

Do federal deficits motivate regional fiscal (im)balances? Evidence for the Spanish case.*

Molina-Parra, Agustín* and Martínez, Diego**

*University of Almería

**University Pablo de Olavide, Seville

PRELIMINARY VERSION. PLEASE, DO NOT QUOTE WITHOUT
AUTHORS' PERMISSION.

Abstract

This paper studies the vertical and horizontal interactions existing between federal and state governments in terms of public deficits. We estimate a fiscal reaction function for the Spanish regions over the period 1995-2010 paying special attention to the impact of federal fiscal stance on the state fiscal imbalances. Our results indicate that higher public deficits of the central government encourage a bigger fiscal imbalances at state level. We also find a significant impact of fiscal decisions taken by governments at the same tier of decision on a specific state. The vertical interaction is interpreted in the context of yardstick competition models.

Keywords: deficit, sustainability, intergovernmental relations, deficit, sustainability, fiscal federalism, fiscal discipline.

JEL classification: H62, H72, H77

1 Introduction

The standard approaches to the problems of over-borrowing in federal countries tend to focus on subnational (local and state) governments as key actors. The empirical evidence delivered when fiscal sustainability is discussed usually supports the idea that the episodes of high public deficits are more prone to appear in the lower levels of governments than in the federal one (see, for instance, Rodden (2006) for a comprehensive review and further analyses). In this sense, there are several reasons for expecting a less exigent attitude in terms of fiscal discipline as local and state governments are involved. Just to name a few: regions suffering vertical imbalances are obliged to borrow more than other well-endowed tiers of decisions (Rodden et al., 2003; Eyraud and Lusinyan, 2013; Van Hecke, 2013); the objective function

*The authors would like to thank Santiago Lago, Javier Pérez, Agnese Sacchi, Luca Salvadori and participants at 2014 XXI Meeting of Public Economics for helpful comments.

of state and local incumbents is far away from the usual nationwide requirements of budget stability and typical agency problems arise (Webb, 2004); the presence of bailout expectations often leads to soft budget constraints (SBC) and, consequently, to systematic budget slippages (Goodspeed, 2002), and others.

A common, general feature in most of the previously cited approaches is that the subnational over-borrowing is the result of institutional characteristics that impel lower levels of government to bias their intertemporal decisions in favor of current consumption. Such institutional framework might be materialized at, for instance, an asymmetric vertical distribution of spending responsibilities and tax revenues, at an imperfect design of incentives to cope with fiscal discipline objectives in the federation as a whole, or at the absence of credible commitments by the federal government to not bailout financially-troubled subnational governments.

In a sense, the previous literature has described the role of federal government to affect fiscal behaviors of local and regional governments as an automatic respondent to institutions. In other words, the equilibria characterizing over-borrowing at subnational levels are primarily caused by the behavior of governments facing some particular institutional features. Even under the coordinates of bailout models, in which the federal government seems to be the key actor by causing SBC at lower levels, strictly speaking we have a game of responses to different institutional arrangements (for instance, constitutional mandates for guaranteeing similar levels of public services across the federation).

We are however convinced that a non-trivial part of the over-borrowing events in federations are beyond the institutional structure of the country. Obviously, this does not mean at all that institutions hardly matter for explaining fiscal behavior in federal contexts, but other potential explanations may well complement the prevailing institutional approach. To put differently, given the institutional framework existing in a country, we are wondering to what extent, if any, strategic fiscal behaviors by the key actors are interrelated each other.

One of the contributions of this paper is precisely to explore this research avenue by providing empirical evidence on how the fiscal behavior of the federal government may affect the subnational public deficits. The idea is to emphasize the way through which strategic interactions between different levels of government impact fiscal imbalances in a federation. Institutional factors are certainly present in our analysis but the bulk of our results and interpretation focus on the vertical interrelations in terms of public deficits.

Particularly, we pay attention to the Spanish case over the period 1995-2010. We have estimated different specifications of fiscal reaction functions (Bohn, 1998) for the Spanish regional governments but conveniently modified to include the federal public deficit among the regressors. The main result we have obtained can be briefly anticipated: the fiscal imbalances at the federal tier of decision have positively encouraged the public deficits of regional governments. After carrying out a number of robustness checks to make sure that our estimates are reliable enough, we have discussed such findings in the context of yardstick competition models (Besley and Case, 1995).

This interpretation made in terms of the incumbent behavior can be seen as another contribution of the paper. In this sense, we have not only applied the premises of the widely accepted model by Besley and Case to explain new empirical results but we have also roughly sketched a reconfiguration of the model in vertical terms.

Recall that the canonical paper by Besley and Case (1995), and the subsequent literature, deal with governments placed at the same tier of decision.

To the best of our knowledge, only a couple of papers have marginally studied this issue. Baskaran (2012) explores whether vertical and horizontal interactions affect subnational borrowing of German states covering the period 1975-2005. While the presence of the latter seems to be clear (although not due to the standard model of yardstick competition but the existence of SBC), no evidence is found regarding vertical strategic interactions, which are measured through the impact of federal public deficit on the deficit-to-GDP ratio of Lander.

On the other hand, Foremny (2014) has recently offered some support to the hypothesis of a positive impact from the central government deficit to the subnational deficits for EU15 over the period 1995-2008. Indeed, under some particular econometric specifications (IV 2SLS and dynamic GMM), a positive and statistically significant coefficient is found for the variable measuring the fiscal position of central government. However, this empirical link is not the matter of interest in Foremny (2014), who just considers it as control variable in his econometric estimations.

All in all, our paper breaks the standard approach of the literature on fiscal sustainability in multi-level contexts, leaving scope for a negative influence of upper levels of government on fiscal deficits of state governments. Moreover, we have broadened the understanding and scope of yardstick competition models, opening the door to new interpretations concerning with vertical issues.

The structure of the paper is as follows. After this introduction we give information on the data and statistical sources used in this paper; we take advantage of that to offer some preliminary correlations between the main variables engaged in this study. Section 3 explains the econometric methodology followed and shows the main results. Section 4 offers robustness analysis. Section 5 discusses the empirical findings in the context of yardstick competition models and, finally, Section 6 concludes.

2 Model specification and data

This section begins looking for statistical evidence on the relationship between government fiscal balances. The idea is to get a preliminary support about the existence of some dependency between variables. The lack of references about such link is hence overcome contrasting federal and state time series through correlation analysis.

Table 1 summarizes the results. The first column references the Pearson linear correlation index, a standard measure of statistical dependency. Alternatively, we also provide coefficient results from the Spearman correlation index. The use of this alternative pretends to deal with some caveats in the Pearson index, i.e. the assumption of a linear relationship between variables and issues to provide good measures under the presence of outliers in the data. Hence, it should be considered as a robustness check.

Overall, pairwise comparison between deficits reveals the existence of links between both fiscal imbalance measures. In general, the public deficits of Spanish states seem to be highly correlated with the federal deficit, although we cannot draw a clear conclusion for some particular cases such as Castilla-León and Baleares, where the statistical significance denoted by the p-value is not conclusive enough. Conse-

quently, we have a fertile ground for further research exploring through econometric techniques whether causal relationships are present.

TABLE 1 HERE

The central idea of this paper is then to investigate whether the fiscal imbalances at federal level have stimulated the public deficits of Spanish regional governments over the period 1995-2010. Beyond the preliminary correlations offered above, we are interested in deepening the understanding of the relationship between both fiscal variables. With this aim, our investigation pays a specific attention to the direction of the causality and to what extent other influential variables may affect the state public deficits. Particularly, the empirical approach aimed at capturing this impact involves the estimation of the following equation:

$$deficit_{it} = \beta_0 + \beta_1 f_deficit_t + \beta_2 X_{it} + \eta_i + \varepsilon_{it} \quad (1)$$

where $deficit_{it}$ is the deficit to GDP ratio in state i at time t , $f_deficit_t$ is the federal deficit to GDP ratio in time t , X_{it} is a vector of control variables as described below, η_i is an unobserved state-specific effect and ε_{it} is the usual error term. Governments fiscal stances are primarily calculated as the difference between non financial expenditures and non financial revenues relative to GDP. Other alternative variables to deal with deficits, such primary balances or deficits to population ratio measures, have been also considered in the robustness checks section (see below). As usual in panel data econometrics, the likely correlation between the region-specific unobserved effects and the error term has been carefully studied. Dynamic specifications of (1) have been also taken into consideration.

The model is a variation of the fiscal reaction functions estimated by Bohn (1998). For the purpose of this paper, we adapt the conventional equation to understand the behaviors at regional level. Therefore, the federal deficit is included as a primary explanation of states fiscal discipline. The statistical significance and magnitude of the coefficient β_1 will indicate to what extent fiscal imbalances at federal level affect (if any) public deficits of states.

The vector of control variables includes economic, political and institutional determinants on the fiscal results of the Spanish regional governments (Argimón and Hernández de Cos, 2012). The business cycle is included to isolate discretionary behaviors from fluctuations in the economic activity. Both expenditures and revenues are prone to vary according to the position of the economy respect to its potential path. Moreover, deficits may increase due to a fall in tax collection in a similar period. The economic cycle effect is captured with the variable *outputgap*. This is the result of applying the Hodrick-Prescott filter (Hodrick and Prescott, 1997) to states nominal GDP.

The debt-to-GDP ratio is also included aimed at testing the sustainability of states fiscal policy. A negative (and significant) coefficient will show indications of fiscal sustainability as long as increases in public debt are accompanied by reductions in public deficits. The effect is captured with the variable $debt_{t-1}$. The variable is lagged one year on the basis that there is not a simultaneous reaction on deficits to debt variations. Indeed, it seems more plausible that government fiscal policies react to a certain debt level once the latter is already observed.

The GDP to population ratio (variable *gdppop*), i. e. the GDP per capita, is intended to capture regional disparities on economic development and hence,

differences in the effort to provide public services. Political variables are grounded in a partisan basis. An index distinguishing political ideology and the geographical scope of parties has been created. The former separates parties into progressive and conservative ideology. The latter indicates whether parties are regional or national oriented. The index provides information to calculate whether federal and regional governments share ideological inclination toward similar policies or not. The effect is captured by including a categorical variable (*alignment*) equal to 1 if ideological alignment exists or 0 otherwise. We also measure a possible difference in the fiscal policy orientation based on the party in power. In this case, the variables *left_sh* and *reg_share* measure the ratio of seats holding by left or regional parties with respect to the total seats in each state parliament.

The process of fiscal decentralization in Spain has been continuous but rather asymmetric across states. Institutional variables are intended to capture these differences. The variable *auto* accounts for an uneven devolution in time of responsibilities. Specifically, some states haven been in charge of public services such health and education while the federal government were financing the same responsibilities in other states until the year 2002. A categorical variable equal to one signals those states with spending responsibilities in health and education and 0 otherwise.

