

# DISCUSSION PAPER SERIES

No. 9154

## FISCAL FEDERALISM IN TIMES OF CRISIS

Dirk Foremny and Jürgen von Hagen

*PUBLIC POLICY*



**Centre for Economic Policy Research**

[www.cepr.org](http://www.cepr.org)

Available online at:

[www.cepr.org/pubs/dps/DP9154.asp](http://www.cepr.org/pubs/dps/DP9154.asp)

# FISCAL FEDERALISM IN TIMES OF CRISIS

Dirk Foremny, Universidad de Barcelona  
Jürgen von Hagen, BRUEGEL, Universität Bonn and CEPR

Discussion Paper No. 9154  
September 2012

Centre for Economic Policy Research  
77 Bastwick Street, London EC1V 3PZ, UK  
Tel: (44 20) 7183 8801, Fax: (44 20) 7183 8820  
Email: [cepr@cepr.org](mailto:cepr@cepr.org), Website: [www.cepr.org](http://www.cepr.org)

This Discussion Paper is issued under the auspices of the Centre's research programme in **PUBLIC POLICY**. Any opinions expressed here are those of the author(s) and not those of the Centre for Economic Policy Research. Research disseminated by CEPR may include views on policy, but the Centre itself takes no institutional policy positions.

The Centre for Economic Policy Research was established in 1983 as an educational charity, to promote independent analysis and public discussion of open economies and the relations among them. It is pluralist and non-partisan, bringing economic research to bear on the analysis of medium- and long-run policy questions.

These Discussion Papers often represent preliminary or incomplete work, circulated to encourage discussion and comment. Citation and use of such a paper should take account of its provisional character.

Copyright: Dirk Foremny and Jürgen von Hagen

## **ABSTRACT**

### **Fiscal Federalism in Times of Crisis\***

We study the subnational fiscal adjustment to the Great Recession in a sample of European countries. We find that there are important differences between unitary and federal countries. Subnational governments in federal states reacted to the Great Recession by running larger budget deficits driven by increased spending particularly on social protection and weak revenue performance. In contrast the revenues of subnational governments in unitary states increased during the Great Recession due to larger transfers from central governments. Subnational government deficits increased much less in unitary states as real spending growth fell.

In unitary states that fell into a debt crisis after 2009, the central government failed to shield local governments against the adverse macroeconomic consequences of the Great Recession, forcing them to adjust real spending to falling real revenues. This result suggests that sound public finances at the central level are critical to assure that subnational governments can deliver their allocative functions efficiently in the face of adverse macroeconomic conditions. In fact, our results call for tighter controls on expenditure growth during goods times and better protection against falling subnational revenues in bad times.

We find that the countries that fell into a debt crisis after 2009 are characterized by weaker fiscal discipline at the subnational level already in the decade or so before the Great Recession. This observation suggests that the sustainability of subnational public finances is an important prerequisite for a country to maintain sustainable public finances at the level of general government.

JEL Classification: H12, H71 and H72

Keywords: European public debt crisis, fiscal federalism, great recession and vertical imbalance

Dirk Foremny  
IEB, University of Barcelona  
690 Avenida Diagonal  
08034 Barcelona  
SPAIN

Email: [dforemny@uni-bonn.de](mailto:dforemny@uni-bonn.de)

For further Discussion Papers by this author see:  
[www.cepr.org/pubs/new-dps/dplist.asp?authorid=176300](http://www.cepr.org/pubs/new-dps/dplist.asp?authorid=176300)

Jürgen von Hagen  
IIW, Universität Bonn  
Lennestrasse 37  
53113 Bonn  
GERMANY

Email: [vonhagen@uni-bonn.de](mailto:vonhagen@uni-bonn.de)

For further Discussion Papers by this author see:  
[www.cepr.org/pubs/new-dps/dplist.asp?authorid=110199](http://www.cepr.org/pubs/new-dps/dplist.asp?authorid=110199)

\*Disclaimer: The views expressed in this paper do not represent the views of the Portuguese Public Finance Council.

Submitted 20 September 2012

## 1. Introduction

In all countries, government consists of several layers, local, regional, and central. While local governments are typically charged with the provision of a large range of public goods and services, from water and sewage to parks, schools, and hospitals, central governments are charged with macroeconomic stabilization, redistributive policies, country-wide public goods such as national defense, and regional governments stand somewhere in between, providing public goods and services with a larger than local geographical incidence, and making use of economies of scale in the provision of public goods and services.<sup>1</sup> The most important taxes, those on personal and corporate income and value added, are typically collected at the central or regional level to avoid detrimental tax competition at the local level. This leaves local governments with own taxes characterized by relatively small tax bases and revenues and taxes shared with higher-level governments. As a result, these different layers of government are interlinked by flows of financial funds and net flows are typically top-down, i.e., central and, where they exist, regional governments pay net transfers to local governments. The degree of “vertical imbalance”, defined as the share of local government spending financed out of transfers from higher-level governments is an important characteristic of the organization of a country’s public finances.

Individual countries are commonly classified as either unitary or federal. A typical unitary country has two layers of elected governments, local and central. Local governments have limited authority to manage their own affairs and depend strongly on transfers from the central government.<sup>2</sup> In contrast, a typical federal country has three layers of elected governments, local, regional (state), and central. Local and regional governments have considerable freedom to manage their own affairs and depend much less financially on the central government than local governments in unitary states.<sup>3</sup> Thus, existing designs of the public sector involve a trade-off between political autonomy and financial dependence at the local level: The larger the degree of political autonomy, the smaller the degree of financial dependence of local from central governments, i.e. the lower the degree of vertical imbalance.

Economists commonly perceive and justify this trade-off on efficiency grounds. In countries where differences between local economic circumstances and local preferences over public goods are large, local governments must be able to respond to local circumstances to deliver public goods and services efficiently. However, this ability

---

<sup>1</sup> This corresponds to the classical assignment of responsibilities by Musgrave (1959, 1971).

<sup>2</sup> Where regional governments exist, they are typically not elected and serve as administrative units.

<sup>3</sup> Obviously, this is only a coarse classification and intermediate cases exist. For example, the combination of two layers of government and a high degree of autonomy of local governments in Scandinavian countries is sometimes called “Scandinavian federalism”, see Rattso (1998).

must be combined with at least some responsibility for financing the public goods and services delivered out of taxes collected locally to avoid problems of moral hazard and free riding leading to excessive spending at the local level. Therefore, a high degree of local political autonomy must be combined with a low degree of vertical imbalance. In contrast, when differences between local economic circumstances and preferences are small, efficient provision of local public goods and services is possible with a lower degree of autonomy granted to local governments and a higher degree of vertical imbalance.

The recent economic and financial crisis, commonly dubbed the Great Recession, leads us to consider the trade-off between the autonomy of subnational governments and the degree of vertical imbalance from a different perspective. This crisis, which hit European economies in 2007 after a string of years of relatively strong growth, caused a sharp decline in public revenues and an increase in public spending due to automatic stabilizers and discretionary macroeconomic stabilization policies. Public sector balances worsened in all European countries as a result. The question we raise in this paper is, how was the fiscal adjustment to the Great Recession distributed between central and subnational governments? In view of the trade-off between political power and financial dependence, the answer to this question is not obvious. On the one hand, central governments might use their greater financial strength to shield local governments against the impact of the crisis. This would involve an increase in the transfers from central to local governments and, therefore, an increase in the degree of vertical imbalance during the crisis. On the other hand, central governments might use their greater political power to force local governments to absorb a greater part of the required fiscal adjustment by cutting transfers and forcing local governments to cut spending by more than in the first scenario. Apriori, it seems plausible that federal systems would tend to be closer to the second alternative and unitary systems closer to the first. The difference between the two scenarios matters, since allocative efficiency calls for a high degree of stability in the provision of local public goods and services, and would seem greater in the first.

