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## Fiscal Equalization Schemes and Fiscal Sustainability

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# **ifo** Working Papers

## Fiscal Equalization Schemes and Fiscal Sustainability

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Ifo Working Paper No. 141

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## Fiscal Equalization Schemes and Fiscal Sustainability\*

### Abstract

Fiscal sustainability tests have largely ignored the institutional setting of fiscal policy making. Fiscal equalization schemes in federal states are one such institution. We examine whether German state governments pursue sustainable fiscal policies taking into account fiscal equalization transfers. Using panel data techniques we assess fiscal sustainability by investigating whether the debt-to-GDP-ratio has had a positive influence on the primary surplus (*Bohn-model*). Distinguishing between different measures of the primary surplus we show that including/excluding fiscal transfers changes the results of the *Bohn-model*. While fiscal equalization transfers do render the fiscal policy of the states sustainable they also provide the states with incentives to increase government spending which, eventually, might render the entire equalization scheme politically unsustainable.

JEL Code: H77, H72, H62, C23.

Keywords: Fiscal sustainability, institutions, fiscal equalization schemes, panel data.

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## 1. Introduction

A most topical question in Public Finance is whether governments pursue sustainable fiscal policies. When fiscal policy is shown to be unsustainable, policies should be changed. Governments could, for example, cut spending, increase public revenues, or implement non-budgetary policies that promote economic growth. Empirical tests of fiscal sustainability are also important because they can be used to publicize the government's fiscal policy performance which may thereby influence the government's (re-)election prospects.

The purpose of this paper is to show that the institutional setting of fiscal policy making needs to be considered in fiscal sustainability tests. So far, studies on fiscal sustainability have largely ignored the institutional setting. In federal states such as the United States and Germany, fiscal equalization transfers between jurisdictions influence the budgets of the federal and lower tier governments. Paying fiscal equalization transfers impairs of course a government's fiscal performance, whereas receiving fiscal equalization transfers appears to improve it. It is therefore possible that ignoring fiscal transfer payments in empirical tests of fiscal sustainability gives rise to misleading conclusions. In particular, when a government with a dismal fiscal performance receives a transfer, empirical tests may predict that the government's fiscal policy is sustainable because of the transfer but not because of the government's sound fiscal policy. By using data for the German states, we show that including fiscal equalization transfers in the state budgets influences the inferences regarding fiscal sustainability.

Three approaches to investigating the sustainability of fiscal policies are commonly used. First, one can examine whether the Debt-to-GDP-ratio has a unit root. When the null hypothesis of a unit root cannot be rejected, fiscal policy is not sustainable. The unit root test of the Debt-to-GDP-ratio has however been criticized because common unit root tests have low power as compared to autoregressive alternatives when the autoregressive coefficient in the test regression is close to one. Low power means that the null hypothesis (the considered

time series contains a unit root) is biased towards rejection. Second, one can investigate whether public revenues and public expenditures are cointegrated (which requires that both public revenues and public expenditures are non-stationary in levels). Cointegration tests may however also suffer from low power. A very prominent alternative test for fiscal sustainability is, third, to examine whether the Debt-to-GDP-ratio has a positive influence on the primary surplus (*Bohn-model*: Bohn 1998, 2008). Governments pursue sustainable fiscal policies when the Debt-to-GDP-ratio increases the primary surplus. An increase in the primary surplus means that the government takes corrective measures by increasing revenues and/or cutting expenditures to counteract the accumulation of public debt.

Sustainable fiscal policies are a precondition for a country's economic growth. High public debt-to-GDP ratios are associated with low economic growth (Reinhart and Rogoff 2010, Checherita Westphal and Rother 2012, Baum et al. 2012). The *Bohn-model* thus provides an indication of the future economic development of a country since it shows whether the government manages to keep its public debt under control. Of course, to draw indicative conclusions from the Bohn test, the fiscal data of a country should not be distorted by fiscal transfers.

Fiscal sustainability tests are usually applied by using cross-country data. Univariate time series techniques and panel data techniques have, however, also been used. Alfred Greiner with collaborators and Antonio Afonso with collaborators have pursued this line of research in a sequence of studies.<sup>3</sup>

Our study is most closely related to Mahdavi and Westerlund (2011) who employ panel unit root and cointegration tests to investigate fiscal policies of US state and local governments. Mahdavi and Westerlund (2011) explore as to what extent balanced budget requirements/rules/provisions (BBRs) facilitate fiscal sustainability and arrive at the result

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<sup>3</sup>See, for example, Afonso (2005), Afonso (2008), Rault and Afonso (2007), Afonso and Rault (2010), Afonso and Jalles (2011), Fincke and Greiner (2012), Byrne et al. (2011), Prohl and Westerlund (2009), Trehan and Walsh (1991), Wilcox (1989). On theoretical considerations of public debt sustainability see, for example, Bohn (1995) and Greiner (2011). On a new approach for fiscal sustainability tests, see Afonso et al. (2011).

that “without federal grants, state and local governments as a group are unable to fund their current operation expenditures using their own-source revenues” (p. 963).

We apply the *Bohn-model* on a panel of German lower tier state governments. We show that fiscal policy in the German states is only sustainable because of the fiscal equalization scheme.

## **2. Prior studies and research framework**

Fiscal policy in some German states has been shown to be unsustainable.<sup>4</sup> Fincke and Greiner (2011) use univariate time series for the West German states over the period 1975-2006 and show that the Debt-to-GDP-ratio has had a positive influence on the primary surplus in all the West German states except Berlin; but also that the Debt-to-GDP-ratio has had a unit root. In a similar vein, Kitterer (2007) and Kitterer and Finken (2006) use univariate time series for the West German states over the period 1971-2004 and for the East German states over the period 1992-2004 and show with the help of univariate unit root tests that only governments in Hesse, North-Rhine Westphalia, and Saxony pursued sustainable fiscal policies. Herzog (2010) tests the *Bohn-model* for Baden-Wuerttemberg and Berlin over the period 1970-2005. The results show that fiscal policy was sustainable in Baden-Wuerttemberg and unsustainable in Berlin. Claeys et al. (2008) estimate the *Bohn-model* in a panel for the West German states over the period 1970-2005 and for the East German states over the period 1991-2005. The results show that the Debt-to-GDP-ratio did not influence the primary surplus.

The empirical techniques used in the previous studies investigating fiscal sustainability in the German states have however some shortcomings. First, the sample size in univariate models for individual states is small. To be sure, investigating whether governments pursue sustainable fiscal policies in every individual state allows comparisons across states. By using

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<sup>4</sup> See Greiner and Semmler (1999), Greiner et al. (2006), Priesmeier and Koester (2012) for fiscal sustainability tests at the federal level in Germany. Evidence is mixed.

panel data and jackknife tests, one can also examine whether inferences are sensitive to including/excluding individual states. Second, estimating a panel data model requires including fixed state and fixed period effects.

We also estimate panel models which include fixed state and fixed period effects. In particular, we investigate whether the Debt-to-GDP-ratio has had a positive influence on the primary surplus (*Bohn-model*). The dataset covers the period 1974-2010 in the West German states and the period 1992-2010 in the East German states.