The devolution of powers in Spain has also differentiated some states from others in the revenue side. The variable *foral* tests differences on deficits between those regions under the foral financing system and those with an ordinary system. Moreover, tax assignments across levels of government have been substantially altered over the sample period. Since 1997, changes in the territorial financing system have increased regional power over tax collection, reducing the dependence on vertical transfers. The increases in fiscal autonomy over the period of study is measured with the variable *tax_auto* (defined as revenues taxes relative to non-financial revenues) or, alternatively, with two dummy variables controlling for the most significant agreements in terms of financial resources available for regions (*fin_agree(97)* and *fin_agree(02)*).

Finally, legal provisions limiting state public deficits and derived from the European Stability and Growth Pact are controlled in the variable SGP. Even though the deficit objective for each country is defined in terms of a unique limit for the country as a whole, subnational governments are also compelled in the compliance of such objective. The variable is a dummy equal to 1 for the years when the rule is in force (since 2002) and 0 otherwise. The interested reader on the statistical sources of the variables used may consult the table 2 in the appendix.

3 Estimation and results

Estimating a model as that of expression (1) may engage the application of different estimators. In principle, given the existence of individual fixed effects from a deterministic sample (the whole population of Spanish regions is available), we have firstly obtained estimates from the least squares dummy variable (LSDV) estimator. As is well-known, the LSDV and the within-estimator (the other alternative to cope with fixed effects model) are equivalent when the lagged dependent variable is not present as regressor.

After running the usual Hausman specification test, we have accepted the null hypothesis of no correlation between the unobserved region-specific effects and the

remaining regressors. Under such circumstances, the so-called random effect (RE) model appears not only as consistent but also more efficient than the LSDV and, therefore, we also show below the estimates coming from the generalized least squares (GLS) estimator, which is the standard way of dealing with RE models.

Finally, we test a possible inertia in state budget balances including the lagged regional deficit as regressor. The introduction of the lagged dependent variable in the specification is prone to suffer the Nickel bias (Nickell, 1981). Consequently, we estimate the model with generalized method of moments estimator (GMM) (Arellano and Bond, 1991). Particularly, given the absence of correlation between the unobserved region-specific effects and the rest of regressors, inconsistency problems derived from the presence of such as individual effects are not expected. In this context, using a level versus first-differences specification with GMM is not a crucial issue. We have opted for showing here the latter but the former are available upon request¹.

Moreover, we have used one-step GMM estimators due to their relative advantages compared to the two-step version². Within this framework, one of the key assumptions is that there is no serial correlation in the disturbances and this is precisely what the statistics $m1$ and $m2$ confirm (Arellano and Bond, 1991). The Sargan test, by contrast, rejects the validity of the set of instruments but the inference here could be subject to a number of caveats³.

A first battery of results are reported in Table 3. Each method is split into two specifications, namely (I) and (II), which differ on whether fiscal autonomy is proxied with a measure of tax autonomy or, alternatively, with financial agreements⁴. The estimate for β_1 is obviously the crucial result of this paper. And the evidence is clear enough across methods and specifications: the effect of federal deficits on states fiscal outcomes is statistically significant positive. This result suggests that state fiscal performances are directly conditioned by the behavior of the federal government. Moreover, the extent to which this impact takes place is quite similar along the columns of Table 3: around 0.20-0.25.

The estimates for remaining regressors also provide interesting results for explaining the state public deficits in Spain. First, regional governments have benefited from the expansionary economic period captured in the sample. The negative sign of the output gap indicates that a reduction in deficits takes place when the economy grows at a higher rate than the potential one. Though public deficits of state governments are not so strongly linked to the performance of fiscal stabilizers as at the federal level, it is also expected a relatively substantial impact of business cycle on public imbalances at state level. Note that the Spanish regional governments enjoy a significant part of the income tax revenues (50 per cent of the total

¹As expected, both estimates are very close each other.

²Several simulation studies have found only small efficiency gains by using two-step GMM estimators even in the presence of heteroskedasticity (see, for instance, Arellano and Bond (1991) and Blundell and Bond (1998)), with less reliable properties of asymptotic distributions (Bond and Windmeijer, 2002).

³(Arellano and Bond, 1991) demonstrate with Montecarlo simulations that the Sargan test tends to reject the null hypothesis of validity of instruments in the presence of heteroskedasticity, which is the price to pay for using one-step GMM estimators. Bowsher (2000) also shows how the power of Sargan test to find out invalid instruments dramatically decrease in finite samples with a high enough number of moment conditions.

⁴Recall that fiscal autonomy of Spanish regions could be measured using two types of control variables.

amount) and of the consumption taxes (between the 50 and the 58) during the late years of our sample.

Regarding the variable GDP per capita we also find a partial explanation of state deficits, though the coefficients are very low. Apparently, this result seems to be difficult to explain: the richer the region, the higher its public deficit. In fact, the opposite finding was rather expected as higher levels of GDP per capita would imply bigger fiscal capacities in richer regions and, consequently, lower levels of fiscal imbalances. But, in line with Barrios and Martínez (2014), the relationship between GDP per capita and regional public deficits is far away from being straightforward. In fact, the link between both variables is strongly conditioned by the equalization system and, particularly, the apparently simple reasoning that higher levels of GDP per capita involve lower levels of fiscal imbalances turns out to be the opposite in the Spanish case⁵.

A relevant variable in estimations of fiscal reaction functions is the lagged stock of public debt. As said above, its inclusion among the regressors is intended to capture whether the financial imbalances are sensitive or not to previous public borrowing, in a kind of policy reaction aimed at guaranteeing fiscal sustainability. Our estimates do not find any statistically significant effect in this regard, and this appears as a general fact in the estimates carried out in the robustness checks next.

It should be mentioned here that the stock of public debt at regional level has not traditionally been a bothersome problem for state governments in Spain⁶. Two factors support this statement. First, the process of fiscal and political devolution of powers is recent enough to have subnational levels suffering over-borrowing and even high levels of public debt. The so-called Comunidades Autónomas (Autonomous Communities, the state governments in Spain) were created in the early 1980s and were born free of financial liabilities. Despite the fact that they were in charge of very dynamic public expenditures since the very beginning, the changes in the territorial financial system was generous enough along its successive reforms that the conventional pressures of increasing expenditures compared to never enough state resources did not become a worrying problem of over-borrowing.

Second, the federal control over state borrowing in Spain has been pretty loose. Although in principle the national laws limiting the public borrowing at subnational levels were rather sensible, their practical implementation has been actually slack. The so-called Escenarios de Consolidación Presupuestaria (ECP, Budgetary Consolidation Scenarios) are good examples. They consisted of political agreements between the federal and state governments to not overcome certain limits in public debt. The problem was that the practical definition and implementation of such limits was clearly endogenous implying de facto its fulfillment. Therefore, it is not surprising that the level of lagged stock of public debt has not involved any significant role by conditioning the fiscal policy of states.

Regarding the coefficient of the dependent variable lagged one period ($defgdp_{t-1}$), we have tried here to obtain some evidence on whether the fiscal behavior of states have somewhat inertia. This variable is only under consideration in the dynamic

⁵By contrast, the German case shows the opposite relationship: the poorest Lander are those in which the public debt has increased comparatively more. The results for Canada are inconclusive (Barrios and Martínez, 2014).

⁶Obviously, things have dramatically changed in the aftermath of the Great Recession, especially for some regional governments. de la Fuente (2013) has recently shown the singular evolution of the state public debt compared with the local and federal ones.

specifications estimated through GMM. Again, both in the central estimates of table 3 and in the subsequent robustness checks below, the variable lacks of any acceptable statistical significance. Potential explanations underlying this fact are not easy to come here without further analyses, out of the scope of this paper. But in a certain way, it could be seen as the dynamic version of the comment previously done for the stock of public debt. The ECP were also defined in terms of public deficit and their strict application was likewise very relaxed.

TABLE 3 HERE

Neither tax autonomy nor political factors (the relative number of seats holding by left or regional parties) report any significance at all across methods and specifications. Precisely, the lack of statistical significance for tax autonomy reported in table 3 calls for another consideration about states finances. Sorribas-Navarro (2011) identifies implicit bailouts through the national financing system. Beyond the strategic use of such funds, the article evidences a shortage of resources available for subnational governments and a likely significant impact on regional public deficits. We have therefore included two dummy variables (*fin_agree(97)* and *fin_agree(02)*) corresponding to the years in which a determined territorial financing system was in force, either that starting in 1997, 2002 or in 2009.

Our central estimates reported in table 3 show that the regional financing system over 2002-2008 was extremely positive for the state public finances, with a negative impact their public deficits. That was mainly due to the extraordinary yield of own and shared taxes closely related to the housing boom in particular and economic activity in general, like the income tax, VAT and estate and gift taxes (de la Fuente, 2013; Herrero and Tránchez, 2011).

By contrast, the entry in force of the Stability and Growth Pact (variable *SGP*) does affect negatively the regional public deficits, although marginally. The variable *foral* has also a negative impact on state public deficits and quantitatively more important than *SGP*⁷. This is clearly in line with the well-documented higher amount of resources available for Navarra and the Basque Country compared to the remaining Spanish regions, as result of their privileged territorial financial system (see, for instance, the recent paper by Zabalza and López-Laborda (2014)).

4 Robustness checks

Given the fact that the scope of our research is wide enough to close any discussion on the econometric specifications only with the results reported above, we have carried out a number of robustness checks in order to make sure of being in the presence of reliable empirical results.

4.1 Potential endogeneity (state deficits affecting federal deficits)

There are two indirect channels through which the state public deficits may affect the federal deficits, reversing the causality posed in this paper. The first one is related

⁷The variable *foral* obviously disappears in the GMM first-differenced specification because is a time-invariant regressor.

with the widely accepted fact that fiscal indiscipline at subnational level may indeed materialized at federal bailouts, with the corresponding impact on fiscal balances at upper level. The second one refers to the negative financial externality that increases in the risk premia of subnational public debt might generate on the credibility of federal bonds and, hence, on the interest payments of federal government.

In our view, none of such circumstances seem to have played a sizable role in our case. Although some evidence of implicit bailouts is available for Spain (Sorribas-Navarro, 2011) over a period (1986-2006) that partially overlaps with ours (1995-2010), to the best of our knowledge no paper has quantitatively specified the impact of such as implicit bailouts on the federal fiscal imbalances⁸. Moreover, on the basis that such as implicit bailouts mainly took place through changes in the territorial financing system, our econometric estimates have already taken into account these adjustments in the extent of vertical grants and shared taxes using time dummies.

The second issue refers to the potential contagion effect in terms of risk premium from the states to federal governments. In principle, in the presence of (explicit or implicit) commitments of bailout, fiscal indiscipline at subnational level may well negatively impact on the quality of federal bond perceived by financial markets (Standard & Poor's, 2012). However, further analyses show evidence that financial stress in regions lead to increase the yield spreads between states and federal bonds, specially in periods of uncertainty, in a kind of fly-to-quality movement (Lemmen, 1999).

