

# Sub-national budgetary discipline during times of crisis: The impact of fiscal rules and tax autonomy

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## 1. Introduction

Since the beginning of the financial crisis in 2008, not only public finances have come under increasing pressures resulting in large increases of general government budget deficits and debts. Since all countries have more than one level of government, the question arises naturally, how the burden of adjustment to the financial crisis and the subsequent Great Recession was shared among national and sub-national governments, and whether any differences in fiscal performance of sub-national government sectors across Europe can be explained by the countries' political and institutional characteristics. More specifically, we are interested in how fiscal adjustments were distributed between the different levels of government and whether the existence and the stringency of fiscal rules and the autonomy which sub-national governments enjoy in setting their tax rates can explain the observed differences. Furthermore, we explore the extent to which central governments have tried and achieved to protect sub-national governments against the fiscal impact of the Great Recession.

Fiscal performance at the sub-national level can be affected by a deficit bias due to a common pool externality (von Hagen, 2005). Budgetary inflows in almost all countries come to a certain extent from a common source in the form of transfers or grants from the central government, while budgetary outflows are targeted to specific regions or municipalities. In many cases a substantial share of revenues is generated with instruments that sub-national entities have no direct discretion over. von Hagen and Eichengreen (1996) argue that the size of the sub-national tax base is responsible for bailout expectations and connected through this channel to the deficit bias. In a dynamic context, the budget constraints of governments which are highly dependent on revenues not generated by their own instruments might become soft. The respective decision makers at the sub-national level might expect ex-ante that, if they cause a large and unsustainable deficit, the resulting outstanding debt would have to be bailed out ex-post by a higher-level government. The latter cannot credibly commit itself to a no-bailout policy, if the respective lower level government has no power to solve fiscal problems on its own. If, instead, the sub-national government has access to substantial revenues from own taxes, this might work as an implicit way of the central government to communicate that sub-national entities have to act on their own behalf. In this case, they can be asked to implement adjustments by increasing tax rates under their control.

A recent attempt to mitigate this time inconsistency problem was to improve features of domestic fiscal governance by imposing fiscal rules on sub-national governments. The number of fiscal frameworks which impose balanced budget or debt rules on

lower government sectors has increased over the last two decades.<sup>1</sup> For example, von Hagen et al (2000) documented the emergence of “internal stability pacts” in several EU countries during the 1990s that aim at improving sub-national fiscal discipline. The European Commission (2009, 2010) has documented the development of fiscal rules in EU states in great detail. Nevertheless, recent work on fiscal rules at the level of general government has shown that the institutional and political background of a country is an important determinant of the effectiveness of balanced budget frameworks and borrowing regulations (see Hallerberg et al. (2009) for an extensive overview). Foremny (2012) provides evidence that the effectiveness of fiscal rules at the subnational level depends on the constitutional framework.

The consequences of sub-national fiscal rules for the behavior of sub-national governments over the business cycle have been studied extensively for state governments in the US. Poterba (1994) showed that more stringent borrowing restraints induced state governments to respond more quickly to fiscal shocks and eliminate unexpected deficits faster. Bayoumi and Eichengreen (1995) find that US state budgets play a major role in the macroeconomic stabilization of the US economy and that fiscal restraints at the state level increase macroeconomic volatility. Fatas and Mihov (2006) argued that strict policy rules at the level of the states prevent states from stabilizing macroeconomic shocks and increase macroeconomic volatility. At the same time, however, they also constrain fiscal policy discretion at the state level, and this reduces macroeconomic volatility. In contrast, Canova and Pappa (2006), in a very comprehensive and careful study of the issue, conclude that fiscal rules have no significant effects on the ability of state governments to stabilize adverse macroeconomic shocks.

The present study investigates the effects of two institutional mechanisms, sub-national tax autonomy and fiscal rules constraining sub-national fiscal policies on the performance of sub-national governments in euro-area countries with a particular focus on the Great Recession, i.e., the period following the financial crisis of 2008. The central questions we ask can be summarized as follows: First, how has the burden of fiscal adjustment to the crisis been shared between central and local governments in unitary states compared to federal states and did this change during the Great Recession? Second, do fiscal rules and autonomy over revenues from taxation contribute to budgetary discipline particularly in times of fiscal stress? Third, does the effectiveness of those two mechanisms during the crisis depend on the constitutional structure of the respective countries?

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<sup>1</sup> Fiscal rules to improve sub-national fiscal discipline have a long tradition in the US, where state legislation has imposed limits of deficits and debts since the 1840s. For an empirical analysis of the effectiveness of such rules see von Hagen (1991) and Bohn and Inman (1994)

We will derive our results from a new panel-data set covering information for all EU15 countries over the period 1995-2010, including the recent years after the outbreak of the Great Recession in 2008. In section 2 of the paper we offer some stylized facts describing the fiscal adjustment of sub-national governments in Europe to the Great Recession. In particular, we ask whether central governments provide more insurance for local governments in unitary states, or whether central governments used their greater power in unitary states to push a larger share of the burden of adjustment onto local governments. In section 3, we analyze the cyclical performance of sub-national budget. In section 4, we use two indicators to measure the strictness of fiscal rules and tax autonomy at the sub-national level. We investigate the impact of the two mechanisms on local and regional budget balances using panel-data econometrics. We do this both for the ratio of budget balances over sub-national revenues and their elasticity with regard to the output gap. Section 5 concludes.

## **2. Stylized facts<sup>1</sup>**

Our sample consists of 15 EU member states for which consistent data is available, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the UK. Of these, Austria, Belgium, Germany, and Spain are federal countries, the others are unitary. In our empirical work, we distinguish between two levels of government, central government and sub-national government; the latter includes local and regional government in the case of federal countries and local government in the case of unitary countries. Denmark, Sweden, and the UK do not belong to the euro zone, the others do. The sample covers the years from 1995 to 2010, as more recent public finance data does not yet exist for all countries.

To set the stage for the subsequent discussion, Figure 1 shows the output gaps in our sample countries for the period from 1995 to 2010. The beginning of the “Great Recession” is clearly visible in all countries as the negative output gap widens considerably in 2008 in all of them.

Figure 2 shows the development of general government revenues, expenditures and budget balances over the same period, all in percent of GDP. Here, too, a break point is clearly recognizable in 2008. With the onset of the Great Recession, general government budget balances fall strongly. The figure shows that most of the fiscal action countering the onset of the Great Recession occurred on the spending side of the budgets. Revenues generally fell, but much by less than the increase in expenditures. The Great Recession thus imposed major stress on general government fi-

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<sup>1</sup> This section is partly based on von Hagen and Foremny (2012).

nances. In what follows, we analyze how this stress was shared between the different levels of government.

Before we turn to that question, we characterize sub-national governments in the sample countries in terms of the structure of revenues and expenditures. Table 1a shows the shares of the main budget categories for sub-national governments before the Great Recession. We exclude the years after 2007 in order to avoid a possible bias due to the reaction of sub-national governments to the recession. On the revenue side, “own taxes” have to be distinguished from “shared taxes.” The former are taxes for which the sub-national jurisdictions have the power to change the tax rate autonomously. The latter are which are collected with a tax rate common to all jurisdictions and shared between the sub-national jurisdiction and the central government. Three observations are noteworthy: First, sub-national governments in unitary states have a much larger share of own taxes and a much smaller share of shared taxes than sub-national governments in federal states.<sup>1</sup> Second, sub-national governments in unitary states obtain a larger share of their revenues from the collection of fees than sub-national governments in federal states. Third, sub-national governments in unitary states receive relatively more transfers from central governments than sub-national governments in federal states.

On the expenditure side, Table 1a shows that sub-national governments in federal states have larger shares of spending on public services and education than sub-national governments in unitary states. Conversely, the latter spend relatively more on housing and health. With regard to the other main spending categories, there are only minor differences in the shares between unitary and federal states.

Figure 3a shows the development of central government and sub-national budget balances over the entire period for the federations in the sample. Budget balances are expressed as shares of total revenues to account for the different size of the public sector in different countries and the fact that GDP data do not exist at the sub-national level. Figure 3b does the same for the unitary states. The vertical red lines mark the beginning of the Great Recession in 2008. Clearly, central government balances turned negative with the onset of the recession everywhere. The evidence for sub-national balances is more mixed. In all federations, sub-national balances turn negative, too, indicating that the sub-national governments contributed to the fiscal adjustment to the negative macroeconomic shock. In unitary states, in contrast, the

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<sup>1</sup> This observation is surprising as one would expect that sub-national governments in federations have more command over their revenues than sub-national governments in unitary states. We suggest that this observation comes from the specific definition of own taxes and the existence of arrangements to prevent harmful tax competition among sub-national governments in European federations.

picture is more mixed. In about half of the countries, the onset of the Great Recession does not seem to have a significant impact on the budget balances of the sub-national governments, in the other half, balances turn negative as in the federal countries.

Figure 4 shows the average annual growth rates of real sub-national government revenues and expenditures over the sample period. Averages are weighted with countries' GDPs, and real data are computed using the GDP deflator. The upper panel of Figure 4 shows the growth rates for unitary states. It indicates, first, that the growth rates of real revenues and real expenditures track each other very closely and cross frequently, indicating that any change in the deficit is quickly reverted. Second, the graph shows that, in the two major recessions that occurred during the sample period, the recession of 2001 and the Great Recession, the growth rates of real spending and real revenues fell together.

The lower panel of Figure 4 illustrates that sub-national governments in federal states on average behave quite differently. Expenditure and revenue growth track each other much less closely. In particular, real spending growth is much more stable in recessions than real revenue growth. Comparing the upper and the lower panel indicates that the differences in growth rates during recessions are much more pronounced in federal states and that real spending growth is much more stable in federal states. This is confirmed by the observation that the standard deviation of real expenditure growth rates over the entire sample is 2.02 percent for unitary countries, which compares to 1.20 percent for federal countries.

