approaches, suggesting instead that markets discriminate between deficits that are the result of higher government current spending and those that stem from higher government investment, penalising the former significantly more than the latter.

The existing empirical literature on the link between fiscal policy and interest rates and hence government borrowing cost has tended to disregard the reasons for which a government may be increasing its debt or running a budget deficit: the latter may be due to an excess in current government expenditure, an excess in government investment, or a shortfall in government revenue. The present paper explicitly incorporates the decomposition of the budget deficit into its current spending, investment and revenue components in an empirical analysis of the fiscal policy determinants of government borrowing cost: it thus takes seriously the intuitively plausible possibility that, from the perspective of bond markets, not all budget deficits are created equal.

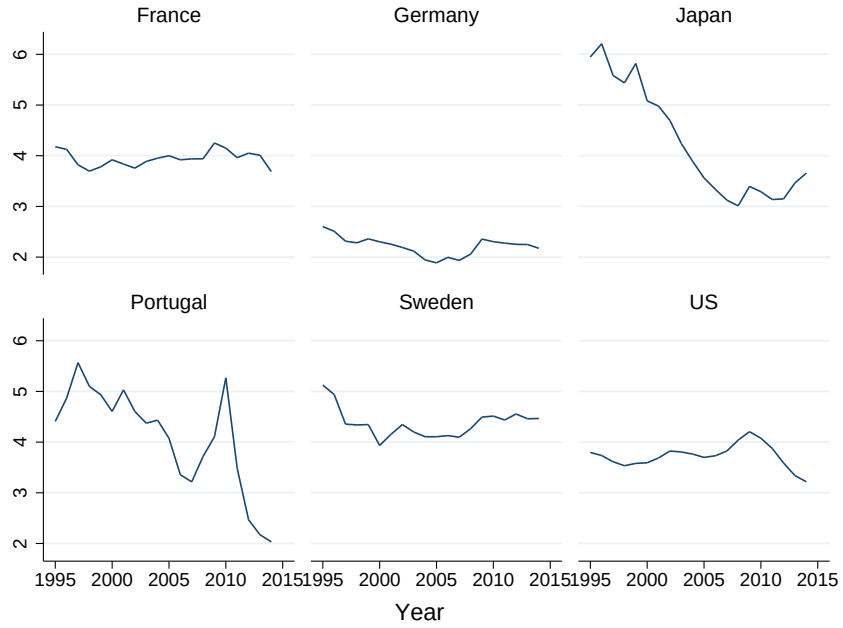
The concern of this paper with government investment and asset accumulation and, hence, the underlying drivers of government budget deficits is motivated by two key observations in particular. First, for many mature economies, government net worth ratios (Buiter (1985)) – that is, total assets less total liabilities as a share of GDP or national income – have declined significantly over recent decades (Atkinson (2015), Piketty and Zucman (2014)). This means that a substantial share of new debt in these countries was not used to finance investment, or that the process of asset accumulation through investment stalled. For example, in the US, in recent years, net worth has entered negative territory, having stood at above 60% of national income in the early 1980s. Figure 1 illustrates this development for selected countries. Second, trend levels of government investment vary substantially across mature economies – typically around or just below 4% of GDP in France and the US, and just about half that in Germany – yet have declined noticeably in recent years in many places, both in countries facing immediate domestic sovereign debt crises, such as Portugal, but also in those that did not, such as Japan and the US. Proxying government investment with gross fixed capital formation of general government, Figure 2 illustrates this fact.

Figure 1: Government net worth, selected countries, 1960-2013



In percent of national income
Source: Piketty and Zucman (2014)

Figure 2: Government investment, selected countries, 1995-2014



Gross fixed capital formation of general government in percent of GDP
Source: AMECO

The present paper explores the relevance of the investment, current spending and revenue components of government budget deficits for the cost of government borrowing by employing a panel of 31 OECD countries over a maximum time span from 1960 to 2014 and data on the decomposition of the government budget deficit drawn from the European Commission. To the best of our knowledge, the existing empirical literature on the links between fiscal policy and government borrowing cost has so far not taken into account the underlying drivers of budget deficits through this kind of decomposition. In line with the existing literature, we confirm that government debt and government budget deficits (relative to GDP) increase government bond yields, with significant yet quantitatively small effects.[1] We extend the existing literature by showing in addition that, in a regression with government borrowing cost as the dependent variable, government investment enters negatively and highly significantly, whereas government current spending enters positively and significantly: this means that markets penalise deficits due to current spending significantly more than deficits due to investment. Based on our preferred specifications, an increase in the deficit solely due to an increase in government investment (holding constant the levels of government current spending and total revenue) would decrease bond yields, while an increase in the deficit solely due to an increase in government current spending would, ceteris paribus, increase yields. This implies that markets perceive government investment, on average, as favourable for growth or as having a positive return (cf. Durlauf et al. (2005)).

These findings reflect the perspective of bond markets on fiscal policy and government budget management, and hence could have important policy implications, especially given the feedback loops between bond market behaviour and fiscal policy decisions that became apparent during Europe's sovereign debt crisis. They imply that austerity policies ought to focus more on government current spending than government investment spending, and that fiscal rules in individual countries and monetary unions – such as the European Union's Maastricht criteria, which limit budget deficits to 3% of GDP irrespective of economic circumstances – should distinguish budget deficits that are the result of government investment from those that are not.

The remainder of this paper proceeds as follows. The related empirical literature and theory on the link between fiscal policy and interest rates are discussed in Section 2. Section 3 introduces the data, model specification and identification approach. The main results, robustness tests and extensions are presented in Section 4. Section 5 concludes.

2 Fiscal policy and interest rates

Fiscal policy directly and indirectly impacts a vast number of macroeconomic outcomes. One way of empirically evaluating fiscal policy is to identify its effects on a macroeconomic outcome of interest. The approach of Reinhart and Rogoff (2010) is to bracket countries by the magnitude of their debt-to-GDP ratio, and compare different brackets'

[1] All fiscal variables in our analysis are measured relative to GDP.

mean and median growth and inflation outcomes. An alternative approach is to use government bond yields, which reflect investors' perspectives on the country's growth and inflation prospects as well as its default risk, as the dependent variable and employ controls for the business cycle and the monetary policy stance to achieve identification of the effects of fiscal policy on these yields. This is the approach taken here.[2]

It is commonly stated that results from research on the fiscal policy determinants of long-term government bond yields and hence borrowing cost have not been conclusive.[3] However, a recent panel-based empirical literature on the question – such as Ardagna et al. (2007) and Gruber and Kamin (2012) – typically tends to conclude that more "profligate" fiscal policy, as reflected in a higher government debt ratio or a higher (primary) deficit relative to GDP, increases government bond yields, using a variety of different econometric approaches. Conclusions vary as regards the precise measure of fiscal policy that is found to matter, the presence of non-linear effects and the extent of spatial and temporal heterogeneity of effects.[4]

Overall, to the best of our knowledge, the existing literature has not yet attempted to consider the composition of government budget deficits. It has not, as far as we are aware, taken into account the current and investment spending components of the (primary) deficit in estimation, which would amount to testing the validity of the restriction that, in a regression with a measure of government borrowing cost as the dependent variable, all components of the (primary) deficit enter with coefficients equal in absolute magnitude: this restriction is frequently imposed in the existing literature and its validity will be investigated here.[5] Dai and Philippon (2006) distinguish deficits caused by changes in spending and changes in taxes, and Laubach (2009) separates total revenue and total spending, but neither considers the investment and current components of spending separately. Ardagna et al. (2007) use a different decomposition of the deficit, stating that changes in the government wage bill, transfers, public investment and business and labour taxes matter for yields, but do not report these results. Yet taking into account the decomposition of the deficit into current spending and investment provides an insightful lense on the underlying drivers of government budget deficits, and investor perceptions of these drivers. This paper adds to the existing literature by doing so. To that end, we bring information to bear on the question that – as far as we are aware – has not been used previously in this context: we use data on the flow decomposition of government budget deficits, allowing the differentiation of the investment and current spending components in the analysis, drawn from the European Commission DG ECFIN's Annual Macroeconomic database (AMECO). These data are discussed in Section 3.1.