Empirical studies of the public finance ramifications of the Great Recession are scarce so far. Ter-Minassian and Fedelino (2010) discuss the impact of the Great Recession on sub-national government finance on qualitative grounds as data was not available. Most of their considerations are in line with our quantitative results presented below. Blöchliger et al. (2010) tackle the hurdle of missing data by using budget projections and results from questionnaires for a sample of OECD countries. Their paper focuses on the cyclical behavior of sub-national public-finances and national stimulus packages. Interestingly, their results indicate that part of some countries' stimulus packages consisted of grants and transfers to sub-national governments. The authors conclude that coordination of the reactions of central and sub-central governments to the Great Recession is essential to ensure that the financial stimulus efforts are as effective as

possible. Jonas (2012) uses US data and documents a sharp decline in sub-national tax revenues due to the Great Recession. He discusses the procyclical policy reactions which occur due to borrowing limitations at the state and municipal level. The institutional set-up in European countries, however, differs substantially. Our analysis contributes to the literature by using most recent European sub-national fiscal data to study the differences between unitary and federal states.

The remainder of this paper is organized as follows. Section 2 describes the impact of the Great Recession in terms of output gaps and government balances. Section 3 analyzes the response of the main budgetary aggregates of subnational governments during the Great Recession. Section 4 delves deeper into the material by distinguishing between the countries that fell into a public debt crisis after 2009 and those that did not. Section 5 concludes.

## **2. The Fiscal Impact of the Great Recession**

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. For reasons of data availability, we distinguish between two levels of government in our empirical work: central government and subnational government, which 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 the beginning of the euro in 1995 to 2010, as more recent public finance data does not yet exist for all countries. Therefore, we cannot study the European public debt crisis in more detail.

Figures 1 and 2 show the development of central government and subnational budget balances over the entire period. Figure 1 has the federations in the sample, while Figure 2 shows the data for the unitary states. The vertical red lines mark the beginning of the Great Recession. Clearly, central government balances turned negative with the onset of the recession everywhere. The evidence for subnational balances is more mixed. In the federations, subnational balances turn negative, too. In unitary states, however, no such general trend can be observed.

Figure 3 shows the development of the output gap over the sample period and for the sample countries. While the performance of individual countries was quite different in the period from 1995 to 2006, it is obvious from the large increase in the negative output gaps that the Great Recession hit all of them simultaneously in 2007. This provides a natural basis for the comparison we have in mind in this paper.

Table 1 shows the shares of the main budget categories for subnational governments before the Great Recession. On the revenue side, revenues from tax bases where the sub-national jurisdiction has the power to change the tax rate autonomously (own taxes) have to be distinguished from taxes which are collected with a tax rate common to all jurisdictions and redistributed to regions or municipalities (shared taxes).<sup>4</sup> Subnational governments in unitary states have a much larger share of own taxes and a much smaller share of shared taxes than subnational governments in federal states. Furthermore, subnational governments in unitary states finance themselves much more out of fees than subnational governments in federal states. Finally, subnational governments in unitary states receive relatively more transfers than subnational governments in federal states. These differences, except for transfers, are also statistically significant.<sup>5</sup>

On the expenditure side, subnational governments in federal states have a larger share of spending on public services and education than subnational 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.

Table 2 shows the response of central and subnational 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. We use the ratio of budget balances to total revenues instead of the more commonly used ratio of budget balances to GDP, because consistent GDP data do not exist at the subnational level for all countries. Furthermore, this takes into account the different size of sub-national sectors relative to their capacity to raise revenues. 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.

Things are different at the subnational level, however. Table 2 shows that, in the years before the Great Recession, subnational budget balances in federal states responded

---

<sup>4</sup> The exact definition follows the OECD Fiscal Decentralization Database. We computed the share of own revenues according to this definition for all years covered in our dataset. For a more detailed discussion, see Foremny (2012)

<sup>5</sup> Here and in what follows, we test this hypothesis with common F-tests. Results are shown in the respective table. We also present p-values for all performed test statistics.



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 subnational budget balances by 0.7 percent of aggregate revenues, which corresponds to about one fifth of the reaction of central government balances. Subnational governments in European federal states thus behave anti-cyclically and pick up part of the macro economic adjustment to a widening recession. During the Great Recession, the reaction of subnational budgets to the output gap more than doubled, mimicking the stronger response of central government budgets to the recession.

The behavior of aggregate subnational government balances in unitary states is remarkably different. Table 2 shows that, before the Great Recession, subnational 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 subnational 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 subnational government finances between federal and unitary states is open to a number of different interpretations. One is that, in unitary states, central governments protect subnational governments against macro economic developments, and that central governments in federal states do not do that to the same extent. In a sense, the greater exposure of subnational governments to macro economic shocks in federal states could be interpreted as the price these governments have to bear for enjoying greater independence from the central government. If subnational governments borrow to keep their expenditures for the provision of public goods and services stable in the face of adverse macro economic shocks, the cost of borrowing could be interpreted as the price they pay for enjoying a greater political freedom. In contrast, subnational governments in unitary states are insured against macro economic shocks, but they enjoy less independence from the central government in return.

The other interpretation is that the different reactions of subnational budget balances to macro economic shocks reflect different degrees in the ability and legal authority of subnational governments to borrow in their own right. If subnational governments in unitary states are more restricted in this regard than subnational governments in federations, the result that subnational balances in unitary states do not react to macro economic shocks might indicate that subnational 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 in unitary states than in federal states. In the next sections, we will explore these different interpretations in more detail.

### 3. Subnational fiscal adjustment to the Great Recession

Figure 4 shows the average annual growth rates of real subnational 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 subnational 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 3 shows how subnational governments performed in the period before the Great Recession and how they adjusted the revenue side of their budgets to the Great Recession. The first column shows the average budget balance as a ratio of total revenues for the period from 1995 to 2007 (pre-crisis) and during the Great Recession (2008-2010, crisis). Consider the pre-crisis period first. As suggested by Figure 4 already, average deficits at the subnational level were much larger in federal countries than in unitary countries. Total real revenues were growing on average in both groups, but more so in unitary states. While real revenues from both own taxes and shared taxes were growing at significantly positive rates in both groups, the main difference between the two was that the growth of transfers and fee incomes was highly significantly positive in unitary states but only weakly significant or not significant at all in federal states.

During the Great Recession, more differences emerged between the two groups. While the average deficit widened in both countries, it did much more so in federal states. The average deficit of federal countries during the Great Recession is statistically

significantly different from that of unitary countries. This is consistent with our observations from Table 1. While the growth rates of real revenues from all sources except transfers from above and fees turned negative (though not significantly so) for federal countries, the pattern is much more mixed in unitary countries, where revenues from shared taxes actually increased (though not significantly). In part, at least, this reflects deliberate policies on the part of central governments which increased the subnational governments' share in these revenues. In Finland, for example, the subnational governments' share of corporate tax income was raised by 10 percentage points to 32 percent for the fiscal years 2009 to 2011. This indicates that the distinction between transfers from the central government and revenues from shared taxes is somewhat murky in unitary countries; if the central government can change the distribution of shared taxes between the two levels of government, shared taxes are much like transfers from the central to local governments.<sup>6</sup> Subnational governments in federal countries saw a significant growth in revenue from fees during the Great Recession, which cannot be observed for subnational governments in unitary countries. The latter, however, saw a significant increase in transfers from the central government during the Great Recession which did not occur in federal states. This suggests that the degree of vertical imbalance increased in unitary states but not in federal states, and that subnational governments in the latter group took much stronger recourse to fees to finance their activities than subnational governments in unitary states. This pattern is also confirmed by the statistical tests in Table 3. Deficits, total revenues and total tax revenues grew at significantly different rates before and during the Great Recession in both groups.