In principle one could also use panel unit root tests to examine whether the debt-to-GDP ratio has a unit root and investigate whether public revenues and public expenditures in the German states are cointegrated – the low power of the tests notwithstanding. Unit root and cointegration tests, however, need to consider structural breaks because of the German Unification in 1990. Moreover, one would have to investigate whether the structural break is part of the cointegration relationship. The critical values of panel unit root and cointegration tests for bounded variables such as debt-to-GDP-ratios need to be adjusted (Herwartz and Xu 2008, Xu and Cavaliere 2012). Because standard panel unit root and panel cointegration tests with structural breaks and bounded variables are not yet available, we do not employ panel unit root and panel cointegration tests.

### **3. Data and descriptive analysis**

#### **3.1 Public Debt and primary surplus in the German states**

We use public debt data provided by the German Federal Statistical Office (*Fachserie 14 Reihe 5*) and consider credit market debt (*Kreditmarktschulden*) which accounts for the largest share on debt, and short-term financial instruments (*Kassenkredite*), which have become more important to balance budgets since the year 2000. We use GDP data for the German states from the revised national accounts of the states (*Volkswirtschaftliche Gesamtrechnung der Länder*). To calculate the primary surplus, we employ the annual

economic results for a financial year provided by the German Federal Statistical Office (*Fachserie 14 Reihe 3.1: Rechnungsergebnisse des öffentlichen Gesamthaushalts*) for the period 1974-2008, and for the years 2009 and 2010 the quarterly cash results of the overall public budget calculation (*Fachserie 14 Reihe 2: Kassenergebnisse des öffentlichen Gesamthaushalts*). We use fiscal data on the state government level, excluding municipalities. The dataset contains annual data for the period 1974-2010 for the West German states and the period 1992-2010 for the East German states. We cannot use data from earlier years, because data for public expenditures and revenues are not available.

Figure 1 illustrates the composition of the German general government debt over the period 1974-2010. In 2010, the general government Debt-to-GDP ratio was 81.2%. The central government Debt-to-GDP ratio was 52.0%, the state governments' Debt-to-GDP ratio was 24.2%, and the municipality governments' Debt-to-GDP ratio was 5.0%. In 2010, the states thus held 30.0% of total public debt as a share of GDP in Germany. Over the period 1974-2010, the states accounted for 29.7% of the total debt as a share of GDP (maximum of 33.5% in 1988). Over the period 1974-2010, the aggregate state governments' Debt-to-GDP ratio increased from 4.6% to 24.2%. The German state governments thus accumulated substantial public debt.

Table 1 shows that the Debt-to-GDP ratios differ a great deal across the German states. Over the period 1974-2010, the Debt-to-GDP ratio in the states was 20.2% on average. In the West German states, the average Debt-to-GDP ratio was 15.4%, in the East German states the average Debt-to-GDP ratio was 23.1%, and in the city states the average Debt-to-GDP ratio was 30.6%. The Debt-to-GDP ratio was especially high in Berlin, Brandenburg, Bremen, Hamburg, Mecklenburg Western-Pomerania, Saarland, Saxony-Anhalt, Schleswig-Holstein and Thuringia.

In 1974 the average Debt-to-GDP ratio in the West German states was 5.5% and in the city states 11.9% (Table 2). After the German unification, the average Debt-to-GDP ratio in



the German states was 12.9% in 1991 (15.1% in the West German states, 2.6% in the East German states, and 24.3% in the city states). In 2010, the average Debt-to-GDP ratio in the German states was 31.3% (25.2% in the West German states, 28.6% in the East German states, and 52.1% in the city states).

We propose three alternatives to measure the primary surplus. First, we use the standard definition of the primary surplus: the difference between primary revenues and primary expenditures (primary surplus 1). Primary expenditures are all expenditures, excluding interest payments. The primary expenditures thus include all public activities. Second, we measure the primary surplus by also excluding all earnings based on the sale of assets and shares (primary surplus 2). We adjust the primary surplus by one-time effects (see, for example, Dietz 2008).<sup>5</sup> Third, we adjust the primary surplus by transfers paid and received by the German fiscal equalization scheme (primary surplus 3). In our baseline model we use the “primary surplus 2” and exclude fiscal equalization transfers; inferences do not change at all when we use the “primary surplus 1” and exclude fiscal equalization transfers (see robustness checks). The official revenue and expenditure data include the transfers by the German fiscal equalization scheme. The state governments cannot, however, directly influence these transfers. The fiscal equalization system, which harmonizes tax revenues across states, is a typical feature of Germany’s fiscal federalism. Transfer payments flow from the federal level to the states (vertical) as well as between the states (horizontal). The horizontal transfers redistribute tax revenues from rich states to poor states. States with an above average per capita tax revenue pay transfers, while states with a below average per capita tax revenue receive transfers. Vertical and horizontal transfers adjust the poor states’

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<sup>5</sup> Examples of divestitures and privatizations: Bavaria: Privatization of the Bayernwerk AG (1994), sale of shares of the VIAG AG (1999); Berlin: Sale of shares of the Berliner Kraft- und Licht AG (1997), privatization of the Berliner Gaswerk AG (1998), sale of shares of the Landesbank Berlin (2007); Bremen: Privatization of the sewage water disposal company (1998); Hamburg: Privatization of the gas works (1988/1991), privatization of the electric power stations (1997/1999/2002), sale of shares of the Hamburgische Landesbank (1997), privatization of the airport (2000/2002), sale of shares of the Hamburger Hafen und Logistik AG (2007).

income effectively to at least 97.5% of average fiscal resources.<sup>6</sup> Since 1995, the East German states have participated in the system, so that the volume of payments has increased. Table 3 illustrates the transfers received and transfers paid between 1974 and 2010 (sum of horizontal and vertical transfers). Five states (Baden-Wuerttemberg, Bavaria, Hamburg, Hesse, and North Rhine-Westphalia) paid more transfers than they received over the period 1974-2010.

Figure 2 shows that the three measures of the primary surplus give rise to different evaluations of the states' fiscal performance. Using the standard definition of the primary surplus (measure 1), the average Primary-surplus-to-GDP ratio in the German states is -0.2% for the years 1974 to 2010 (-0.1% in the West German states, -0.8% in the East German states, and -0.2% in the city states). Seven states (Berlin, Brandenburg, Bremen, Mecklenburg Western-Pommerania, North Rhine-Westphalia, Saxony-Anhalt, and Thuringia) have had larger deficits than the average state. Excluding all sales of assets and shares (measure 2), the average Primary-surplus-to-GDP ratio is -0.4% (-0.1% in the West German states, -0.9% in East Germany, and -0.7% in the city states). Six states (Berlin, Brandenburg, Bremen, Mecklenburg-Western Pomerania, Saxony-Anhalt, and Thuringia) have had larger deficits than the average state. Excluding fiscal equalization transfers (measure 3), the average Primary-surplus-to-GDP ratio is -1.8% (-0.5% in the West German states, -5.1% in the East German states, and -2.4% in the city states) and eight states (Berlin, Brandenburg, Bremen, Mecklenburg-Western Pomerania, Saarland, Saxony, Saxony-Anhalt, and Thuringia) have had larger deficits than the average state (Table 4).