Table 1b shows the average budget balances and the real growth rates of sub-national government revenues and expenditures for the period from 1995 to 2007, i.e., before the Great Recession, and for the period of the Great Recession, from 2008 to 2010. Column 1 confirms the visual impression from Figure 4, i.e., that average deficits of sub-national governments were much larger in federal than in unitary countries and that deficits in both groups widened strongly during the Great Recession. The remaining columns of this table show the average real growth rates of sub-national government revenues and their main categories and of sub-national government expenditures. We see, first, that real revenues growth fell from strongly positive during 1995-2007 to zero or below during the Great Recession in both groups. In both groups, revenue growth from own taxes had the strongest reversal: From an average of 7.9 percent until 2007 to an average (-3.0) percent during the Great Recession in federal countries, and from an average of 5.5 percent to an average of (-2,4) percent in unitary states.

Second, we observe that sub-national governments in the two groups cope with this sudden decline in revenue growth in different ways. In federal countries, real transfers grew at an average rate of 1.8 percent (weakly statistically significant) during 1995-2007, and only by 1.5 percent (not statistically significant) during the Great Recession. In these countries, sub-national governments appear to have tried to compensate for the loss in tax revenues by increasing their incomes from fees, the growth rate of which jumped from practically zero to two percent on average. In unitary countries, in contrast, the growth rate of real transfers to sub-national governments increased from 2.8 percent to 4.8 percent annually during the Great Recession. Thus, central governments in unitary states undertook efforts to shield sub-national governments from the effects of the adverse macroeconomic shock by increasing their transfers, while central governments in federal states scaled back their transfers during the Great Recession.

Third, we note remarkable differences between the two groups on the expenditure side. Real expenditure growth increased from an annual average of 1.5 percent during 1995-2007 to an average of 2.6 percent in federal countries. Column 9 shows that this increase comes with a strong increase in sub-national government spending for social protection during the Great Recession. In contrast, real spending growth of sub-national governments in unitary states fell from an average of 3.4 percent (statistically significant) during 1995-2007 to 1.4 percent (not statistically significant) during the Great Recession, and the growth rate of sub-national spending on social protection also fell in this group.<sup>1</sup>

### **3. Cyclical Performance of Sub-national Budgetary Policies**

Table 2a shows the response of central and sub-national government balances to changes in the output gap in the years before and during the Great Recession. We regress the ratio of budget balances to total revenues at the respective level of government on the output gap. All regressions are performed with and without country fixed effects.

Several observations are noteworthy. First, the response of central budget balances to the output gap is somewhat larger in federal states than in unitary states, but the difference is not statistically significant. Second, the response of central budget balances to the output gap increased significantly during the Great Recession in both federal and unitary states, with regression coefficients almost doubling for both groups. In terms of their budgetary responses to the Great Recession, central governments in federal and in unitary states are thus remarkably alike.

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<sup>1</sup> Differences in the further spending categories between the two groups are of less interest and omitted here; see Foremny and von Hagen (2012).

Things are different at the sub-national level, however. Table 2a shows that, in the years before the Great Recession, sub-national budget balances in federal states responded significantly and positively to changes in the output gap. Using the more reliable fixed-effects estimator, a one percent widening in a negative output gap would come with a worsening of aggregate sub-national budget balances by 0.7 percent of aggregate revenues, which corresponds to about one fifth of the reaction of central government balances. Sub-national governments in European federal states thus behave anti-cyclically and pick up part of the macroeconomic adjustment to a widening recession. During the Great Recession, the reaction of sub-national budgets to the output gap more than doubled, mimicking the stronger response of central government budgets to the recession.

The behavior of aggregate sub-national government balances in unitary states is remarkably different. Table 2a shows that, before the Great Recession, sub-national budget balances did not respond at all to changes in the output gap. The OLS estimate for the Great Recession has a significantly positive coefficient on the output gap, but the more reliable fixed-effects estimator has suggests no significant coefficient. This difference between unitary and federal countries during the Great Recession is also statistically significant. Thus, the data suggest that sub-national government balances in our group of unitary countries are effectively shielded against cyclical movements of the macro economy.

This stark difference in the performance of sub-national government finances between federal and unitary states is open to a number of different interpretations. One is that, in unitary states, central governments protect sub-national governments against macroeconomic developments, and that central governments in federal states do not do that to the same extent. In a sense, the greater exposure of sub-national governments to macroeconomic shocks in federal states could be interpreted as the price these governments have to bear for enjoying greater independence from the central government. If sub-national governments borrow to keep their expenditures for the provision of public goods and services stable in the face of adverse macroeconomic shocks, the cost of borrowing could be interpreted as the price they pay for enjoying a greater political freedom. In contrast, sub-national governments in unitary states are insured against macroeconomic shocks, but they enjoy less independence from the central government in return. If this were true, we would expect that sub-national government spending be less pro-cyclical in unitary states than in federal states.

The other interpretation is that the different reactions of sub-national budget balances to macroeconomic shocks reflect different degrees in the ability and legal authority of



sub-national governments to borrow in their own right. If sub-national governments in unitary states are more restricted in this regard than sub-national governments in federations, the result that sub-national balances in unitary states do not react to macroeconomic shocks might indicate that sub-national governments are forced to cut spending in line with falling revenues during a recession, and that they increase expenditures when revenues are strong in good times. This would imply that the provision of local public services is less stable over time and more pro-cyclical in unitary states than in federal states.

Table 2b shows the results of regressing the annual growth rates of real government revenues and spending on the output gap at the central and the sub-national levels of government. Generally, revenues seem to respond more strongly to changes in the output gap than expenditures. On the revenue side, we see, again, that central governments in federal and unitary states respond quite similarly to changes in the output gap. In the period before the Great Recession, the growth rate of real revenues falls by 0.5 percent when the output gap falls by one percent.<sup>1</sup> At the sub-national level, government revenues are positively related to the output gap in federal countries before the Great Recession, but not significantly so. During the Great Recession, however, revenue growth fell very strongly with the widening of the output gap. In fact, revenue growth at the sub-national level responds much more strongly to the widening output gap than central government revenues. In unitary states, we observe that revenues are positively and significantly related to the output gap with similar coefficients both before and during the Great Recession.

In Table 2c, we repeat these regressions but we use sub-national government revenues net of transfers from the central government as the dependent variable.<sup>2</sup> Column 2a has sub-national revenues net of transfers as defined by the OECD, while column 2b additionally subtracts the revenues from shared taxes from sub-national government revenues. With regard to federations, we note that revenues net of transfers are more strongly related to the output gap in the Great Recession than total revenues. At the same time, the coefficient on the output gap is only weakly statistically significant, indicating that there is greater heterogeneity across the federations in the sample. This suggests that own revenues of sub-national governments in federations are more cyclically elastic than total revenues and that central governments use their transfers to offset part of the cyclical dependence. For unitary countries, the impact of the output gap on revenues net of transfers is both larger and more strongly

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<sup>1</sup> The coefficient on the output gap for central governments in federal countries is small and not significantly different from zero. This is due to the large differences in reactions among the federal states during the Great Recession.

<sup>2</sup> Column 1a in Table 2c simply repeats the results from Table 2b to facilitate comparison. Column 1b has the same dependent variable as column 1a but omits Greece for which no data on transfers are available.

significant than the impact on total revenues, indicating that central governments use their transfers to local governments in order to protect the latter against the impact of macroeconomic shocks on their revenues.

The other important insight from Table 2b is that sub-national government spending is generally *pro-cyclical*, i.e., expenditures fall when the output gap turns negative. In unitary states, this effect is marginally significant before the Great Recession, but it is highly significant during the Great Recession. For a one-percent widening of a negative output gap during the Great Recession real spending growth at the sub-national level falls by almost one percent. In federations, the reaction of sub-national real government spending growth is less pronounced and only weakly statistically significant.

#### **4. Fiscal Institutions and Sub-national Fiscal Adjustment**

The distinction between federal and unitary states is obviously a very coarse one, as federal or unitary fiscal systems can each be designed in quite different ways. In this section, we explore the importance of two dimensions of that design, the stringency of fiscal rules at the sub-national level and the degree of autonomy sub-national governments have over their taxes. These two dimensions are interesting because they reflect two different approaches to the issue of controlling deficits and debts at the sub-national level. Fiscal rules emanate from a control approach: The central government imposes rules on sub-national governments to ensure that their behavior is consistent with the goals of fiscal policy at the national level, such as maintaining sustainable public finances. The nature and the coverage of these rules vary across countries and over time in our sample. They include variations of the *Golden Rule* (that deficits must not exceed investment spending), balanced budget requirements, administrative procedures local and regional governments must follow when they have experienced deficits that were deemed too large, and constitutional debt limits.

Granting tax autonomy to sub-national governments is consistent with the view that each unit of government must be responsible for its own performance, which would imply that sub-national governments spending less may reduce taxes in their own jurisdictions, and that sub-national governments borrowing more to finance current expenditures will later need to raise more revenues from their own taxes. Conversely, one may argue that the smaller the share of revenues from own-source taxation the greater is the likelihood of a bailout in times of fiscal stress, since sub-national governments with few own resources have no ability to correct for past high deficits by raising additional revenues.<sup>1</sup>

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<sup>1</sup> Eichengreen and von Hagen (1996)

#### 4.1. Identification

We estimate a reduced form model of a fiscal reaction function extending our results from Table 2a. The reaction function takes the following form:

$$\left(\frac{\text{budget balance}}{\text{revenues}}\right)_{i,t} = \gamma \boldsymbol{\theta} \cdot \text{rules}_{i,t} + \delta \boldsymbol{\theta} \cdot \text{tax autonomy}_{i,t-1} + \boldsymbol{\beta} \mathbf{Z}_{i,t} + \boldsymbol{\mu}_i + \boldsymbol{\varepsilon}_{i,t}$$

Here, the parameter  $\gamma$  captures the impact of the strength of fiscal rules. Next, the impact of the tax-structure in terms of sub-national autonomy is captured by the parameter  $\delta$ . We estimate the reaction to a lagged variable of the share of taxes which are under discretion of the respective government. We argue that using the one period lag is important since policy makers will use their knowledge from the past to build their expectations about the future. A high dependency on own-source taxes in the past indicates that it is likely that current deficits must be paid back by own resources instead of expecting to receive transfers from the central government.