Table 4 provides similar data for the expenditure side of the budget. During the period before the Great Recession, subnational government real spending was growing at significantly positive rates in both groups, but the average growth rate in unitary states was about twice the rate in federal states. During the Great Recession, total subnational spending grew significantly and at a higher rate than before in federal countries. This growth can be mainly attributed to a strong increase in the growth rate of real spending on social protection. In unitary states, the growth rate of total real spending fell and became non-significant during the Great Recession. The largest declines in real spending growth occurred in the areas of environmental protection, housing and community amenities, and education. Comparing Tables 3 and 4, it seems that increasing real expenditures contributed significantly to the emergence of subnational budget deficits in federal states, while subnational budget deficits in unitary states were mainly due to declining revenues.

---

<sup>6</sup> For a similar observation in Portugal, see Portuguese Council of Public Finances (2012).

#### 4. Subnational fiscal performance in the debt crisis countries

Tables 5 and 6 provide similar data as Tables 3 and 4, but they distinguish between those countries that fell into public debt crises after 2009 and the rest. Among the federal states, we count Spain as a crisis country. Among the unitary states, the crisis countries are Greece, Ireland, Italy, and Portugal.

Table 5 considers the budget balance ratios and real revenue growth rates. Clearly, subnational governments in crisis countries had much larger deficits relative to total revenues already before the Great Recession and these deficits widened both relative to total revenues and compared to non-crisis countries during the Great Recession. Note that subnational governments in unitary non-crisis countries had practically balanced budgets over the period from 1996 to 2007, while subnational governments in crisis countries had an average deficit of 1.4 percent of total revenues. Table 5 thus indicates that there was a lack of fiscal discipline at the subnational level in (what later turned out to be) the crisis countries already before the Great Recession, and that subnational government budgets in countries that fell into a debt crisis seem much more exposed to cyclical downturns than in subnational government budgets in non-crisis countries.

Turning to the growth rates of real revenues, Table 5 shows that subnational governments in crisis countries generally had much stronger revenue growth in the years before the Great Recession and experienced a much stronger decline in revenue growth during the Great Recession than subnational governments in non-crisis countries. Finally, the Table shows that there are interesting differences between unitary non-crisis and crisis states. In the first group, transfers to subnational governments increased significantly already before the Great Recession, and central governments stepped up their transfers even more during the Great Recession. This group thus corresponds very well to the paradigm of central governments insuring subnational governments against losses of tax revenues in bad times. In contrast, transfers to subnational governments grew significantly neither before nor during the Great Recession in the crisis countries, resulting in much more procyclical revenues in these countries.

Turning to the expenditure side, Table 6 suggests that, in the group of federal states, subnational government real spending did not grow significantly on average over the period before the Great Recession in the non-crisis countries, but subnational governments increased spending significantly and mostly on social protection during the Great Recession. In the crisis countries, in contrast, subnational government spending grew very rapidly and in all categories already before the Great Recession. When the recession hit, subnational governments had to increase spending on social protection and cut spending growth in all other categories.

Among the unitary states, we observe that subnational government real spending grew much faster in the crisis states than in the non-crisis states before the Great Recession. With the onset of the recession, subnational governments in non-crisis states managed to maintain a stable spending growth rate both for total spending and for most individual categories, only spending on social protection grew much more rapidly than before. The crisis states, in contrast, had to cut spending growth drastically, resulting in negative growth rates for total spending and several individual categories including social protection.

## 5. Conclusions

This paper has studied the subnational fiscal adjustment to the Great Recession in a sample of European countries. We find that the Great Recession had important ramifications for public finances in the sample countries, and that there are important differences between unitary and federal countries.

Our results show that subnational governments in federal states reacted to the Great Recession by running larger budget deficits driven by increased spending particularly on social protection and weak revenue performance. In contrast the revenues of subnational governments in unitary states increased during the Great Recession due to larger transfers from central governments. Subnational government deficits increased much less in unitary states as real spending growth fell.

Several different patterns of adjustment to the Great Recession emerge. Unitary countries that did not fall into a debt crisis later conform most to the paradigm of a country where a financially and politically strong central government shields local governments against the effects of adverse macro economic shocks, allowing them to maintain a stable provision of local public goods and services. In federal countries that did not fall into a debt crisis later, subnational governments managed to borrow to stabilize their spending on the provision of public goods and services while increasing their spending on social protection. These countries conform most to the paradigm of a federalist model where the cost of borrowing during adverse macro economic times is the price subnational governments pay for their greater independence from the central government.

In unitary states that fell into a debt crisis, the central government failed to shield local governments against the adverse macro economic consequences of the Great Recession, forcing them to adjust real spending to falling real revenues. As a result, subnational governments performed more pro-cyclically than in the non-crisis group. It is likely that this had more adverse consequences for the efficiency of the provision of local

public goods and services than in the former group of unitary countries. This result suggests that sound public finances at the central level are critical to assure that subnational governments can deliver their allocative functions efficiently in the face of adverse macro economic conditions. In fact, our results suggest that greater allocative efficiency in unitary states calls for tighter controls on expenditure growth during goods times and better protection against falling subnational revenues in bad times.

Similarly, subnational governments in Spain, the crisis country among the federal countries in our sample, had to revert drastically the previously fast growth of real spending during the Great Recession, probably with adverse allocative consequences for the provision of local public goods and services. Our results suggest that subnational governments in Spain rely on revenues from taxes which are more cyclically elastic than subnational governments in other European federations, and that they let their real expenditures grow much faster in good times than subnational governments in the other federations. A more efficient model of federalism would call for a higher degree of fiscal discipline at the subnational level in good times to assure that subnational governments can sustain the anti-cyclical adjustment the federal model requires of them in bad times.

We find that the countries that fell into a debt crisis after the Great Recession are characterized by weaker fiscal discipline at the subnational level already in the decade or so before the Great Recession. While we cannot make any assertions about causality between these two based on our data, this observation suggests that the sustainability of subnational public finances is an important prerequisite for a country to maintain sustainable public finances at the level of general government in the face of adverse macro economic developments. Paying attention to this prerequisite is important for both federal and unitary states and justifies the imposition of appropriate fiscal rules by the central government in both types of systems, even if the design of such rules is likely to differ between them.

## References

Blöchliger, Hansjörg, Monica Brezzi, Claire Charbit, Mauro Migotto, José Maria Pinero Campos, Camila Vammalle (2010), "Fiscal Policy Across Levels of Government in Times of Crisis", OECD Working Papers on Fiscal Federalism, No. 12, OECD Publishing

Foremny, Dirk (2012), Vertical aspects of sub-national deficits: the impact of fiscal rules and tax autonomy in European countries, MPRA Working Paper

Jonas, Jiri (2012), Great Recession and Fiscal Squeeze at U.S. Subnational Government Level, IMF Working Paper 12/184

Musgrave, Richard A. (1959), *The Theory of Public Finance*. New York: McGraw Hill