[2]Econometrically, unrestricted reduced-form regression approaches such as the one used here, but also reduced forms imposing restrictions derived from theory, simple or structural VARs and narrative approaches have been used to investigate the fiscal policy determinants of government bond yields.

[3]E.g., Ardagna et al. (2007) but also Bernheim (1989), who states: "The evidence is extremely mixed, and it is easy to cite a large number of studies that support any conceivable position."

[4]Fiscal policy may be measured in stock (debt) or flow (deficit) terms, and in ex post or projected form. High-debt countries may be allowed to differ from low-debt ones, or effects to vary during crises.

[5]Most of the literature uses the primary deficit rather than a non-primary measure, since excluding government interest payments directly deals with one potential source of endogeneity of the deficit measure as an explanatory variable in a model of bond yields.

From a theoretical perspective, based on the expectations hypothesis in its weak form (Gürkaynak and Wright (2012)), fiscal policy can principally influence the long-term interest rate and, hence, government borrowing cost through two main channels: first, by affecting current and expected future short-term nominal interest rates – which in turn reflect both real short-term interest rates and expected future inflation – or, second, by affecting the term premium, which is typically presumed to vary over time. In standard macroeconomic frameworks such as New Keynesian models, the effects of fiscal policy are commonly presumed to operate via the current short-term interest rate – such as the central bank's policy rate – and thus fall into the first category. By the expectations hypothesis, long-term interest rates will also be indirectly affected, to the extent that the effects of changes in fiscal policy on short-term interest rates are perceived as being persistent. In addition, there are plausible channels of the second type that directly link fiscal policy and long-term interest rates, such as a default risk premium.

As regards the first type of channel, since most of macroeconomic theory, based on a range of different modelling approaches and assumptions, tends to conclude that fiscal expansions lead to higher interest rates (Fatás and Mihov (2001), Gale and Orszag (2003))[6], the focus here lies on whether distinguishing government investment and government current spending yields different conclusions as regards their impact on interest rates. One way of distinguishing these different types of government spending is by whether or not they generate assets that enter firms' production function, and thus, whether or not they contribute to the stock of public assets. Government investment can plausibly be assumed to do so, and this type of spending is then called "productive".[7] In New Keynesian models (as in, for example, Linnemann and Schabert (2005)), an increase in "productive" government spending in this sense would tend to raise interest rates by less than an increase in non-productive government spending, while the opposite is true in the RBC model based on Baxter and King (1993).[8] Table 6 in the

[6]To illustrate the wide range of possibilities in thinking about this matter theoretically, one might consider the static or dynamic and partial- or general-equilibrium and direct or indirect effects on nominal or real long- or short-term interest rates, related to each other by the Fisher equation and flexible or sticky prices. These interest rates may be responding to persistent or temporary changes in government current or investment spending which do or do not enter the utility function or contribute to the capital stock and which are financed by a deficit and thus debt, or by an increase in lump-sum or distortionary taxation. All of this is taking place in the context of a more or less open economy with Ricardian or non-Ricardian consumers and with a central bank targeting inflation or the output gap, or the nominal or real interest rate, via a Taylor rule or otherwise.

[7]This can be implemented via a non-zero elasticity ϑ_G of output Y_t with respect to public capital G_t in a Cobb-Douglas production function, as in Baxter and King (1993) in the context of a real business cycle (RBC) model: $Y_t = F(K_t, L_t, G_t) = AK_t^{\vartheta_K} L_t^{\vartheta_L} G_t^{\vartheta_G}$

[8]In New Keynesian and RBC models, assuming that government investment is "productive" in the spirit of $\vartheta_G > 0$ entails that it affects the marginal product schedules for both private capital and labour. In the RBC model of Baxter and King (1993), in response to a shock to productive government spending, the interest rate rises by more than in the case of current or non-productive government spending. In the New Keynesian model of Linnemann and Schabert (2005), the resulting increase in G_t reduces firms' marginal costs, but higher aggregate demand also puts upward pressure on firms' real marginal cost, as would be the case for non-productive government spending. If the former effect dominates the latter, consumption increases and inflation – which depends on marginal cost – declines, and so the nominal interest rate will actually decline in response to the increase in

Appendix provides an overview of these effects on short-term interest rates. To the extent that shocks to fiscal measures are persistent and price adjustment is gradual, the effects just discussed will also feed through to long-term interest rates (Ardagna et al. (2007)). However, it is important to note that in the type of model that is commonly estimated in the literature (e.g., Ardagna et al. (2007), Gruber and Kamin (2012)) and is used as the baseline here, too – in which the long-term bond yield is the dependent variable and a short-term interest rate is included as a control for monetary policy and cyclical conditions – it is typically not these types of effects that are identified, but instead those that operate via the term premium, which are discussed next.

As regards the second type of channel then, a range of further direct links between fiscal policy and long-term interest rates – and, hence, the cost of government borrowing – via a time-varying term premium are theoretically plausible. Most importantly, these relate to perceptions of default risk and of inflation risk over the time horizon until maturity. More expansive or "profligate" fiscal policy – as reflected in, for example, a higher government budget deficit – is generally thought to increase default risk (Alesina et al. (1992), Ardagna et al. (2007), Laubach (2010)). Yet to the extent that the government investment component of a government budget deficit is perceived to contribute to overall economic growth and higher future tax revenues, it should render any given fiscal policy stance more sustainable. Hence, a budget deficit due to government investment ought to increase default risk by less than a budget deficit due to government current spending. The inflation risk channel works via inflation expectations, and hence expectations of future short-term nominal interest rates, where the positive association between higher debt and the risk premium arises from investors' fear that governments will attempt to monetise their debt, thus eroding the value of the bond to the bondholder (Gruber and Kamin (2012), Gürkaynak and Wright (2012)).[9] If government investment adds to the economy's capacity, it should reduce pressure on inflation, both current and expected. Then, to the extent that a government's investment in year t is perceived to be informative about the government's future policy mix in terms of investment and current spending, one would expect government investment in year t to increase inflation risk by less than government current spending in year t.

Hence, in a regression of government borrowing cost on fiscal policy measures and controls, the central hypothesis that this paper seeks to investigate is that the coefficient on government current spending is positive and larger than that on government investment and, hence, that the composition of a government's budget deficit matters for the cost of government borrowing.

government investment. As an aside, note that the magnitude of effects in New Keynesian models depend on whether the monetary authority is assumed to follow a Taylor rule that responds only to the inflation gap or to the output gap as well, as D'Auria (2015)) notes – in the latter case, effects are more muted. However, she does not consider whether productive government spending affects the level of potential output against which the output gap is measured, and the story might change if one were to do so.

[9] Ardagna et al. (2007) also connect this to a related channel via expected currency depreciation.

3 Methodology

3.1 The data

In order to investigate the effects of the composition of the government budget deficit on the cost of government borrowing, a new sample for econometric analysis is assembled. The sample includes annual data on the current spending, investment and revenue components of government budget deficits for 31 OECD economies drawn from AMECO and covering, on average, 22 years per country. It also includes annual interest rate and macroeconomic data from AMECO, the OECD and the IMF. The focus of all our fiscal policy measures and the surrounding discussion is on "general government", as defined in international accounting standards to include central, local and state government and social security funds (2008 SNA; ESA 2010). The panel comprises data for Austria, Belgium, Bulgaria, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, the United Kingdom and the United States.[10] It covers a maximum time span from 1960 to 2014 and is unbalanced.