### **3.2 Correlation between public debt and the primary surplus**

To illustrate the association between the primary surplus and public debt in the German states, we present correlations between the three measures of the Primary-surplus-to-GDP ratio and the Debt-to-GDP ratio of the German state governments. Following the related empirical

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<sup>6</sup> See Barette et al. (2002) and Bundesministerium der Finanzen (2012).

studies on fiscal sustainability, we use the Debt-to-GDP ratio in period t-1 and t because policy makers may well adjust the primary surplus in period t to the public debt in period t-1. Figure 3 shows that public debt has had a weak positive influence on the standard measure of the primary surplus (primary surplus 1). The correlation coefficient between the Debt-to-GDP ratio in period t-1 and the Primary-surplus-to-GDP ratio is 0.26. The correlation coefficient between the Debt-to-GDP ratio in period t and the Primary-surplus-to-GDP ratio is 0.16. These correlations give rise to the conjecture that fiscal policy was sustainable because policy makers achieved a positive primary surplus when public debt was high. The positive influence of the Debt-to-GDP ratio on the primary surplus diminishes when the sales of assets and shares are excluded (primary surplus 2). The correlation coefficient between the debt-to-GDP ratio in period t-1 and the primary surplus is 0.16 and between the Debt-to-GDP ratio in period t and the Primary-surplus-to-GDP ratio in period t is 0.06 (Figure 4).

By contrast, when excluding the fiscal equalization transfers (primary surplus 3), the Debt-to-GDP ratio has had a negative influence on the Primary-surplus-to-GDP ratio: the correlation between the Debt-to-GDP ratio in period t-1 and the Primary-surplus-to-GDP ratio is -0.49, and between the Debt-to-GDP ratio in period t and the Primary-surplus-to-GDP ratio in period t is -0.55 (Figure 5). The correlations do, however, not take into account the development over time, individual state effects and other covariates, which we consider in the econometric panel data model.

## 4. Econometric analysis

### 4.1 Empirical specification

The baseline panel data model has the following form:

$$\text{'Primary Surplus'}_{ijt} = \alpha \text{'Public Debt'}_{it-1} + \sum \beta_l Z_{it} + \eta_i + \varepsilon_t + u_{it}$$

with  $i= 1, \dots, 16$ ;  $j=1, \dots, 3$

(1)

where the dependent variable ‘Primary Surplus’<sub>ijt</sub> denotes the primary-surplus-to-GDP ratio in state *i* in period *t*. We distinguish between three measures of the primary surplus denoted by *j*. ‘Public Debt’<sub>it-1</sub> describes the debt-to-GDP ratio in period *t-1*. The vector *Z*<sub>it</sub> includes two variables that control for business cycle fluctuations and temporary government spending (Barro 1979). In previous studies three approaches to measuring business cycle fluctuations and temporary government spending have been used. First, based on Barro’s tax smoothing model, the business cycle indicator YVAR, and the measure for temporary government spending GVAR have been used. Barro (1986) defines both variables as follows:

$$YVAR = (1 - y_t / y_t^T) * (g_t^T / y_t), \quad (2)$$

$$GVAR = (g_t - g_t^T) / y_t, \quad (3)$$

where *y*<sub>*t*</sub> and *g*<sub>*t*</sub> describe the actual values of real GDP and real expenditure, and *y*<sub>*t*</sub><sup>T</sup> and *g*<sub>*t*</sub><sup>T</sup> the trend values of *y*<sub>*t*</sub> and *g*<sub>*t*</sub>. YVAR measures the relative deviation of actual output to trend output weighted by (*g*<sub>*t*</sub><sup>T</sup>/*y*<sub>*t*</sub>). Positive values of YVAR indicate an actual output below the trend (output shortfall). GVAR measures the amount of temporary spending above trend spending. A positive value of GVAR indicates actual expenditures above the trend. Second, Bohn (2008) uses the difference between the actual value and trend value of log real GDP as a proxy for the output gap and the difference between actual and estimated permanent military outlays (relative to GDP) as a proxy for the expenditure gap. In contrast to Barro’s approach, a positive output gap in Bohn’s approach indicates an output above the trend (output surplus). Third, Fincke and Greiner (2011) compute the deviation of actual real GDP from its trend and the deviation of real public spending from its trend. We use the deviation of all government real expenditures excluding interest payments from their trend to compute the expenditure gap (Mendoza and Ostry 2008).<sup>7</sup> We calculate the trend values by using the Hodrick-Prescott

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<sup>7</sup> Bohn (2008) computes the permanent component of military outlays/GDP from an estimated AR(2) process because an Hodrick-Prescott filter would impute an implausible degree of foresight about the start, end, and

filter using a smoothing parameter of 100. When the “primary surplus 3” is used as dependent variable, we use expenditure gap variables that exclude fiscal equalization transfers. We expect the GVAR variable, the two measures of the expenditure gap, and the YVAR variable to have a negative influence, and the two measures of the output gap to have a positive influence on the primary surplus.<sup>8</sup>  $\eta_i$  describes a fixed state effect,  $\varepsilon_t$  describes a fixed period effect and  $u_{it}$  describes an error term. Table 5 shows descriptive statistics of all variables included.

Our baseline model includes all states. Other specifications include the West German states excluding Berlin. The city state Berlin plays a special role among the German states. Before 1990, West Berlin was part of the Federal Republic of Germany. In 1990, West and East Berlin were unified and the fiscal data for Berlin thus has a structural break.

We estimate the model by employing feasible generalized least squares (FGLS) with fixed state and fixed period effects. We apply heteroskedastic and autocorrelation consistent (HAC) Newey-West type standard errors and variance-covariance estimates (Newey and West 1987, Stock and Watson 2008) because the Wooldridge test for serial correlation in the idiosyncratic errors of a linear panel-data model implies the existence of strong arbitrary serial correlation (Wooldridge 2002, p. 176-177). For robustness checks, we replace the Debt-to-GDP ratio in period t-1 by the Debt-to-GDP ratio in period t and also include government ideology as another explanatory variable. We also estimate a dynamic panel data model including the lagged dependent variable.

## 4.2 Basic Results

Table 6 shows the regression results when the standard definition of the Primary-surplus-to-GDP ratio (measure 1) is used. The Debt-to-GDP ratio in period t-1 has a positive influence

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intensity of wars. We consider all government expenditures and not only military expenditures because the German state governments do not have military expenditures budgets.

<sup>8</sup>Sørensen et al. (2001) examine how output fluctuations influence U.S. state and local government fiscal policies.

on the primary surplus when all states are included. The coefficients are statistically significant at the 10% level and indicate that the primary-surplus-to-GDP ratio increases by about 0.07 percentage points when the Debt-to-GDP ratio in period t-1 increases by one percentage point (columns 1 to 3). This means that an increase in public debt in period t-1 by 100 Euro increases the primary surplus in period t by 7 Euro. In the West German states the coefficient estimate of the lagged Debt-to-GDP ratio in period t-1 is also about 0.07 (columns 4 to 6). Using the standard measure of the primary surplus gives rise to the conclusions that governments have pursued sustainable fiscal policies.

The coefficients of the temporary government spending variables have the expected negative sign. The GVAR (Barro) variable has a negative sign and is statistically significant at the 1% level in columns (1) and (4). The state expenditure gap (Bohn, Mendoza & Ostry) variable is statistically significant at the 1% level in columns (2) and (5). The state expenditure gap variable (Fincke & Greiner) is statistically significant at the 10% level in column (3) and statistically significant at the 5% level in column (6). The signs of the coefficients of the different measures of the business cycle differ across the panel specifications. We expect a negative influence of YVAR (output shortfall) on the primary surplus. The coefficient of the YVAR variable has, however, a positive sign and is statistically significant at the 5% level in column (4). It lacks statistical significance in column (1). We expected a positive influence of the output gap variables as measured by Bohn and Fincke and Greiner (output surplus) on the primary surplus, because the primary surplus should increase with higher government revenues. The coefficient of the output gap variable (Bohn) has a negative sign and is statistically significant at the 10% level in columns (2) and (5). The coefficient of the output gap variable (Fincke & Greiner) lacks statistical significance in columns (3) and (6). Our results correspond with Fincke and Greiner (2011) who find the output gap not to be significant for most German states in their univariate regressions.