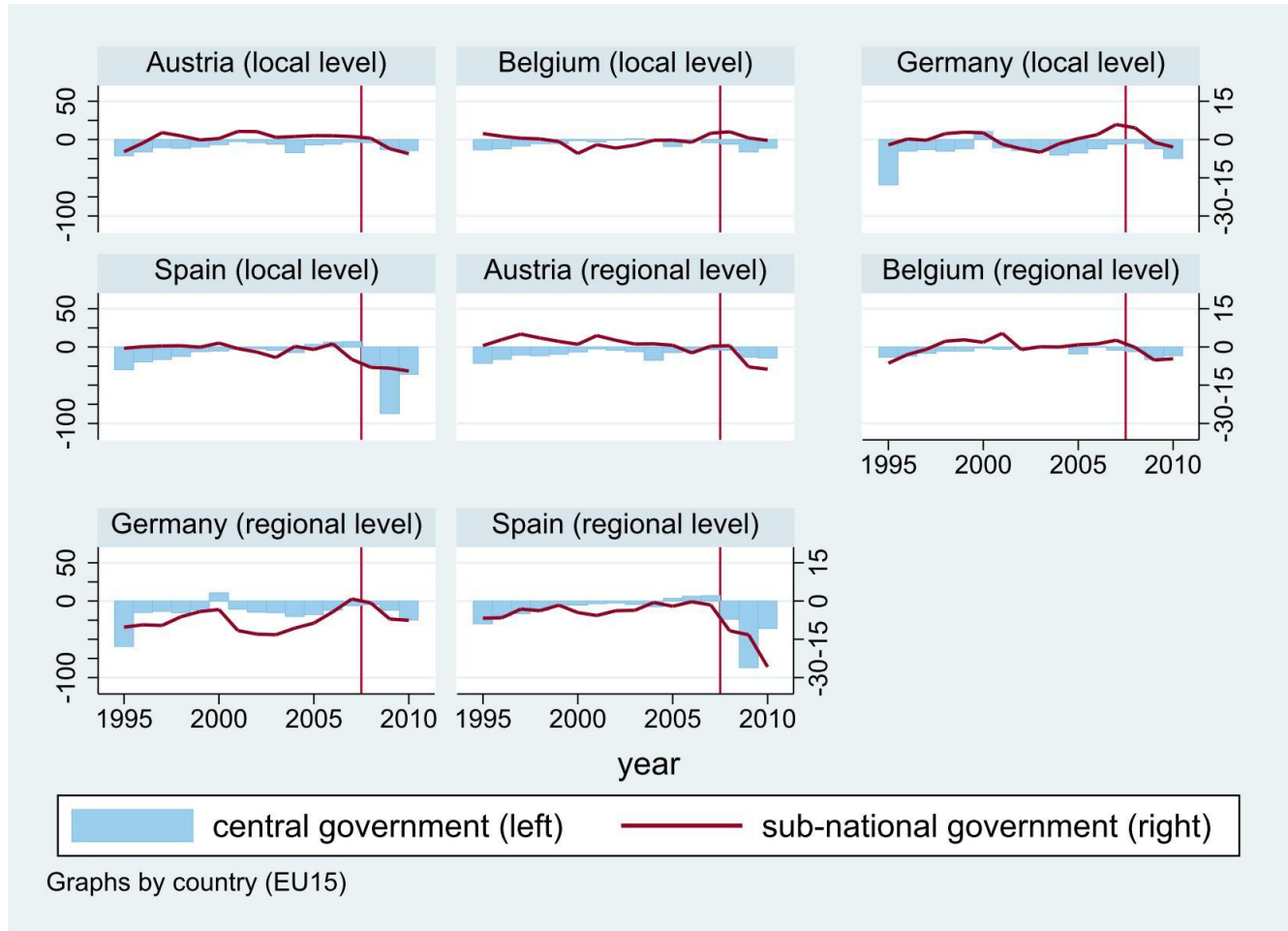
Musgrave, Richard A. (1971), Economics of Fiscal Federalism, Nebraska Journal of Economics and Business, Vol. 10, No. 4, pp. 3-13

Portuguese Council on Public Finances (2012), *Principles for Revising Subnational Public Finance Laws*. Lisbon

Ter-Minassian, Teresa and Annalisa Fedelino (2010), Impact of the Global Crisis on Sub-National Governments' Finances, Bank of Italy Occasional Paper

## Figures

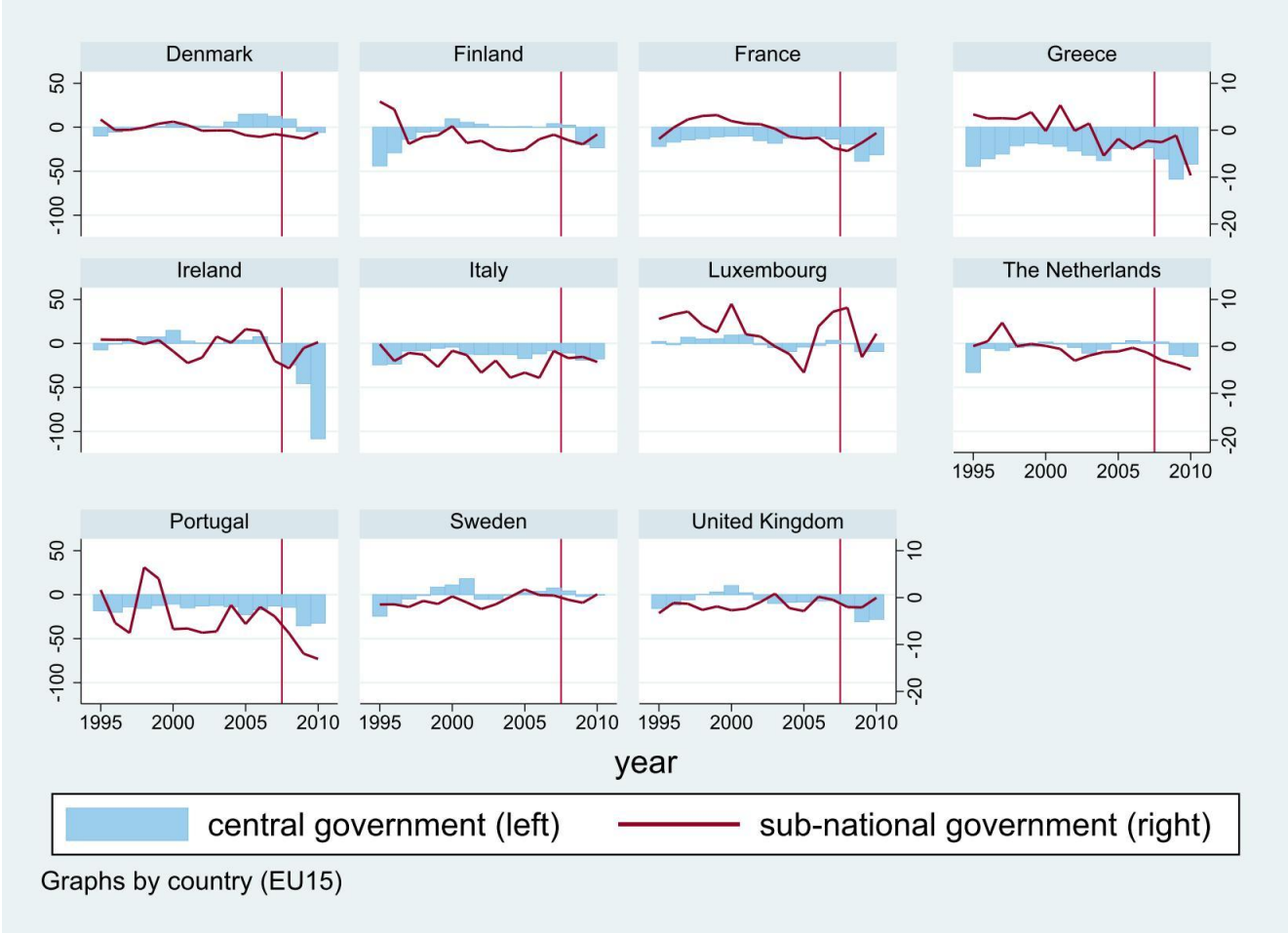
Figure 1: **Central and sub-national budget balances in federal countries.**



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



Figure 2: Central and sub-national budget balances in unitary countries.



