

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

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Abstract

This paper studies the vertical and horizontal interactions existing between federal and state governments in terms of public deficits. Recent studies usually restraint budget slippages to the incentives created by the institutional arrangements within a country. Alternatively, here 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 bigger fiscal imbalances at state level. This vertical interaction is interpreted in the context of yardstick competition models. We also find a significant impact of fiscal decisions taken by governments at the same tier of decision on a specific state.

Keywords: public deficit, vertical and horizontal interactions, inter-governmental relations, yardstick competition.

JEL classification: H62, H72, H77

1 Introduction

The standard approaches to problems of over-borrowing in federal countries tend to focus on subnational (local and state) governments as key actors¹. Empirical evidence usually supports the idea that the episodes of high public deficits are more prone to appear in lower levels of government (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 when local and state governments are involved. Just to name a few: regions suffering vertical imbalances are obliged to borrow more

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¹Hereafter, the terms states and regions, and central and federal are used interchangeably.

than other well-endowed tiers (Rodden et al., 2003; Eyraud and Lusinyan, 2013; Van Hecke, 2013); the objective function of state and local incumbents is far away from the usual nationwide requirements of budget stability and, therefore, the typical agency problems arise (Webb, 2004); the presence of bailout expectations often leads to soft budget constraints (SBC) and, consequently, to systematic budget slippages at regional level (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 inter-temporal decisions in favour of current consumption. Examples of such institutional frameworks are: an asymmetric vertical distribution of spending responsibilities and tax revenues; an imperfect design of incentives to cope with fiscal discipline objectives in the federation as a whole; and the absence of credible commitments by the federal government not to bailout financially-troubled subnational governments.

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

However, we are convinced that a nontrivial part of the over-borrowing events in federations are beyond the institutional structure of the country. Obviously, this does not imply that the institutional approach neglect strategic fiscal behaviours in federal contexts, but other potential explanations may well complement the prevailing institutional view. To put differently, given the institutional framework existing in a federal country, here we assess to what extent, if any, strategic fiscal behaviours are interrelated to each other (Brueckner, 2003).

One important contribution of this paper is precisely to explore this research avenue by providing empirical evidence on how the fiscal behaviour of other jurisdictions may affect subnational public deficits. The idea is to emphasize the way through which the strategic interactions between governments (at different and at the same tier of decision as well) impact fiscal imbalances in a federation. Institutional factors are certainly present in our analysis but the bulk of our results and our interpretation focus on the vertical and horizontal interrelations in terms of public deficits. We develop this approach not only addressing the vertical interactions (in general hardly studied in previous references) but also the horizontal impact of fiscal deficits at regional level, which has never been investigated before for an Spanish sample.

Particularly, we pay attention to the Spanish case over the period 1995-2010. We have estimated different specifications of a fiscal reaction function à la Bohn (1998) for the Spanish regional governments. The main result of this study can be briefly anticipated: the fiscal imbalances of the federal government and neighbouring regions have positively encouraged the public deficit

of a given state government. After carrying out a number of robustness checks to ensure that our estimates are sufficiently reliable, we discuss such findings in the context of yardstick competition models (Besley and Case, 1995).

This interpretation in terms of the incumbent's behaviour can be seen as the second main contribution of the paper. In this sense, we have not only applied the premises of the widely accepted model by Besley and Case but we have also roughly sketched a reconfiguration of the model in vertical terms and using the public deficit as central variable.

To the best of our knowledge, only three recent papers have studied the strategic interactions between jurisdictions in terms of fiscal balances, as we do. Baskaran (2012) explores whether vertical and horizontal interactions affect subnational borrowing of German states in 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 the EU15 over the period 1995-2008. Indeed, under some particular econometric specifications, a positive and statistically significant coefficient is found for the variable measuring the fiscal stance of the central government by explaining subnational fiscal imbalances. However, this empirical link is not the focus of interest in Foremny (2014), who just considers it as a control variable in his econometric estimations.