The dependent variable is almost always the annual average of the 10-year constant-maturity secondary-market government bond yield, as is standard in this literature (see, for example, Ardagna et al. (2007) or Gruber and Kamin (2012)), with data drawn from the OECD. The dependent variable will be referred to as the "long-term government bond yield" or as $GBY10$ below.[11]

Data on the components of the government budget deficit is drawn from AMECO. The available data allows the decomposition of the primary budget deficit ($GDEFPRI$) – that is, the deficit excluding interest payments – into an accounting identity as

$$GDEFPRI = GCEXP + GEOCE + GINV - GTREV \tag{1}$$

Current spending ($GCEXP$) includes most saliently the compensation of public-sector employees and social benefits, but, importantly, does not include interest payments on the government's outstanding debt. Other capital expenditure ($GEOCE$) includes capital expenditure that does not amount to new productive investment, comprising capital transfers payable, changes in inventories, net acquisitions of valuables such as gold and net acquisitions of non-financial non-produced assets, such as subsoil assets or patents. It thus often includes extraordinary or one-off items. Because $GEOCE$

[10] It would have been topical and interesting – yet potentially also distorting, given Greece's drawn-out sovereign debt crisis and bailouts – to add Greece to the sample, yet available data covers too short a time period.

[11] Specifically, these yields are typically based on daily closing market bids on actively traded securities, not adjusted for tax or brokerage commissions and averaged over the year of interest. Comparability of this measure of government bond yields across countries is considered to be high by the OECD (OECD (2014)).

enters insignificantly in all specifications considered here – and with a coefficient for which the restriction that it is equal to that on $GCEXP$ is not rejected – we subsume it into current expenditure ($GCEXP$) in estimation and call the resulting variable $GCEXP2$.[12] This also facilitates applying instrumental variable approaches, since the extraordinary nature of items typically included in $GEOCE$ makes its lagged values relatively uninformative instruments for the components of the deficit. Investment spending ($GINV$) refers to government gross fixed capital formation and covers net acquisitions of fixed assets, such as investments in roads, railways, bridges and so on.[13] Finally, government revenue ($GTREV$) includes, most importantly, direct and indirect taxes as well as social contributions. It refers to all revenue accrued to the government in a given year.

Data on a set of macroeconomic controls – including short-term interest rates (in particular, the three-month interbank money market rate), inflation and real economic growth – is also mostly drawn from AMECO as well as the OECD and the IMF. Tables 7 and 8 in the Appendix provide summary statistics, sources and units of measurement for all included variables.

Finally, as Table 9 in the Appendix demonstrates, the evidence for all the time series included in the analysis – in particular, for all fiscal and control variables as well as the dependent variable – is overwhelmingly in favour of stationarity. The only exception to this are liabilities as a share of GDP, which are found to be non-stationary and hence are not included in baseline specifications to ensure the validity of the regression set-up with a stationary dependent variable. In line with the literature, the panel unit root test developed by Im, Pesaran, and Shin (2003, "IPS test") is used here.[14] The test is applied to demeaned series to reflect the fact that all main specifications presented below include year dummies.[15] Note that the existing literature has related bond yields and fiscal policy measures in both $I(0)$ and $I(1)$ terms (see Ardagna et al. (2007) for both). The comparatively short time series included in this dataset, with T ranging around 20 for many countries and below 20 for some, may contribute to explaining the conclusions reached here. Furthermore, although the existing literature frequently allows for common year effects by including year dummies in the estimated specifications, it does not appear to apply unit root tests to the demeaned series.

[12]The OLS estimates of specifications which include $GEOCE$ separately indicate that the two types of capital expenditure included ($GINV$ and $GEOCE$) enter very differently. This may be bcause $GINV$ captures new productive investment, as reflected by government fixed capital formation, whereas $GEOCE$ does not.

[13]For data availability reasons, $GINV$ is included as a gross measure, that is, it is not net of depreciation or consumption of fixed capital (see ESA 2010, P.51g).

[14]The IPS test estimates an augmented Dickey-Fuller equation for each variable and country. The resulting t-statistics are then averaged across countries, thus combining the results from N unit root tests performed on the data for N countries (Maddala and Wu (1999)). We reach the same conclusions regarding the stationarity properties of the data using other standard panel unit root tests.

[15]This is equivalent to estimation in terms of deviations from the cross-sectional mean.

3.2 Model specification

We employ the following reduced-form regression approach to investigate the relevance of the composition of the government budget deficit for government borrowing cost:

$$y_{i,t} = \alpha_i + \beta F_{i,t} + \gamma C_{i,t} + \delta_t + \varepsilon_{i,t} \tag{2}$$

Here, $y_{i,t}$ refers to the cost of government borrowing in country i in year t. α_i is a country-specific fixed effect, controlling for time-invariant unobserved characteristics of country i that affect its borrowing cost, such as the quality of its fiscal institutions and governance (De Grauwe and Ji (2013)). $F_{i,t}$ is a vector that includes the set of fiscal policy variables of interest, $C_{i,t}$ is a vector of controls for current economic conditions, and β and γ are vectors of coefficients. δ_t is a year-specific fixed effect, accounting principally for the common long-term downward trend in yields since the 1980s and the possibility that this trend is not adequately captured by the included country-specific explanatory variables.[16] Finally, $\varepsilon_{i,t}$ is the error term. This type of model is in line with, for example, the approaches of Ardagna et al. (2007) and Gruber and Kamin (2012).

The cost of government borrowing $y_{i,t}$ is proxied with the 10-year constant maturity government bond yield ($GBY10_{i,t}$) in estimation. $F_{i,t}$ typically includes either the primary deficit $GDEFPRI_{i,t}$ or its decomposition into current spending $GCEXP2_{i,t}$, investment $GINV_{i,t}$ and revenue $GTREV_{i,t}$, all measured as a share of GDP. $C_{i,t}$ includes a short-term interest rate $ISN_{i,t}$, the inflation rate $CPI_{i,t}$, the real growth rate $GROWTH_{i,t}$ and a dummy $EURO_{i,t}$ that is equal to 1 from the year onwards that country i joined the EMU. This set of controls and, in particular, the inclusion of a short-term interest rate as a control for the cycle and monetary policy are in line with the existing literature (Ardagna et al. (2007), Baldacci and Kumar (2010), Faini (2006) and Gruber and Kamin (2012), among others), but not innocuous. The inclusion of the short-term interest rate can be interpreted as an attempt at "holding monetary policy constant" – although this can mean many different things, referring to the path of the money supply, adherence to a Taylor rule or the inflation target (Woodford (2011)) – so that results are informative about the response of long-term government borrowing costs to fiscal policy over and above any central bank reaction as captured by the short-term interest rate (Canzoneri et al. (2002)).[17]

Based on the discussion in Section 2, the main hypothesis that this paper aims to investigate is that the coefficient on current expenditure is positive and larger than

[16] Figure 3 in the Appendix shows the long-term government bond yield.

[17] Thus, as regards the theoretical links between bond yields and fiscal policy discussed in Section 2, the effects identified below reflect the response to fiscal policy of the term premium and of shifts to expected future short-term interest rates, since the current short-term interest rate – via which the mechanisms analysed by most macroeconomic models are usually assumed to play out – is included as a control. Also, note that any central bank reaction function as captured by a regression of the short-term interest rate on any of the fiscal variables and controls does not yield significant coefficients on fiscal variables in our sample, in line with the findings of Ardagna et al. (2007).

that on investment spending. In addition, total revenue should enter negatively. We would also expect both the short-term interest rate and the inflation rate to enter positively, although they might not both enter significantly simultaneously since they may capture related information. The real growth rate may reflect higher future growth and hence inflation expectations, suggesting a positive coefficient, yet potentially also lower default risk, since higher growth would also make any given fiscal policy stance more sustainable, suggesting a negative coefficient. Finally, on the assumption that joining the Eurozone provides governments with a lender of last resort, being in the Eurozone should reduce yields and so the Eurozone dummy should enter with a negative coefficient.