Anyway, we have neutralized the potential problems of endogeneity derived from the variable (f_defgdp) using lags when used as regressor. Tables 4 and 5, respectively, report estimates with the federal public deficit lagged one period and with variable in levels and lagged as well. The coefficients still continue being statistically significant and around 0.20 – 0.25. The coefficient of the federal deficit in t-1 is slightly lower than that of the current federal deficit, except in the GMM specification.

TABLE 4 HERE

TABLE 5 HERE

4.2 Business cycle alternatives

Until now, we have measured the state economic cycles using non-observable variables per se. Output gaps are therefore the result of decomposing regional GDP time series with the Hodrick-Prescott filter. Even though this is a widely accepted technique, it has not been without an absent of controversy (Kaiser and Maravall, 2001). In our particular case, some technical and economic concerns arise. One drawback of the filter is the introduction of bias in the output gap estimates at the end of the sample (Baxter and King, 1999). Such failure may be particularly important in our case since the last years of GDP series are strongly influenced by the economic crisis and hence, the estimator is prone to yield inappropriate measures of the business cycle. A second drawback is related to the arbitrary choice of the parameter which determinate the smoothness of the function estimated (known

⁸A completely different scenario is that starting in 2010, when the Spanish federal government got underway several financial facilities in favor of states, which were suffering liquidity and even solvency troubles as result of the Great Recession; see Gordo et al. (2013).

as λ). In this case, we have followed the standard suggestion by Ravn and Uhlig (2002), who determinate $\lambda = 6.25$ for annual data.

Next, we reestimate our central specification after substituting the variable output gap by the regional level of unemployment and the deviation of such level from the national one, respectively⁹. Tables 6 and 7 show that the coefficients of the federal public deficit is somewhat lower than in our central estimates when the business cycle is proxied by the unemployment rate and slightly higher when the relative regional unemployment (not statistically significant) is used. But they still are around 0.20, that is, pretty similar to those of table 3.

TABLE 6 HERE
TABLE 7 HERE

4.3 Changes in the dependent variable

Although the usual approach when estimating fiscal reaction functions involves variables defined in terms of GDP, Fernández-Leiceaga and Lago-Peñas (2013) has recently argued that in the presence of strong equalization across territories (as in the Spanish case), the use of regional GDP to assess the sustainability of state public finances could be not appropriate.

Consequently, we have redefined the key variables of our study to express them in per capita terms (this is what the suffixes *-pop* mean when used at the end of the variables) and considering the primary balance instead of the total public deficit (the new variables begin then with the letter *p*). As is well known, the primary balances do not consider interest payments to compute the public deficit; in this way, we analyze the fiscal decisions taken by the state governments without bearing the inertia of previous stocks of public debt.

Tables 8, 9 and 10 offer the new estimates and it can be clearly seen that the impact of federal public deficit on state fiscal imbalances keeps unchanged, both in terms of statistical significance and magnitude. With respect to the remaining control variables, it is worthwhile noting that the coefficient of dependent variable lagged one period appears now as significantly positive when the total deficit and the primary deficit expressed in per capita terms are under consideration. As was briefly stated before, this point would deserve a further analysis but the substantial influence of population by determining the distribution of financial resources across states is likely to play a significant role in the understanding of that results.

TABLE 8 HERE
TABLE 9 HERE
TABLE 10 HERE

4.4 Political variables

Given the potential impact that the political factors may have on the state public deficits, we have reinforced the set of political variables used as regressors. Particularly, we have included two dummy variables measuring political cycles at national

⁹Bande et al. (2008) widely develop the interactions between regional unemployment and business cycle in Spain.

and subnational levels. Specifically, both dummies control for years in which either the regional or the federal government have been subject to elections. One of the arguments behind this strategy is to take account that incumbents are likely to incur on higher deficits when opting for reelection (Hodler, 2011; Maskin and Tirole, 2014). In the table 11, the two new variables are considered. In any case, none of the dummy variables are statistically significant. This is an indication on how difficult is to capture political influences on fiscal policies (Brender and Drazen, 2008).

Moreover, we have tried to capture additional links between the state public deficit and the territorial financing system. Beyond the dummies included in the previous section to control for the impact of different regional financing systems, a new dummy (*fin_mod*) has been considered in order to refer to the particular years when the financial conditions of the system change. It should be noted here that the successive reforms of the financial relationships between the federal and state governments in Spain has been traditionally guided by political criteria and subject to the previous commitment that none of the regions should not be worse off under the new system (Herrero and Tránchez, 2011). Hence, it is not surprising to find out a highly significant and negative coefficient for the variable *fin_mod*. Each change in the territorial financing system has implied a substantial improvement for the state public finances and contracting effects on their fiscal imbalances.

TABLE 11 HERE

5 Discussion

The previous section has clearly stated that the federal public deficits positively affect the state public deficits. The questions now are: what is the rationale for this? What is the channel through which the public imbalances at federal level may encourage states deficits? In this section we do not aim at providing detailed and clear-cut answers but a tentative explanation of the main forces driving this causal relationship, within the framework of widely accepted previous contributions. Additionally, we intend to launch some preliminary ideas on how further research could deal with some of the empirical findings we have reached.

At first sight, there is a potential candidate to be used as rough explanation of what is at work: the theoretical models concerning with the bailouts of subcentral governments. As is well-known, this approach points out that the excessive borrowing levels chosen by the regional governments are originated as they face soft budget constraints as a result of the failure of federal government to credibly commit to not bailout. In essence, we are in the presence of federal policy decisions affecting state public deficit and, in principle, liable to explain our empirical findings.

Particularly, we have taken as benchmark in our discussion the pioneering contribution by Goodspeed (2002) that relates excessive state borrowing to fiscal decisions chosen by the upper government. The game is sequential, with the states moving first (the Stackelberg leader) and knowing the federal's (the follower) reaction function. The function to be optimized by both governments is the probability of a voter to re-elect the government, which is pretty sensitive to the availability of financial resources to provide state public consumption. The main result is that as long as state governments may anticipate positive vertical grants from the federal government, they will borrow more than optimal and, in a sense, result in state soft budget

constraint and eventually financial bailouts.

How appropriate is this theoretical framework to explain our empirical evidence? Unfortunately, the above econometric estimates cannot be accommodated into the canonical model described in Goodspeed (2002). Indeed, we have adapted his theoretical framework to our case and the conclusions are precisely the opposite¹⁰. The underlying intuition behind this conclusion is straightforward. Using the rationale given by the Goodspeed's (2002) model, a higher federal deficit in period 1 means less resources for vertical grants in favor of states in the period 2, when the federal public debt must be paid back. Given that the basis for an excessive state borrowing in period 1 stems from the likely grants to be received in period 2, the tighter federal budget constraint in the future results in lower state public deficits in the present.

Precisely going further along this line, a potentially promising research could study under which circumstances the lack of fiscal discipline at federal government can be interpreted by the lower tiers of decision as fewer resources available for possible bailouts and, in a sense, becoming a positive incentive for sound public finances at regional level. Anyway, it is evident that the theoretical framework offered by such models does not match accurately our empirical results. Nonetheless such alternative should not be dismissed as potential explanation in other federal countries.

Extending the reasoning about to what extent facing fixed resources at federal level might harden the state budget constraints, we now refer to a common property problem when federal systems are under scrutiny (see, for instance, Boadway and Shah (2007)). In a kind of federal solution for the tragedy of commons, charging (or just leaving this chance open) a tax-price to the region i when the federal government increases the vertical grant not only to the borrowing region but also to any and all states, might indeed mitigate over-borrowing of states.

In our empirical approach, however, this effect does not appear to be strong enough to disincentive the excessive public borrowing through the lower opportunity cost of public consumption in period 1 versus the foregone public consumption in period 2, based on expectations of higher grants from the federal government. Indeed, we find a positive and significant coefficient of the other regions' deficits when explaining the deficit of state i .

Recently, Baskaran (2012) has found a pretty similar result for the German states over the period 1975-2005. The positive horizontal interactions detected by Baskaran's paper are interpreted as regional governments not excessively concerned with the exhaustion of the federal fiscal commons as result of either unsound federal fiscal policies or bailout transfers to regions in financial troubles.

The use of bailout models with Spanish data is not unprecedented, with mixed evidence. While Lago (2005) does not find a role for bailout expectations over the period 1984-1996, Sorribas-Navarro (2011) shows however evidence in favor of partial bailout transfers between 1986 and 2006. The latter must not be seen at all as a contradiction with respect to our empirical findings. What Sorribas-Navarro (2011) describes is the fact that the Spanish federal government has used discretionary and non-discretionary grants to help financially troubled regional governments. Yet, the evidence we offer supports the idea that the federal fiscal imbalances encourage state public deficits, and the standard bailout models are usefulness to explain why and how.

¹⁰The technical details with the algebraic manipulations are available upon request.

We are though convinced that our results can be better interpreted using the theoretical framework (and the subsequent empirical evidence) of yardstick competition models initially developed by Besley and Case (1995). As is well-known, the basic idea of these models is straightforward: in the presence of information asymmetries across voters and incumbents, information externalities coming from neighboring jurisdictions modify the fiscal behaviors of politicians while in office, because the voters condition their re-election support according to what they observe in other states. In this sense, in a model of two periods, the voters with no information on incumbents' quality and concern with minimizing their tax payoffs in the future, choose whether or not to re-elect the politicians in office after appraising their current management and the information arriving from neighboring jurisdictions. In turn, the incumbents, who observe the true cost of providing public services, are perfectly aware of such vote discipline and must decide the tax rates to set up in both periods. If possible, bad incumbents will charge rent on the highest provision cost, while good politicians in office will fix the state tax rates closely linked to the provision cost and without rent-seeking behavior.

One of the main implications of this game is that the willingness of bad incumbents for acting as rent-seekers heavily depends upon what is happening in other territories with their corresponding fiscal decisions. If it happens to be that the incumbent taken as benchmark is good, the margin for rising taxes above their optimal values available for the bad incumbent in a given region is much lower. By contrast, when the voters of a given region take a jurisdiction governed by bad politicians as benchmark, they will be less exigent with their own incumbents and the room for rent-seeking activities will be bigger and likely resulting in higher than optimal tax rates.

Nevertheless, the appropriate interpretation of our empirical results within the theoretical framework of models of yardstick competition requires dealing with two key issues: the vertical interaction between jurisdictions instead of the horizontal dimension considered in Besley and Case (1995) and in the subsequent literature, and the focus on the variable public deficit rather than on tax rates.