In terms of horizontal interactions the recent paper by Borck et al. (2015) is also a central reference for us. Although dealing with local jurisdictions, they focus on public debt (that is, fiscal imbalances as we do) and open the door to interpret their results in the context of yardstick competition models. They clearly conclude that subnational debt should not be dismissed when strategic interactions are at play in federations.

All in all, our paper breaks the standard approach of the literature on fiscal sustainability in multi-level contexts, leaving scope for new influences on fiscal deficits of state governments. Moreover, we have broadened the understanding and scope of yardstick competition models, expanding them to new interpretations concerning with vertical issues and taking the public deficit as reference.

The structure of the paper is as follows. After this introduction we give information on the data and statistical sources used in this paper. Section 3 explains the econometric methodology together with the main results. Next, Section 4 offers some robustness analyses. Section 5 discusses the empirical findings in the context of yardstick competition models and, finally, Section 6 concludes.

2 Model specification and data

The literature has claimed that strategic behaviours are expected to be found when fiscal choices are analysed at the same tier of decision (Brueckner, 2003). However, the lack of previous references regarding vertical relationships across governments and in terms of public deficits requires at least some

preliminary evidence. Hence, this section begins looking for some statistical foundations linking government fiscal balances at different levels of government. At first sight, the simple correlation coefficients between the federal and state public deficits may provide information on whether these two variables are associated each other.

Table 1 summarizes the results. The first column reports the Pearson linear correlation index as standard measure of statistical relationship while the second column shows the outcomes for the Spearman correlation index². Overall, the pairwise comparison between deficits highlights the existence of vertical correlation between both variables. In general, the regional public deficits in Spain seem to be highly correlated with the federal deficit, although we cannot draw a clear conclusion for some particular cases such as Castilla-Leon and Baleares, where the statistical significance is not conclusive enough.

TABLE 1 HERE

Given this preliminary evidence, the central idea of the paper is to investigate whether the budgetary slippages of the Spanish regions are stimulated by the deficits of other governments over the period 1995-2010. The study pays particular 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:

$$deficit_{it} = \beta_0 + \beta_1 f_deficit_t + \beta_2 neighbour_deficit_{it} + \beta_3 \mathbf{X}_{it} + \eta_i + \varepsilon_{it} \quad (1)$$

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 , $neighbour_deficit_{it}$ is the average deficit-to-GDP ratio at time t of those states bordering with state i , \mathbf{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 imbalances 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 deficit-to-population ratios, have been taken into account in the robustness checks section (see below). As usual in panel data econometrics, the possible correlation between the unobserved region-specific effects and the remaining regressors has been carefully studied. Dynamic specifications of expression (1) have been also considered.

The model is a variation of the fiscal reaction function approach set up by Bohn (1998). For the purpose of this paper, the standard equation has been conveniently adapted to tackle with subnational features. First, the federal deficit has been included as one of the likely explanations of state fiscal stances. The statistical significance and magnitude of the coefficient β_1 will then indicate to what extent (if any) fiscal imbalances at federal level affect

²The use of this alternative non-parametric method pretends to deal with some caveats of the Pearson index, i.e. the assumption of a linear relationship between variables and the treatment of outliers in the data.

state public deficits. Second, the introduction of the deficit from neighbouring jurisdictions (related to the coefficient β_2) aims at testing the presence of horizontal interactions.

The vector of control variables includes economic, political and institutional determinants of fiscal balances at regional level in Spain (Argimón and Hernández de Cos, 2012). The business cycle is taken into account to isolate the impact of automatic stabilizers on the fiscal balances. Both public expenditures and revenues are prone to vary according to the position of the economy with respect to its potential level. The economic cycle effect is then captured with the variable *outputgap*, which has been obtained after applying the Hodrick-Prescott filter (Hodrick and Prescott, 1997) to the states nominal GDP.