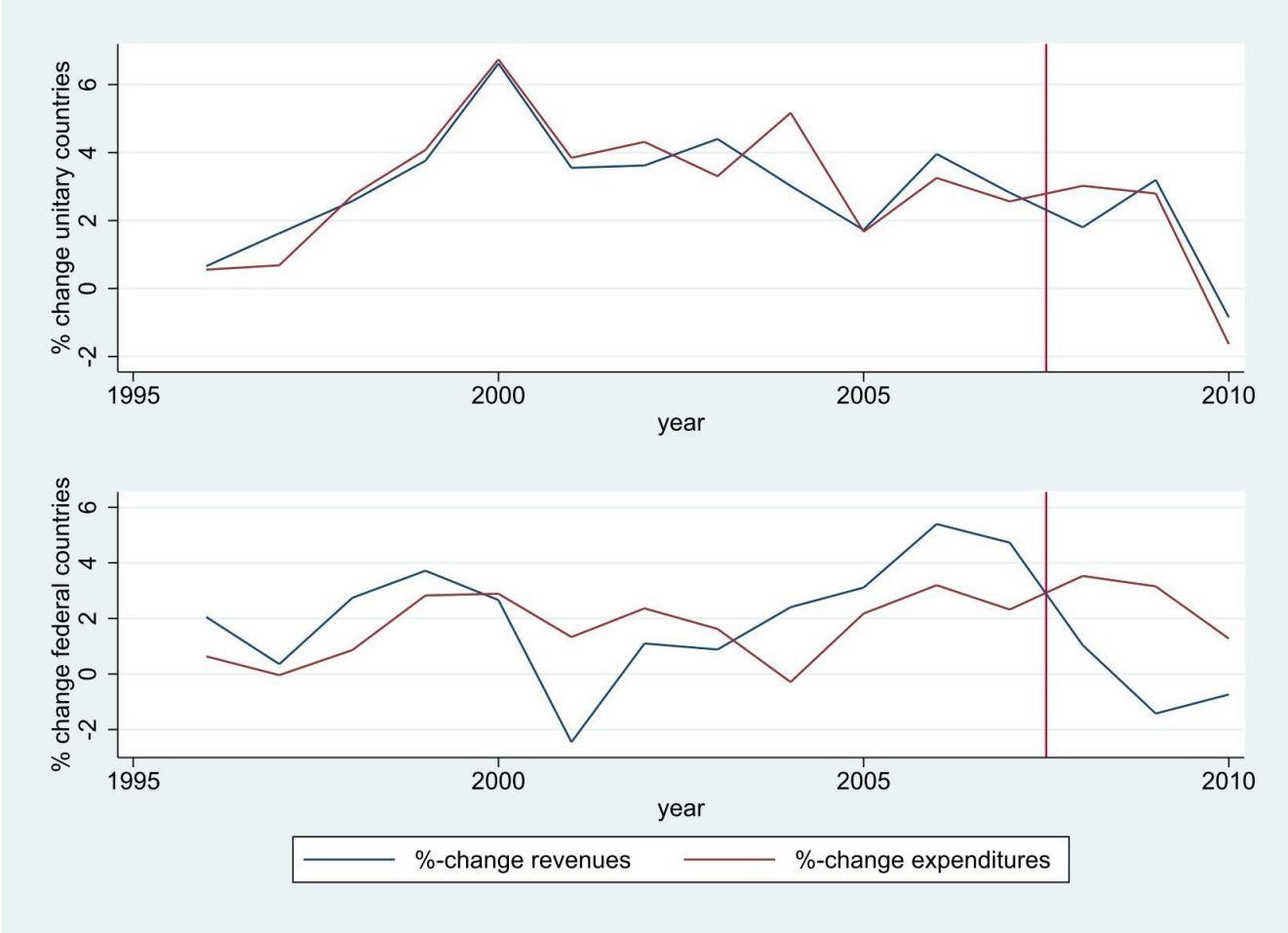
Notes: Budget balances as share of revenues. Data based on EUROSTAT and own calculations.

Figure 3: Output gap and impact of the crisis.



Notes: Data based on EUROSTAT

Figure 4: Year-on-year percentage change of revenues and expenditures.



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

## Tables

Table 1: **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 2: Cyclical response of budget balances.

| groups                                      | variables                 | (1a) CS                             | (1b) FE                 | (2a) CS                 | (2b) FE                 |
|---|---------------------------|-------------------------------------|-------------------------|-------------------------|-------------------------|
|   |                           | budget balance as share of revenues |                         |                         |                         |
|   |                           | sub-national                        |                         | central                 |                         |
| federations: before crisis<br>(up to 2007)  | output gap                | <b>0.41*</b><br>(0.23)              | <b>0.70**</b><br>(0.29) | <b>3.9***</b><br>(0.69) | <b>3.4***</b><br>(0.77) |
| federations: Great Recession<br>(2008-2010) |                           | <b>2.8***</b><br>(0.48)             | <b>1.8***</b><br>(0.44) | <b>6.7**</b><br>(2.9)   | <b>6.2**</b><br>(2.8)   |
| unitary: before crisis<br>(up to 2007)      |                           | 0.004<br>(0.19)                     | 0.05<br>(0.13)          | <b>2.2***</b><br>(0.44) | <b>2.3***</b><br>(0.51) |
| unitary: Great Recession<br>(2008-2010)     |                           | <b>0.46***</b><br>(0.18)            | 0.31<br>(0.20)          | <b>4.3***</b><br>(1.4)  | <b>4.5***</b><br>(1.5)  |
|   | interest                  | -0.05***<br>(0.01)                  | 0.04*<br>(0.02)         | -2.8***<br>(0.43)       | -3.3***<br>(0.9)        |
|   | constant                  | 0.37<br>(0.38)                      | -2.2***<br>(0.6)        | -1.5<br>(1.4)           | -0.2<br>(2.7)           |
|   | Observations              | 304                                 | 304                     | 240                     | 240                     |
|   | R-squared                 | 0.247                               | 0.223                   | 0.369                   | 0.427                   |
|   | F-test (H01) <sup>1</sup> | 9.7                                 | 3.8                     | 0.93                    | 1.4                     |
|   | Prob > F (H01)            | 0.00                                | 0.07                    | 0.34                    | 0.26                    |
|   | F-test (H02) <sup>2</sup> | 2.8                                 | 1.0                     | 2.1                     | 2.7                     |
|   | Prob > F (H02)            | 0.09                                | 0.33                    | 0.15                    | 0.13                    |
|   | F-test (H03) <sup>3</sup> | 10.2                                | 9.7                     | 0.60                    | 0.29                    |
|   | Prob > F (H03)            | 0.00                                | 0.01                    | 0.44                    | 0.60                    |
|   | Number of code            |                                     | 19                      |                         | 15                      |

Notes: Robust standard errors in parentheses. 1) F-Test  $H_0^1$  for equal coefficients of both periods in federations, 2) F-Test  $H_0^2$  for equal coefficients of both periods in unitary countries, 3) F-Test  $H_0^3$  for equal coefficients of unitary countries and federations during the crisis. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 3: Short-term changes in fiscal policy - revenues.