The first one involves a change in the tier of government taken as benchmark: in our approach the relevant jurisdiction providing information about the fiscal variables to state voters is the federal government whereas the standard approach refers to governments placed at the same level and conveniently weighted (by border contiguity, by political coincidence of incumbents, etc.). This has a number of implications. First, the information set is identical across the subnational governments given that there is only one provider of such information: the federal government. However, it does not prevent us from capturing empirically the specific interactions between the federal government and each one of the states, especially in terms of electoral calendar and/or ideological synchronization of officeholders.

Second, a new and more complex debate on the interactions between the federal and state governments arises. From the political science side, the issues related to vertical competition in decentralized countries have been already explored (Breton, 1996, 2006; Jimenez, 2014). In economics, by contrast, future work needs to be done for a more comprehensive view. While in the canonical version of the yardstick competition models the jurisdictions play at the same level, resulting in a Bayesian Nash equilibrium, our approach opens the door to a consideration of the role played by the federal government as Stackelberg leader.

Indeed, what we are guessing in this paper is that the decision making of states usually follows that of the federal government. This is especially true in the context of fiscal discipline, where most (if not all) nationwide agreements and regulations come from federal initiatives, in a kind of pragmatic resolution of the dilemma between sub-central autonomy and fiscal sustainability of the country as a whole, in favor of the latter.

Obviously, our emphasis on the federal level to fix the benchmark for state governments does not involve at all a disregard of the horizontal dimension by explaining state deficits. By contrast, as noted above, testing the hypothesis of common property problem within the framework of bailout theories and the own setup of the yardstick competition models, have pushed us to include likely horizontal interactions in our estimations, as we discuss later.

The second issue to take into consideration for an interpretation of our empirical findings into the scope of yardstick competition approach is the decision variable on which voters and incumbents must decide. Whereas from the seminal contribution by Besley and Case (1995) the focus lies in tax rates changes or in composition of public spending (see, for instance, Borck et al. (2007) and Bartolini and Santolini (2012)), our interest falls on the budget deficit. This is not a completely isolated innovation because the very pioneers of the literature already sketched such possibility (Besley and Case, 1995, pp. 40-41).

The point here is how the public deficit becomes the key variable for voters and incumbents instead of taxes. Based on the Ricardian equivalence and the rational expectations of both types of agents, the standard rationale in terms of taxes can be translated to our view using budget deficits. It must be claimed on this, however, that Besley and Case (1995) disregarded such substitution between taxes and public debt with the argument that some tentative regressions with the variable “changes in the level of state debt” did not offer statistically significant results (their table 3).

Yet, our approach differs from that followed by Besley and Case (1995) in this specific issue. Our reasoning takes into consideration the state public deficit as dependent variable and not the incumbent defeat as they do when including public debt just as a regressor. By contrast, a more consistent comparison should be done using their estimation of state tax changes (their table 4) and re-estimate in terms of debt variations.

Alternatively, it is possible to think of a model without recurring to Ricardian equivalence and able to explicate our results in terms of yardstick competition. Contrary to the previous assumptions, in a world with voters suffering fiscal illusion, the public deficits can be seen as positive signals of good incumbents. When the taxpayers are not aware of the true cost of public debt in the form of higher future taxes, they tend to interpret the public deficit as the provision of public services at a lower cost than the actual one. In this context, the voters will interpret the lack of fiscal discipline at federal and horizontal levels as a positive signal and will support their jurisdiction’s incumbents provided that they follow the same fiscal policy than those of the benchmark (and in debt) governments.

Having said that, we turn now to interpret our econometric findings within the general framework of yardstick competition models, keeping in mind the above caveats. We have a number of state governments choosing their fiscal policy, which is defined in terms of public surplus/deficit. Voters can perceive the public deficit as

an indication of bad management, in the Ricardian equivalence sense, or as a signal of being in the presence of good incumbents, following the postulates of public-choice literature. In line with the yardstick competition models, what happens in neighboring jurisdictions (at horizontal dimension and vertical as well) becomes indeed crucial by determining the sense of votes whether or not to support the re-election of the politicians in office. In our empirical approach we have focused on how the federal decisions impact the state choices.

Our empirical results are clear. The federal public deficits encourage the state public deficits through which can be partially interpreted as result of a process of yardstick competition. Higher deficits at federal level modify the perception of state voters in relation to the public borrowing and made them friendlier to it. One starting point for further research is that we are not able to put forward whether this positive vertical interaction is driven by the Ricardian equivalence postulates or, by contrast, by the theories on fiscal illusion. To disentangle this issue we would need a more comprehensive treatment of the voters' behaviors, which is out of the scope of this paper¹¹.

We have also captured indications of yardstick competition coming from other regions placed at the same tier of government. To do that, we have measured the horizontal interactions using three different types of variables. The first one is the aggregate public deficit existing in other regions as percentage of total GDP in such regions. The results can be seen in Table 12 and are little clarifying. While the coefficient of new variable *defgdg_j* has an extraordinary and significant positive effect, the statistical significance of the federal deficit disappears.

At this point, we are prone to interpret this as a reflex of the vertical interaction in deficits. Indeed, given that this vertical impact is common across the states, it is likely to be in the presence of a multicollinearity problem; in fact, the loss of statistical significance of our key variable (federal public deficit) and its high correlation (around 0.8) with the new one (the aggregate deficit in the other states) are clearly compatible with such interpretation.

TABLE 12 HERE

A second approach to horizontal interactions involves to build more specific measures for such as same-level connections. In this regard, we define the variable *neigh_defgdp* as the average fiscal imbalance of the geographically adjacent regions to a given state *i*. For Balearic Islands and Canary Islands we have taken the average of the all remaining state governments. Table 13 reports the corresponding estimates. The coefficient of the variable measuring horizontal interactions is positive and with acceptable levels of statistical significance. The coefficient of the federal deficit, although of lower extent, continues being positive and significant. In the dynamic specifications, the coefficients of the deficit in the neighboring states are three times higher than those of the federal deficit.

TABLE 13 HERE

¹¹Notwithstanding this, we only infer some weak support for rejecting the Ricardian equivalence hypothesis regarding the absence of statistical significance of the variable tax autonomy in our estimates. Indeed, voters worried on the future effects of current public deficit (in form of higher future taxes) would result in a (statistically significant) negative coefficient of the variable tax autonomy, as long as more visible taxes for the voters would imply fewer incentives for regional public deficits.

Precisely along this approach, we have advanced a further step by defining horizontal spillovers as the interaction between the above public deficit in neighboring regions and a dummy variable which is equal to 1 when both incumbents have the same political ideology. We mix then geographical and political criteria on the basis that the horizontal influences may be more fluid under such conditions. The results, reported in the table 14, confirm the previous ones: positive impacts of the federal and weighted regional (by proximity and ideology) public deficits, with improvements in the statistical significance of the coefficients and lower differences between both interactions; in this case the impact of the horizontal effect doubles that of the vertical one.

TABLE 14 HERE

Overall, in this section we just aimed at providing some rationale to the empirical findings we obtained before. We have accommodated them into a new version of the yardstick competition models, in which the relevant interaction affecting fiscal behaviors of regions comes through a vertical dimension, from the federal to the state governments. Potential research avenues for further studies have been also pointed out.

6 Conclusions

The objective of the paper was to provide new insights about the behavior of state governments in a federation. Particularly, we have focused on the interrelations between the deficit decisions taken by the federal and state governments in Spain over the period 1995-2010. Several conclusions can be obtained in line with our results.

Fiscal imbalances at state level seem not to be only driven by institutional arrangements within the country. Instead, our results suggest the existence of vertical and horizontal interactions eroding fiscal balances. The behavior of the central government, together with the decisions made by neighboring jurisdictions, have a remarkable influence on the intertemporal choices of a specific state.

We have provided an interesting rationale for a better understanding of such connections on the basis of yardstick competition models. In the absence of perfect information, individuals take the central government as benchmark to measure the quality of fiscal policy within their own jurisdiction. In this context, greater deficits at central level lead to higher deficits at state level. The same can be applied with neighboring (by geographical or ideological similarities) jurisdictions.

An alternative explanation of the empirical results obtained could be based on the so-called copycat effect followed by local and state governments. The point here is that subnational levels mimic the profligacy of upper governments, increasing fiscal imbalances as there are reasons to believe that they will not be sanctioned, given the bad example offered by the federal government. This promising approach could be further studied in the context of a system of credible penalties to fiscally-undisciplined governments.

Even though we have provided an alternative view to soft budget constraint models by explaining fiscal imbalances at state level, we indeed think that further research on vertical interactions in federations may well create new incentives to

soften subnational budget constraints. Such interactions are especially relevant on the revenue side. As a matter of fact, our results indicate some dependency of state fiscal stance from the territorial financing system. Given that tax autonomy at the Spanish lower levels of government does not seem to matter, the common pool of resources set up at federal level strongly affect the possibilities of states to provide public services. Hence, the financial stress between spending needs and tax revenues is often solved using the recourse to deficit.

Another singular issue in relation with the impact of federal fiscal decisions on state public deficits emerges from the grounds of the standard vertical externalities. Recall that they arise when two or more levels of government share taxes. Under some assumptions, tax changes at one level usually induce same-sense tax changes at other governments. In a context of fiscal reform, like that currently existing in Spain, to what extent the federal decrease of the income tax rates will affect the federal fiscal balance and, consequently, the state budget constraints is an intriguing fact to be studied in the medium term.

References

- Arellano, M. and S. Bond (1991). Some test of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies* 58(2), 277–297.
- Argimón, I. and P. Hernández de Cos (2012). Fiscal rules and federalism as determinants of budget performance: an empirical investigation for the Spanish case. *Public Finance Review* 40(1), 30–65.
- Bande, R., M. Fernández, and V. Montuenga (2008). Regional unemployment in Spain: Disparities, business cycle and wage settings. *Labour Economics* 15(5), 885–914.
- Barrios, S. and D. Martínez (2014). Fiscal equalisation schemes and sub-central government borrowing. GEN Working Paper A 2014-1, GEN - Governance and Economics research network.
- Bartolini, D. and R. Santolini (2012). Political yardstick competition among Italian municipalities on spending decisions. *The Annals of Regional Science* 49(1), 213–235.
- Baskaran, T. (2012). Soft budget constraints and strategic interactions in subnational borrowing: Evidence from the German States, 1975-2005. *Journal of Urban Economics* 71(1), 114–127.
- Baxter, M. and R. G. King (1999). Measuring business cycles: approximate band-pass filters for economic time series. *The Review of Economics and Statistics* 81(4), 575–593.
- Besley, T. and A. Case (1995). Incumbent behavior: vote-seeking, tax-setting, and yardstick competition. *The American Economic Review* 85(1), 25–45.
- Blundell, R. and S. Bond (1998). Initial conditions and moment restriction in dynamic panel data models. *Journal of Econometrics* 87(1), 115–143.