3.3 Identification

In the reduced-form regression approach employed in this paper, the valid identification of the effects of fiscal policy on the cost of government borrowing hinges on ensuring that potential sources of endogeneity of the fiscal variables are investigated and dealt with appropriately. Endogeneity might arise in this setting from (i) potential reverse causation from interest rates to fiscal policy decisions and (ii) the potential simultaneity of fiscal variables and interest rates with respect to both the economic cycle and institutional factors. The former is addressed by employing instrumental variable methods and by shifting the timing of fiscal explanatory variables backwards in order to confirm the robustness of the main results. The latter is dealt with by including macroeconomic explanatory variables in all specifications to control for the cycle and by investigating the robustness of results to splitting expenditure and revenue measures into their cyclical and structural components, to changes in the set of controls, as well as to the inclusion of additional explanatory variables that reflect time-varying institutional factors. Time-invariant institutional factors that might cause simultaneity are addressed by the use of country fixed effects in all specifications.

In addition to accounting for the above-mentioned potential scope for endogeneity, several econometric issues need to be addressed. There is evidence of both heteroskedasticity and serial correlation in the error term, which is dealt with by employing, in all estimations, standard errors that are robust to heteroskedasticity and a high but not unlimited order of serial correlation.[18] Furthermore, the dependent variable – the secondary-market long-term government bond yield – exhibits a close degree of co-movement across countries and, in particular, a clear common downward trend since the early 1980s, as mentioned above and illustrated in Figure 3 in the Appendix. In line with the literature (see, for example, Ardagna et al. (2007) or Gruber and Kamin (2012)), year dummies are therefore introduced in our main specifications, in order to

[18]This seems the appropriate approach given the unbalanced nature of the panel. All main results hold also when standard errors are clustered at the country level instead. The Arellano-Bond (1991) test is used to investigate the presence of serial correlation here, since it is consistent in the presence of heteroskedasticity, runs on the undifferenced errors – in contrast to, for example, Wooldridge-based tests (Wooldridge (2010)) – and can be applied to the general class of linear GMM regressions, which subsumes OLS.

address the possibility that this downward trend in yields is not fully captured by the country-specific fundamentals included in our specifications, such as inflation or growth rates. Additionally, because a formal test of cross-section dependence (Pesaran (2004)) rejects the null hypothesis of cross-sectional independence for some, though not all, specifications, we report standard errors that are consistent not just in the presence of heteroskedasticity and serial correlation, but also in the presence of a range of forms of cross-section dependence (Driscoll and Kraay (1998)).[19]

4 Results

4.1 Main findings

This section presents key results from estimating a model of the type presented in equation (2). In essence, we investigate here whether bond markets accord importance to the composition of government budget deficits, in the sense of distinguishing deficits due to higher current spending and deficits due to higher investment.[20]

Table 1 presents OLS estimates of key specifications of interest. We report Driscoll-Kraay (1998) standard errors.[21] Column (1) presents results from estimating a specification that is common in the literature, including only the primary deficit in order to reflect the fiscal policy stance, which amounts to imposing the restriction that all components of the deficit enter equally in absolute terms. The deficit enters significantly, with the anticipated sign and with a coefficient of a magnitude that is in line with the literature (see, for example, Gruber and Kamin (2012)), yet suggesting an effect that is very small in absolute terms.[22] Column (2) includes both the primary deficit and the government investment component of the deficit. The highly significant coefficient on the investment component implies that the restriction that the coefficients on all components of the primary deficit are equal in absolute value is strongly rejected. Column (3) includes the full breakdown of the primary budget deficit into an accounting identity, as per equation (1). The coefficient on government revenue is insignificant. The coefficient on government current spending has the anticipated positive sign and is statistically significant. In addition, we can confidently reject[23] the restriction that the coefficients on government current spending and government investment are equal:

[19]The null of cross-sectional dependence is not rejected, with a p-value of 0.23, for specification (3) in Table 1, but is rejected with a p-value of 0.04 for specification (5) in Table 1.

[20]Note that the primary deficit is a positive number when government expenditure exceeds government revenue and vice versa. All fiscal variables are included as ratios relative to GDP.

[21]Based on specifications reported in Table 1, the Arellano-Bond (1991) test indicates up to 15th, but no higher order serial correlation present in residuals from these main specifications of interest. Hence, standard errors allow for up to 15th order serial correlation. All main results hold also when standard errors are clustered at the country level instead, as Table 10 in the Appendix demonstrates for a main specification of interest.

[22]An increase in the primary budget deficit, relative to GDP, of one standard deviation would increase yields by about 10 basis points, based on column (1) in Table 1.

[23]With a p-value from a Wald test of 0.00 in column (3).

government investment enters not just with a smaller, positive coefficient, but in fact negatively and highly significantly. This is a fascinating and, in its magnitude and significance, perhaps surprising result, since it implies that ceteris paribus, higher government investment – which is a type of government expenditure and thus might have been expected to decrease creditworthiness from a creditors' perspective – is associated with lower bond yields. It suggests that markets tend to view government investment, on average, as favourable for growth or as having a positive return (cf. Durlauf et al. (2005) for a positive rather than normative perspective on the matter). The magnitudes of the estimated coefficients, furthermore, imply that a government budget deficit that is due solely to higher government investment may even decrease government borrowing cost.

Columns (4) and (5) address the fact that a key source of heterogeneity among countries included in this sample is that a substantial number of countries, but not all, were directly or indirectly embroiled in the European sovereign debt crisis in recent years, and thus witnessed large spikes in government bond yields at some point after 2008.[24] To ensure that the large and highly significant negative effect of government investment on government bond yields is not an artefact of these particular and unusual circumstances, column (4) estimates the specification in column (3) on the sample before 2008. The coefficients on investment and current spending confirm the picture emerging from column (3) while, additionally, government revenue enters significantly and negatively, as anticipated. Next, we split the sample into "troubled" and stable countries[25] and create a time-invariant dummy called "Trouble" that is equal to 1 for those countries in the first category, and interact it with all fiscal and macroeconomic explanatory variables as well as year fixed effects. When estimated using a variety of specifications, only the interaction terms with the real economic growth rate and with the year dummies for years 2011 and 2012 are significant, so we keep only these three interaction terms in the reported specification. The specification that includes these three interaction terms is our preferred one and results are reported in column (5). Coefficients on the fiscal variables of interest are extremely robust, again suggesting that bond markets accord significant importance to the composition of the deficit.[26] It also appears that growth matters more for bond yields in these "troubled" countries, likely reflecting the workings of a default risk channel.[27] Additionally, the highly significant interaction terms with year dummies in 2011 and 2012 suggest that, in these years, common factors were not so common: investors might have been penalising certain countries in 2011 and 2012 irrespective of at least those fundamentals included in the specifications estimated here.

[24] See Figure 3 in the Appendix for a graph of the long-term bond yield.

[25] We sort countries into these two categories depending on whether or not the average yearly change in bond yield in the period from 2008 to 2011 was positive (Cyprus, Hungary, Ireland, Italy, Latvia, Lithuania, Poland, Portugal, Slovenia and Spain) or not.

[26] A Wald test of $\beta_{GCEXP2} = \beta_{GINV}$ rejects this restriction with a p-value of 0.00.

[27] This effect can partially be attributed to growth mattering more for less stable countries over the entire sample period, and partially to growth mattering more for all countries during the crisis years. Results for the fiscal variables are extremely similar when these additional interactions are included.