Including the different measures for business cycle fluctuations and temporary government spending does not change the inferences regarding the Debt-to-GDP variable at all.

We replaced the Debt-to-GDP ratio in period  $t-1$  by the Debt-to-GDP ratio in period  $t$ . Table 6 shows the results of the coefficient estimates of the Debt-to-GDP variable in period  $t$ . It has the expected positive sign and is statistically significant in the sample with the West German states.<sup>9</sup>

Table 7 shows the results when the primary surplus is measured by the second alternative (excluding the sales of shares and assets from the states' revenues). The coefficient of the lagged Debt-to-GDP ratio has the expected positive sign across all specifications, but it lacks statistical significance in columns (1) to (3). The results suggest that governments did not pursue sustainable fiscal policies. In the sample with the West German states however the sign of the coefficient of the lagged debt-to-GDP ratio is significant at the 1% level.

Table 8 shows the results when the primary surplus is measured by the third alternative (excluding fiscal equalization transfers). The coefficient of the Debt-to-GDP ratio in period  $t-1$  has a negative sign and is statistically significant at the 10% level in columns (1) to (3) (all states) and lacks statistical significance in the sample for the West German states. The results contrast with the results when the primary surplus includes fiscal equalization transfers. We have replaced the Debt-to-GDP ratio in period  $t-1$  by the Debt-to-GDP ratio in period  $t$ : Inferences do not change.

These results show that fiscal equalization transfers need to be considered in fiscal sustainability tests. The results change a great deal when fiscal equalization transfers are included/excluded.

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<sup>9</sup> Because data on public debt is available since 1950 the number of observations does not differ when we include the debt-to-GDP ratio in period  $t$  and period  $t-1$ .

### 4.3 Robustness Checks

We checked the robustness of the results in several ways. Some political-economic studies investigated whether government ideology influenced fiscal policy in the German states (e.g., Oberndorfer and Steiner 2007, Berger and Holler 2007, Jochimsen and Nuscheler 2011, Potrafke 2011). The hypothesis to be tested is that leftwing governments pursue more expansionary policies than rightwing governments. We have therefore included government ideology as a control variable. The results show that government ideology does not turn out to be statistically significant and including government ideology does not change the inferences regarding the Debt-to-GDP ratio.

We have estimated a dynamic panel data model including the lagged dependent variable because governments change public revenues and expenditures gradually (e.g., Blanchard 1984). The results excluding the lagged dependent variable may suffer from omitted variable bias. We apply Bruno's (2005a, 2005b) bias corrected least squares dummy variable estimator for dynamic panel data models with small  $N$ .<sup>10</sup> The results show that the lagged dependent variable is statistically significant at the 1% level in every specification. When the lagged dependent variable is included, the Debt-to-GDP ratio in period  $t-1$  has a stronger influence on the primary surplus. When we use the standard measure of the primary surplus, for example, the Debt-to-GDP ratio in period  $t-1$  is also statistically significant at the 1% level in every specification. By contrast, when we use the measure of the primary surplus excluding fiscal equalization transfers, the Debt-to-GDP ratio in period  $t-1$  does not turn out to be statistically significant in the sample including all states and in the sample for the West German states.

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<sup>10</sup> We choose the Blundell and Bond (1998) estimator as the initial estimator in which the instruments are collapsed as suggested by Roodman (2006). This procedure makes sure to avoid using invalid and too many instruments (see Roodman 2006 and 2009 for further details). Following Bloom et al. (2007) we undertake 50 repetitions of the procedure to bootstrap the estimated standard errors. Bootstrapping the standard errors is common practice applying this estimator. The reason is that Monte Carlo simulations demonstrated that the analytical variance estimator performs poorly for large coefficients of the lagged dependent variable (see Bruno 2005b for further details). The results do not qualitatively change with more repetitions such as 100, 200 or 500 or when the Arellano-Bond (1991) estimator is chosen as initial estimator.



Jackknife tests show that the results are sensitive to the inclusion/exclusion of Berlin. When we exclude Berlin from the sample including all German states, the coefficient of the lagged debt-to-GDP ratio in the regression for standard primary surplus (primary surplus 1) is as twice as large as shown in Table 6. When we exclude Berlin and use the “primary surplus 3” (excluding sales of shares and assets and fiscal transfers) the coefficient of the lagged debt-to-GDP ratio does not turn out to be statistically significant. These findings correspond with the results by Fincke and Greiner (2011), Kitterer (2007), Kitterer and Finken (2006), Herzog (2010) and Claeys et al. (2008). The governments in Berlin did not pursue sustainable fiscal policies. By contrast, Saxony is the only East German state that pursued sound fiscal policies. Including/excluding other states does not change the inferences.

In our baseline model we have measured “primary surplus 3” by excluding fiscal equalization transfers from “primary surplus 2”. The results in Table 9 show that inferences do not change when we exclude fiscal equalization transfers from “primary surplus 1”.

## **5. Conclusion**

We test whether the fiscal behavior of the German states is sustainable and show that the result of standard fiscal sustainability tests crucially depends on whether fiscal equalization transfers are taken into account. In particular, we examine whether the Debt-to-GDP-ratio has had a positive influence on the primary surplus (*Bohn-model*) and distinguish between different measures of the primary surplus. If fiscal equalization transfers are not included in the primary surplus, the test results indicate that the German state governments did not pursue sustainable fiscal policies. Our results indicate that federal states and international organizations such as the European Union, the International Monetary Fund, and the World Bank need to consider fiscal transfer payments in their studies examining whether governments pursue sustainable fiscal policies.

Our findings are compatible with findings of empirical studies employing vector error-correction models to investigate how fiscal equalization transfers influence fiscal performance. Buettner and Wildasin (2006) and Buettner (2009) use data for German and US municipalities and show that fiscal equalization transfers give rise to fiscal adjustment. In Germany the numerical effect is substantial. Fiscal equalization transfers increase by about 34 cents in present value terms when own revenues permanently decrease by about 1 Euro (Buettner 2009).

From our analysis we derive two main policy implications which would also apply to the design of a European fiscal union: fiscal transfers need to be incentive compatible and fiscal equalization schemes need to be politically sustainable. It appears that transfers sugarcoat the budgets of governments that do not attempt to keep their budgets balanced. Fiscal equalization transfers therefore provide perverse incentives. Buettner (2006) arrives at similar results for transfers on the municipality level. The German fiscal equalization scheme in particular reduces the incentives of the states to increase their own tax revenues. (To be sure, German state governments have hardly any means to change tax rates. German state governments influence tax revenues implicitly by, for example, boosting economic performance or increasing tax enforcement activities). When the tax revenue increases in a state that receives fiscal transfers, the transfers received decrease. By contrast, when the tax revenue increases in a state that pays fiscal transfers, the transfers paid increase. Baretta et al. (2001) portray three examples on how the German fiscal equalization scheme reduces the incentives of the states to increase their own tax revenues. First, empirical evidence shows that the fiscal equalization scheme reduces the states' tax enforcement efficiency (see also Baretta et al. 2002). Second, the fiscal transfers constrain government activities to enhance economic growth (e.g. infrastructure investments). The state has to bear the cost of the investment but the additional tax revenues resulting from higher economic growth are absorbed by the equalization scheme. Third, fiscal equalization schemes distort the states'

incentives to attract companies to increase tax revenues. An important issue for future research is to design incentive compatible fiscal equalization schemes.