- Boadway, R. and A. Shah (2007). *Intergovernmental fiscal transfers: principles and practice*. Number 7171. World Bank Publications.
- Bohn, H. (1998). The behavior of U.S. public debt and deficits. *The Quarterly Journal of Economics* 113(3), 949–963.
- Bond, S. and F. Windmeijer (2002). Finite sample inference for GMM estimators in linear panel data models. cemmap working paper CWP04/2, The Institute for Fiscal Studies.
- Borck, R., M. Caliendo, and V. Steiner (2007). Fiscal competition and the composition of public spending: theory and evidence. *FinanzArchive/Public finance analysis* 63(2), 264–277.
- Bowsher, C. (2000). On testing overidentifying restrictions in dynamic panel data models. Working Paper 2000-W28, Nuffield College.
- Brender, A. and A. Drazen (2008). How do budget deficits and economic growth affect reelection prospects? Evidence from a large panel of countries. *The American Economic Review* 98(5), 2203–20.
- Breton, A. (1996). *Competitive governments: an economic theory of politics and public finance*. Cambridge University Press.
- Breton, A. (2006). *Handbook of Fiscal Federalism*. Edward Elgar Publishing.
- de la Fuente, A. (2013). Las finanzas autonómicas en boom y en crisis (2003 – 12). *Hacienda Pública Española* 205(2), 127–150.
- Eyraud, L. and L. Lusinyan (2013). Vertical fiscal imbalances and fiscal performance in advanced economies. *Journal of Monetary Economics* 60(5), 571–587.
- Fernández-Leiceaga, X. and S. Lago-Peñas (2013). Sobre el reparto de los derechos de déficit entre las Comunidades Autónomas: una propuesta alternativa. *Revista de Economía Aplicada* 21(63), 117–163.
- Foremny, D. (2014). Subnational deficits in European countries: The impact of fiscal rules and tax autonomy. *European Journal of Political Economy* 34(June 2014), 86–110.
- Goodspeed, T. J. (2002). Bailouts in a federation. *International Tax and Public Finance* 9(4), 409–421.
- Gordo, L., P. Hernández de Cos, and J. Pérez (2013). Developments in Spanish Public Debt since the start of the crisis. Economic Bulletin July-August, Bank of Spain.
- Herrero, A. and J. M. Tránchez (2011). El desarrollo y evolución del sistema de financiación autonómica. *Presupuesto y gasto público* 62, 33–65.
- Hodler, R. (2011). Elections and the strategic use of budget deficits. *Public Choice* 148(1-2), 149–161.

- Hodrick, R. J. and E. C. Prescott (1997). Postwar U.S. business cycles: an empirical investigation. *Journal of Money, Credit and Banking* 29(1), 1–16.
- Jimenez, B. S. (April 2014). The fiscal performance of overlapping local governments. *Public Finance Review*, Forthcoming.
- Kaiser, R. and A. Maravall (2001). *Measuring business cycles in economic time series*. Springer.
- Lago, S. (2005). Evolving federations and regional public deficits: testing the bailout hypothesis in the Spanish case. *Environment and Planning C: Government and Policy* 23(3), 437–453.
- Lemmen, J. (1999). Managing government default risk in federal states. Special Paper 116, Financial Market Group, Nijmegen, Netherlands.
- Maskin, E. and J. Tirole (2014). Pandering and pork-barrel politics. Working paper. mimeo, Harvard Business School.
- Nickell, S. (1981). Biases in dynamic models with fixed effects. *Econometrica* 49(6), 1417–1426.
- Ravn, M. O. and H. Uhlig (2002). On adjusting the Hodrick-Prescott filter for the frequency of observations. *The Review of Economics and Statistics* 84(2), 371–376.
- Rodden, J. (2006). *Hamilton’s paradox: the promise and peril of Fiscal Federalism*. Cambridge University Press.
- Rodden, J., G. S. Eskeland, and J. Litvack (2003). *Fiscal decentralization and the challenge of hard budget constraints*. The MIT press.
- Sorribas-Navarro, P. (2011). Bailouts in a fiscal federal system: evidence from Spain. *European Journal of Political Economy* 27(1), 154–170.
- Standard & Poor’s (2012). Research update: Spain ratings affirmed at ‘BB+/A-2’ on strong commitment to economic and fiscal adjustments; outlook remains negative.
- Van Hecke, A. (2013). Vertical debt spillovers in EMU countries. *Journal of International Money and Finance* 37, 468–492.
- Webb, S. (2004). Fiscal responsibility laws for subnational discipline: the Latin American experiences. World Bank Policy Research Working Paper 3309, The World Bank.
- Zabalza, A. and J. López-Laborda (2014). The uneasy coexistence of the Spanish foral and common regional finance systems. WP-EC 2014-2, Instituto Valenciano de Investigaciones Económicas (IVIE).

A Graphs and tables

Table 1: Correlation analysis coefficients.

State	Pearson Index		Spearman Index	
	deficit/GDP	p-value	deficit/GDP	p-value
Andalucía	0.7585	0.007	0.7676	0.0005
Aragón	0.6965	0.0027	0.7294	0.0013
Asturias	0.7059	0.0022	0.6588	0.0055
Baleares (I.)	0.5094	0.0439	0.3353	0.2043
Canarias (I.)	0.8614	0	0.8971	0
Cantabria	0.5598	0.0241	0.7647	0.0006
Castilla La Mancha	0.635	0.0082	0.4735	0.0006
Castilla-León	0.3717	0.1563	0.4471	0.0825
Cataluña	0.759	0.0007	0.7941	0.0002
C. Valenciana	0.7532	0.0008	0.7912	0.003
Extremadura	0.6627	0.0052	0.7529	0.0008
Galicia	0.7703	0.0005	0.8441	0
C. Madrid	0.7385	0.0011	0.7118	0.002
Murcia (R.)	0.5974	0.0145	0.7382	0.0011
La Rioja	0.6228	0.01	0.7618	0.0006
País Vasco	0.8889	0	0.8588	0
Navarra	0.5225	0.0379	0.5529	0.0263

Table 2: Definition and source of variables.

Variable	Label	Description	Source
Regional deficit	<i>defgdp</i>	SNG budget performance. Non financial expenditures minus non financial revenues relative to regional GDP.	BADESPE ¹ and own calculation.
Federal deficit	<i>f_defgdp</i>	Central government budget performance. Non financial expenditures minus non financial revenues relative to GDP.	BADESPE and own calculation.
Regional primary balance	<i>pbgdp</i>	Regional deficit minus interest payments.	BADESPE and own calculation.
Federal primary balance	<i>f_pbgdp</i>	Federal deficit minus interest payments.	BADESPE and own calculation.
GDP	<i>gdp</i>	Nominal GDP.	INE. ²
Output gap	<i>output_gap</i>	Distance between real and potential GDP.	Own calculation based on Hodrick and Prescott (1997) with $\lambda = 6.25$ for annual data.
Unemployment	<i>unemp</i>	Regional and federal unemployment rates.	INE.
Unemployment deviation	<i>unemp_dev</i>	Distance between regional and federal unemployment rates.	INE and own calculation.
Debt	<i>debt_{t-1}</i>	Lagged values of regional total debt relative to GDP.	Bank of Spain and own calculation.
GDP per capita	<i>gdppop</i>	Regional GDP relative to population.	INE and own calculation.
Population	<i>pop</i>	Regional and central population at the beginning of year t.	INE.
Regional elections	<i>SNG_elect</i>	Dummy variable. 1 = regional electoral years.	Regional Parliaments database and own calculation.
Federal elections	<i>fed_elect</i>	Dummy variable. 1 = center electoral years.	Ministry for home affairs and own calculation.
Alignment	<i>alignment</i>	Dummy variable. 1 = Regional and central governments managed by similar ideological parties.	Own calculation.
Left share	<i>left_sh</i>	Share of left wing parties seats in each regional Parliament.	Regional Parliaments database and own calculation.
Regional share	<i>reg_sh</i>	Share of regionalist parties seats in each regional Parliament.	Regional Parliaments database and own calculation.
Autonomy	<i>auto</i>	Dummy variable. 1 = Assumption of health and education responsibilities before 2002.	Own calculation.
Foral	<i>foral</i>	Dummy variable. 1 = Regional foral regime.	Own calculation.
Tax autonomy	<i>tax_auto</i>	Regional revenue taxes relative to total non financial revenues.	Own calculation.
Financial agreements	<i>fin_agree(year)</i>	Dummy variables for each financial agreement (1997 and 2002) between regional and central government.	Own calculation.
Stability and Growth Pact	<i>SGP</i>	Dummy variable. 1 = European Stability and Growth Pact in force.	Own calculation.
Financing model	<i>fin_mod</i>	Dummy variable. 1 = Change in the regional financing system (1997, 2002 and 2009).	Own calculation.
Neighboring deficits (a)	<i>defgdp(j)</i>	Average states deficits to GDP ratio.	Own calculation.
Neighboring deficits (b)	<i>neigh_defgdp</i>	Average deficits of geographical adjacent jurisdictions to a given state i.	Own calculation.
Neighboring deficits (c)	<i>ideo * defgdp(j)</i>	Average deficits of politically aligned jurisdictions to a given state i.	Own calculation.

¹ BADESPE: Spanish fiscal database elaborated by the Institute of Fiscal Studies.

² INE: National Institute of Statistics.

B Result outcomes

Table 3: States deficit response to federal fiscal imbalances.

	LSDV		RE		GMM	
	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)
f.defgdp	0.219*** (0.030)	0.241*** (0.034)	0.221*** (0.027)	0.250*** (0.032)	0.221*** (0.033)	0.228*** (0.032)
<i>Economic variables</i>						
output_gap	-0.091** (0.037)	-0.076* (0.043)	-0.083*** (0.029)	-0.062* (0.036)	-0.098*** (0.035)	-0.092** (0.040)
debt(t-1)	0.001** (0.000)	0.001** (0.000)	0.001* (0.001)	0.001* (0.001)	0.000 (0.001)	0.000 (0.001)
gdppop	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.002*** (0.000)	0.001*** (0.000)
defgdp(t-1)					0.043 (0.074)	0.047 (0.077)
<i>Political variables</i>						
alignment	-0.002 (0.001)	-0.002* (0.001)	-0.002 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.001 (0.001)
left_sh	0.014 (0.015)	0.014 (0.015)	0.016 (0.014)	0.018 (0.014)	-0.006 (0.020)	-0.009 (0.020)
reg_sh	0.002 (0.018)	-0.001 (0.018)	-0.001 (0.008)	0.001 (0.007)	-0.014 (0.026)	-0.016 (0.026)
<i>Institutional variables</i>						
auto	-0.018*** (0.005)	-0.019*** (0.005)	-0.006 (0.004)	-0.005 (0.004)		
foral	-0.028*** (0.009)	-0.030*** (0.008)	-0.014*** (0.003)	-0.014*** (0.003)		
SGP	-0.007*** (0.003)		-0.006** (0.003)		-0.009*** (0.003)	
tax_auto	-0.006 (0.006)		-0.007 (0.005)		-0.003 (0.008)	
fin_agree(97)		0.003 (0.002)		0.004** (0.002)		0.000 (0.001)
fin_agree(02)		-0.006 (0.004)		-0.003 (0.003)		-0.009** (0.004)
constant	-0.020** (0.009)	-0.021** (0.009)	-0.033*** (0.007)	-0.035*** (0.006)	-0.027*** (0.010)	-0.026** (0.010)
Observations	255	255	255	255	238	238
Adjusted R^2	0.583	0.583	0.4936	0.4932		
Hausman			2.27 (0.9862)	2.97 (0.9655)		
Arellano-Bond:						
m1					-2.6791 (0.0074)	-2.7017 (0.0069)
m2					1.264 (0.2062)	1.2703 (0.2064)
Sargan					145.1499 (0.0048)	143.8411 (0.0059)

Standard errors in parentheses.