The debt-to-GDP ratio has been also considered to test the sustainability of the regional public accounts. A negative (and significant) coefficient would show indications of fiscal sustainability as long as increases in public debt are accompanied by reductions in public deficits. This effect is captured with the variable *debt_{t-1}*. As usual, this variable is lagged one year on the basis that there is not a simultaneous reaction of deficits to debt variations. Indeed, it seems more plausible that the government fiscal policies react to a given debt level once the latter has been already observed.

The inclusion of GDP-to-population ratio (variable *gdppop*) as a control variable is intended to capture regional disparities on economic development, and hence differences in the fiscal effort to provide public services. In turn, the introduction of political factors as determinants of budget deficits have been studied along several dimensions³. In this paper, we have dealt with a number of variables controlling for the ideological orientation of citizens and incumbents.

First, the voters' preferences are represented by the political ideology of the incumbent in office. It has been argued that the composition of the public services may change according to whether a left-wing or right-wing party is in power. We have captured such heterogeneity and its impact on public deficits in several ways. The variable *left.sh* has been measured as the share of seats hold by left parties with respect to the total seats in each Parliament. Alternatively, the variable *reg.sh* accounts for the share of regionalist/nationalist parties in each state Parliament, which are likely to have particular preferences in terms of the composition of tax/expenditure menus.

Second, a reasonable and common hypothesis in political economy papers refers to the territorial allocation of grants as response to political and/or partisan interests (Simón-Cosano et al., 2014). However, this factor may have ambiguous effects. On the one hand, it is plausible that the federal government biases the allocation of the territorial funds in favour of those states with similar ideology but, on the other hand, the states not politically aligned with the upper level are prone to develop higher bargaining powers (i.e., more aggressive strategies) when the distribution of resources is negotiated. In order to control for this effect, a dummy variable (*alignment*) is included, with value equal to 1 if the regional and central governments share the same political orientation, and 0 otherwise.

³For instance, see Eslava (2011) for an overview of political economy considerations.

The process of fiscal decentralisation in Spain has been continuous but rather asymmetric across states. Thus, some institutional variables are added up to capture these differences. Specifically, some states have been in charge of public services, such as health and education, while the federal government was providing the same responsibilities in other states until the year 2002. Thus, the extra efforts in public spending and their subsequent consequences on regional deficits are considered with a categorical variable (*auto*) equal to 1 for those states with spending responsibilities in health and education before 2002, and 0 otherwise.

The devolution of powers in Spain has also differentiated some states from others on the revenue side. The variable *foral* takes into account the differences between those regions under the foral financing system (País Vasco and Navarra) and those within the ordinary system. A synthetic review (with normative implications) of the foral vs the ordinary territorial financing system can be found in Zabalza and López-Laborda (2014). For the sake of simplicity, it is worth to clarify that both regions in the foral system collect all the accrued taxes within their territories and transfer a grant to the federal government for redistribution purposes and as compensation for the public services exclusively provided by the upper level. The performance is the opposite for the ordinary territorial financing system existing in the remaining 15 Spanish regions.

Moreover, tax assignments across levels of government have been substantially altered over the sample period. Since 1997, the changes in the territorial financing system have increased the regional power over tax collection, reducing their dependence on vertical transfers. The variable *tax_auto* (defined as tax revenues relative to non-financial revenues) accounts for increases in fiscal autonomy. Alternatively, two dummy variables (*fin_agree(97)* and *fin_agree(02)*) are employed to control for the years in which the most significant agreements (in terms of new financial resources available for regions) entered into force.

Finally, legal provisions setting ceilings for state public deficits and derived from the European Stability and Growth Pact are taken into consideration with 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, the subnational governments are also compelled in the compliance of such objective. The variable *SGP* is then a dummy equals to 1 for the years when the rule is in force (since 2002), and 0 otherwise. The reader interested on details about the statistical sources of the variables used in this paper can consult Table 2.