When fiscal policies of federal states are shown to be only sustainable when fiscal equalization transfers are assumed to be also forthcoming in the future, the question arises to which extent governments paying fiscal equalization transfers are willing to proceed paying. This question is discussed not only in Germany, but also in federal countries such as Italy and Spain. The issue then is not whether fiscal policy is sustainable but whether fiscal equalization schemes are politically sustainable.

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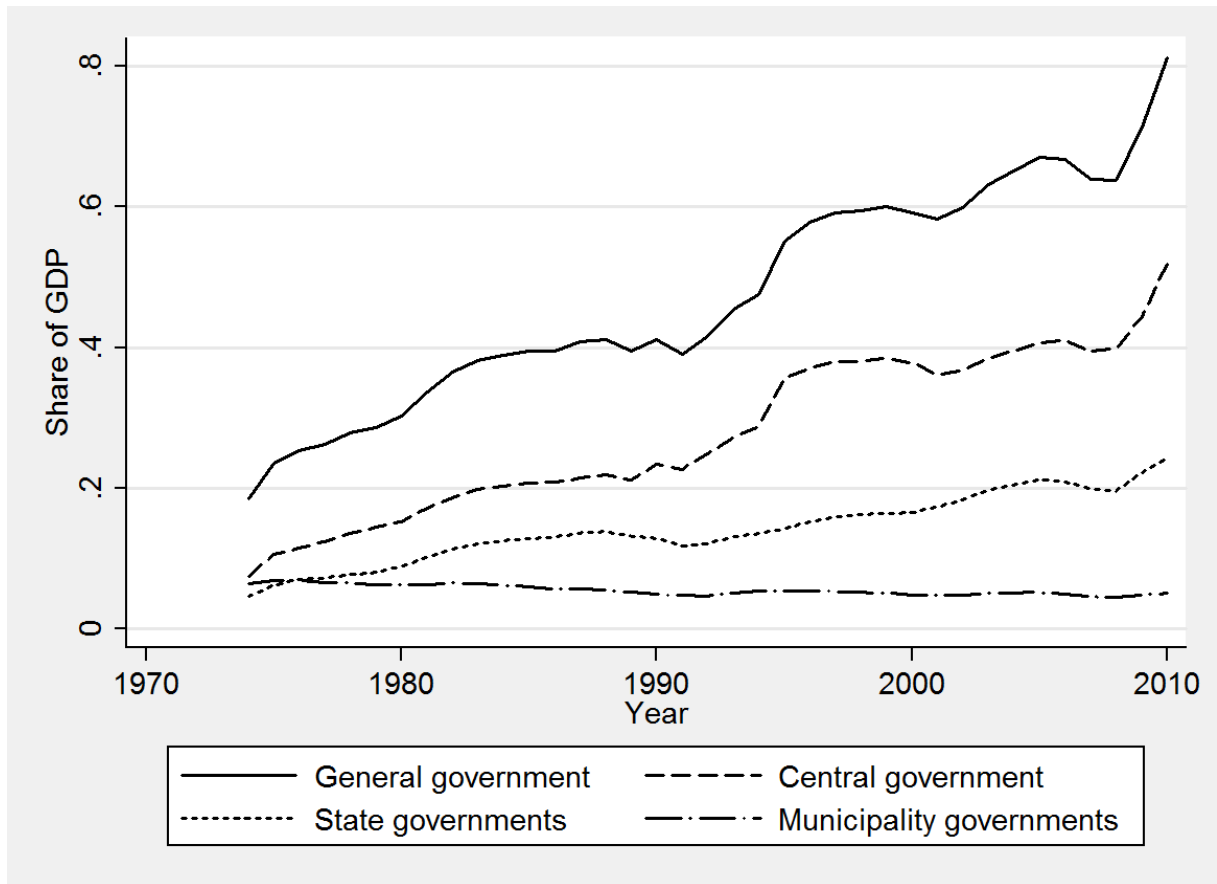
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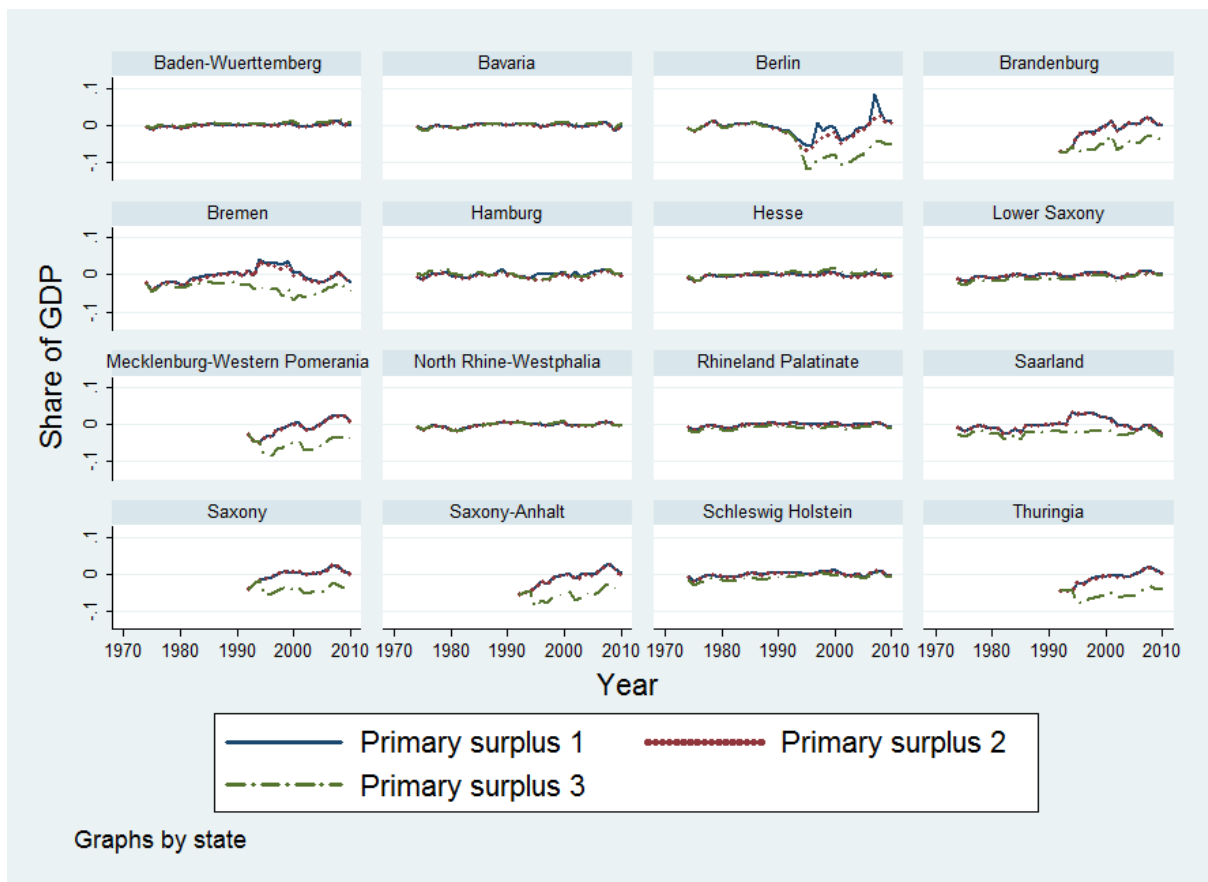
Figure 1: Debt-to-GDP ratios by government level in Germany 1974-2010