|             |                           | (1)                                 | (2)          | (3)    | (3a)    | (3b)       | (6)       | (7)    | (8)    |
|-------------|---------------------------|-------------------------------------|--------------|--------|---------|------------|-----------|--------|--------|
|             |                           | deficit                             | revenue side |        |         |            |           |        |        |
| groups      |                           | budget balance as share of revenues | total        | tax    | own tax | shared tax | transfers | fees   | other  |
| federations | before crisis             | -1.2***                             | 1.9***       | 5.4*** | 7.9**   | 5.2*       | 1.8*      | 0.03   | 1.8*   |
|             | (up to 2007)              | (0.38)                              | (0.49)       | (1.9)  | (3.8)   | (3.2)      | (1.0)     | (1.1)  | (1.1)  |
|             | Great Recession           | -5.1***                             | -0.27        | -0.82  | -3.0    | -1.4       | 1.5       | 2.0*** | -0.95  |
|             | (2008-2010)               | (1.3)                               | (0.75)       | (1.8)  | (1.8)   | (1.8)      | (1.9)     | (0.59) | (2.0)  |
| unitary     | before crisis             | -0.45*                              | 3.2***       | 4.2*** | 5.5***  | 3.3*       | 2.8***    | 3.5*** | 3.8*** |
|             | (up to 2007)              | (0.27)                              | (0.57)       | (0.68) | (1.5)   | (1.7)      | (1.0)     | (0.46) | (1.3)  |
|             | Great Recession           | -2.5***                             | 0.92         | -0.21  | -2.4    | 0.15       | 4.8***    | 1.12   | -1.9   |
|             | (2008-2010)               | (0.68)                              | (1.0)        | (1.2)  | (3.1)   | (4.7)      | (1.8)     | (0.77) | (3.4)  |
|             | Observations              | 304                                 | 285          | 285    | 285     | 285        | 270       | 285    | 270    |
|             | R-squared                 | 0.18                                | 0.16         | 0.10   | 0.05    | 0.02       | 0.07      | 0.10   | 0.05   |
|             | F-test (H01) <sup>1</sup> | 8.46                                | 5.70         | 5.54   | 6.52    | 3.37       | 0.02      | 2.29   | 1.51   |
|             | Prob > F (H01)            | 0.00                                | 0.02         | 0.02   | 0.01    | 0.07       | 0.88      | 0.13   | 0.22   |
|             | F-test (H02) <sup>2</sup> | 8.20                                | 3.95         | 10.31  | 5.42    | 0.40       | 1.00      | 6.82   | 2.44   |
|             | Prob > F (H02)            | 0.00                                | 0.05         | 0.00   | 0.02    | 0.53       | 0.32      | 0.01   | 0.12   |
|             | F-test (H03) <sup>3</sup> | 3.11                                | 0.90         | 0.08   | 0.02    | 0.10       | 1.62      | 0.75   | 0.06   |
|             | Prob > F (H03)            | 0.08                                | 0.35         | 0.78   | 0.88    | 0.76       | 0.20      | 0.39   | 0.81   |

Notes: From (2) onwards year on year percentage growth rates of budgetary categories in real values. Robust standard errors in parentheses. 1) F-Test  $H_0^1$  for equal coefficients of both periods in federations, 2) F-Test  $H_0^2$  for equal coefficients of both periods in unitary countries, 3) F-Test  $H_0^3$  for equal coefficients of unitary countries and federations during the crisis. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 4: Short-term changes in fiscal policy - expenditures.

| groups      |                             | (9)              | (10)             | (11)              | (12)             | (13)                    | (14)             | (15)                   | (16)                            | (17)            | (18)                              | (19)             |
|-------------|-----------------------------|------------------|------------------|-------------------|------------------|-------------------------|------------------|------------------------|---------------------------------|-----------------|-----------------------------------|------------------|
|             |                             | total            | public services  | social protection | defense          | public order and safety | economic affairs | environment protection | housing and community amenities | health          | re-creation, culture and religion | education        |
| federations | before crisis (up to 2007)  | 1.5***<br>(0.51) | 1.2**<br>(0.56)  | 2.4***<br>(0.67)  | -0.22<br>(1.2)   | 3.4***<br>(1.2)         | 1.9**<br>(0.83)  | 1.0<br>(1.9)           | 0.89<br>(1.7)                   | 4.5**<br>(2.0)  | 3.7***<br>(1.2)                   | 1.6**<br>(0.78)  |
|             | Great Recession (2008-2010) | 2.6***<br>(0.49) | 2.7**<br>(1.3)   | 4.5***<br>(0.92)  | 4.5<br>(3.7)     | 1.7*<br>(0.92)          | 2.4*<br>(1.3)    | 0.58<br>(1.3)          | 1.5<br>(2.8)                    | 3.1***<br>(1.1) | 1.1<br>(0.78)                     | 2.8***<br>(0.75) |
| unitary     | before crisis (up to 2007)  | 3.4***<br>(0.60) | 3.2***<br>(0.88) | 8.5*<br>(4.8)     | 179.1<br>(180.2) | 2.3***<br>(0.79)        | 4.2***<br>(1.1)  | 5.3***<br>(0.7)        | 3.7**<br>(1.5)                  | 4.5**<br>(2.2)  | 3.5***<br>(0.85)                  | 4.1***<br>(0.54) |
|             | Great Recession (2008-2010) | 1.4<br>(0.97)    | 1.2<br>(1.9)     | 2.9<br>(2.3)      | -1.0<br>(0.74)   | 3.4**<br>(1.3)          | 1.4<br>(1.5)     | -1.2<br>(1.6)          | 0.7<br>(3.5)                    | 6.5<br>(9.1)    | 2.0<br>(1.4)                      | 0.02<br>(1.7)    |
|             | Observations                | 285              | 285              | 285               | 285              | 285                     | 285              | 285                    | 285                             | 285             | 285                               | 285              |
|             | R-squared                   | 0.17             | 0.08             | 0.03              | 0.01             | 0.08                    | 0.08             | 0.08                   | 0.02                            | 0.03            | 0.10                              | 0.16             |
| H0-1        | F-test (federations)        | 2.17             | 1.10             | 3.29              | 1.51             | 1.31                    | 0.10             | 0.04                   | 0.04                            | 0.33            | 3.40                              | 1.13             |
|             | Prob > F (federations)      | 0.14             | 0.30             | 0.07              | 0.22             | 0.25                    | 0.76             | 0.85                   | 0.85                            | 0.56            | 0.07                              | 0.29             |
| H0-2        | F-test (unitary countries)  | 3.07             | 0.75             | 1.11              | 1.00             | 0.46                    | 2.19             | 14.15                  | 0.59                            | 0.04            | 0.80                              | 4.94             |
|             | Prob > F (unitary)          | 0.08             | 0.39             | 0.29              | 0.32             | 0.50                    | 0.14             | 0.00                   | 0.44                            | 0.83            | 0.37                              | 0.03             |
| H0-3        | F-test (crisis)             | 1.05             | 0.32             | 0.44              | 2.14             | 1.12                    | 0.22             | 0.79                   | 0.03                            | 0.13            | 0.30                              | 2.09             |
|             | Prob > F (crisis)           | 0.31             | 0.57             | 0.51              | 0.14             | 0.29                    | 0.64             | 0.38                   | 0.86                            | 0.72            | 0.59                              | 0.15             |