The impact of other explanatory control variables is measured by the parameters in the vector  $\boldsymbol{\beta}$ .  $\boldsymbol{\mu}_i$  are individual fixed effects at the observational level. The inclusion of individual fixed effects captures unobserved heterogeneity, but it also implies that the estimated effects of fiscal rules and tax autonomy stem from variation across time rather than variation across countries in our sample. This assures that they are not confounded with country-specific differences in preferences for fiscal discipline and other characteristics of fiscal policy culture.

To take into account the structure of government, we interact a set of dummies  $\boldsymbol{\theta}$  with the main variables of interest.

$$\boldsymbol{\theta} = \begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \\ \theta_3 \end{bmatrix} = \begin{array}{l} 1 \text{ if federation and no crisis, else } 0 \\ 1 \text{ if federation and crisis, else } 0 \\ 1 \text{ if unitary country and no crisis, else } 0 \\ 1 \text{ if unitary country and crisis, else } 0 \end{array}$$

We end up eventually with separate coefficients on tax autonomy and fiscal rules for federal and unitary countries.

#### 4.2. Data

We use aggregate data for sub-national sectors of all EU15 members over a period ranging from 1995 to 2010 as more recent data is not available yet. As in the previous section, we differentiate between the period from 1995 to 2007 and the Great Recession, 2008-2010. We include regional and local governments as separate entities in the four federal organized member states.

The dependent variable is defined as the annual budget balance as a share of sub-national revenues. Two indicators have to be computed in order to investigate the effects of fiscal rules and tax autonomy. We construct both indicators as time-varying indexes that capture the developments for each country over the entire time period.

The indicator of tax autonomy is the share of own-source tax revenues in total revenues at each level of government. The classification of own-source revenues is, unfortunately, not straightforward. Other studies rely on the degree of vertical imbalance or the share of taxes in total revenues, which can be misleading in some cases.<sup>1</sup> It is important to distinguish real own-source revenues from revenues which arise due to tax-sharing arrangements, i.e. taxes collected by a higher level and automatically transferred to the lower one. The OECD (1999) provides a classification of the taxing power of sub-national levels. Unfortunately, their *Fiscal Decentralization Database* provides only information for three or at most four years, 1995, 2002, 2005, and 2008. We use the *Revenue Statistics* of the OECD, the *Taxes in Europe* database of the European Commission, numerous national sources over changes in tax-systems, and the information provided by Stegarescu (2005) to construct an indicator over the entire 16 years of the sample. We treat all taxes over which either discretion on rates, reliefs, or both lies with the sub-national entity as own-source tax revenues. This measure does not overestimate the revenue autonomy in the presence of shared taxes.

We construct an indicator of the strength of fiscal rules measuring how stringently sub-national budgets are regulated in each country. Fiscal rules have become increasingly common at the sub-national level in European countries<sup>2</sup> to mitigate a deficit bias and to harden the budget constraint by imposing numerical targets on budgetary variables or limiting the access to credit. We use the data provided by the European Commission (2010) to create an index of the strictness of these rules. All fiscal rules which can have an impact on the deficit are included in the calculation of the index. We adjust the original index proposed by the European Commission (2010) to the situation of sub-national levels. In the non-federal countries, an average of the rules applying to different levels, weighted by their share of expenditures in the total sub-national budget, is used.

Table 6 gives the average values of these indicators for the sample countries and over the entire period. The indicator of tax autonomy ranges from 0.5 for German

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<sup>1</sup> As an example, the share of tax revenues in total revenues in German federal states is substantial. The share of real own-source taxes is close to zero since states cannot decide on an individual tax rate as only a one which is common to all states exists.

<sup>2</sup> See European Commission (2009, 2008, 2006) and Sutherland et al. (2005) for an overview.

*Länder* to 62.4 for Swedish municipalities. The average value is 23.8. As indicated above, sub-national governments in federal states have a lower average tax autonomy (18.0) than sub-national governments in unitary states (28.1). Conversely, federal countries have a higher index of the strength of fiscal rules (0.67) than unitary states (0.38); here, the overall average is 0.5. The correlation between the two indicators is weakly positive with 0.34.

The other controls are summarized in Table 5. The fiscal position of the central government is included to capture a copycat effect. Sub-national governments that observe a loose fiscal policy at the national level can follow the example given by the central government, expecting that they are not sanctioned if the higher level is profligate as well.

The degree of decentralization is taken into account by the share of sub-national expenditures in general government expenditures. Unfortunately, this indicator is not able to distinguish between expenditures that could be categorized as compulsory or those that are optional. Nevertheless, the share of expenditures captures the weight of the sub-national sector in the general budget and how spending proportions are shared between the governmental levels. These shares differ across European countries, with varying responsibilities and discretion over their exercises.

Additional covariates are included to capture cyclical and institutional effects and to consider the spending needs of lower-level governments. We spent special addition to the output gap to investigate cyclical behavior. We control further for the unemployment rate, the ratio of the working age to total population, the log of total population, and interest expenses. All fiscal variables are computed as share of revenues.

### 4.3. Baseline Results

Table 3 reports the results of our estimates. Consider column 1. We find that tax autonomy has a positive effect on budget balances in federations. An increase in the degree of tax autonomy by ten points increases the budget balance of sub-national governments by approximately two percent of sub-national government revenues. This effect is strongly statistically significant. In contrast, the degree of tax autonomy has no significant impact on the budget balances of sub-national governments in unitary countries.

According to column 1, the stringency of fiscal rules has a negative impact on budget balances in federal countries, but the effect is not statistically significant.<sup>1</sup> In contrast, the impact of fiscal rules is strongly positive and statistically significant in unitary countries. An increase in the fiscal rules indicator by one increases the budget balance of sub-national governments in unitary countries by 3.8 percent.

The most important insight from these results is that fiscal institutions have different effects on budgetary performance in different constitutional environments. Turning to the remaining control variables, we find that the degree of expenditures decentralization has a significantly negative effect on sub-national budget balances in our sample, and that countries with growing populations tend to have larger sub-national government budget deficits. As noted in the previous section, the output gap affects sub-national budget balances positively. The remaining controls have no statistically significant impact.

In column 2 of Table 3, we estimate separate coefficients on the indexes of fiscal institutions for the two sub-periods in our sample. Again, we observe that the effect of tax autonomy is positive and significant in federal countries. The coefficient even increases, but the level of significance is weaker, which is most likely due to the fewer number of observations in that sub-period. As before, tax autonomy does not have a significant impact on sub-national government budget balances in unitary countries. For fiscal rules, the results are opposite, as before.

Since these effects are estimated using the multiplicative interaction of the indexes of fiscal institutions and the dummies for federal versus unitary countries, it is instructive to compute the marginal effect of an increase in each index at each value of the level of the index. This we do in Figures 5 and 6 for the joint interaction term of the dummies differentiating between unitary and federal countries, the dummy indicating the time period, and the index itself.<sup>2</sup> There, the solid lines indicate the predicted effect of the index for the country group and period under consideration, evaluated at the mean of all other variables. Note that the means of the other variables determine the location of the curve, in the diagram, while moving along the curve show how an increase in the index changes the predicted budget balance. The dashed lines indicate the upper and the lower limits of the 95 percent confidence interval around the predicted effect. Each of the panels shows the effect separately for unitary and federal

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<sup>1</sup> A possible explanation of the negative sign is that there is a degree of endogeneity in the sense that countries with larger deficits at the sub-national level adopt more stringent fiscal rules. Foremny (2012) explores this issue in more depth by using an instrumental variables estimator for fiscal rules and finds that fiscal rules have no significant effect on budget balances in federal countries.

<sup>2</sup> Note that the significance levels reported in Table 3 correspond to the marginal effect computed at the average value of the index.

countries and for the time before and during the Great Recession relative to all other observations.

Figure 5a shows the marginal effects of tax autonomy on the budget balance of sub-national governments in federal countries. Consider the first sub-period illustrated in the left panel. The effect of tax autonomy is positive and increases with the level of the index. The confidence interval is bounded away from the zero line only for values of the index greater than 25 percent. This suggests that there is a minimum level of tax autonomy that must be granted to sub-national governments in order to achieve a positive impact on their budget balances. Moving from no to small degrees of autonomy will not achieve better budgetary performance. The right panel for federal countries during the Great Recession confirms these results, but, due to the fewer observations and greater heterogeneity of performance during this period, the lower limit of the confidence interval stays close to the zero line in this subsample.

Figure 5b repeats the same exercise for the unitary countries in our sample. Here, the marginal effect of tax autonomy as indicated by the slope is negative, but the effect is mostly not significant, confirming our earlier results.

Turning to the impact of fiscal rules, Figure 6a shows that the marginal effect in federations is almost vertical before the Great Recession and not different from zero after 2007. The positive slope of Figure 6b instead indicates that stronger rules are able to improve the budgetary position in unitary countries before the Great Recession. With very strong rules, i.e., index values exceeding 1.0, the predicted budget balance is no longer significantly different from zero. Again, for the sub-period of the Great Recession the effect is mostly insignificant. The wide confidence bounds in this case indicate an imprecise estimation of the effect for those years.

#### 4.4. Fiscal Institutions and the Cyclical Performance of Sub-national Budgets

The results in Table 4 pay further attention to the cyclical elasticity of budget balances.<sup>1</sup> While in our baseline results the reaction of the budget balance to the output gap was assumed to be the same for federations and unitary countries, we allow for different coefficients from now on.

The first column confirms the results obtained in Section 3. The reaction of federations is much stronger than the reaction of sub-national sectors in unitary countries, where the effect is insignificant. In column 2 we distinguish further between the time before and during the Great Recession. We find that the cyclical effect is mainly driven by the increasing deficits during the Great Recession in response to widening neg-

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<sup>1</sup> Note that, to simplify the presentation, we suppress the results of the other control variables in Table 4.

ative output gaps. Again, sub-national governments in unitary countries do not react to the cycle in either of the subperiods. In columns three and four we investigate whether or not the cyclical elasticity depends on the design of fiscal institutions. We do so by estimating the interaction effect of the output gap and our indicator of fiscal rules and tax autonomy.