TABLE 2 HERE

3 Estimation and results

The estimation of expression (1) usually involves the application of different strategies. Since the entire population of Spanish regions is available, it is assumed that the sample has deterministic properties (with individual fixed effects). Thus, estimates from the least squares dummy variable (LSDV) estimator are firstly obtained. As is well-known, the LSDV and the within-estimator (the other alternative to cope with fixed effect models) are equivalent when the lagged dependent variable is not included as regressor.

After running the usual Hausman specification test, the null hypothesis of no correlation between the unobserved region-specific effects and the remaining regressors has been accepted. Under such circumstances, the so-called random effect (RE) model appears not only as consistent but also more efficient than the LSDV. Therefore, the estimates from the generalised least squares (GLS) estimator, which is the standard way of dealing with RE models, are also reported below.

A non-trivial issue by estimating this type of models is how to deal with the potential problem of endogeneity or joint determination of both key variables: the federal and state fiscal imbalances. 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 to the widely accepted fact that fiscal indiscipline at subnational level may be indeed materialise at federal bailouts, with the corresponding impact on fiscal balances at the upper level. 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 implicit bailouts on the federal public accounts⁴. Moreover, given that these implicit bailouts mainly took place through changes in the territorial financing system, the econometric estimations will take these adjustments into account with dummies that explicitly control for such as institutional changes.

The second one refers to the negative financial externality due to the increases in the risk premia of subnational public debt, which affect the credibility of federal bonds and its interest payments. In the presence of (explicit or implicit) commitments of bailout, the fiscal indiscipline at subnational level may well impact negatively on the quality of federal bond perceived by the financial markets (Standard & Poor's, 2012). On the contrary, some deeper analyses have shown that financial stress in the regions leads to an increase in the yield spreads between the states and federal bonds, specially in periods of uncertainty, in a kind of fly-to-quality movement (Lemmen, 1999).

An additional problem of endogeneity may arise from the introduction of the horizontal dimension in the equation. If fiscal interactions exist, the state deficits are simultaneously determine by definition (Brueckner, 2003; Baskaran, 2012). These potential problems of endogeneity are neutralised by using the two stage least square estimator (2SLS). The instrumental variables employed are the current and lagged values of federal non-financial revenues for the vertical interaction and the lagged average value of non-financial revenues of neighbouring jurisdictions for the horizontal interaction.

As is well-known, the validity of the instruments requires both correlation with the endogenous variables and no correlation with the error term. Such conditions are checked by applying the Sargan overidentification test, in which the null hypothesis is the absence of correlation between the instruments and the error term. The resulting statistics are reported in the tables below. Moreover, the estimates of the reduced form equations in the first stage of 2SLS

⁴A completely different scenario is that starting in 2010, when the Spanish federal government got underway several financial facilities in favour of states, which were suffering liquidity and even solvency troubles; see Gordo et al. (2013).

(not shown here but available upon request) support the evidence in favour of correlation between the instruments and the potentially endogenous variables.

Once the instruments have been accepted as appropriate, the RE and the 2SLS estimates are compared by running the Hausman test in order to check how important endogeneity is. The test has rejected the null hypothesis of systematic differences in the coefficients, and hence the RE estimator appears to be the most suitable one regarding its relative advantages in terms of efficiency.

Given the heterogeneous size of the units i (regions) in our sample, a potential problem of heteroskedasticity is likely to be present. The standard inferences from the White and the modified Wald tests, however, do not offer conclusive evidence on that as a result of the caveats linked to the asymptotic properties of the sample⁵. Based on this, we have opted for using heteroskedasticity-robust standard errors in all the estimates. A different strategy, however, has been followed with respect to the GMM estimator (Table 6), as argued below.