Source: German Federal Statistical Office (Fachserie 14 Reihe 5)

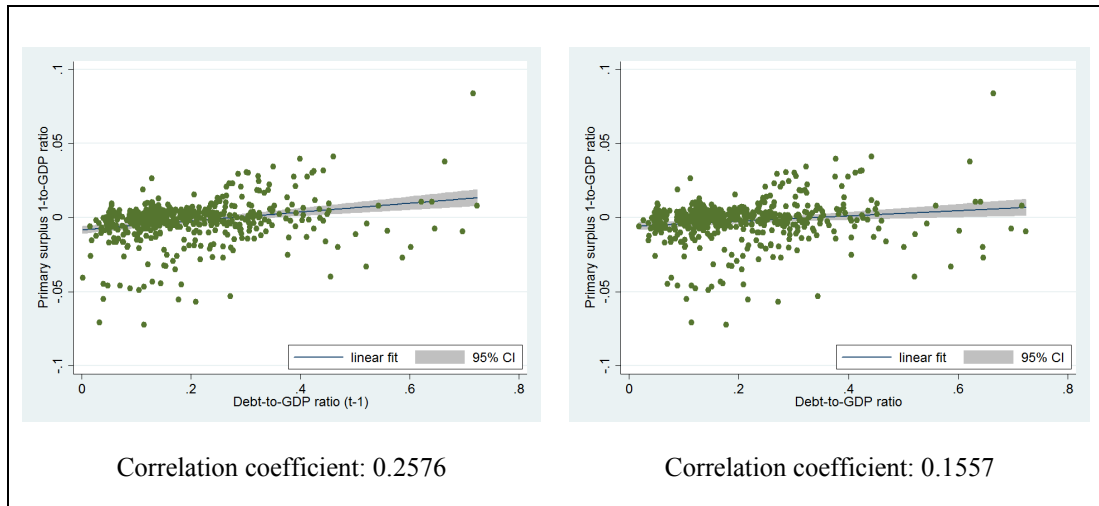


**Figure 2: State government primary surplus 1, 2 and 3 as a share of GDP by state 1974-2010**



Source: German Federal Statistical Office (Fachserie 14 Reihe 3.1, Fachserie 14 Reihe 2)

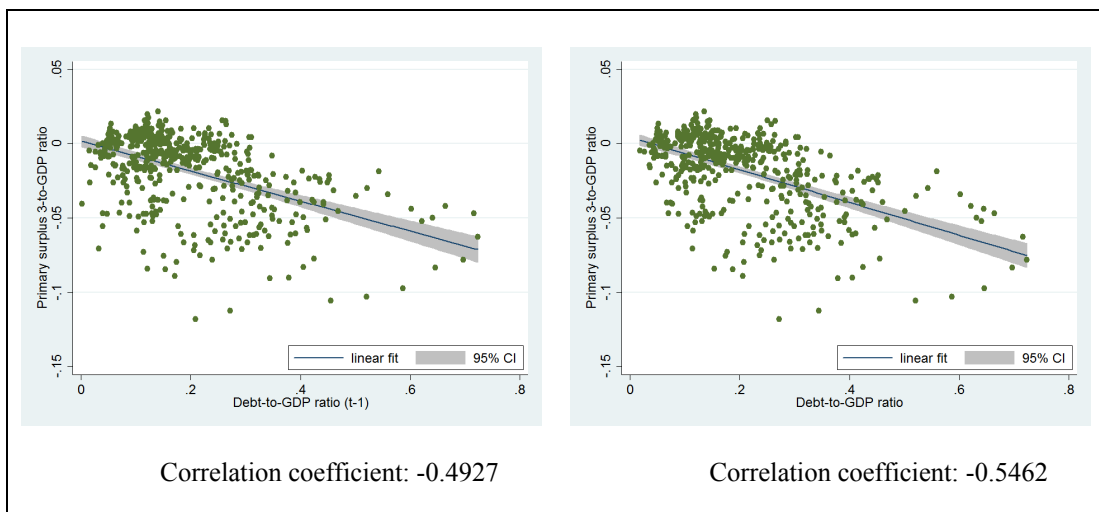
**Figure 3: Correlation between Primary surplus 1-to-GDP and Debt-to-GDP**



**Figure 4: Correlation between Primary surplus 2-to-GDP and Debt-to-GDP**  
**Excluding earnings based on the sale of assets and shares**



**Figure 5: Correlation between Primary surplus 3-to-GDP and Debt-to-GDP**  
**Excluding earnings based on the sale of assets and shares and fiscal equalization transfers**



**Table 1: Descriptive statistics for the debt-to-GDP ratios by state**  
 West German states: 1974-2010; East German states: 1991-2010

State	N	Mean	Std. Dev.	Min	Max
All states	507	0.202	0.127	0.003	0.724
West states	296	0.154	0.080	0.019	0.405
East states	100	<b>0.231</b>	0.107	0.003	0.405
City states	111	<b>0.306</b>	0.169	0.108	0.724
Baden-Wuerttemberg	37	0.094	0.026	0.035	0.165
Bavaria	37	0.055	0.010	0.027	0.069
Berlin	37	<b>0.312</b>	0.227	0.108	0.724
Brandenburg	20	<b>0.276</b>	0.085	0.033	0.354
Bremen	37	<b>0.401</b>	0.115	0.130	0.645
Hamburg	37	<b>0.204</b>	0.048	0.118	0.285
Hesse	37	0.117	0.022	0.063	0.164
Lower-Saxony	37	0.172	0.053	0.060	0.254
Mecklenburg-Western Pomerania	20	<b>0.228</b>	0.095	0.017	0.334
North Rhine-Westphalia	37	0.148	0.064	0.019	0.322
Rhineland Palatinate	37	0.174	0.059	0.067	0.284
Saarland	37	<b>0.254</b>	0.081	0.084	0.405
Saxony	20	0.110	0.034	0.003	0.141
Saxony-Anhalt	20	<b>0.291</b>	0.108	0.040	0.405
Schleswig Holstein	37	<b>0.217</b>	0.067	0.084	0.364
Thuringia	20	<b>0.250</b>	0.094	0.040	0.350

Values in bold are above the overall mean  
 Source: German Federal Statistical Office (Fachserie 14 Reihe 5)

**Table 2: Development of the debt-to-GDP ratios by state**  
 West German states: 1974-2010; East German states : 1991-2010

State	1974	1991	2010
All states	0.072	0.129	0.313
West states	0.055	<b>0.151</b>	0.252
East states	-	0.026	0.286
City states	<b>0.119</b>	<b>0.243</b>	<b>0.521</b>
Baden-Wuerttemberg	0.035	0.088	0.161
Bavaria	0.027	0.057	0.066
Berlin	<b>0.108</b>	0.128	<b>0.632</b>
Brandenburg	-	0.033	<b>0.354</b>
Bremen	<b>0.130</b>	<b>0.427</b>	<b>0.645</b>
Hamburg	<b>0.118</b>	<b>0.175</b>	0.284
Hesse	0.063	0.104	0.164
Lower-Saxony	0.060	<b>0.152</b>	0.254
Mecklenburg-Western Pomerania	-	0.017	0.287
North Rhine-Westphalia	0.019	<b>0.142</b>	<b>0.322</b>
Rhineland Palatinate	0.067	<b>0.157</b>	0.284
Saarland	<b>0.084</b>	0.310	<b>0.405</b>
Saxony	-	0.003	0.067
Saxony-Anhalt	-	0.040	<b>0.394</b>
Schleswig Holstein	<b>0.084</b>	<b>0.199</b>	<b>0.364</b>
Thuringia	-	0.040	<b>0.330</b>