Dependent variable: Deficit to GDP ratio. Specifications (I) and (II) differ on whether fiscal autonomy is proxied with a measure of tax autonomy or, alternatively, with financial agreements.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

C Robustness checks outcomes

Table 4: States deficit response to previous federal fiscal imbalances.

	LSDV		RE		GMM	
	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)
f_defgdp(t-1)	0.212*** (0.033)	0.208*** (0.035)	0.208*** (0.028)	0.215*** (0.030)	0.251*** (0.032)	0.236*** (0.033)
<i>Economic variables</i>						
output_gap	-0.076 (0.048)	-0.094* (0.054)	-0.067* (0.037)	-0.072 (0.047)	-0.072 (0.049)	-0.090 (0.056)
debt(t-1)	0.001 (0.000)	0.001 (0.000)	0.001 (0.001)	0.001 (0.001)	-0.001*** (0.000)	-0.001** (0.000)
gdppop	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.001*** (0.000)	0.002*** (0.000)	0.002*** (0.000)
defgdp(t-1)					0.080 (0.098)	0.076 (0.100)
<i>Political variables</i>						
alignment	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.001 (0.001)	-0.000 (0.002)
left_sh	0.013 (0.016)	0.010 (0.016)	0.016 (0.014)	0.019 (0.015)	0.001 (0.028)	-0.002 (0.028)
reg_sh	0.009 (0.019)	0.006 (0.019)	-0.003 (0.008)	-0.002 (0.007)	-0.007 (0.037)	-0.010 (0.037)
<i>Institutional variables</i>						
auto	-0.018*** (0.005)	-0.019*** (0.006)	-0.005 (0.004)	-0.004 (0.004)		
foral	-0.033*** (0.010)	-0.038*** (0.009)	-0.015*** (0.003)	-0.015*** (0.003)		
SGP	-0.008*** (0.003)		-0.006** (0.003)		-0.011*** (0.003)	
tax_auto	-0.007 (0.006)		-0.008 (0.005)		-0.002 (0.006)	
fin_agree(97)		-0.003 (0.002)		-0.001 (0.002)		-0.003* (0.002)
fin_agree(02)		-0.013*** (0.004)		-0.009*** (0.003)		-0.015*** (0.004)
constant	-0.024** (0.010)	-0.021** (0.010)	-0.037*** (0.007)	-0.038*** (0.007)	-0.031** (0.013)	-0.029** (0.014)
Observations	255	255	255	255	238	238
Adjusted R^2	0.521	0.521	0.4165	0.4143		
Hausman			5.10 (0.8251)	8.98 (0.4387)		
Arellano-Bond:						
m1					-2.1928 (0.0283)	-2.1771 (0.0295)
m2					0.84066 (0.4005)	0.86364 (0.3878)
Sargan					167.2387 (0.0001)	167.3799 (0.0001)

Standard errors in parentheses.

Dependent variable: Deficit to GDP ratio. Specifications (I) and (II) differ on whether fiscal autonomy is proxied with a measure of tax autonomy or, alternatively, with financial agreements.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: States deficit response to current and previous federal fiscal imbalances.

	LSDV		RE		GMM	
	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)
f.defgdp	0.186*** (0.035)	0.210*** (0.038)	0.189*** (0.034)	0.217*** (0.037)	0.189*** (0.035)	0.203*** (0.035)
f.defgdp(t-1)	0.111*** (0.042)	0.129*** (0.042)	0.103*** (0.037)	0.128*** (0.036)	0.189*** (0.034)	0.191*** (0.035)
<i>Economic variables</i>						
output_gap	-0.024 (0.041)	0.018 (0.048)	-0.019 (0.032)	0.031 (0.040)	0.005 (0.039)	0.030 (0.047)
debt(t-1)	0.001* (0.000)	0.001 (0.000)	0.001 (0.001)	0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
gdppop	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.002*** (0.000)	0.001*** (0.000)
defgdp(t-1)					-0.050 (0.062)	-0.059 (0.057)
<i>Political variables</i>						
alignment	-0.001 (0.001)	-0.002* (0.001)	-0.002 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.001 (0.002)
left_sh	0.009 (0.015)	0.010 (0.014)	0.015 (0.015)	0.016 (0.014)	-0.020 (0.025)	-0.016 (0.023)
reg_sh	0.001 (0.018)	0.000 (0.017)	-0.002 (0.008)	0.001 (0.007)	-0.026 (0.032)	-0.021 (0.031)
<i>Institutional variables</i>						
auto	-0.018*** (0.005)	-0.017*** (0.005)	-0.005 (0.004)	-0.004 (0.004)		
foral	-0.032*** (0.009)	-0.030*** (0.008)	-0.014*** (0.003)	-0.014*** (0.003)		
SGP	-0.007*** (0.003)		-0.006** (0.003)		-0.010*** (0.003)	
tax_auto	-0.001 (0.005)		-0.004 (0.005)		0.008 (0.008)	
fin_agree(97)		0.005** (0.002)		0.006*** (0.001)		0.004** (0.002)
fin_agree(02)		-0.001 (0.004)		0.001 (0.003)		-0.004 (0.004)
constant	-0.019** (0.009)	-0.021** (0.009)	-0.034*** (0.007)	-0.037*** (0.007)	-0.022* (0.012)	-0.023** (0.011)
Observations	255	255	255	255	238	238
Adjusted R^2	0.596	0.602	0.5109	0.5181		
Hausman			3.26 (0.9747)	3.08 (0.9796)		
Arellano-Bond:						
m1					-2.2206 (0.0264)	-2.2447 (0.0248)
m2					1.1599 (0.2461)	1.1043 (0.2694)
Sargan					152.1558 (0.0015)	151.2393 (0.0017)

Standard errors in parentheses.

Dependent variable: Deficit to GDP ratio. Specifications (I) and (II) differ on whether fiscal autonomy is proxied with a measure of tax autonomy or, alternatively, with financial agreements.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6: States deficit response to federal fiscal imbalances.

	LSDV		RE		GMM	
	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)
f.defgdp	0.197*** (0.042)	0.217*** (0.043)	0.207*** (0.042)	0.228*** (0.042)	0.184*** (0.048)	0.195*** (0.047)
<i>Economic variables</i>						
unemp	0.000** (0.000)	0.000** (0.000)	0.000** (0.000)	0.000** (0.000)	0.001** (0.000)	0.001** (0.000)
debt(t-1)	0.001** (0.000)	0.001* (0.000)	0.001* (0.001)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)
gdppop	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.002*** (0.000)	0.001*** (0.000)
defgdp(t-1)					0.080 (0.080)	0.068 (0.076)
<i>Political variables</i>						
alignment	-0.001 (0.001)	-0.002 (0.001)	-0.001 (0.001)	-0.002 (0.001)	-0.000 (0.001)	-0.001 (0.001)
left_sh	0.006 (0.016)	0.007 (0.015)	0.009 (0.015)	0.011 (0.015)	-0.027 (0.021)	-0.024 (0.021)
reg_sh	-0.001 (0.018)	-0.001 (0.018)	-0.002 (0.008)	0.001 (0.008)	-0.021 (0.027)	-0.018 (0.027)
<i>Institutional variables</i>						
auto	-0.019*** (0.005)	-0.018*** (0.005)	-0.007* (0.004)	-0.006 (0.004)		
foral	-0.027*** (0.009)	-0.028*** (0.008)	-0.014*** (0.003)	-0.014*** (0.003)		
SGP	-0.006** (0.003)		-0.005** (0.002)		-0.008*** (0.003)	
tax_auto	-0.005 (0.005)		-0.005 (0.005)		0.000 (0.007)	
fin_agree(02)		-0.002 (0.003)		-0.001 (0.002)		-0.005** (0.003)
fin_agree(97)		0.005*** (0.002)		0.005*** (0.001)		0.003** (0.001)
constant	-0.021** (0.009)	-0.025*** (0.009)	-0.035*** (0.007)	-0.039*** (0.006)	-0.026*** (0.010)	-0.028*** (0.010)
Observations	255	255	255	255	238	238
Adjusted R^2	0.580	0.586	0.4907	0.4976		
Hausman			3.36 (0.9485)	4.16 (0.9005)		
Arellano-Bond:						
m1					-2.4915 (0.0127)	-2.5193 (0.0118)
m2					1.4846 (0.1377)	1.4345 (0.1514)
Sargan					148.0672 (0.003)	146.8929 (0.0036)

Standard errors in parentheses.

Dependent variable: Deficit to GDP ratio. Specifications (I) and (II) differ on whether fiscal autonomy is proxied with a measure of tax autonomy or, alternatively, with financial agreements.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7: States deficit response to federal fiscal imbalances.

	LSDV		RE		GMM	
	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)
f.defgdp	0.255*** (0.029)	0.279*** (0.031)	0.254*** (0.026)	0.280*** (0.029)	0.247*** (0.031)	0.260*** (0.030)
<i>Economic variables</i>						
unemp_dev	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
debt(t-1)	0.001*** (0.000)	0.001** (0.000)	0.001** (0.001)	0.001* (0.001)	0.001 (0.001)	0.001 (0.001)
gdppop	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
defgdp(t-1)					0.096 (0.081)	0.089 (0.078)
<i>Political variables</i>						
alignment	-0.001 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.002 (0.001)	-0.001 (0.001)	-0.002 (0.001)
left_sh	0.009 (0.016)	0.010 (0.016)	0.012 (0.015)	0.014 (0.014)	-0.018 (0.021)	-0.017 (0.022)
reg_sh	-0.003 (0.018)	-0.004 (0.018)	-0.001 (0.008)	0.002 (0.007)	-0.023 (0.026)	-0.023 (0.026)
<i>Institutional variables</i>						
auto	-0.017 (0.011)	-0.015 (0.010)	-0.007* (0.004)	-0.006 (0.004)		
foral	-0.025*** (0.009)	-0.027*** (0.008)	-0.014*** (0.003)	-0.013*** (0.003)		
SGP	-0.006** (0.003)		-0.005** (0.002)		-0.008*** (0.002)	
tax_auto	-0.007 (0.006)		-0.007 (0.005)		-0.004 (0.007)	
fin_agree(97)		0.005*** (0.002)		0.005*** (0.001)		0.002* (0.001)
fin_agree(02)		-0.002 (0.003)		-0.001 (0.002)		-0.005** (0.002)
constant	-0.016 (0.010)	-0.018* (0.010)	-0.030*** (0.006)	-0.034*** (0.006)	-0.019* (0.010)	-0.021* (0.011)
Observations	255	255	255	255	238	238
Adjusted R^2	0.574	0.578	0.4828	0.4877		
Hausman			2.40 (0.9834)	2.96 (0.9657)		
<i>Arellano-Bond:</i>						
m1					-2.5603 (0.0105)	-2.594 (0.0095)
m2					1.3975 (0.1623)	1.3689 (0.171)
Sargan					146.1834 (0.0041)	144.5249 (0.0053)

Standard errors in parentheses.