Table 1: Baseline specifications

		Including deficit decomposition			
	(1)	(2)	(3)	(4)	(5)
Primary deficit	2.367***	3.601***			
	(0.639)	(0.472)			
Investment spending		-36.734***	-31.853***	-17.875***	-30.065***
		(7.416)	(7.931)	(3.893)	(6.406)
Current spending			4.001***	6.139***	3.758***
			(0.534)	(0.592)	(0.517)
Total revenue			0.427	-4.449**	1.215
			(1.341)	(2.187)	(1.813)
Short-term interest rate	0.416***	0.381***	0.378***	0.421***	0.383***
	(0.025)	(0.031)	(0.034)	(0.022)	(0.041)
Inflation rate	-0.068***	-0.047**	-0.041*	0.030	-0.020
	(0.025)	(0.021)	(0.023)	(0.034)	(0.023)
Real growth rate	-0.152***	-0.156***	-0.150***	-0.010	-0.045*
	(0.043)	(0.038)	(0.038)	(0.022)	(0.027)
Real growth × "Trouble"					-0.176***
					(0.025)
Eurozone dummy	0.062	0.020	-0.027	-0.257*	-0.177
	(0.112)	(0.113)	(0.131)	(0.148)	(0.130)
2011 dummy × "Trouble"					1.979***
					(0.110)
2012 dummy × "Trouble"					1.892***
					(0.203)
R-squared	0.76	0.76	0.76	0.85	0.81
Observations	666	666	654	445	654

Notes: Significance levels are denoted as * p<0.1; ** p<0.05; *** p<0.01. OLS with country and year fixed effects and Driscoll-Kraay standard errors. R2 adjusted to exclude the effect of year fixed effects.
"Trouble" is equal to 1 for Cyprus, Hungary, Ireland, Italy, Latvia, Lithuania, Poland, Portugal, Slovenia, Spain.

4.2 Robustness

To address the potential scope for endogeneity of the fiscal variables, this section presents a range of robustness tests. First, we apply instrumental variable (IV) methods, as is common in the literature. Due to evidence of serial correlation in baseline specifications, the validity of employing lagged values of fiscal variables as instruments for their contemporaneous values hinges here on neither the Hansen overidenfication test nor the Hausman (1978) test of exogeneity indicating the presence of any problems. IV results, using the first and second lags of fiscal variables as instruments, for our preferred specification (column (5) in Table 1) are presented in Table 2 and are promising.

Table 2: Robustness: Instrumenting fiscal variables

	OLS	**IV – 2nd stage**	**IV – 1st stages**		
			Current spending	Investment spending	Total revenue
	(1)	(2)	(3)	(4)	(5)
Current spending	4.255***	7.695***			
	(0.636)	(1.961)			
Investment spending	-30.733***	-37.295***			
	(6.071)	(6.085)			
Total revenue	1.466	-2.213			
	(1.685)	(1.679)			
Current spending, 1st lag			0.527***	-0.011**	-0.009
			(0.079)	(0.005)	(0.009)
Current spending, 2nd lag			0.203***	-0.023***	0.025***
			(0.028)	(0.007)	(0.010)
Investment sp., 1st lag			0.167	0.748***	-0.211**
			(0.126)	(0.081)	(0.090)
Investment sp., 2nd lag			-0.034	0.009	-0.058
			(0.161)	(0.066)	(0.092)
Total revenue, 1st lag			0.089*	-0.005	0.794***
			(0.053)	(0.006)	(0.026)
Total revenue, 2nd lag			0.039	0.019**	-0.053**
			(0.037)	(0.008)	(0.021)
Short-term interest rate	0.351***	0.344***	0.001***	-0.000**	0.000
	(0.028)	(0.028)	(0.000)	(0.000)	(0.000)
Inflation rate	-0.016	-0.012	-0.001***	0.000	-0.001***
	(0.026)	(0.026)	(0.000)	(0.000)	(0.000)
Real growth rate	-0.052**	-0.043**	-0.004***	0.000	-0.002***
	(0.022)	(0.017)	(0.001)	(0.000)	(0.000)
Real growth × "Trouble"	-0.178***	-0.175***	0.000	0.000***	0.001**
	(0.026)	(0.023)	(0.000)	(0.000)	(0.000)
Eurozone dummy	-0.182	-0.169	0.003***	-0.000	0.002
	(0.153)	(0.140)	(0.001)	(0.000)	(0.001)
2011 dummy × "Trouble"	2.001***	1.985***	-0.012***	-0.002***	-0.005***
	(0.103)	(0.107)	(0.002)	(0.001)	(0.001)
2012 dummy × "Trouble"	1.909***	1.951***	-0.027***	-0.003***	0.001
	(0.200)	(0.176)	(0.001)	(0.000)	(0.001)
Observations	616	616	616	616	616
Underid. test (p)		0.00	0.00	0.00	0.00
Underid. test (p), Newey-West SE		0.00	0.00	0.00	0.00
F-test			117.40	73.21	118.99
F-test, Newey-West SE			118.88	117.75	147.96
Multivariate F-test			127.69	58.23	151.59
Multivariate F-test, Newey-West SE			108.42	130.84	142.62

Notes: Significance levels denoted as * p<0.1; ** p<0.05; *** p<0.01. OLS (1) / 2SLS (2) with country and year fixed effects and Driscoll-Kraay standard errors. Test statistics computed using Newey-West standard errors allow for up to 15th order serial correlation.

A Hansen test does not reject the null hypothesis of joint validity of the instruments, while Hausman (1978) tests comparing coefficients estimated by OLS and by 2SLS do not reject the null hypotheses, for the coefficients of fiscal variables individually, of exogeneity.[28] Furthermore, first-stage results suggest that first and, in part, second lags are informative instruments, and the Kleibergen-Paap (2006) test and conventional or multivariate F-tests (Sanderson and Windmeijer (2016)) do not give any cause for worry about underidentification or weak identification. Thus, endogeneity of the fiscal variables does not appear to be a serious concern, enabling consistent inference using OLS and lending support to main results discussed above.

Second, Table 3 addresses concerns about simultaneity stemming from underlying macroeconomic conditions by investigating whether the cyclical components of government revenue and current spending enter differently than their structural components. The structural components of revenue and expenditure correspond to discretionary spending, while the cyclical ones reflect automatic stabilisers. Data on cyclically adjusted fiscal variables is also provided by AMECO, though for a significantly smaller subset of country-year observations. Column (1) presents results from estimating our preferred specification on this subset. When current expenditure and total revenue are split into their cyclical and structural components, as in column (2), only the structural component is significant in the case of expenditure and neither is significant in the case of revenue, in line with results above. The large standard errors on the coefficients of cyclical components suggest that these components may be highly collinear with the included cylical controls, and are reassuring insofar as they suggest that these controls are in fact adequately controlling for cyclical conditions. It is also worth noting that the macroeconomic models discussed in Section 2 typically evaluate the response to discretionary government spending changes, whereas the default risk channel also discussed above might plausibly reflect worry both about discretionary spending as well as automatic stabilisers, since both can ultimately result in insolvency.

Third, Table 4 presents a range of further robustness tests that, among other things, address concerns about reverse causation and simultaneity stemming from time-varying institutional factors.[29] Columns (1) and (2) shift the timing of information sets. Column (1) uses a fourth-quarter average instead of an annual average of the dependent variable, the long-term bond yield. This is in order to reflect the fact that information about the budget deficit for year t emerges gradually over the course of the year and is finalised only towards the end, hence matching information sets more closely.[30]

[28]The Hausman test for the coefficients of the three fiscal variables jointly cannot be computed as the covariance difference matrix is not positive definite. For computational reasons, the Hausman and Hansen test statistics are calculated using Newey-West standard errors, thus allowing for heteroskedasticity and serial correlation. Table 2 reports underidentification and F-test statistics using both Driscoll-Kraay and Newey-West standard errors. Allowing for cross-section dependence additionally does not appear to affect conclusions.