A first battery of results that can be seen as the central ones are reported in Table 3. Each method has been split into two different specifications, namely (I) and (II), which respectively differ on whether fiscal autonomy is proxied with a measure of tax autonomy or, alternatively, with financial agreements⁶. The coefficient of federal deficit is obviously one of the crucial results of this paper and the evidence is clear enough across methods and specifications: the effect of federal deficits on states fiscal imbalances is statistically significant and positive. Moreover, the quantitative impact estimated is relatively similar across the columns of Table 3: around 0.14 on average.

A positive and significant impact of the horizontal interaction on regional deficits is also found. Even though the statistical significance is less clear than in the vertical case, the fiscal behaviour of neighbouring jurisdictions positively affects the deficit of a given state i . The coefficients range from 0.25 to 0.54, with higher values when the 2SLS estimator is used.

The estimates of the remaining regressors also provide interesting results to explain the state public deficits in Spain. Although the public deficits of state governments are not so strongly linked to fiscal stabilizers as the federal ones, a relatively substantial impact of business cycle on regional public imbalances might be expected as well. Note that the Spanish regional governments enjoy a significant part of the income tax revenues (50 per cent of the total amount) and of the consumption taxes (between the 50 and the 58 per cent) in the late years of the sample. The negative sign of the *outputgap* implies a reduction in deficits when the economy grows above its potential level.

Nevertheless, the lack of statistical significance in this variable requires a reconsideration on how important the regional business cycle is for state finances. Certainly, the intense expansionary cycle experienced by the Spanish economy since the mid of 1990s fuelled public revenues across governments and made the fiscal consolidation processes easier. However, it is worth to mention that the Spanish regions as a whole did not have any public surplus in any of the years considered here. Additionally, a significant part of the shared taxes

⁵Details on that are available upon request.

⁶Recall that the fiscal autonomy of Spanish regions could be measured using two kinds of control variables.

between the federal and regional governments are paid off by the upper level of government after a two-year delay, breaking partially the contemporaneous link between the business cycle and the public revenues. Consequently, it can be stated that the cyclical component of the public balance has not been powerful enough as to neutralise the structural component.

The coefficients for the variable GDP per capita report a weak positive impact on state deficits, with very low values. Contrary to expectation, 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 the richer regions and, consequently, lower levels of fiscal imbalance. But, in line with Barrios and Martínez-López (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 equalisation 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 case⁷.

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

It should be mentioned here that the stock of public debt at a regional level has not been traditionally a bothersome problem for state governments in Spain⁸. Two factors support this statement. First, the process of fiscal and political devolution of powers is recent enough to come about the sub-national levels suffering from over-borrowing and 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 beginning, the successive reforms in the territorial financial system have been generous enough to neutralise the conventional pressures on public accounts from the crescendo of regional expenditures.

Secondly, the federal control on state borrowing in Spain has been markedly loose. Although, in principle, the national laws limiting the public borrowing at subnational levels were rather prudent, their practical implementation has been actually slack. The so-called *Escenarios de Consolidación Presupuestaria* (ECP, Budgetary Consolidation Scenarios) are good examples of it. They consisted of political agreements between the federal and state governments not to overcome certain limits in public debt. The problem was that the practical definition and implementation of such limits were clearly endogenous, implying

⁷By 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-López, 2014).

⁸Obviously, 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.

de facto its fulfilment. Not surprisingly, the level of lagged stock of public debt has not involved any significant role by conditioning the fiscal policy of the states.

TABLE 3 HERE

Neither tax autonomy nor political factors (the relative number of seats held by left or regional parties) report any significance across methods and specifications. Precisely, the lack of statistical significance for tax autonomy reported in Table 3 calls for another consideration about the regional public finances. Sorribas-Navarro (2011) identified implicit bailouts through the territorial financing system. Beyond the strategic use of such funds, her article evidenced a shortage of resources available for subnational governments as well as a likely significant impact on regional public deficits. Therefore, two dummy variables (*fin_agree*(97) and *fin_agree*(02)) have been included corresponding to the years in which a particular territorial financing system was in force, which occurred in 1997 and 2002.