Dependent variable: Deficit to GDP ratio. Specifications (I) and (II) differ on whether fiscal autonomy is proxied with a measure of tax autonomy or, alternatively, with financial agreements.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 8: States deficit to population ratio response to federal fiscal imbalances.

	LSDV		RE		GMM	
	defpop (I)	defpop (II)	defpop (I)	defpop (II)	defpop (I)	defpop (II)
f.defpop	0.234*** (0.035)	0.241*** (0.036)	0.240*** (0.038)	0.251*** (0.039)	0.219*** (0.037)	0.219*** (0.035)
<i>Economic variables</i>						
output_gap	-1.471* (0.858)	-1.419 (0.967)	-1.241 (0.765)	-1.056 (0.877)	-1.462** (0.661)	-1.472** (0.737)
debt(t-1)	0.027*** (0.009)	0.025*** (0.009)	0.027*** (0.010)	0.025*** (0.009)	0.014 (0.013)	0.014 (0.012)
gdppop	0.016*** (0.006)	0.015** (0.007)	0.013*** (0.004)	0.010** (0.005)	0.020*** (0.006)	0.021*** (0.006)
defpop(t-1)					0.120* (0.065)	0.121* (0.066)
<i>Political variables</i>						
alignment	-0.035* (0.021)	-0.038* (0.022)	-0.036 (0.024)	-0.042* (0.024)	-0.035* (0.018)	-0.035 (0.022)
left_sh	0.487 (0.312)	0.473 (0.314)	0.411 (0.263)	0.427 (0.260)	0.184 (0.305)	0.156 (0.323)
reg_sh	0.317 (0.378)	0.285 (0.383)	0.119 (0.110)	0.146 (0.102)	0.239 (0.561)	0.217 (0.590)
<i>Institutional variables</i>						
auto	-0.333*** (0.079)	-0.342*** (0.081)	-0.139** (0.067)	-0.132** (0.064)		
foral	-0.519** (0.201)	-0.562*** (0.180)	-0.303*** (0.044)	-0.296*** (0.047)		
SGP	-0.144*** (0.051)		-0.128*** (0.045)		-0.181*** (0.053)	
tax_auto	-0.092 (0.113)		-0.077 (0.087)		-0.023 (0.131)	
fin_agree(97)		0.013 (0.034)		0.030 (0.027)		-0.009 (0.027)
fin_agree(02)		-0.148** (0.067)		-0.105* (0.054)		-0.194*** (0.056)
constant	-0.417** (0.195)	-0.407** (0.195)	-0.543*** (0.124)	-0.554*** (0.121)	-0.587*** (0.201)	-0.572*** (0.216)
Observations	255	255	255	255	238	238
Adjusted R^2	0.581	0.580	0.5144	0.5133		
Hausman			1.70 (0.9954)	1.85 (0.9936)		
Arellano-Bond:						
m1					-2.1448 (0.032)	-2.1518 (0.0314)
m2					0.80192 (0.4226)	0.80199 (0.4226)
Sargan					163.1611 (0.0002)	162.7184 (0.0002)

Standard errors in parentheses.

Dependent variable: Deficit to population ratio. Specifications (I) and (II) differ on whether fiscal autonomy is proxied with a measure of tax autonomy or, alternatively, with financial agreements.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 9: States primary balances to GDP ratio response to federal fiscal imbalances.

	LSDV		RE		GMM	
	pbgdp (I)	pbgdp (II)	pbgdp (I)	pbgdp (II)	pbgdp (I)	pbgdp (II)
f_pbgdp	0.214*** (0.033)	0.238*** (0.038)	0.217*** (0.030)	0.246*** (0.035)	0.207*** (0.033)	0.225*** (0.033)
<i>Economic variables</i>						
output_gap	-0.112*** (0.038)	-0.098** (0.044)	-0.106*** (0.031)	-0.087** (0.038)	-0.107*** (0.041)	-0.093** (0.047)
debt(t-1)	0.001 (0.000)	0.001 (0.000)	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)
gdppop	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
pbgdp(t-1)					0.074 (0.081)	0.083 (0.083)
<i>Political variables</i>						
alignment	-0.002 (0.001)	-0.002* (0.001)	-0.002 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.002 (0.001)
left_sh	0.011 (0.016)	0.010 (0.016)	0.014 (0.013)	0.015 (0.013)	-0.007 (0.017)	-0.010 (0.017)
reg_sh	0.001 (0.018)	-0.002 (0.018)	-0.000 (0.008)	0.002 (0.007)	-0.006 (0.025)	-0.008 (0.024)
<i>Institutional variables</i>						
auto	-0.018*** (0.005)	-0.018*** (0.005)	-0.006 (0.004)	-0.006 (0.004)		
foral	-0.028*** (0.009)	-0.030*** (0.008)	-0.015*** (0.002)	-0.014*** (0.003)		
SGP	-0.008*** (0.003)		-0.007*** (0.003)		-0.009*** (0.003)	
tax_auto	-0.007 (0.006)		-0.007 (0.005)		-0.008 (0.008)	
fin_agree(97)		0.003 (0.002)		0.003** (0.002)		0.002 (0.002)
fin_agree(02)		-0.006 (0.004)		-0.005 (0.003)		-0.008** (0.004)
constant	-0.009 (0.010)	-0.008 (0.010)	-0.023*** (0.006)	-0.023*** (0.006)	-0.018** (0.008)	-0.017** (0.008)
Observations	255	255	255	255	238	238
Adjusted R^2	0.580	0.579	0.4737	0.4730		
Hausman			1.19 (0.9988)	1.55 (0.9967)		
Arellano-Bond:						
m1					-2.684 (0.0073)	-2.6985 (0.007)
m2					1.3152 (0.1884)	1.3265 (0.1847)
Sargan					149.5156 (0.0023)	147.4579 (0.0033)

Standard errors in parentheses.

Dependent variable: Primary balance to GDP ratio. Specifications (I) and (II) differ on whether fiscal autonomy is proxied with a measure of tax autonomy or, alternatively, with financial agreements.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 10: States primary balances to population ratio response to federal fiscal imbalances.

	LSDV		RE		GMM	
	pbpop (I)	pbpop (II)	pbpop (I)	pbpop (II)	pbpop (I)	pbpop (II)
f_pbpop	0.221*** (0.036)	0.230*** (0.038)	0.227*** (0.038)	0.242*** (0.040)	0.206*** (0.037)	0.214*** (0.036)
<i>Economic variables</i>						
output_gap	-2.042** (0.864)	-1.976** (0.976)	-1.804** (0.757)	-1.588* (0.866)	-1.823*** (0.698)	-1.705** (0.769)
debt(t-1)	0.020** (0.009)	0.018** (0.009)	0.021** (0.010)	0.018* (0.010)	0.009 (0.013)	0.008 (0.012)
gdppop	0.015** (0.006)	0.013* (0.007)	0.012*** (0.004)	0.008* (0.005)	0.020*** (0.006)	0.018*** (0.006)
pbpop(t-1)					0.135** (0.067)	0.141** (0.068)
<i>Political variables</i>						
alignment	-0.036* (0.021)	-0.041* (0.022)	-0.038 (0.024)	-0.045* (0.025)	-0.036* (0.020)	-0.043* (0.023)
left_sh	0.421 (0.317)	0.403 (0.320)	0.370 (0.256)	0.395 (0.251)	0.104 (0.300)	0.060 (0.306)
reg_sh	0.309 (0.380)	0.268 (0.386)	0.096 (0.109)	0.134 (0.098)	0.336 (0.553)	0.300 (0.585)
<i>Institutional variables</i>						
auto	-0.335*** (0.081)	-0.344*** (0.084)	-0.141** (0.068)	-0.132** (0.065)		
foral	-0.568*** (0.201)	-0.619*** (0.182)	-0.324*** (0.042)	-0.316*** (0.052)		
SGP	-0.146*** (0.052)		-0.129*** (0.045)		-0.172*** (0.054)	
tax_auto	-0.114 (0.117)		-0.104 (0.087)		-0.109 (0.148)	
fin_agree(97)		0.018 (0.035)		0.037 (0.027)		0.014 (0.026)
fin_agree(02)		-0.150** (0.069)		-0.102* (0.053)		-0.175*** (0.058)
constant	-0.262 (0.201)	-0.245 (0.200)	-0.397*** (0.117)	-0.404*** (0.113)	-0.448** (0.179)	-0.433** (0.180)
Observations	255	255	255	255	238	238
Adjusted R^2	0.568	0.567	0.4865	0.4849		
Hausman			1.52 (0.9970)	1.85 (0.9936)		
Arellano-Bond:						
m1					-2.1502 (0.0315)	-2.1564 (0.0311)
m2					0.84505 (0.3981)	0.84621 (0.3974)
Sargan					167.7061 (0.0001)	166.5407 (0.0001)

Standard errors in parentheses.

Dependent variable: Primary balance to population ratio. Specifications (I) and (II) differ on whether fiscal autonomy is proxied with a measure of tax autonomy or, alternatively, with financial agreements.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 11: States deficit response to political cycles.