[29]Results – not reported here – are also highly robust when alternative ways for controlling for the common downward trend in bond yields since the early 1980s are employed, such as specifying two linear trend segments in place of year dummies, or when the inflation rate is excluded as a control.

[30]Note that, for 51 country-year observations, quarterly interest rate data was not available, so for the observations, annual data was used instead. Results are also robust when these observations are excluded.

Table 3: Robustness: Cyclical and structural components

	Baseline	**Split**
	(1)	(2)
Current spending	6.135***	
	(0.862)	
Current spending, structural component		5.514***
		(0.782)
Current spending, cyclical component		9.189
		(5.499)
Investment spending	-26.753***	-24.877**
	(8.087)	(9.550)
Total revenue	3.208	
	(3.447)	
Total revenue, structural component		3.451
		(3.229)
Total revenue, cyclical component		-28.798
		(46.075)
Short-term interest rate	0.427***	0.430***
	(0.048)	(0.051)
Inflation rate	-0.031	-0.034*
	(0.019)	(0.018)
Real growth rate	-0.047*	-0.039
	(0.026)	(0.034)
Real growth × "Trouble"	-0.154***	-0.155***
	(0.025)	(0.024)
Eurozone dummy	0.243**	0.265**
	(0.116)	(0.123)
2011 dummy × "Trouble"	1.875***	1.873***
	(0.148)	(0.148)
2012 dummy × "Trouble"	1.901***	1.884***
	(0.253)	(0.236)
R-squared	0.85	0.87
Observations	477	477

Notes: Significance levels denoted as * p<0.1; ** p<0.05; *** p<0.01. OLS with country and year fixed effects and Driscoll-Kraay standard errors. R2 adj. to exclude effect of year fixed effects.

Table 4: Robustness: further tests

	Q4 yield (dep. var.)	**Lagged fiscals**	**Political factors**	**Excl. short rate**	**Policy rate**	**W/ debt ratio**	**Spreads vs. Germany**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Current spending	6.256***	6.354***	3.704***	3.564***	3.980***	1.793**	4.666***
	(1.063)	(1.090)	(0.562)	(0.843)	(0.833)	(0.775)	(0.737)
Investment spending	-21.336***	-28.725***	-31.854***	-45.931***	-42.161***	-21.278***	-30.469***
	(5.308)	(6.023)	(8.481)	(3.519)	(7.955)	(4.149)	(6.247)
Total revenue	1.497	-1.173	0.854	2.423	-1.349	2.075	1.744
	(1.756)	(1.223)	(1.904)	(1.730)	(1.677)	(2.207)	(2.585)
Left-wing share of gov.			0.000				
			(0.001)				
Monetary policy rate					0.230***		
					(0.066)		
Debt ratio						0.948***	
						(0.254)	
Short-term interest rate	0.348***	0.366***	0.386***			0.393***	0.378***
	(0.033)	(0.031)	(0.041)			(0.040)	(0.059)
Inflation rate	0.021	-0.018	-0.016	0.140**	0.099**	-0.036	-0.042***
	(0.026)	(0.028)	(0.024)	(0.059)	(0.047)	(0.025)	(0.012)
Real growth rate	-0.026	-0.069***	-0.048*	-0.094***	-0.082***	-0.049*	-0.051**
	(0.027)	(0.022)	(0.028)	(0.015)	(0.010)	(0.028)	(0.023)
Real growth rate × "Trouble"	-0.188***	-0.187***	-0.175***	-0.201***	-0.112***	-0.170***	-0.166***
	(0.024)	(0.029)	(0.026)	(0.026)	(0.031)	(0.024)	(0.022)
Eurozone dummy	-0.161	-0.148	-0.148	-0.645***	-0.458***	-0.042	-0.000
	(0.156)	(0.141)	(0.117)	(0.156)	(0.145)	(0.107)	(0.056)
2011 dummy × "Trouble"	2.909***	1.956***	2.008***	1.742***	2.095***	1.906***	1.937***
	(0.111)	(0.098)	(0.102)	(0.104)	(0.185)	(0.099)	(0.116)
2012 dummy × "Trouble"	1.317***	1.901***	1.912***	1.468***	2.175***	1.799***	1.888***
	(0.174)	(0.177)	(0.214)	(0.138)	(0.298)	(0.185)	(0.208)
R-squared	0.79	0.80	0.80	0.44	0.75	0.80	0.68
Observations	654	636	625	659	568	641	548

Notes: Significance levels denoted as * p<0.1; ** p<0.05; *** p<0.01. OLS with country and year fixed effects and Driscoll-Kraay standard errors.

R2 adjusted to exclude the effect of year fixed effects.

Column (2) in Table 4 uses fiscal variables from period $t-1$ instead of t to deal with the potential for reverse causation from interest rates to fiscal policy decisions. In both cases, results are highly robust. Column (3) adds an indicator that reflects the ideological stance of the governing party or coalition – specifically, the share of left-leaning parties in government[31] – with the objective of controlling for at least part of time-varying institutional characteristics that might cause simultaneity. This indicator enters insignificantly and leaves results unaffected. Column (4) demonstrates the effect of excluding the short-term interest rate as a control – effects of fiscal policy variables are qualitatively robust, yet changes relative to the baseline specification are hard to interpret, because the short-term interest rate serves as a control for both cyclical conditions and the monetary policy reaction function. Column (5) addresses the fact that the use of the three-month interbank rate as a control might introduce the effects of changes in banking risk and liquidity by instead including the monetary policy rate, typically an overnight rate, as a control. While the sample shrinks somewhat due to data inavailability, results are robust. Column (6) includes the debt ratio as an additional indicator of the fiscal policy stance. Although this is formally invalid due to the non-stationarity of the debt ratio, our main results are qualitatively unaffected. Lastly, column (7) relates the bond yield spread relative to Germany to the usual set of fiscal and control variables, all expressed as differences relative to Germany. Results are highly robust. Note that the presence of year fixed effects, which are commonly specified in the literature and throughout this paper, means that spread-based estimation is exactly equivalent to relating the level of the yield to country-specific fiscal and control variables as before, on the sample that excludes Germany and non-overlapping observations.[32]

Finally, Table 11 in the Appendix displays results from using "mean groups" estimation approaches, thus allowing coefficients of explanatory variables to be country-specific (Pesaran and Smith (1995), Eberhardt and Teal (2010), Eberhardt (2013)). Results are extremely similar to pooled results and thus indicate that the pooling approach taken here is not inappropriate.

4.3 Heterogeneity

Table 5 investigates some aspects of temporal and spatial heterogeneity in the estimated effects of the composition of government budget deficits on government borrowing cost.[33]

[31] It measures the cabinet posts of social democratic and other left parties as a percentage of total cabinet posts, weighted by number of days in office (Armingeon et al. (2015)), ranging from 0 to 100.

[32] This is because the inclusion of year fixed effects controls for the evolution of yields in a reference country such as Germany. It is interesting to note that in spite of this, specifications employed in research that investigates the fiscal policy determinants of bond yield spreads relative to a reference country (such as Hagen et al. (2011)) tend to differ substantially from those employed in research that does so for the level of the bond yield (such as Ardagna et al. (2007)).