First, we interact the output gap with fiscal rules in column 3. The total reaction of sub-national budget balances to the output gap for federations is now given by the sum of the simple output gap term and the interactive term. For the period before the Great Recession, this is  $(-2.7)+4.9*(\text{fiscal rules index})$ . Both coefficients are highly statistically significant. This indicates that sub-national budget balances react negatively to the output gap, and thus in a pro-cyclical way, when fiscal rules are weak. As fiscal rules increase, the pro-cyclical behavior first vanishes and for values of the fiscal rules index above 0.46 the reaction becomes positive, i.e. sub-national balances behave anti-cyclically. The estimates for the Great Recession show a similar result, although here the coefficient on the simple output gap term is positive and not statistically significant, indicating that sub-national balances do not behave pro-cyclically in the case of weak fiscal rules. However, the coefficient on the interactive term is significantly positive, suggesting that sub-national balances behave in a more anti-cyclical way as fiscal rules become stronger. In sum, sufficiently strong fiscal rules improve the cyclical performance of sub-national budgetary policies in federal countries. We do not find a similar effect in the case of unitary countries.

Turning to tax autonomy, we do not find such an effect for the interaction with the output gap. Here, the overall effect is not different across the groups for different values of tax autonomy in neither unitary nor federal countries.

## 5. Conclusions

This paper has investigated how the fiscal adjustment to the Great Recession and to cyclical movements of the macro-economy more generally is shared between the different levels of government in EU states. We find that the budgetary policies of sub-national governments in federal states behave in a counter-cyclical way and assume a much larger part of the burden of adjustment than sub-national governments in unitary states. The difference between federal and unitary states comes mostly from a much stronger counter-cyclical pattern of sub-national government revenues in the former group. In fact, central governments in unitary states make efforts to shield sub-national governments from the impact of adverse macro-economic shocks through vertical transfers. This protection, however, comes at the cost of a much stronger need for sub-national governments in unitary states to cut expenditures in bad times. If the functions of local governments are mostly in the allocative area, the



resulting greater disruptiveness of local public services due to macro-economic shocks can well result in greater inefficiencies compared to federal countries.

Turning to the impact of fiscal institutions, we find that fiscal rules contribute to greater fiscal discipline of sub-national governments in unitary states, but not so in federal states. A suggestive explanation is that, in unitary states, fiscal rules are enforced (if at all) by the central government, while the enforcement is left to sub-national governments in federal states, where they enjoy larger legal autonomy. Our results then confirm earlier research indicating that rules need proper enforcement mechanisms to be effective, and that, therefore, the effectiveness of fiscal rules depends on countries' constitutional frameworks (Hallerberg et al, 2009). Furthermore, we find that, in order to have a positive impact on fiscal discipline, fiscal rules must have a minimum degree of stringency. Weak and modestly strong rules achieve nothing in terms of improving fiscal discipline at the sub-national level. The lesson for institutional reforms is that governments should not hope for gaining any improvement in fiscal performance unless they impose relatively strong fiscal rules.

In contrast, the degree of tax autonomy influences fiscal discipline at the sub-national level positively in federal but not in unitary states. This suggests that the proper incentive to improve fiscal discipline at the sub-national level in federal states is to create an environment in which a commitment on the part of the central government to deny bailouts to sub-national governments can be credible.

Finally, we observe that the counter-cyclical behavior of sub-national government budgets in federal states becomes stronger in the presence of strong fiscal rules. That is, sub-national governments run larger deficits in "bad" times if they are subject to stronger fiscal rules. This suggests that there may be a pay-off from fiscal rules in terms of greater credibility for sub-national governments in federal states: In the presence of stronger rules promising the elimination of any deficits such governments are able to better able borrow in the capital markets. This would imply that fiscal rules can have a value in federal setting albeit not in terms of reducing average deficits. Instead, by allowing sub-national governments to smooth expenditures to a greater degree over the business cycle, they facilitate achieving a higher degree of allocative efficiency.

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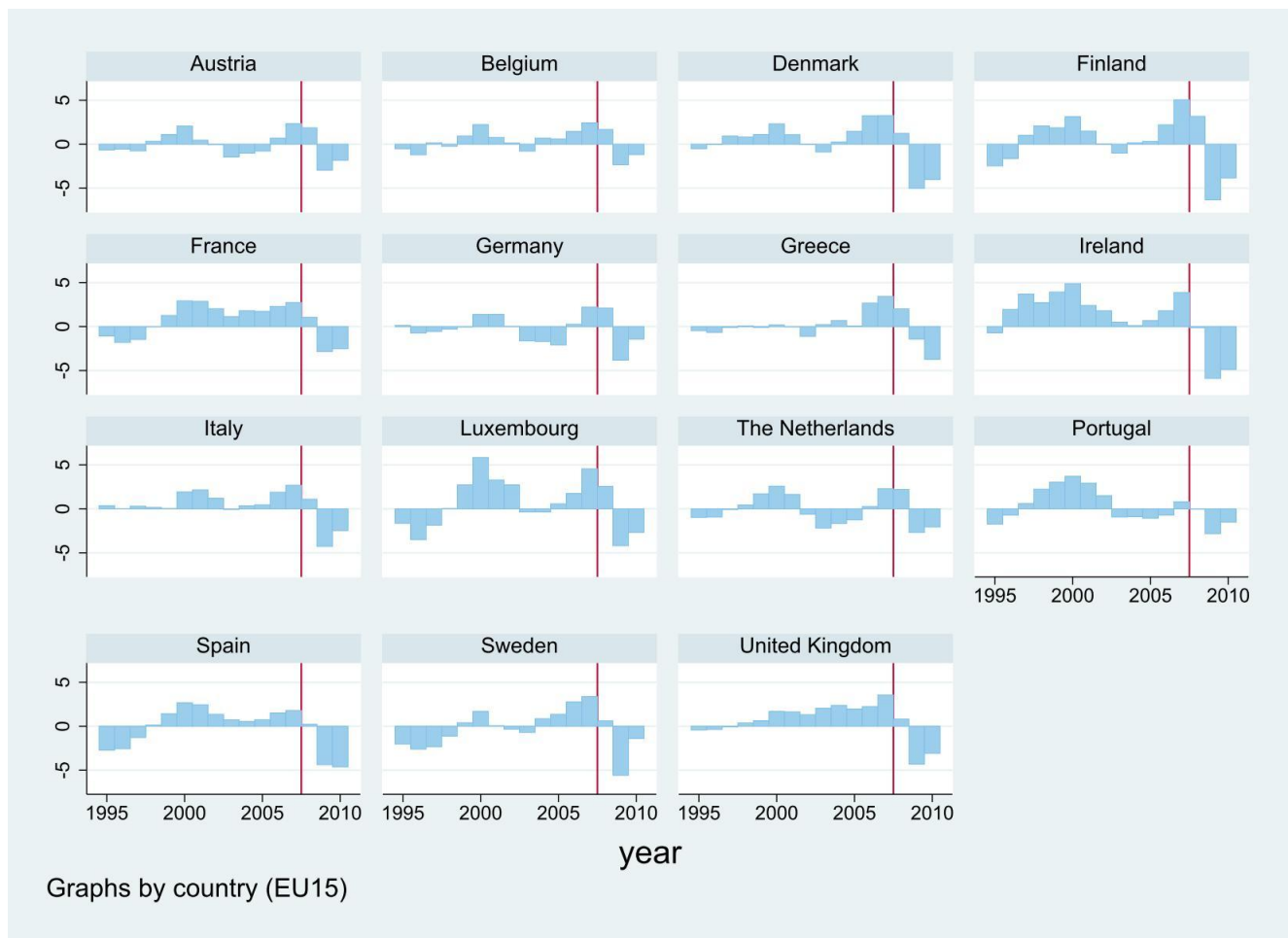
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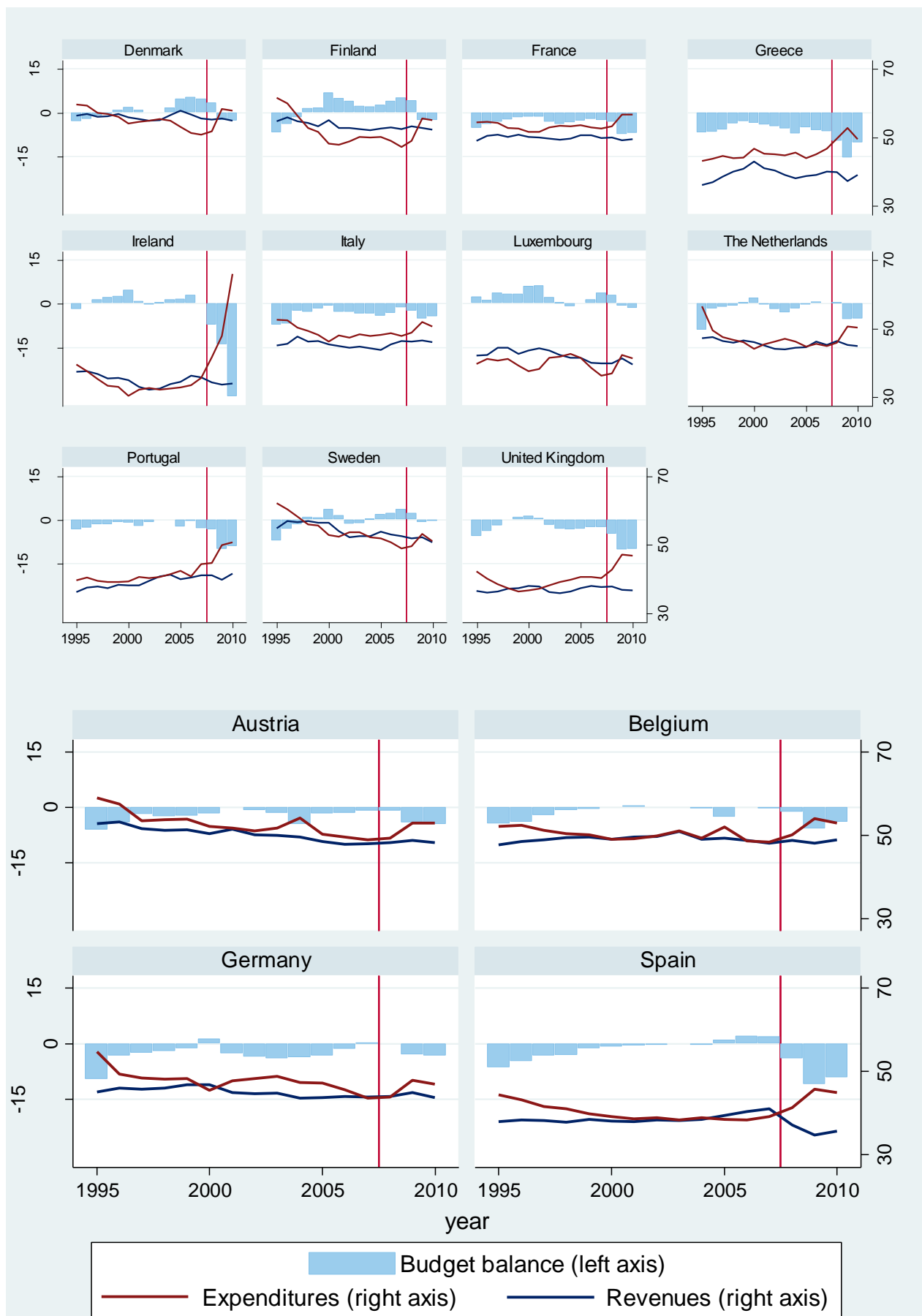
## Figures

Figure 1: Output Gaps in 15 EU Countries, (1995-2010).