Values in bold are above the overall mean  
 Source: German Federal Statistical Office (Fachserie 14 Reihe 5)

**Table 3: Horizontal and vertical transfers by the fiscal equalization scheme 1974-2010,  
nominal values (million Euro)**

West German states: 1974-2010; East German states: 1991-2010

State	horizontal transfers paid	horizontal transfers received	vertical transfers received	net transfers received
All states	142 744	142 746	245 513	245 515
West states	134 343	39 606	47 833	- 46 904
East states	0	50 870	146 693	197 563
City states	8 401	52 270	50 989	94 858
Baden-Wuerttemberg	44 867	0	0	- 44 867
Bavaria	34 674	1 643	1 808	- 31 223
Berlin	0	42 334	38 119	80 453
Brandenburg	0	8 712	26 357	35 069
Bremen	0	9 847	12 870	22 717
Hamburg	8 401	89	0	- 8 312
Hesse	41 726	0	0	- 41 726
Lower-Saxony	0	17 726	16 828	34 554
Mecklenburg-Western Pomerania	0	7 153	19 726	26 879
North Rhine-Westphalia	13 001	650	266	-12 085
Rhineland Palatinate	0	8 425	11 005	19 430
Saarland	0	5 206	11 548	16 754
Saxony	0	16 345	45 826	62 171
Saxony-Anhalt	0	9 502	28 533	38 035
Schleswig Holstein	75	5 956	6 377	12 258
Thuringia	0	9 158	26 250	35 408

Source: German Ministry of Finance

**Table 4: Descriptive statistics for the primary surplus 1, 2 and 3-to-GDP ratios**  
 West German states: 1974-2010; East German states: 1992-2010

State	N	PS1-to-GDP	PS2-to-GDP Excluding earnings based on the sale of assets and shares	PS3-to-GDP Excluding fiscal equalization transfers
		Mean [Min; Max]	Mean [Min; Max]	Mean [Min; Max]
All states	502	-0.002 [-0.072; 0.084]	-0.004 [-0.073; 0.037]	-0.018 [-0.118; 0.022]
West states	407	-0.001 [-0.025; 0.034]	-0.001 [-0.026; 0.034]	-0.005 [-0.039; 0.020]
East states	95	<b>-0.008</b> [-0.072; 0.028]	<b>-0.009</b> [-0.073; 0.026]	<b>-0.051</b> [-0.089; -0.015]
City states	111	<b>-0.002</b> [-0.057; 0.084]	<b>-0.007</b> [-0.067; 0.037]	<b>-0.024</b> [-0.118; 0.022]
Baden-Wuerttemberg	37	0.000 [-0.011; 0.010]	-0.001 [-0.011; 0.009]	0.005 [-0.007; 0.016]
Bavaria	37	0.000 [-0.017; 0.009]	-0.001 [-0.017; 0.008]	0.001 [-0.016; 0.013]
Berlin	37	<b>-0.005</b> [-0.057; 0.084]	<b>-0.013</b> [-0.067; 0.026]	<b>-0.039</b> [-0.118; 0.010]
Brandenburg	20	<b>-0.012</b> [-0.072; 0.022]	<b>-0.013</b> [-0.067; 0.026]	<b>-0.052</b> [-0.075; -0.027]
Bremen	37	<b>-0.002</b> [-0.043; 0.041]	<b>-0.005</b> [-0.044; 0.037]	<b>-0.035</b> [-0.067; -0.018]
Hamburg	37	0.001 [-0.012; 0.015]	-0.002 [-0.013; 0.011]	0.002 [-0.012; 0.022]
Hesse	37	-0.001 [-0.017; 0.005]	-0.002 [-0.017; 0.005]	0.005 [-0.015; 0.020]
Lower-Saxony	37	-0.001 [-0.016; 0.011]	-0.002 [-0.017; 0.008]	-0.009 [-0.026; 0.007]
Mecklenburg-West. Pom.	20	<b>-0.007</b> [-0.048; 0.024]	<b>-0.008</b> [-0.049; 0.024]	<b>-0.053</b> [-0.085; -0.026]
North Rhine-Westphalia	37	<b>-0.002</b> [-0.017; 0.009]	-0.002 [-0.017; 0.008]	-0.001 [-0.017; 0.008]
Rhineland Palatinate	37	-0.001 [-0.014; 0.007]	-0.001 [-0.015; 0.007]	-0.009 [-0.023; 0.002]
Saarland	37	-0.001 [-0.025; 0.034]	-0.001 [-0.026; 0.034]	<b>-0.023</b> [-0.029; -0.007]
Saxony	20	-0.001 [-0.041; 0.026]	-0.001 [-0.041; 0.026]	<b>-0.040</b> [-0.059; -0.015]
Saxony-Anhalt	20	<b>-0.010</b> [-0.055; 0.028]	<b>-0.012</b> [-0.055; 0.025]	<b>-0.055</b> [-0.089; -0.026]
Schleswig Holstein	37	-0.001 [-0.020; 0.009]	-0.002 [-0.020; 0.009]	-0.010 [-0.029; 0.004]
Thuringia	20	<b>-0.011</b> [-0.047; 0.019]	<b>-0.011</b> [-0.047; 0.018]	<b>-0.055</b> [-0.080; -0.034]

Values in bold are below the mean

Source: German Statistical Office (Fachserie 14 Reihe 3.1, Fachserie 14 Reihe 2)

**Table 5: Descriptive Statistics (all variables on the state government level, excluding municipalities)**

	Period	N	Mean	Std. Dev.	Min	Max
State gov. Debt-to-GDP ratio	1973-2010	518	0.199	0.127	0.003	0.724
State primary surplus 1-to-GDP ratio	1974-2010	502	-0.002	0.014	-0.072	0.084
State primary surplus 2-to-GDP ratio	1974-2010	502	-0.004	0.014	-0.073	0.037
State primary surplus 3-to-GDP ratio	1974-2010	502	-0.018	0.025	-0.118	0.022
State primary surplus 4-to-GDP ratio	1974-2010	502	-0.016	0.025	-0.108	0.022
State YVAR (Barro)	1974-2010	502	-0.000	0.005	-0.019	0.025
State GVAR (Barro)	1974-2010	502	-0.000	0.007	-0.037	0.031
State GVAR (Barro) excl. fiscal transfers	1974-2010	502	-0.000	0.007	-0.037	0.031
Output gap (Bohn)	1974-2010	502	0.001	0.024	-0.067	0.086
State expenditure gap (Bohn, M&O)	1974-2010	502	-0.000	0.007	-0.037	0.031
State expenditure gap (Bohn, M&O) excl. fiscal transfers	1974-2010	502	-0.000	0.007	-0.037	0.031
Output gap (F&G)	1974-2010	502	11.711	3 570.437	-16 619.530	17 613.190
State expenditure gap (F&G)	1974-2010	502	-0.000	672.282	-2 907.230	5 250.684
State expenditure gap (F&G) excl. fiscal transfers	1974-2010	502	-0.000	651.153	-2 826.438	5 015.512
Government ideology	1974-2010	502	0.504	0.464	0	1