[33] Additional sources of potential heterogeneity that were also investigated but are not reported here include adding inflation and GDP forecasts from the WEO for 1 to 5 years ahead to specifications, in order to more appropriately reflect the forward-looking nature of financial markets, but these forecasts

Table 5: Heterogeneity

	Pre-crisis sample	**Post-crisis sample**	**Crisis interaction**	**Eurozone interaction**
	(1)	(2)	(3)	(4)
Current spending	6.135***	4.824**	3.513***	3.657***
	(0.558)	(1.348)	(0.492)	(0.516)
Investment spending	-17.921***	-42.231**	-24.849***	-20.224***
	(4.349)	(16.693)	(4.553)	(2.333)
Investment sp. interaction			-21.296***	-37.168***
			(4.936)	(10.067)
Total revenue	-4.455*	7.061	1.505	1.626
	(2.276)	(4.495)	(1.989)	(1.903)
Short-term interest rate	0.421***	0.182**	0.384***	0.381***
	(0.022)	(0.073)	(0.038)	(0.036)
Inflation rate	0.029	0.004	-0.019	-0.022
	(0.036)	(0.039)	(0.023)	(0.025)
Real growth rate	-0.010	-0.124***	-0.054*	-0.045*
	(0.029)	(0.025)	(0.029)	(0.026)
Real growth rate × "Trouble"	0.002	-0.199***	-0.177***	-0.175***
	(0.037)	(0.043)	(0.025)	(0.022)
Eurozone dummy	-0.256*	-0.716	-0.197	1.127***
	(0.146)	(0.425)	(0.126)	(0.315)
2011 dummy × "Trouble"		1.910***	2.026***	1.878***
		(0.175)	(0.110)	(0.113)
2012 dummy × "Trouble"		1.629***	1.841***	1.710***
		(0.196)	(0.207)	(0.203)
R-squared	0.90	0.84	0.87	0.86
Observations	445	209	654	654

Notes: Significance levels denoted as * p<0.1; ** p<0.05; *** p<0.01. OLS with country and year fixed effects and Driscoll-Kraay standard errors. R2 adjusted to exclude the effect of year fixed effects.

Columns (1) to (3) in Table 5 address the conjecture that the recent financial crisis awoke bond markets from their "sleeping beauty" state of being to the realisation that government bonds do involve default and other risks, which means that effects of fiscal variables may have changed since the crisis. Column (1) is similar to column (4) of

were never significant and did not affect results. Furthermore, we used a measure of the output gap as an alternative control for the economic cycle, but results were unaffected. Additionally, measures of the effective exchange rate, sourced from BIS, were added to a range of baseline specifications, but did not enter significantly and did not change results. Countries that had AAA- or at-least-A rated sovereign debt, based on data from Moody's and Fitch, consistently throughout the sample period were compared to those that did not, but differences in the effects of fiscal variables of interest were found to be minimal. Finally, the relevance of hitting the zero lower bound (ZLB) in short-term nominal interest rates, liberally defined as rates below 50 basis points, was assessed, but our main results were unaffected.

Table 1[34], and reports results from estimating the baseline specification on the sample prior to 2008, while column (2) does so on the sample from 2008 to 2014. While the effect of investment doubles in magnitude in the sample after 2008, results are qualitatively unchanged. Note, however, the relatively small sample size and short time series available for the specification reported in column (2). Furthermore, the real growth rate becomes more important and enters significantly negatively in column (2), which suggests the workings of a default risk channel and is in line with the conjecture that since the crisis, the spectre of government default has returned to investors' minds. This also demonstrates that imposing the coefficients on control variables to be stable over time is not innocuous, although doing so does not affect the main conclusions reached. Column (3) uses the full sample but adds an interaction effect between investment spending and a crisis-time dummy, equal to 1 from 2008 to 2012, but constrains the coefficients on all other variables to be constant throughout the sample period. Here, in line with the findings from the post-crisis sample, it appears that government investment was perceived to matter more during the crisis, with a significant and negative interaction effect. Lastly, column (4) estimates a baseline specification with an added interaction term between investment spending and the Eurozone dummy, which is 1 for the Eurozone countries from the year onwards that they joined.[35] Interestingly, investment spending seems to be perceived as particularly relevant for Eurozone countries.

5 Conclusion

This paper has sought to explore whether bond markets accord importance to the composition of and hence reasons behind government budget deficits. We find that bond markets indeed distinguish between deficits that are due to higher government current spending and those that are due to higher government investment, penalising the former significantly more than the latter. These results imply that markets tend to view government investment, on average, as favourable for growth or as having a positive return.

These findings could have important policy implications. Insofar as the normative perspective on fiscal policy that financial markets provide is considered to be a useful indicator of the appropriateness, validity or sustainability of any given fiscal policy stance, these results suggest that austerity policies ought to focus more on government current spending than on government investment and that fiscal rules should distinguish budget deficits that are the result of government investment from those that are not.

[34]Column (1) here additionally includes the interaction term between the growth rate and our "trouble" dummy.

[35]Interaction terms with the crisis time and Eurozone dummies for the other fiscal and controls variables were investigated, but mostly did not enter significantly and did not affect the conclusions reached regarding the effects of the fiscal variables.

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Appendix

Table 6: Comparison of interest rate effects across models

Increase in current G

Model	**Agents**	**Rigidity** (p, w)	**Mon. pol.**	C	L	I	Y	**Nom.** i
IS-LM (1)	Non-Ricardian	Prices sticky	exogenous	↑	↑	↓	↑	↑
NK (2)	Ricardian	Both sticky	Taylor rule	↓	↑	↓	↑	↑
RBC (3)	Ricardian	Both flexible	irrelevant	↓	↑	↑	↑	↑

Increase in productive G

Production function with a non-zero elasticity of output with respect to public capital

Model	**Agents**	**Rigidity** (p, w)	**Mon. pol.**	C	L	I	Y	**Nom.** i
IS-LM	Non-Ricardian	Prices sticky	exogenous	↑	↑	↓ or ↑	↑	↑ less or ↓
NK (4)	Ricardian	Both sticky	Taylor rule	↓ or ↑	↑	↑	↑	↑ less or ↓
RBC (3)	Ricardian	Both flexible	irrelevant	↑	↑	↑	↑	↑ more

(1) as per Galí et al (2007). (2) as per Smets and Wouters (2003) – Taylor rule with $\phi_y > 0$, $\phi_\pi > 0$.

(3) as per Baxter and King (1993). (4) as per Linnemann and Schabert (2005) – Taylor rule with $\phi_y = 0$, $\phi_\pi > 0$.

In IS-LM, money supply is assumed to be constant. In RBC case, impacts on C, L, I and Y are in equilibrium.

In NK, the stickiness of both prices and wages is not required for these results to obtain.

Table 7: Data units and sources

Variable	**Units**	**Source**
Government bond yield	Percentage points, annual average	AMECO, OECD
Primary deficit	Percent of GDP*	AMECO
Current spending	Percent of GDP*	AMECO
Investment spending	Percent of GDP*	AMECO
Other cap. expenditure	Percent of GDP*	AMECO
Total revenue	Percent of GDP*	AMECO
Liabilities	Percent of GDP*	AMECO, IMF WEO April 2016
Short-term interest rate	Percentage points, annual average	AMECO, OECD
Inflation rate	Percentage points, yoy growth rate	AMECO, OECD
Real growth rate	Percentage points, yoy growth rate	AMECO
"Left-wing" gov. share	Index level $\in [0, 100]$	Armingeon et al. 2015
Monetary policy rate	Percentage points, annual average	Datastream, IMF IFS
Sovereign ratings	Discrete index categories	Fitch, Moody's

*For example: a debt-to-GDP ratio of 60% is coded as 0.6; analogously for all fiscal variables.