Only the variable *fin_agree*(97) appears as statistically significant (in some specifications), with a positive impact on state public deficits. It is difficult to find a rationale for this result. The new territorial financing system that entered into force in 1997 implied more tax resources for the regions through higher shares in federal taxes like the income tax. This might have exacerbated (more than proportionally) the propensity to spend by the state governments with effects on the deficits. But this is just a hypothesis to be checked by further research.

In turn, a clear conclusion on the strategic use of funds in relation to the variable *alignment* cannot be drawn. The negative signs of the coefficients indicate a better performance of those states sharing political orientation with the central government. However, their statistical significance is not generalised.

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

4 Robustness checks

Taking the estimates of Table 3 as benchmark, a number of robustness checks have been performed to ensure the reliability of our empirical results. These are explained in detail below.

4.1 Horizontal interaction: different measures

The horizontal interactions have been measured using two additional, different types of variables. The first one is the aggregate public deficit existing in other regions as percentage of the corresponding GDP. The results, reported

in Table 4, show that while the coefficient of the new variable $defgdp_j$ 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 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 multicollinearity problems. In fact, the loss of statistical significance of the federal public deficit and its high correlation (around 0.8) with the new variable (the aggregate deficit in the other states) are clearly compatible with such interpretation.

TABLE 4 HERE

In addition, the horizontal spillovers have been also described as the interaction between the public deficit in neighbouring regions and a dummy variable which equals to 1 when both incumbents have the same political ideology. Geographical and political criteria have been then mixed on the basis that the horizontal influences may be more fluid under such conditions. The results, listed in Table 5, confirm those of the central estimates in Table 3, namely, positive impacts of the federal and weighted (by proximity and ideology) regional public deficits, with improvements in the statistical significance of the coefficients.

TABLE 5 HERE

4.2 Persistence in state budget balances

The potential persistence in state budget balances has been tested including the lagged regional deficit as regressor. However, the introduction of the lagged dependent variable in the specification is likely to suffer the Nickell bias (Nickell, 1981). Hence, the model has been re-estimated using the generalised method of moments (GMM) estimator (Arellano and Bond, 1991). Given the absence of correlation between the unobserved region-specific effects and the remaining regressors, the usual inconsistency problems derived from the presence of individual effects are not expected. In this context, using the level versus first-differences specification with GMM is not a crucial issue. We have opted here for showing only the latter but the former is available upon request⁹. Moreover, the one-step GMM estimators have been considered because of their relative advantages compared to the two-step version¹⁰.

Within this framework, one of the key assumptions is that there is no serial correlation in the disturbances, which is exactly what the statistics $m1$ and $m2$ confirm (Arellano and Bond, 1991). By contrast, the Sargan test rejects the validity of the set of instruments but the inference here could be subject to a number of caveats¹¹.

⁹As expected, both estimates are practically identical.

¹⁰Several simulation 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)). By contrast, such two-step GMM estimators offer less reliable properties in terms of asymptotic distributions (Bond and Windmeijer, 2002).

¹¹Arellano 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 (2002) also shows how the power of the Sargan test to find

The coefficients reported in Table 6 are in line with our previous results. Under the assumption of persistence in the fiscal behaviour of states, the fiscal (vertical and horizontal) interactions are still driving the fiscal imbalances at regional level. The coefficient of the dependent variable lagged one period ($defgdp_{t-1}$) lacks of any acceptable statistical significance. Potential explanations underlying this fact would require further analyses that are 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 (recall: Spanish acronym for the Budgetary Consolidation Scenarios) were also defined in terms of public deficits and their strict application was likewise very relaxed.

TABLE 6 HERE

4.3 Business cycle alternatives

The regional economic cycles have been proxied until now with output gaps, which are non-observable variables per se. As is well-known, these are the result of decomposing the regional GDP time series with the standard Hodrick-Prescott filter. Even though this is a widely accepted technique, it has not been exempt 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). In our case, such failure may be particularly important since the last years of the GDP series might be substantially 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 determines the smoothness of the estimated function (known as λ)¹².