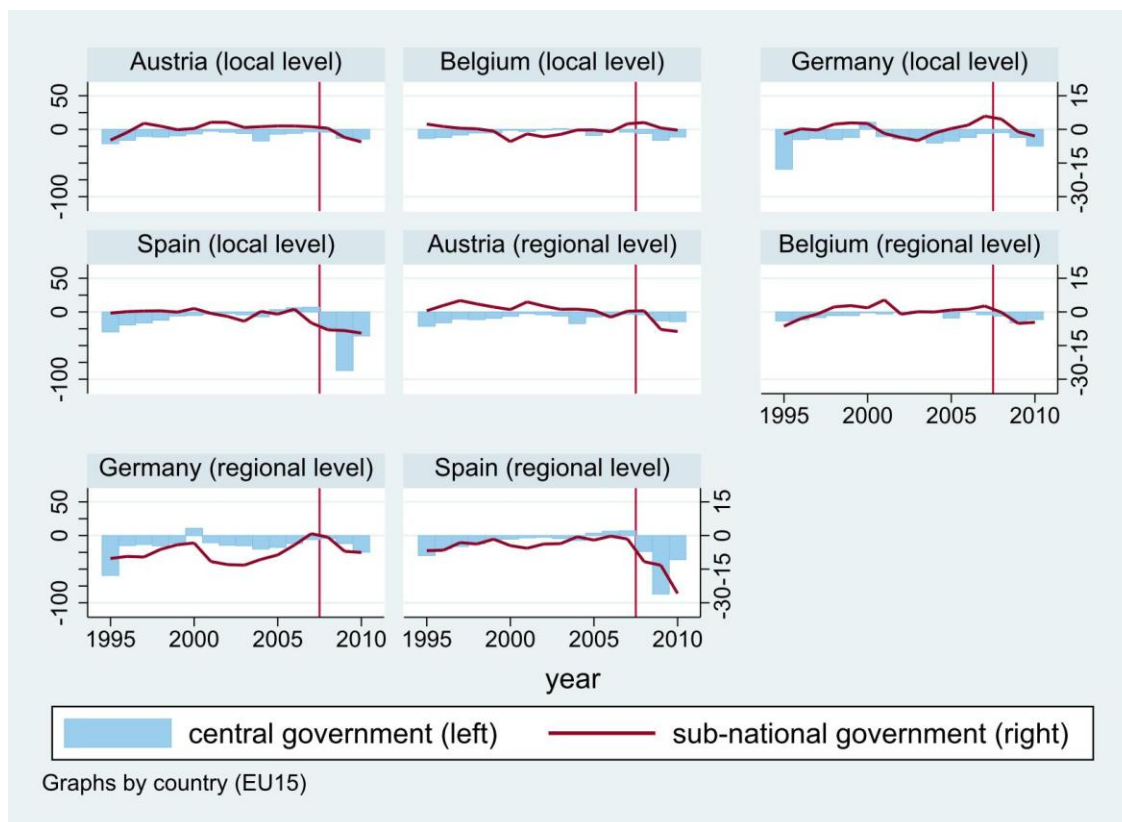
Notes: Data based on EUROSTAT.

Figure 2: **General Government Revenues, Expenditures, and Budget Balances, (1995-2010).**



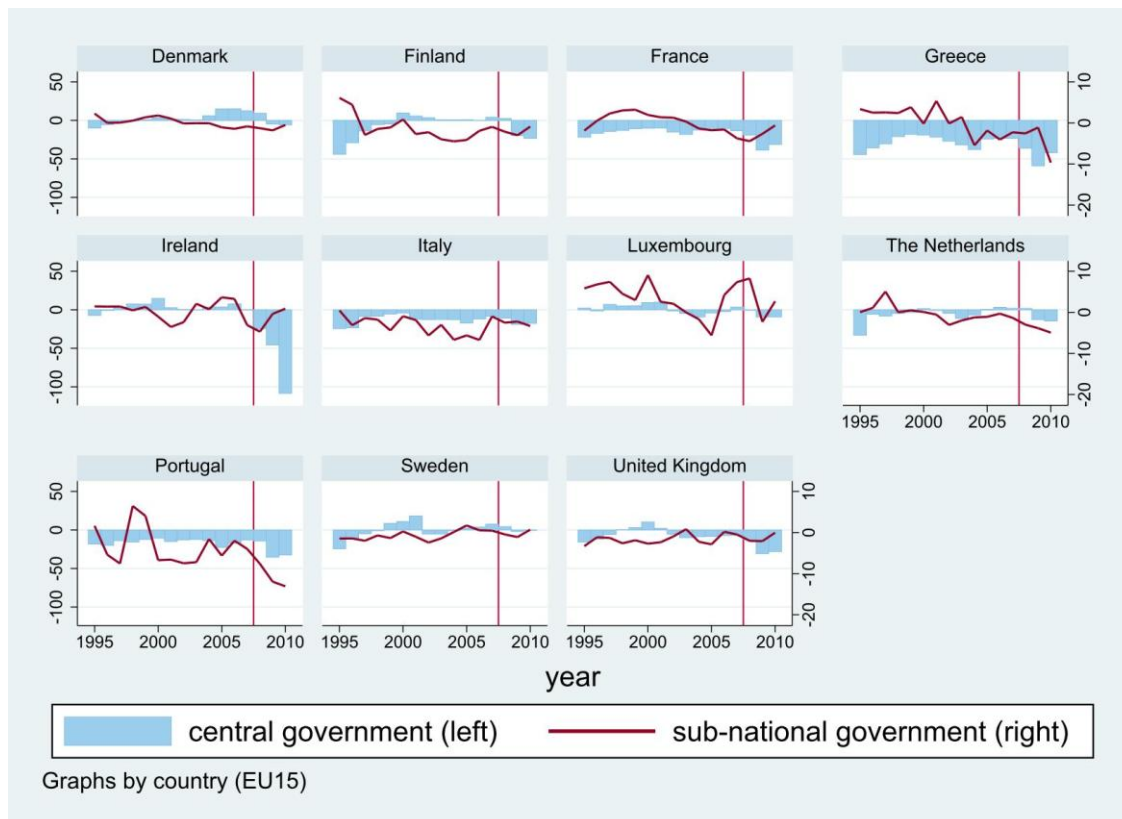
Notes: Data based on the IMF Economic Outlook. Left axis for budget balances as shares of GDP, right axis for expenditures (red) and revenues (blue) as shares of GDP. Top panel for the unitary countries, bottom panel for federations.

Figure 3a: **Central and Sub-national Budget Balances in Federal Countries, (1995-2010).**



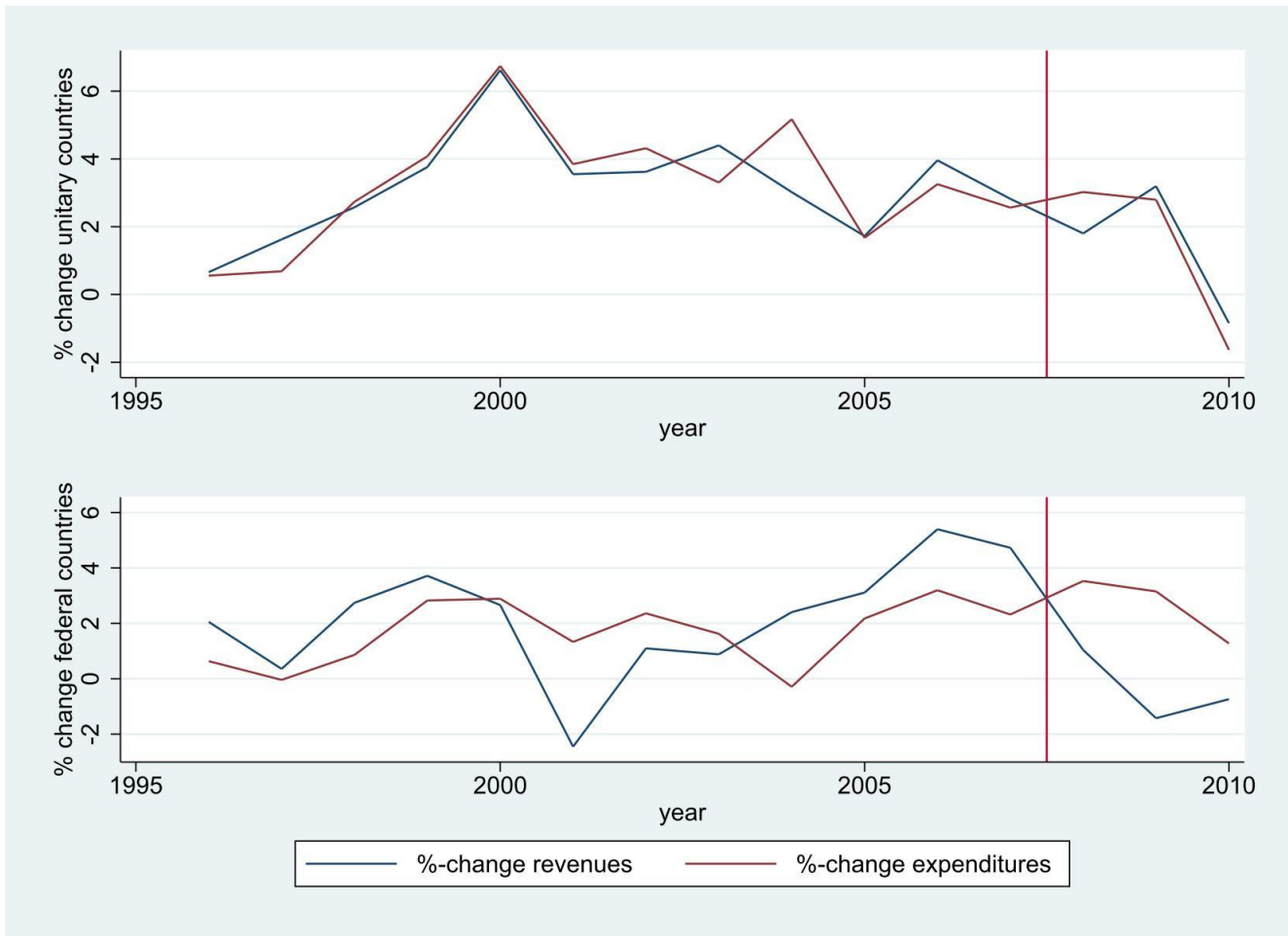
Notes: Budget balances as share of revenues. Data based on EUROSTAT and own calculations.