Output gap (F&G) and state expenditure gap (F&G) in million Euro

Table 6: Regression results for the Fiscal Reaction Function

**Dependent variable: State primary surplus 1 as a share of GDP**

(Standard measure)

West states: 1974-2010; East states: 1992-2010

	All states			West states		
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged state gov. Debt-to-GDP ratio	0.0718* (0.0364)	0.0707* (0.0360)	0.0714* (0.0360)	0.0705*** (0.0120)	0.0704*** (0.0115)	0.0736*** (0.0130)
State YVAR (Barro)	0.107 (0.197)			0.529** (0.193)		
State GVAR (Barro)	-0.340*** (0.0496)			-0.403*** (0.110)		
Output gap (Bohn)		-0.0712* (0.0381)			-0.0724* (0.0363)	
State expenditure gap (Bohn, M&O)		-0.311*** (0.0493)			-0.409*** (0.109)	
Output gap (F&G)			-1.19e-07 (1.14e-07)			1.37e-08 (6.92e-08)
State expenditure gap (F&G)			-2.11e-06* (1.08e-06)			-1.97e-06** (7.64e-07)
Fixed period effects	Yes	Yes	Yes	Yes	Yes	Yes
Fixed state effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (overall)	0.197	0.207	0.187	0.290	0.290	0.258
Observations	502	502	502	370	370	370
Number of states	16	16	16	10	10	10
State gov. Debt-to-GDP ratio	0.0404 (0.0292)	0.0392 (0.0288)	0.0402 (0.0290)	0.0379*** (0.00591)	0.0379*** (0.00572)	0.0429*** (0.00783)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (overall)	0.208	0.222	0.198	0.387	0.387	0.339
Observations	502	502	502	370	370	370
Number of states	16	16	16	10	10	10

FGLS with heteroskedastic and autocorrelation consistent (HAC) New ey-West type standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1



Table 7: Regression results for the Fiscal Reaction Function

**Dependent variable: State primary surplus 2 as a share of GDP**

(excluding earnings based on the sale of shares and assets)

West states: 1974-2010; East states: 1992-2010

	All states			West states		
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged state gov. Debt-to-GDP ratio	0.0587 (0.0423)	0.0577 (0.0420)	0.0583 (0.0419)	0.0723*** (0.0133)	0.0720*** (0.0129)	0.0751*** (0.0144)
State YVAR (Barro)	0.0834 (0.205)			0.473** (0.181)		
State GVAR (Barro)	-0.323*** (0.0574)			-0.395*** (0.118)		
Output gap (Bohn)		-0.0644 (0.0391)			-0.0711* (0.0350)	
State expenditure gap (Bohn, M&O)		-0.295*** (0.0579)			-0.401*** (0.118)	
Output gap (F&G)			-9.52e-08 (1.05e-07)			-1.21e-08 (7.51e-08)
State expenditure gap (F&G)			-2.00e-06* (9.82e-07)			-1.99e-06** (7.42e-07)
Fixed period effects	Yes	Yes	Yes	Yes	Yes	Yes
Fixed state effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (overall)	0.143	0.152	0.136	0.213	0.215	0.187
Observations	502	502	502	370	370	370
Number of states	16	16	16	10	10	10
State gov. Debt-to-GDP ratio	0.0279 (0.0347)	0.0268 (0.0344)	0.0277 (0.0345)	0.0412*** (0.00821)	0.0409*** (0.00810)	0.0458*** (0.0101)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (overall)	0.177	0.190	0.168	0.305	0.308	0.261
Observations	502	502	502	370	370	370
Number of states	16	16	16	10	10	10

FGLS with heteroskedastic and autocorrelation consistent (HAC) New ey-West type standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Table 8: Regression results for the Fiscal Reaction Function

**Dependent variable: State primary surplus 3 as a share of GDP**

(excluding earnings based on the sale of shares and assets and adjusted for fiscal equalization transfers)

West states: 1974-2010; East states: 1992-2010

	All states			West states		
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged state gov. Debt-to-GDP ratio	-0.0870* (0.0438)	-0.0879* (0.0436)	-0.0875* (0.0433)	-0.0141 (0.0144)	-0.0145 (0.0142)	-0.0138 (0.0133)
State YVAR (Barro)	0.185 (0.178)			-0.176 (0.114)		
State GVAR (Barro)	-0.471*** (0.0997)			-0.438*** (0.117)		
Output gap (Bohn)		-0.0646* (0.0334)			0.0124 (0.0271)	
State expenditure gap (Bohn, M&O)		-0.462*** (0.0924)			-0.436*** (0.116)	
Output gap (F&G)			-3.12e-07* (1.47e-07)			-4.42e-08 (8.25e-08)
State expenditure gap (F&G)			-2.92e-06** (1.05e-06)			-1.86e-06** (6.31e-07)
Fixed period effects	Yes	Yes	Yes	Yes	Yes	Yes
Fixed state effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (overall)	0.346	0.353	0.340	0.272	0.276	0.261
Observations	502	502	502	370	370	370
Number of states	16	16	16	10	10	10
State gov. Debt-to-GDP ratio	-0.109** (0.0427)	-0.110** (0.0425)	-0.110** (0.0422)	-0.0179 (0.0104)	-0.0184 (0.0102)	-0.0167 (0.0100)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (overall)	0.393	0.399	0.386	0.324	0.329	0.302
Observations	502	502	502	370	370	370
Number of states	16	16	16	10	10	10

FGLS with heteroskedastic and autocorrelation consistent (HAC) Newey-West type standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Table 9: Regression results for the Fiscal Reaction Function  
**Dependent variable: State primary surplus 4 as a share of GDP**  
 (adjusted for fiscal equalization transfers)  
 West states: 1974-2010; East states: 1992-2010

	All states			West states		
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged state gov. Debt-to-GDP ratio	-0.0739* (0.0377)	-0.0750* (0.0374)	-0.0745* (0.0372)	-0.0160 (0.0155)	-0.0161 (0.0153)	-0.0153 (0.0141)
State YVAR (Barro)	0.209 (0.154)			-0.120 (0.0957)		
State GVAR (Barro)	-0.486*** (0.0888)			-0.442*** (0.110)		
Output gap (Bohn)		-0.0715** (0.0302)			0.0109 (0.0215)	
State expenditure gap (Bohn, M&O)		-0.477*** (0.0847)			-0.440*** (0.110)	
Output gap (F&G)			-3.35e-07* (1.63e-07)			-1.81e-08 (8.39e-08)
State expenditure gap (F&G)			-3.01e-06** (1.18e-06)			-1.80e-06** (6.64e-07)
Fixed period effects	Yes	Yes	Yes	Yes	Yes	Yes
Fixed state effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (overall)	0.288	0.296	0.280	0.297	0.299	0.282
Observations	502	502	502	370	370	370
Number of states	16	16	16	10	10	10
<hr/>						
State gov. Debt-to-GDP ratio	-0.0968** (0.0368)	-0.0978** (0.0365)	-0.0971** (0.0362)	-0.0212 (0.0117)	-0.0214* (0.0115)	-0.0196 (0.0107)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (overall)	0.337	0.345	0.328	0.361	0.364	0.337
Observations	502	502	502	370	370	370
Number of states	16	16	16	10	10	10

FGLS with heteroskedastic and autocorrelation consistent (HAC) New ey-West type standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

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