To overcome these potential problems, our central specification is re-estimated once the variable output gap is substituted by either (i) the regional level of unemployment ($unemp$) or (ii) the deviation of such level from the national one ($unempdev$)¹³. The coefficients of both deficit interactions (Tables 7 and 8) are in excellent agreement with those shown in Table 3. In other words, the same results are obtained regardless of the business cycle measure employed.

TABLE 7 HERE

TABLE 8 HERE

4.4 Changes in the dependent variable

Although the usual approach by estimating fiscal reaction functions involves variables defined in terms of GDP, Fernández-Leiceaga and Lago-Peñas (2013) have recently argued that in the presence of strong equalisation across

out invalid instruments, dramatically decreases in finite samples with a high enough number of moment conditions, which is the case in this study.

¹²In this case, we have followed the standard suggestion by Ravn and Uhlig (2002), who determines $\lambda = 6.25$ for annual data.

¹³Bande et al. (2008) widely develop the interactions between regional unemployment and business cycle in Spain.

territories (as in the Spanish case), the use of regional GDP to assess the soundness of state public finances might not be appropriate.

Consequently, the key variables of our study have been re-defined in per capita terms (expressed with the suffix *-pop*) and used the primary balance instead of the total public deficit (the new variables begin with the letter *p*). Since the primary balances do not consider interest payments to compute the public deficit, the fiscal decisions taken by the state governments have been analysed without bearing the persistence of previous stocks of public debt.

The new estimates (Tables 9, 10 and 11) clearly indicate that the impact of federal public deficits or of the average deficit in neighbouring jurisdictions on the state fiscal imbalances remains practically unchanged, both in terms of statistical significance and magnitude. If any, the coefficients of the horizontal interactions are now slightly higher than in the central estimates of Table 3. With respect to the remaining control variables, it is worth noting that the coefficients of the variable *auto* are significantly negative across specifications only when the total deficit and the primary deficit are expressed in per capita terms. As already mentioned, this finding would deserve further analyses but the substantial influence of population in determining the distribution of financial resources across states is likely to play a significant role in understanding these results.

TABLE 9 HERE

TABLE 10 HERE

TABLE 11 HERE

4.5 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, two dummy variables measuring political cycles at national and subnational levels have been included. 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 into account that incumbents are likely to incur on higher deficits when opting for reelection (Hodler, 2011; Maskin and Tirole, 2014). These two new variables are considered in Table 12. In any case, none of the dummy variables are statistically significant. These results show the complexity of capturing political influences on fiscal policy decisions (Brender and Drazen, 2008; Klomp and de Haan, 2013).

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). Thus, beyond the dummies included in the previous section to control for the impact of different regional financing systems over subperiods, a new dummy (*fin_mod*) has been incorporated. This new variable refers to the particular years in which the financial conditions of the system changed. Not surprisingly, a negative (but marginally significant) coefficient is found for the variable *fin_mod* (Table 12). This result comes from the fact that the changes in the territorial financing

system have usually implied substantial improvements for the state public finances (Herrero and Tránchez, 2011).

TABLE 12 HERE

5 Discussion

The previous section has clearly stated that the public deficit of a given Spanish regional government is positively affected by the borrowing of both federal and other state governments. Therefore, the pending questions are: what is the rationale behind these findings? What is the channel through which the public imbalances in other jurisdictions may encourage state deficits? In this section we do not aim at providing detailed and clear-cut answers to these questions but a tentative explanation of the main forces driving this causal relationship, within the framework of widely accepted previous contributions.

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 of regional governments is originated because 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 deficits and, in theory, liable to explain our empirical findings, at least in its vertical dimension.