Figure 3b: **Central and Sub-national Budget Balances in Unitary Countries, (1995-2010).**



Notes: Budget balances as share of revenues. Data based on EUROSTAT and own calculations.

Figure 4: Year-on-year Percentage Change of Revenues and Expenditures, (1996-2010).



Notes: Real values price adjusted with the GDP deflator. Average weighted by country GDP.

Figure 5a: Predicted Effect of Tax Autonomy on Budget Balances (Federations)

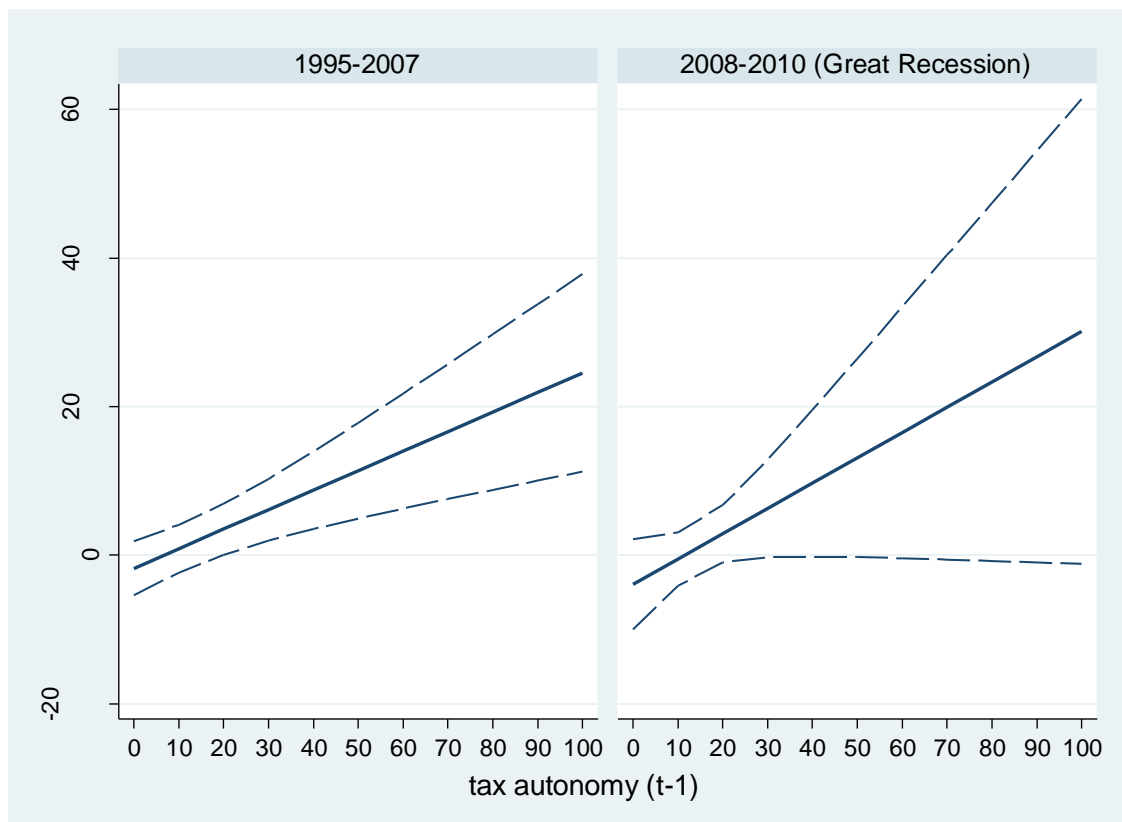
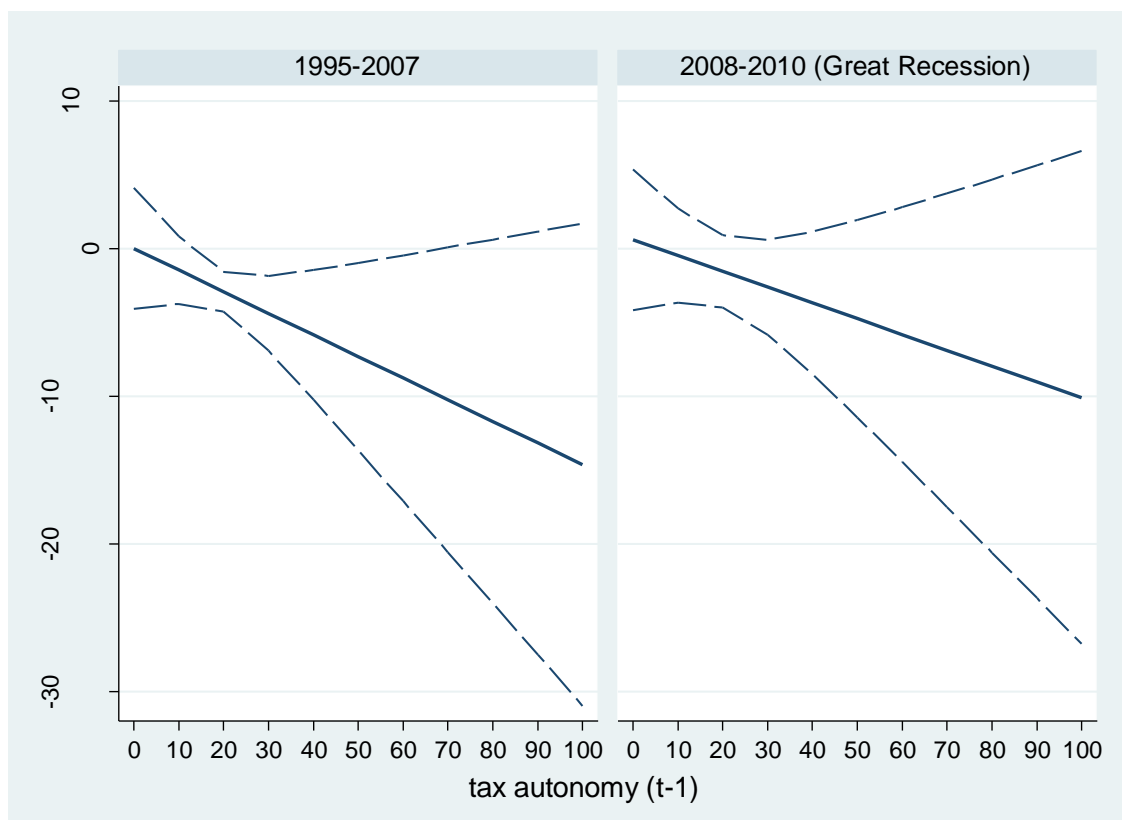


Figure 5b: Predicted Effects of Tax Autonomy on Budget Balances (Unitary Countries)



Notes: Slope shows the average marginal effect of tax autonomy on budget balances according to Model (2) of Table 1. Evaluated at the mean of all other variables. 95% confidence interval in dashed lines. Top panel 5a): federations, bottom panel 5b): unitary countries.



Figure 6a: Predicted Effects of Fiscal Rules on Budget Balances (Federations)