	LSDV		RE		GMM	
	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)
f.defgdp	0.240*** (0.030)	0.281*** (0.036)	0.241*** (0.028)	0.288*** (0.035)	0.254*** (0.035)	0.282*** (0.037)
<i>Economic variables</i>						
output_gap	-0.091** (0.039)	-0.066 (0.043)	-0.083** (0.033)	-0.054 (0.039)	-0.100*** (0.036)	-0.081** (0.041)
debt(t-1)	0.001** (0.000)	0.001** (0.000)	0.001* (0.001)	0.001 (0.001)	0.000 (0.001)	-0.000 (0.001)
gdppop	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.002*** (0.000)	0.001*** (0.000)
defgdp(t-1)					0.035 (0.070)	0.039 (0.072)
<i>Political variables</i>						
alignment	-0.001 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.001 (0.001)
left_sh	0.014 (0.015)	0.014 (0.015)	0.016 (0.015)	0.018 (0.014)	-0.008 (0.022)	-0.009 (0.022)
reg_sh	-0.000 (0.018)	-0.003 (0.018)	-0.002 (0.008)	0.001 (0.007)	-0.021 (0.026)	-0.022 (0.026)
SNG_elect	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
fed_elect	-0.000 (0.001)	0.000 (0.001)	-0.000 (0.001)	0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)
<i>Institutional variables</i>						
auto	-0.018*** (0.005)	-0.018*** (0.005)	-0.006 (0.004)	-0.005 (0.004)		
foral	-0.028*** (0.009)	-0.029*** (0.008)	-0.014*** (0.003)	-0.014*** (0.003)		
SGP	-0.008*** (0.003)		-0.007*** (0.003)		-0.011*** (0.003)	
tax_auto	-0.007 (0.006)		-0.007 (0.005)		-0.005 (0.008)	
fin_agree(97)		0.005** (0.002)		0.006*** (0.002)		0.004** (0.002)
fin_agree(02)		-0.004 (0.004)		-0.002 (0.003)		-0.008* (0.004)
fin_mod	-0.003 (0.002)	-0.003** (0.002)	-0.002* (0.001)	-0.003** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)
constant	-0.020** (0.009)	-0.022** (0.009)	-0.033*** (0.007)	-0.037*** (0.007)	-0.024** (0.010)	-0.025** (0.010)
Observations	255	255	255	255	238	238
Adjusted R^2	0.584	0.587	0.5014	0.5056		
Hausman			2.26 (0.9989)	2.67 (0.9975)		
Arellano-Bond:						
m1					-2.5933 (0.0095)	-2.6074 (0.0091)
m2					1.2241 (0.2209)	1.2072 (0.2274)
Sargan					143.8688 (0.0059)	143.0275 (0.0067)

Standard errors in parentheses.

Dependent variable: Deficit to GDP ratio. Specifications (I) and (II) differ on whether fiscal autonomy is proxied with a measure of tax autonomy or, alternatively, with financial agreements.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 12: States deficit response to horizontal interactions.

	LSDV		RE		GMM	
	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)
f.defgdp	0.051 (0.057)	0.060 (0.063)	0.078 (0.049)	0.096* (0.053)	0.008 (0.053)	0.010 (0.051)
defgdp(j)	0.737*** (0.177)	0.729*** (0.178)	0.622*** (0.162)	0.593*** (0.139)	0.931*** (0.178)	0.901*** (0.174)
<i>Economic variables</i>						
output_gap	-0.041 (0.037)	-0.033 (0.040)	-0.028 (0.035)	-0.018 (0.039)	-0.065* (0.038)	-0.064 (0.042)
debt(t-1)	0.000 (0.000)	0.000 (0.000)	0.001** (0.000)	0.001** (0.000)	-0.001** (0.001)	-0.001** (0.001)
gdppop	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
defgdp(t-1)					0.003 (0.053)	-0.005 (0.053)
<i>Political variables</i>						
alignment	-0.002** (0.001)	-0.002** (0.001)	-0.002* (0.001)	-0.002* (0.001)	-0.002* (0.001)	-0.002 (0.002)
left_sh	0.014 (0.013)	0.015 (0.013)	0.018 (0.014)	0.018 (0.015)	0.004 (0.018)	0.006 (0.018)
reg_sh	0.004 (0.016)	0.004 (0.016)	0.007 (0.009)	0.008 (0.008)	0.003 (0.029)	0.005 (0.028)
<i>Institutional variables</i>						
auto	-0.013** (0.005)	-0.013** (0.005)	-0.007* (0.004)	-0.007* (0.004)		
foral	-0.024*** (0.009)	-0.023*** (0.008)	-0.013*** (0.003)	-0.013*** (0.003)		
SGP	-0.003 (0.003)		-0.003 (0.003)		-0.004 (0.003)	
tax_auto	0.000 (0.005)		-0.000 (0.004)		0.008 (0.007)	
fin_agree(97)		0.001 (0.002)		0.002 (0.002)		0.000 (0.001)
fin_agree(02)		-0.001 (0.004)		-0.001 (0.004)		-0.003 (0.004)
constant	0.001 (0.010)	-0.000 (0.010)	-0.018** (0.007)	-0.019*** (0.007)	-0.001 (0.011)	-0.002 (0.011)
Observations	255	255	255	255	238	238
Adjusted R^2	0.631	0.631	0.5457	0.5458		
Hausman			35.21 (0.0001)	29.34 (0.0011)		
Arellano-Bond:						
m1					-2.473 (0.0134)	-2.4741 (0.0134)
m2					1.3513 (0.1766)	1.3445 (0.1788)
Sargan					138.6203 (0.0132)	139.9657 (0.0108)

Standard errors in parentheses.

Dependent variable: Deficit to GDP ratio. Specifications (I) and (II) differ on whether fiscal autonomy is proxied with a measure of tax autonomy or, alternatively, with financial agreements.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 13: States deficit response to horizontal interactions from neighboring states.

	LSDV		RE		GMM	
	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)
f.defgdp	0.158*** (0.049)	0.180*** (0.053)	0.158*** (0.043)	0.180*** (0.046)	0.126*** (0.049)	0.133*** (0.047)
neigh.defgdp	0.262* (0.139)	0.258* (0.139)	0.268* (0.139)	0.270** (0.133)	0.404*** (0.125)	0.405*** (0.124)
<i>Economic variables</i>						
output_gap	-0.060 (0.039)	-0.047 (0.043)	-0.056 (0.037)	-0.040 (0.042)	-0.056 (0.038)	-0.050 (0.044)
debt(t-1)	0.001* (0.000)	0.001* (0.000)	0.001 (0.001)	0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)
gdppop	0.001** (0.000)	0.001* (0.000)	0.001** (0.000)	0.001* (0.000)	0.001** (0.000)	0.001* (0.000)
defgdp(t-1)					0.042 (0.071)	0.042 (0.073)
<i>Political variables</i>						
alignment	-0.002 (0.001)	-0.002* (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.001 (0.001)	-0.001 (0.001)
left_sh	0.017 (0.015)	0.016 (0.015)	0.017 (0.014)	0.018 (0.013)	-0.003 (0.019)	-0.004 (0.020)
reg_sh	0.001 (0.018)	-0.001 (0.018)	0.002 (0.008)	0.004 (0.008)	-0.007 (0.027)	-0.008 (0.028)
<i>Institutional variables</i>						
auto	-0.017*** (0.005)	-0.017*** (0.005)	-0.007 (0.004)	-0.006 (0.004)		
foral	-0.021** (0.010)	-0.023** (0.009)	-0.012*** (0.003)	-0.011*** (0.003)		
SGP	-0.005 (0.003)		-0.004 (0.003)		-0.005* (0.003)	
tax_auto	-0.006 (0.005)		-0.005 (0.005)		-0.002 (0.008)	
fin_agree(97)		0.002 (0.002)		0.003** (0.001)		0.001 (0.001)
fin_agree(02)		-0.003 (0.004)		-0.002 (0.003)		-0.005 (0.004)
constant	-0.013 (0.010)	-0.014 (0.010)	-0.025*** (0.008)	-0.027*** (0.008)	-0.013 (0.010)	-0.012 (0.010)
Observations	255	255	255	255	238	238
Adjusted R^2	0.592	0.592	0.5079	0.5073		
Hausman			1.03 (0.9998)	1.26 (0.9995)		
Arellano-Bond:						
m1					-2.6672 (0.0076)	-2.6833 (0.0073)
m2					1.2223 (0.2216)	1.2228 (0.2214)
Sargan					145.5468 (0.0045)	144.4968 (0.0053)

Standard errors in parentheses.

Dependent variable: Deficit to GDP ratio. Specifications (I) and (II) differ on whether fiscal autonomy is proxied with a measure of tax autonomy or, alternatively, with financial agreements.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 14: States deficit response to horizontal interactions from states aligned ideologically.

	LSDV		RE		GMM	
	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)
f.defgdp	0.178*** (0.035)	0.196*** (0.041)	0.187*** (0.032)	0.210*** (0.036)	0.166*** (0.036)	0.172*** (0.036)
ideo*defgdp(j)	0.303*** (0.109)	0.299*** (0.111)	0.267** (0.106)	0.263*** (0.098)	0.368*** (0.114)	0.366*** (0.113)
<i>Economic variables</i>						
output_gap	-0.077** (0.037)	-0.066 (0.042)	-0.068** (0.034)	-0.051 (0.040)	-0.092*** (0.036)	-0.087** (0.041)
debt(t-1)	0.001** (0.000)	0.001** (0.000)	0.001* (0.001)	0.001* (0.001)	0.000 (0.000)	-0.000 (0.000)
gdppop	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
defgdp(t-1)					0.040 (0.063)	0.044 (0.066)
<i>Political variables</i>						
alignment	-0.002 (0.001)	-0.002* (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.001 (0.001)	-0.001 (0.001)
left_sh	0.028* (0.016)	0.027* (0.016)	0.022 (0.014)	0.023 (0.014)	0.023 (0.020)	0.020 (0.021)
reg_sh	0.007 (0.017)	0.005 (0.017)	0.000 (0.008)	0.002 (0.008)	0.005 (0.026)	0.003 (0.026)
<i>Institutional variables</i>						
auto	-0.016*** (0.004)	-0.016*** (0.004)	-0.006 (0.004)	-0.006 (0.004)		
foral	-0.024*** (0.009)	-0.026*** (0.008)	-0.013*** (0.003)	-0.012*** (0.003)		
SGP	-0.006** (0.003)		-0.005* (0.003)		-0.007*** (0.003)	
tax_auto	-0.006 (0.005)		-0.005 (0.004)		-0.003 (0.006)	
fin_agree(97)		0.002 (0.002)		0.003* (0.002)		0.000 (0.001)
fin_agree(02)		-0.004 (0.004)		-0.002 (0.004)		-0.007* (0.004)
constant	-0.021** (0.009)	-0.021** (0.009)	-0.030*** (0.006)	-0.032*** (0.007)	-0.032*** (0.010)	-0.032*** (0.010)
Observations	255	255	255	255	238	238
Adjusted R^2	0.599	0.599	0.5155	0.5148		
Hausman			-21.19	-22.67		
<i>Arellano-Bond:</i>						
m1					-2.6912 (0.0071)	-2.7024 (0.0069)
m2					1.141 (0.2539)	1.1448 (0.2523)
Sargan					146.7397 (0.0037)	145.6504 (0.0044)

Standard errors in parentheses.

Dependent variable: Deficit to GDP ratio. Specifications (I) and (II) differ on whether fiscal autonomy is proxied with a measure of tax autonomy or, alternatively, with financial agreements.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$