Table 8: Summary statistics

Variable		**NxT**	**mean**	**sd**	**min**	**max**
Dependent variable						
Government bond yield	$GBY10_{i,t}$	670	5.58	2.84	0.55	15.85
Fiscal variables (all as a share of GDP)						
Primary deficit	$GDEFPRI_{i,t}$	654	-0.01	0.04	-0.29	0.21
Deficit	$GDEF_{i,t}$	654	0.02	0.04	-0.32	0.19
Current spending	$GCEXP_{i,t}$	654	0.36	0.07	0.21	0.54
Investment spending	$GINV_{i,t}$	654	0.04	0.01	0.02	0.07
Other cap. expenditure	$GEOCE_{i,t}$	654	0.01	0.01	-0.01	0.22
Total revenue	$GTREV_{i,t}$	654	0.42	0.07	0.29	0.59
Liabilities	$GLI_{i,t}$	670	0.58	0.34	0.04	2.46
Controls						
Short-term interest rate	$ISN_{i,t}$	670	4.56	3.66	0.01	18.77
Inflation rate	$CPI_{i,t}$	670	2.93	2.66	-1.71	17.80
Real growth rate	$GROWTH_{i,t}$	670	2.41	3.07	-14.81	11.90

Countries included: Austria, Belgium, Bulgaria, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Japan, Latvia,Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, UK, US (31)

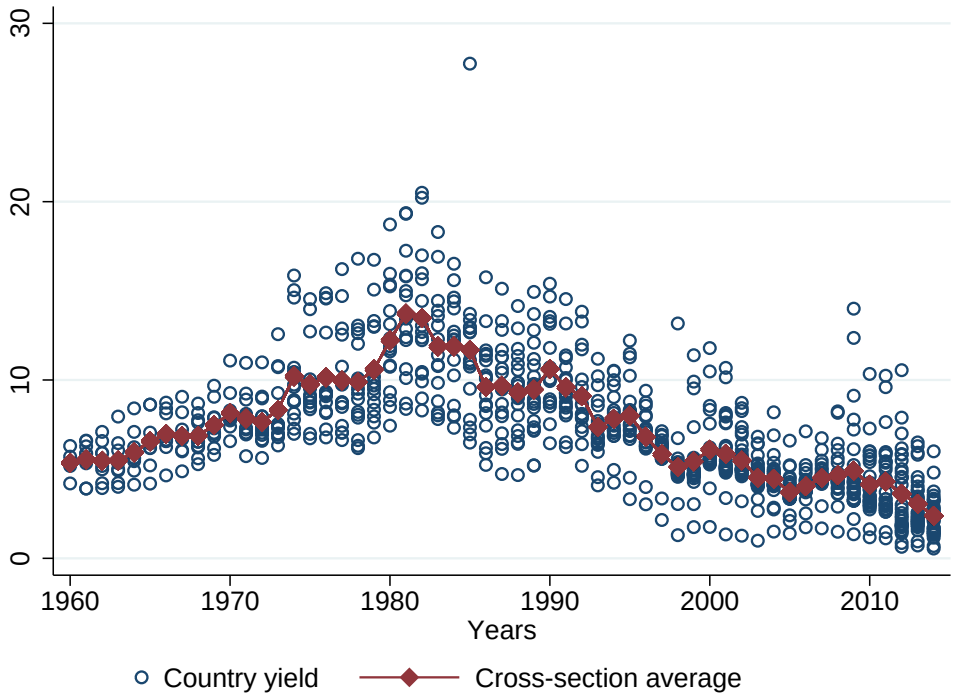
Table 9: Testing for unit roots – IPS test

Variable		**p-values**
Government bond yield	$GBY10_{i,t}$	0.00
Primary deficit	$GDEFPRI_{i,t}$	0.00
Current spending	$GCEXP_{i,t}$	0.00
Investment spending	$GINV_{i,t}$	0.00
Other cap. expenditure	$GEOCE_{i,t}$	0.00
Revenue	$GTREV_{i,t}$	0.00
Liabilities	$GLI_{i,t}$	0.80
Short-term interest rate	$ISN_{i,t}$	0.00
Inflation	$CPI_{i,t}$	0.00
Real growth rate	$GROWTH_{i,t}$	0.00

Im et al. (2003)test for unit roots. Lag length selected by AIC.

Null hypothesis: all panels contain unit roots ($\phi_i = 0 \; \forall \, i$)

Figure 3: Long-term government bond yield, 1960-2014



In percentage points
Source: AMECO

Table 10: Standard error adjustment

	White	**Newey-West**	**Clustered (country)**
	(1)	(2)	(3)
Current spending	3.758***	3.758**	3.758**
	(1.339)	(1.489)	(1.601)
Investment spending	-30.065***	-30.065***	-30.065***
	(5.889)	(6.691)	(7.018)
Total revenue	1.215	1.215	1.215
	(2.030)	(2.578)	(2.808)
Short-term interest rate	0.383***	0.383***	0.383***
	(0.029)	(0.039)	(0.042)
Inflation rate	-0.020	-0.020	-0.020
	(0.026)	(0.031)	(0.033)
Real growth rate	-0.045**	-0.045***	-0.045**
	(0.022)	(0.017)	(0.017)
Real growth × "Trouble"	-0.176***	-0.176***	-0.176***
	(0.037)	(0.034)	(0.033)
Eurozone dummy	-0.177	-0.177	-0.177
	(0.121)	(0.157)	(0.181)
2011 dummy × "Trouble"	1.979***	1.979***	1.979***
	(0.538)	(0.589)	(0.617)
2012 dummy × "Trouble"	1.892***	1.892***	1.892***
	(0.505)	(0.520)	(0.541)
R-squared	0.81	0.81	0.81
Observations	654	654	654

Notes: Significance levels denoted as * p<0.1; ** p<0.05; *** p<0.01. OLS with country and year fixed effects. R2 is adjusted to exclude the effect of year fixed effects.

"Trouble" is 1 for Cyprus, Hungary, Ireland, Italy, Latvia, Lithuania, Poland, Portugal, Slovenia, Spain.

A1 Robustness: "Mean groups" estimation

Estimating panel data models using the "mean groups" estimation approach generally involves estimating a separate regression for group, and then averaging estimated coefficients across groups (Pesaran and Smith (1995), Eberhardt (2013)).

Table 11 reports results from estimating a baseline specification – column (3) in Table 1 – while allowing regression coefficients to be country-specific rather than pooling them across countries. The fact that year dummies are specified in pooled regressions is here reflected by, for results reported in columns (1) and (2), demeaning all variables prior to estimation.

Column (1) in the below reports unweighted means of country-specific regression coefficients. Column (2) reports the outlier-robust mean of country-specific regression coefficients. Column (3) (Eberhardt and Teal (2010)) is generated by first estimating a pooled regression that includes year dummies, and then including the estimated year fixed effects when subsequently running the country-specific regressions. Coefficients reported are again unweighted means of the country-specific regression results.

Table 11: "Mean groups" estimation

	Mean groups (MG)	**Outlier-robust MG**	**Augmented MG**
	(1)	(2)	(3)
Current spending	8.879	2.817	9.906***
	(5.719)	(3.866)	(3.370)
Investment spending	-20.178**	-22.090**	-33.561***
	(9.389)	(10.089)	(12.413)
Total revenue	-0.658	-2.438	-6.733
	(4.230)	(3.916)	(4.983)
Short-term interest rate	0.277***	0.267***	0.465***
	(0.076)	(0.047)	(0.053)
Inflation rate	0.028	0.011	0.026
	(0.042)	(0.044)	(0.045)
Real growth rate	-0.086***	-0.086***	-0.076***
	(0.023)	(0.024)	(0.017)
Eurozone dummy	0.715	0.176	0.148
	(0.717)	(0.460)	(0.159)
Observations	654	654	654

Notes: Significance levels denoted as * p<0.1; ** p<0.05; *** p<0.01.

(1) and (2): on demeaned series to reflect use of year dummies in baseline spec.

(3): on regular series since estimation procedure involves year dummies

(1) and (2): Pesaran and Smith (1995); (3) Eberhardt and Teal (2010)