Notes: Year on year percentage growth rates of budgetary categories in real values. Robust standard errors in parentheses. 1) F-Test  $H_0^1$  for equal coefficients of both periods in federations, 2) F-Test  $H_0^2$  for equal coefficients of both periods in unitary countries, 3) F-Test  $H_0^3$  for equal coefficients of unitary countries and federations during the crisis. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 5: Crisis vs. non-crisis countries - revenues.**

| groups   |  | (1)<br>budget<br>balance as<br>share of<br>revenues | revenue side      |                  |                  |                    |                  |                  |                  |                |  |
|--|--|---|-------------------|------------------|------------------|--------------------|------------------|------------------|------------------|----------------|--|
|  |  |   | (2)<br>total      | (3)<br>tax       | (3a)<br>own tax  | (3b)<br>shared tax | (6)<br>transfers | (7)<br>fees      | (8)<br>other     |                |  |
| federations  | non-crisis countries                                       | before crisis (1996-2007)                           | -0.90*<br>(0.49)  | 0.49<br>(0.51)   | 2.4**<br>(1.2)   | 1.6<br>(1.6)       | 4.0<br>(4.1)     | 1.3<br>(1.2)     | -1.6<br>(1.4)    | 1.1<br>(1.2)   |  |
|  |  | Great Recession (2008-2010)                         | -2.6***<br>(0.91) | 0.12<br>(0.61)   | 1.1<br>(2.1)     | -1.7<br>(2.3)      | 1.2<br>(1.4)     | 0.03<br>(1.9)    | 1.6**<br>(0.60)  | 0.56<br>(2.0)  |  |
|  | crisis countries   | before crisis (1996-2007)                           | -2.0***<br>(0.47) | 6.0***<br>(0.72) | 14.2**<br>(6.4)  | 26.9*<br>(14.0)    | 9.2***<br>(3.2)  | 3.3**<br>(1.6)   | 4.9***<br>(1.4)  | 4.5*<br>(2.1)  |  |
|  |  | Great Recession (2008-2010)                         | -12.8***<br>(2.5) | -1.4<br>(2.3)    | -6.7**<br>(2.8)  | -6.7***<br>(2.0)   | -9.1**<br>(4.5)  | 5.9<br>(4.6)     | 3.3**<br>(1.4)   | -5.5<br>(4.7)  |  |
|  | non-crisis countries                                       | before crisis (1996-2007)                           | 0.07<br>(0.30)    | 2.6***<br>(0.44) | 3.0***<br>(0.60) | 3.1***<br>(0.56)   | 3.3<br>(2.6)     | 2.8***<br>(0.91) | 3.5***<br>(0.48) | 2.7*<br>(1.4)  |  |
|  |  | Great Recession (2008-2010)                         | -1.2**<br>(0.60)  | 2.4***<br>(0.48) | 0.4<br>(1.0)     | 0.09<br>(1.1)      | -5.1<br>(3.5)    | 6.4***<br>(2.2)  | 1.4**<br>(0.60)  | -0.6<br>(4.6)  |  |
| unitary countries  | crisis countries   | before crisis (1996-2007)                           | -1.4***<br>(0.52) | 4.3***<br>(1.4)  | 6.3***<br>(1.5)  | 9.8**<br>(4.0)     | 3.4**<br>(1.7)   | 2.7<br>(2.6)     | 3.4***<br>(0.94) | 6.3**<br>(2.6) |  |
|  |  | Great Recession (2008-2010)                         | -4.9***<br>(1.3)  | -1.7<br>(2.5)    | -1.3<br>(2.7)    | -6.8<br>(8.1)      | 9.3<br>(11.1)    | 1.3<br>(3.1)     | 0.64<br>(1.9)    | -5.0<br>(4.3)  |  |
|  | Observations   |   | 304               | 285              | 285              | 285                | 285              | 270              | 285              | 270            |  |
|  | R-squared  |   | 0.31              | 0.23             | 0.17             | 0.12               | 0.04             | 0.08             | 0.14             | 0.06           |  |
|  | F-test for equal coefficients in both periods <sup>1</sup> |   |                   |                  |                  |                    |                  |                  |                  |                |  |
|  | F-test (Ho1: federal non-crisis)                           |   | 2.62              | 0.21             | 0.28             | 1.58               | 0.41             | 0.33             | 4.26             | 0.05           |  |
| p-value  |  | 0.11  | 0.65              | 0.60             | 0.21             | 0.52               | 0.56             | 0.04             | 0.83             |                |  |
| F-test (Ho1: federal crisis)   |  | 17.25   | 9.24              | 9.14             | 5.66             | 11.07              | 0.28             | 0.71             | 3.43             |                |  |
| p-value  |  | 0.00  | 0.00              | 0.00             | 0.02             | 0.00               | 0.59             | 0.40             | 0.07             |                |  |
| F-test (Ho2: unitary non-crisis)                                       |  | 3.65  | 0.09              | 4.71             | 5.78             | 3.71               | 2.20             | 7.73             | 0.49             |                |  |
| p-value  |  | 0.06  | 0.76              | 0.03             | 0.02             | 0.06               | 0.14             | 0.01             | 0.49             |                |  |
| F-test (Ho2: unitary crisis)   |  | 6.29  | 4.45              | 5.87             | 3.39             | 0.28               | 0.12             | 1.71             | 5.08             |                |  |
| p-value  |  | 0.01  | 0.04              | 0.02             | 0.07             | 0.60               | 0.74             | 0.19             | 0.03             |                |  |
| F-test for equal coefficients across groups during crisis <sup>2</sup> |  |   |                   |                  |                  |                    |                  |                  |                  |                |  |
| F-test (Ho3: unitary crisis vs. federal crisis)                        |  | 7.69  | 0.00              | 1.94             | 0.00             | 2.38               | 0.70             | 1.21             | 0.01             |                |  |
| p-value  |  | 0.01  | 0.95              | 0.17             | 0.99             | 0.12               | 0.40             | 0.27             | 0.94             |                |  |
| F-test (Ho3: unitary non-crisis vs. unitary crisis)                    |  | 6.50  | 2.56              | 0.34             | 0.71             | 1.55               | 1.82             | 0.15             | 0.49             |                |  |
| p-value  |  | 0.01  | 0.11              | 0.56             | 0.40             | 0.22               | 0.18             | 0.70             | 0.49             |                |  |
| F-test (Ho3: unitary crisis vs. federal non-crisis)                    |  | 2.10  | 0.48              | 0.50             | 0.36             | 0.54               | 0.13             | 0.21             | 1.36             |                |  |
| p-value  |  | 0.15  | 0.49              | 0.48             | 0.55             | 0.46               | 0.72             | 0.65             | 0.24             |                |  |
| F-test (Ho3: federal crisis vs. unitary non-crisis)                    |  | 19.63   | 2.58              | 5.75             | 9.00             | 0.50               | 0.01             | 1.39             | 0.56             |                |  |
| p-value  |  | 0.00  | 0.11              | 0.02             | 0.00             | 0.48               | 0.93             | 0.24             | 0.46             |                |  |
| F-test (Ho3: federal crisis vs. federal non-crisis)                    |  | 14.32   | 0.41              | 5.10             | 2.70             | 4.73               | 1.40             | 1.17             | 1.39             |                |  |
| p-value  |  | 0.00  | 0.52              | 0.02             | 0.10             | 0.03               | 0.24             | 0.28             | 0.24             |                |  |

Notes: From (2) onwards year on year percentage growth rates of budgetary categories in real values. 1) Test of equal coefficients in each group before and during crisis 2) Test of equal coefficients across groups during the crisis period. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1



Table 6: Crisis vs. non-crisis countries - expenditures.