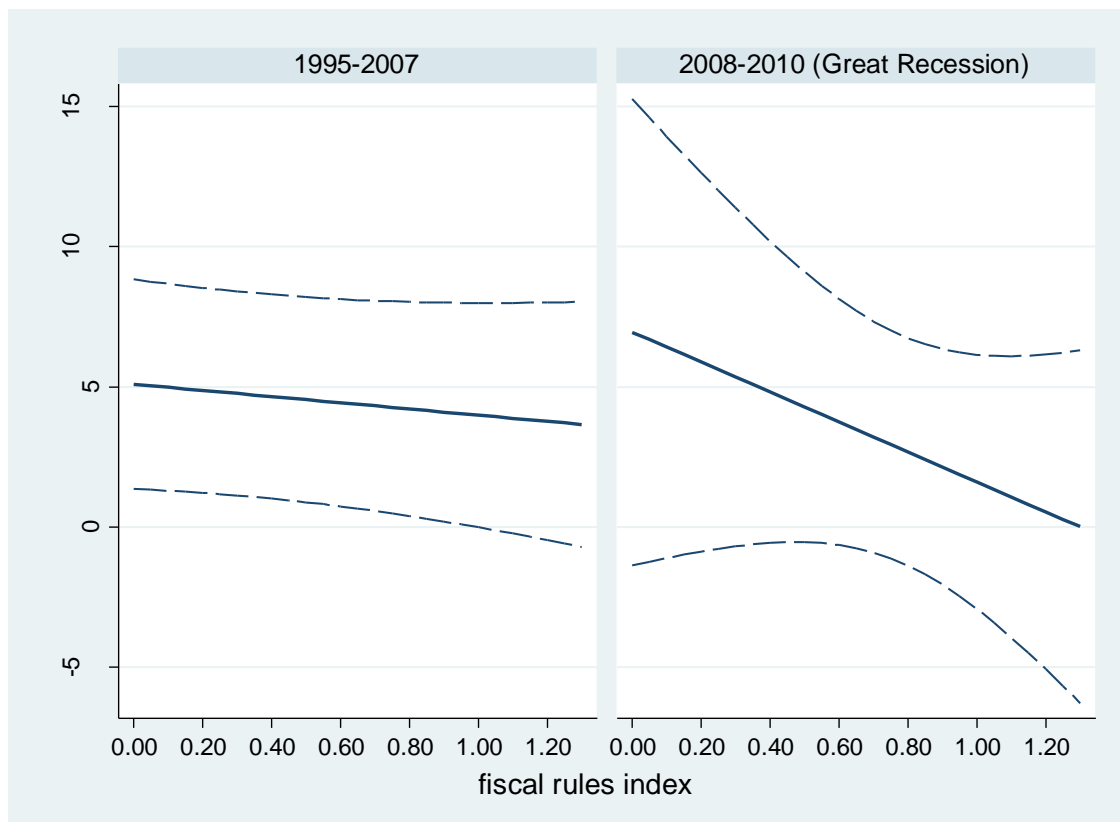
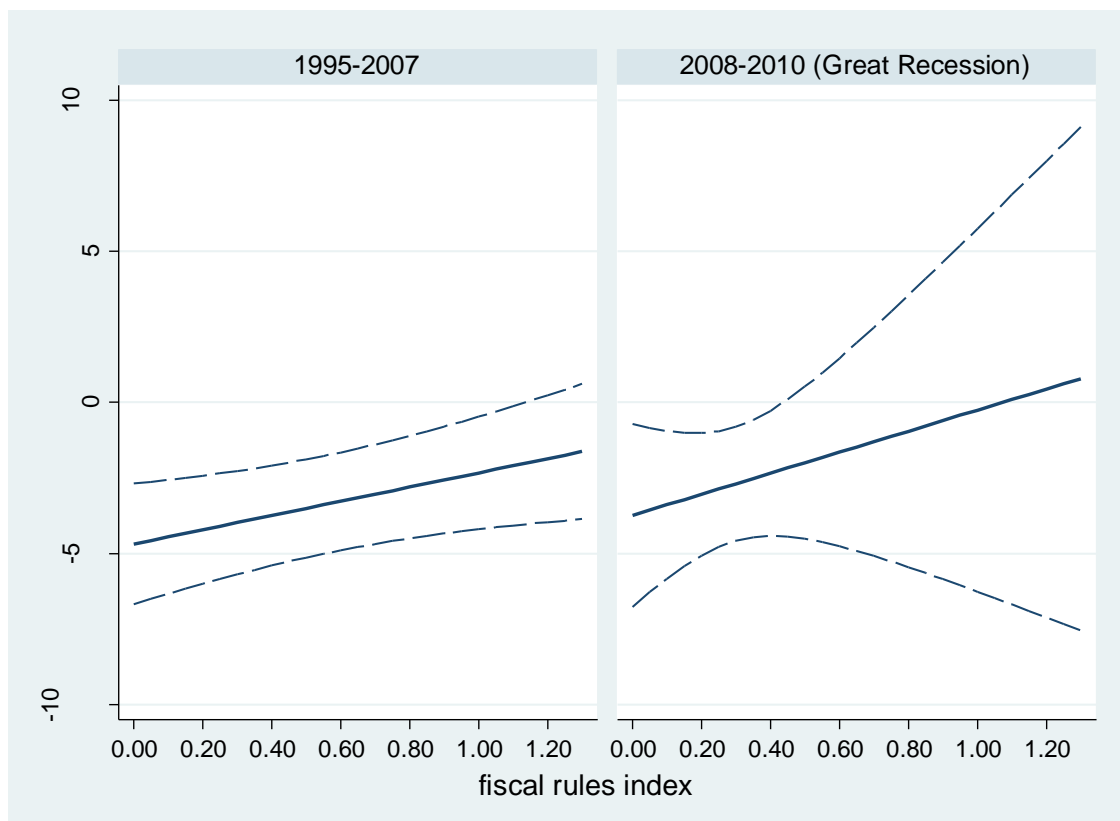


Figure 6b: Predicted Effects of Fiscal Rules on Budget Balances (Unitary Countries)



Notes: Slope shows the average marginal effect of fiscal rules on budget balances according to Model (2) of Table 1. Evaluated at the mean of all other variables. 95% confidence interval in dashed lines. Top panel 6a): federations bottom left panel: unitary countries up to 2007, bottom panel 6b): unitary countries.

## Tables

Table 1a: Budget Categories (1995-2007).

	(1)	(1a)	(1b)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	revenue side (shares of total revenues)						expenditure side (shares of total expenditures)									
groups	taxes	own taxes	shared taxes	transfers	fees	other	public services	social protection	defense	public order and safety	economic affairs	environment protection	housing and community amenities	health	recreation culture and religion	education
federations	40.6***	17.7***	22.9***	40.9***	8.8***	9.8***	20.4***	16.4***	0.0	4.5***	13.6***	4.1***	4.3***	10.5***	5.4***	20.8***
	(1.8)	(1.5)	(1.4)	(1.8)	(0.56)	(0.38)	(0.96)	(1.2)	(0.00)	(0.34)	(0.51)	(0.44)	(0.46)	(1.4)	(0.32)	(0.88)
unitary countries	32.4***	28.4***	4.0***	44.4***	14.4***	7.8***	15.7***	18.0***	0.01***	2.6***	13.2***	6.5***	6.7***	14.3***	6.3***	16.5***
	(1.6)	(1.3)	(1.2)	(1.6)	(0.48)	(0.34)	(0.82)	(1.0)	(0.00)	(0.29)	(0.43)	(0.37)	(0.39)	(1.2)	(0.28)	(0.75)
Observations	247	247	247	234	247	234	247	247	236	247	247	247	247	247	247	247
R-squared	0.79	0.71	0.53	0.84	0.82	0.84	0.77	0.68	0.29	0.51	0.87	0.62	0.62	0.44	0.76	0.81
F-test <sup>1</sup>	11.73	28.63	106.30	2.16	57.95	16.45	13.76	1.11	27.10	18.59	0.44	17.83	18.66	3.95	4.24	14.15
p-value	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.29	0.00	0.00	0.51	0.00	0.00	0.05	0.04	0.00

Notes: Standard errors in parentheses. 1) F-test for equal coefficients, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 1b: Annual Averages Main Budgetary Categories

		(1)	(2)	(3)	(3a)	(3b)	(6)	(7)	(8)	(9)
			real revenue groth						real expenditure groth	
groups		budget balance as share of revenues	total	tax	own tax	shared tax	transfers	fees	total	social protection
federations	1995-2007	-1.2***	1.9***	5.4***	7.9**	5.2*	1.8*	0.03	1.5***	2.4***
		(0.38)	(0.49)	(1.9)	(3.8)	(3.2)	(1.0)	(1.1)	(0.51)	(0.67)
	Great Recession (2008-2010)	-5.1***	-0.27	-0.82	-3.0	-1.4	1.5	2.0***	2.6***	4.5***
		(1.3)	(0.75)	(1.8)	(1.8)	(1.8)	(1.9)	(0.59)	(0.49)	(0.92)
unitary	1995-2007	-0.45*	3.2***	4.2***	5.5***	3.3*	2.8***	3.5***	3.4***	8.5*
		(0.27)	(0.57)	(0.68)	(1.5)	(1.7)	(1.0)	(0.46)	(0.60)	(4.8)
	Great Recession (2008-2010)	-2.5***	0.92	-0.21	-2.4	0.15	4.8***	1.12	1.4	2.9
		(0.68)	(1.0)	(1.2)	(3.1)	(4.7)	(1.8)	(0.77)	(0.97)	(2.3)
	Observations	304	285	285	285	285	270	285	285	285
	R-squared	0.18	0.16	0.10	0.05	0.02	0.07	0.10	0.17	0.03
	F-test (H01) <sup>1</sup>	8.46	5.70	5.54	6.52	3.37	0.02	2.29	2.17	3.29
	Prob > F (H01)	0.00	0.02	0.02	0.01	0.07	0.88	0.13	0.14	0.07
	F-test (H02) <sup>2</sup>	8.20	3.95	10.31	5.42	0.40	1.00	6.82	3.07	1.11
	Prob > F (H02)	0.00	0.05	0.00	0.02	0.53	0.32	0.01	0.08	0.29
	F-test (H03) <sup>3</sup>	3.11	0.90	0.08	0.02	0.10	1.62	0.75	1.05	0.44
	Prob > F (H03)	0.08	0.35	0.78	0.88	0.76	0.20	0.39	0.31	0.51

Notes: Robust standard errors in parentheses. ). \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. 1) F-test for equal coefficients across periods for federations. 2) F-test for equal coefficients across periods for unitary countries. 3) F-test for equal coefficients across federations and unitary countries during the Great Recession.

Table 2a: Cyclical Reactions of Budget Balances

	groups	variables	(1a) CS	(1b) FE	(2a) CS	(2b) FE
			budget balance as share of revenues			
			sub-national		central	
federations	1995-2007	output gap	0.41* (0.23)	0.70** (0.29)	3.9*** (0.69)	3.4*** (0.77)
	Great Recession		2.8*** (0.48)	1.8*** (0.44)	6.7** (2.9)	6.2** (2.8)
unitary countries	1995-2007		0.004 (0.19)	0.05 (0.13)	2.2*** (0.44)	2.3*** (0.51)
	Great Recession		0.46*** (0.18)	0.31 (0.20)	4.3*** (1.4)	4.5*** (1.5)
		interest	-0.05*** (0.01)	0.04* (0.02)	-2.8*** (0.43)	-3.3*** (0.9)
		constant	0.37 (0.38)	-2.2*** (0.6)	-1.5 (1.4)	-0.2 (2.7)
		Observations	304	304	240	240
		R-squared	0.247	0.223	0.369	0.427
		F-test (H01)1	9.7	3.8	0.93	1.4
		Prob > F (H01)	0.00203	0.0714	0.336	0.257
		F-test (H02)2	2.8	1.023	2.093	2.659
		Prob > F (H02)	0.093	0.325	0.149	0.125
		F-test (H03)3	10.19	9.682	0.595	0.285
		Prob > F (H03)	0.00156	0.00602	0.441	0.602
		Number of groups		19		15

Notes: Dependent variable is the annual budget balance as a share of total revenues. 1a and 2a are cross section estimates; 1b and 2b include individual fixed effects.