|  |                      |                             | (9)              | (10)            | (11)              | (13)                    | (14)             | (15)                   | (16)                            | (17)   | (18)                             | (19)      |
|--|----------------------|-----------------------------|------------------|-----------------|-------------------|-------------------------|------------------|------------------------|---------------------------------|--------|----------------------------------|-----------|
|  |                      |                             | expenditure side |                 |                   |                         |                  |                        |                                 |        |                                  |           |
| groups   |                      |                             | total            | public services | social protection | public order and safety | economic affairs | environment protection | housing and community amenities | health | recreation, culture and religion | education |
| federations  | non-crisis countries | before crisis               | 0.03             | 0.0             | 0.76              | 2.21                    | 0.51             | -0.59                  | 0.12                            | 3.5    | 2.7*                             | -0.24     |
|  |                      | (1996-2007)                 | (0.53)           | (0.65)          | (0.63)            | (1.5)                   | (1.0)            | (2.4)                  | (2.2)                           | (2.3)  | (1.5)                            | (0.49)    |
|  |                      | Great Recession (2008-2010) | 2.5***           | 1.9             | 3.5***            | 1.9**                   | 2.3**            | 1.1                    | -0.27                           | 1.8    | 1.8**                            | 3.4***    |
|  | crisis countries     | before crisis               | 5.8***           | 4.9***          | 7.5***            | 7.0***                  | 6.0***           | 5.9**                  | 3.2                             | 7.2*   | 6.6***                           | 7.2***    |
|  |                      | (1996-2007)                 | (0.70)           | (0.77)          | (1.5)             | (2.0)                   | (1.7)            | (2.3)                  | (2.4)                           | (4.3)  | (1.0)                            | (2.5)     |
|  |                      | Great Recession (2008-2010) | 2.8              | 5.0             | 7.5**             | 0.88                    | 2.45             | -1.0                   | 6.9                             | 7.2*** | -0.83                            | 0.79      |
|  |                      |                             | (1.7)            | (3.5)           | (3.1)             | (2.7)                   | (4.3)            | (2.8)                  | (6.4)                           | (2.4)  | (1.8)                            | (2.6)     |
| unitary countries  | non-crisis countries | before crisis               | 2.7***           | 2.4**           | 1.8*              | 2.5**                   | 3.1**            | 4.7***                 | 2.9                             | 5.2*   | 2.8***                           | 3.7***    |
|  |                      | (1996-2007)                 | (0.45)           | (1.0)           | (0.91)            | (1.5)                   | (1.6)            | (0.86)                 | (2.2)                           | (3.1)  | (0.79)                           | (0.50)    |
|  |                      | Great Recession (2008-2010) | 2.6***           | 2.1             | 4.7***            | 2.4***                  | 3.9***           | -0.97                  | 3.8                             | 9.9    | 1.7*                             | 1.2       |
|  | crisis countries     | before crisis               | 4.8***           | 4.7***          | 20.2              | 2.0*                    | 6.1***           | 6.2***                 | 5.0**                           | 3.3    | 4.6**                            | 4.9***    |
|  |                      | (1996-2007)                 | (1.5)            | (1.6)           | (13.0)            | (1.2)                   | (1.5)            | (1.2)                  | (2.0)                           | (2.9)  | (1.9)                            | (1.2)     |
|  |                      | Great Recession (2008-2010) | -0.63            | 0.18            | -0.36             | 5.1                     | 3.0              | -1.6                   | -4.7**                          | 0.46   | 2.4                              | 2.0       |
|  |                      | (2.3)                       | (4.8)            | (5.9)           | (3.3)             | (2.9)                   | (2.0)            | (2.0)                  | (0.68)                          | (3.5)  | (4.3)                            |           |
|  |                      | Observations                | 285              | 285             | 285               | 285                     | 285              | 285                    | 285                             | 285    | 285                              | 285       |
|  |                      | R-squared                   | 0.25             | 0.11            | 0.05              | 0.10                    | 0.12             | 0.10                   | 0.03                            | 0.03   | 0.11                             | 0.22      |
| F-test for equal coefficients in both periods <sup>1</sup> |                      |                             |                  |                 |                   |                         |                  |                        |                                 |        |                                  |           |
| F-test (Ho1: federal non-crisis)                           |                      |                             | 14.95            | 1.92            | 11.85             | 0.03                    | 1.91             | 0.38                   | 0.01                            | 0.49   | 0.33                             | 33.19     |
| p-value  |                      |                             | 0.00             | 0.17            | 0.00              | 0.86                    | 0.17             | 0.54                   | 0.92                            | 0.49   | 0.57                             | 0.00      |
| F-test (Ho1: federal crisis)                               |                      |                             | 3.05             | 0.00            | 0.00              | 3.24                    | 0.57             | 3.54                   | 0.29                            | 0.00   | 12.74                            | 3.23      |
| p-value  |                      |                             | 0.08             | 0.97            | 0.99              | 0.07                    | 0.45             | 0.06                   | 0.59                            | 0.99   | 0.00                             | 0.07      |
| F-test (Ho2: unitary non-crisis)                           |                      |                             | 0.00             | 0.03            | 4.95              | 0.01                    | 0.18             | 5.78                   | 0.02                            | 0.10   | 0.71                             | 3.73      |
| p-value  |                      |                             | 0.96             | 0.87            | 0.03              | 0.93                    | 0.67             | 0.02                   | 0.88                            | 0.75   | 0.40                             | 0.05      |
| F-test (Ho2: unitary crisis)                               |                      |                             | 3.98             | 0.82            | 2.07              | 0.76                    | 7.67             | 11.17                  | 11.46                           | 0.94   | 0.30                             | 2.33      |
| p-value  |                      |                             | 0.05             | 0.37            | 0.15              | 0.39                    | 0.01             | 0.00                   | 0.00                            | 0.33   | 0.58                             | 0.13      |
| F-test for equal coefficients across groups <sup>2</sup>   |                      |                             |                  |                 |                   |                         |                  |                        |                                 |        |                                  |           |
| F-test (Ho3: unitary crisis vs. federal crisis)            |                      |                             | 1.44             | 0.67            | 1.39              | 0.94                    | 1.07             | 0.03                   | 2.96                            | 7.44   | 0.69                             | 0.31      |
| p-value  |                      |                             | 0.23             | 0.42            | 0.24              | 0.33                    | 0.30             | 0.87                   | 0.09                            | 0.01   | 0.41                             | 0.58      |
| F-test (Ho3: unitary non-crisis vs. unitary crisis)        |                      |                             | 1.86             | 0.15            | 0.73              | 0.60                    | 4.55             | 0.04                   | 2.19                            | 0.43   | 0.04                             | 0.49      |
| p-value  |                      |                             | 0.17             | 0.70            | 0.39              | 0.44                    | 0.03             | 0.84                   | 0.14                            | 0.51   | 0.84                             | 0.48      |
| F-test (Ho3: unitary crisis vs. federal non-crisis)        |                      |                             | 1.80             | 0.13            | 0.43              | 0.84                    | 2.93             | 1.23                   | 1.53                            | 1.05   | 0.04                             | 1.56      |
| p-value  |                      |                             | 0.18             | 0.72            | 0.51              | 0.36                    | 0.09             | 0.27                   | 0.22                            | 0.31   | 0.85                             | 0.21      |
| F-test (Ho3: federal crisis vs. unitary non-crisis)        |                      |                             | 0.01             | 0.61            | 0.72              | 0.28                    | 0.11             | 0.00                   | 0.14                            | 0.03   | 1.55                             | 0.02      |
| p-value  |                      |                             | 0.93             | 0.44            | 0.40              | 0.60                    | 0.74             | 0.99                   | 0.71                            | 0.85   | 0.21                             | 0.90      |
| F-test (Ho3: federal crisis vs. federal non-crisis)        |                      |                             | 0.03             | 0.69            | 1.62              | 0.13                    | 0.00             | 0.46                   | 1.03                            | 4.29   | 1.71                             | 1.02      |
| p-value  |                      |                             | 0.86             | 0.41            | 0.21              | 0.72                    | 0.98             | 0.50                   | 0.31                            | 0.04   | 0.19                             | 0.31      |

Notes: Year on year percentage growth rates of budgetary categories in real values. Robust standard errors in parentheses. 1) Test of equal coefficients in each group before and during crisis 2) Test of equal coefficients across groups during the crisis period. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1