Table 2b: Cyclical Reactions of Real Revenues and Expenditure Growth

	groups	variables	(1a) FE	(1b) FE	(2a) FE	(2b) FE
			revenues		expenditures	
			sub-national	central	sub-national	central
federations	1995-2007	output gap	0.100 (0.117)	0.510** (0.203)	0.364* (0.179)	0.471 (0.318)
	Great Recession		1.151*** (0.345)	0.024 (0.853)	0.680* (0.385)	-0.615 (0.414)
unitary countries	1995-2007		0.797** (0.363)	0.511*** (0.166)	0.959* (0.558)	0.299 (0.176)
	Great Recession		0.713* (0.365)	1.164*** (0.214)	0.992** (0.454)	-0.412 (0.323)
		constant	2.105*** (0.179)	1.875*** (0.142)	4.822*** (0.222)	4.127*** (0.148)
		Observations	285	225	285	225
		R-squared	0.082	0.084	0.096	0.019
		F-test (H01)1	12.18	0.289	0.951	2.302
		Prob > F (H01)	0.00262	0.599	0.342	0.151
		F-test (H02)2	0.0348	5.139	0.00566	3.871
		Prob > F (H02)	0.854	0.0398	0.941	0.0693
		F-test (H03)3	0.762	1.683	0.275	0.150
		Prob > F (H03)	0.394	0.216	0.607	0.705
		Number of groups	19	15	19	15

Notes: Dependent variable is the year-on-year percentage change of real revenues (1a/1b) and real primary expenditures (2a/2b). All models include individual fixed effects.

Table 2c: Cyclical Reactions of Sub-national Revenues Net of Transfers

			(1a) FE	(1b) FE	(2a) FE	(2b) FE
			revenues		net revenues	
	groups	variables	sub-national			
federations	1995-2007	output gap	0.100 (0.117)	0.100 (0.117)	-0.036 (0.257)	-0.563 (0.329)
	Great Recession		1.151*** (0.345)	1.151*** (0.346)	1.841* (1.013)	1.773* (0.948)
unitary countries	1995-2007		0.797** (0.363)	0.867** (0.387)	0.247 (0.274)	0.202 (0.286)
	Great Recession		0.713* (0.365)	0.433* (0.238)	1.139*** (0.376)	1.070** (0.387)
		constant	2.105*** (0.179)	1.882*** (0.166)	3.086*** (0.194)	3.470*** (0.208)
		Observations	285	270	270	270
		R-squared	0.082	0.080	0.046	0.031
		Number of groups	19	18	18	18

Notes: Dependent variable is the year-on-year percentage change of real revenues as defined before (1a/1b). Model (2a) is the year-on-year change of real revenue net of transfers, Model (2b) net of transfers and shared taxes. All models include individual fixed effects.

**Table 3: Empirical Effects of Sub-national Fiscal Institutions**

Dep:Var.		(1)	(2)	(3)
sub-national budget balance as share of revenues				
budget balance (t-1)				0.496*** (0.063)
federations: tax autonomy (t-1)	all years	0.198** (0.076)		
	1995-2007		0.263*** (0.074)	0.145* (0.082)
	Great Recession		0.341* (0.185)	0.226* (0.120)
unitary countries: tax autonomy (t-1)	all years	-0.196 (0.116)		
	1995-2007		-0.146 (0.103)	-0.081 (0.082)
	Great Recession		-0.107 (0.105)	-0.051 (0.110)
federations: fiscal rules	all years	-2.021 (1.312)		
	1995-2007		-1.104 (1.301)	-1.406 (1.748)
	Great Recession		-5.340 (4.743)	-6.894** (3.187)
unitary countries: fiscal rules	all years	3.836** (1.452)		
	1995-2007		2.352** (1.065)	1.577 (1.669)
	Great Recession		3.482 (4.117)	1.380 (3.535)
central government deficit (share of revenues)		-0.028 (0.026)	-0.020 (0.028)	-0.002 (0.021)
expenditure decentralization		-0.345*** (0.086)	-0.379*** (0.103)	-0.219*** (0.062)
interest expenditures		-0.702 (0.425)	-0.610 (0.383)	-0.287 (0.306)
output gap		0.221 (0.131)	0.307** (0.145)	0.206* (0.118)
population (log)		-50.964*** (17.315)	-56.817*** (15.990)	-31.383** (14.351)
unemployment rate		-0.181 (0.226)	-0.158 (0.204)	-0.063 (0.133)
share of age >15 and <65		0.497 (0.602)	0.400 (0.543)	0.131 (0.390)
linear trend		-0.014 (0.135)	0.019 (0.148)	0.037 (0.107)
country fixed effects		yes	yes	yes
year fixed effects		no	no	no
R-squared		0.313	0.382	
Number of Groups		19	19	19
Number of Observations		285	285	285

Notes: Data for 1995-2010 included. Fixed effect estimates with robust standard errors (in parentheses). \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Constant terms not reported here. The dynamic estimation (3) is estimated with the biased corrected LSDV estimator (Bruno, 2005). Estimation initialized by the Arellano-Bond estimator. Standard errors are bootstrapped in that case.

**Table 4: Sub-national Fiscal Institutions and Cyclical Elasticity of Budget Balances**

Dep.Var.:		(1)	(2)	(3)	(4)
sub-national budget balance as share of revenues		(1)	(2)	(3)	(4)
federations: tax autonomy (t-1)	1995-2007	0.238*** (0.075)	0.236*** (0.074)	0.162** (0.071)	0.260*** (0.071)
	Great Recession	0.316 (0.183)	0.306* (0.177)	0.194 (0.161)	0.320* (0.169)
unitary countries: tax autonomy (t-1)	1995-2007	-0.125 (0.101)	-0.128 (0.103)	-0.129 (0.101)	-0.124 (0.104)
	Great Recession	-0.082 (0.100)	-0.085 (0.104)	-0.074 (0.101)	-0.081 (0.102)
federations: fiscal rules	1995-2007	-1.221 (1.405)	-1.079 (1.391)	-0.023 (1.225)	-0.864 (1.437)
	Great Recession	-4.570 (4.784)	-3.941 (4.460)	-0.874 (4.021)	-3.948 (4.370)
unitary countries: fiscal rules	1995-2007	2.273** (0.861)	2.274** (0.855)	2.150** (0.915)	1.227 (1.058)
	Great Recession	2.458 (4.181)	2.354 (4.221)	1.548 (4.918)	1.379 (4.260)
federations: output gap	all years	0.718*** (0.223)			
	1995-2007		0.486 (0.315)	-2.658** (1.089)	1.106* (0.600)
	Great Recession		0.997*** (0.217)	-0.458 (0.659)	1.005*** (0.345)
unitary countries: output gap	all years	0.180 (0.176)			
	1995-2007		0.195 (0.187)	0.054 (0.322)	-0.330 (0.365)
	Great Recession		0.170 (0.204)	0.517 (0.300)	0.467 (0.390)
federations: output gap * rules	1995-2007			4.902*** (1.613)	
	Great Recession			2.030** (0.747)	
unitary countries: output gap * rules	1995-2007			0.468 (0.601)	
	Great Recession			-0.540 (0.576)	
federations: output gap * tax autonomy (t-1)	1995-2007				-0.042 (0.028)
	Great Recession				-0.000 (0.023)
unitary countries: output gap * tax autonomy (t-1)	1995-2007				0.016* (0.008)
	Great Recession				-0.009 (0.009)
R-squared		0.372	0.378	0.412	0.396
Number of Groups		19	19	19	19
Number of Observations		285	285	285	285

Notes: Only main coefficients are presented. List of controls as before. Fixed effect estimates with robust standard errors.  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Table 5: Summary Statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max
<i>Dependent variable</i>					
budget balance <sup>1</sup>	304	-1.29	4.05	-25.81	9.07
<i>Main variables of interest</i>					
own tax revenues <sup>1</sup>	303	23.90	16.14	0.00	65.10
fiscal rules index	304	0.50	0.32	0.00	1.22
<i>Controls</i>					
output gap	304	0.18	2.02	-6.34	5.85
deficit central government <sup>1</sup>	304	10.38	14.91	-18.24	108.40
expenditure decentralization	304	25.46	13.22	4.33	65.90
interest expenditures <sup>1</sup>	304	2.24	1.72	0.34	7.82
total population (log)	304	16.50	1.29	12.91	18.23
unemployment rate	304	7.85	3.41	1.90	20.10
dependency ratio	304	66.90	1.19	63.67	68.82

Notes: 1) as shares of revenues

**Table 6: Average (1995-2010) Fiscal Rules Index and Tax Autonomy by Country**

Country	Rules Index	Tax Autonomy
Austria (local)	0,52	15,0
Austra (regional)	0,52	14,0
Belgium (local)	0,64	32,1
Belgium (regional)	0,60	12,2
Germany (local)	0,81	20,2
Germany (regional)	0,69	0,5
Denmark	0,34	43,6
Greece	0,00	6,1
Spain (local)	0,63	29,1
Spain (regional)	0,96	21,1
Finland	0,66	44,6
France	0,77	38,3
Ireland	0,23	7,0
Italy	0,45	28,6
Luxemburg	0,68	35,2
The Netherlands	0,00	8,5
Portugal	0,30	21,6
Sweden	0,54	62,5
United Kingdom	0,18	12,9

Notes: Average over the years 1995-2010 per country and level of government. The Rules Index is calculated as described in the text. Tax autonomy refers to the share of revenues which are generated by tax instruments where the sub-national jurisdiction can decide autonomously over tax rates.