In order to assess how close our empirical results to this bailout approach are, we take the pioneering contribution by Goodspeed (2002) as benchmark. This paper sets up a sequential game, with the states moving first and knowing the federal's (the follower) reaction function. The function to be optimised by both governments is the probability of a voter to re-elect the government, which is very sensitive to the availability of financial resources to provide state public consumption. The main result is that as long as the state governments anticipate positive vertical grants from the federal government, they will borrow more than optimal and result in soft budget constraints and, eventually, financial bailouts.

How appropriate is this theoretical framework to explain our empirical evidence? Unfortunately, the above econometric estimates cannot be easily 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 opposite¹⁴.

The underlying intuition behind this conclusion is straightforward. Using the rationale given by the Goodspeed's (2002) model, a higher federal deficit in the period 1 means less resources for vertical grants in favour of states in the period 2, when the federal public debt must be paid back. Given that the excessive state borrowing in the period 1 stems from the likely grants to be received in the period 2, the tighter federal budget constraint in the future results in lower state public deficits in the present. It is evident that the theoretical framework offered by these models does not match our empirical

¹⁴The technical details with the algebraic manipulations are available upon request.

results, which precisely suggest the opposite¹⁵.

However, the application of Spanish data to bailout models is not unprecedented, with mixed evidence. While Lago-Peñas (2005) does not find a role for bailout expectations over the period 1984-1996, Sorribas-Navarro (2011) shows however evidence in favour 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 here supports the idea that the fiscal imbalances of other jurisdictions encourage the regional public deficits, and the standard bailout models do not seem to be useful to explain why and how.

Extending this view, we turn now to a version of the commons problem within a federal context (see, for instance, Boadway and Shah (2007)). Again, the issue is how intense are the incentives for over-borrowing in the period 1 based on the expectations of higher grants from the federal government in the period 2. The crucial point is now whether the regional governments are concerned with the exhaustion of the federal fiscal commons as a result of either unsound federal fiscal policies or bailout transfers to regions in financial troubles.

In our empirical approach, however, this effect does not appear to be strong enough as to disincentive the excessive public borrowing through the lower opportunity cost of public consumption in the period 1 versus the foregone public consumption in the period 2. Recall that 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 very similar result for the German states over the period 1975-2005.

At this juncture, we are though convinced that our results can be better interpreted using the theoretical framework of yardstick competition models initially developed by Besley and Case (1995). As it is well-known, the basic idea of these models is straightforward: in the presence of information asymmetries across voters and incumbents, the information externalities coming from neighbouring jurisdictions modify the fiscal behaviours of politicians while in office, because the voters condition their re-election support to what they observe in other governments. In this sense, in a model of two periods, the voters with no information on incumbents' quality but concern for minimising 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 neighbouring jurisdictions. In turn, the incumbents, who observe the true cost of providing public services, are perfectly aware of such vote discipline and accordingly decide the tax rates to set up in both periods. If possible, bad incumbents will charge a 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 behaviour.

One of the main implications of this game is that the willingness of bad incumbents for acting as rent-seekers heavily depends on what is happening in

¹⁵Nonetheless, such bailout-based models should not be dismissed as potential explanations of regional deficits in other samples.

other territories in terms of 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 crucial issues: the vertical interaction between jurisdictions and the focus on the variable public deficit rather than on tax rates. The first one entails a widening of the involved jurisdictions: in addition to the same level governments (conveniently weighted by border contiguity, by political coincidence of incumbents, etc.) as usual from the standard approach, we also need a reference to the federal government. 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 synchronisation of officeholders, as we have done in the previous sections.

Second, a new and more complex debate on the interactions between the federal and the state governments emerges. From the political science side, the issues related to vertical competition in decentralised 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 consider the role played by the federal government as Stackelberg leader.

Certainly, what we guess 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. Obviously, this does not involve at all a disregard of the horizontal dimension by explaining state deficits, which has been indeed taken into consideration.

The second issue for an interpretation of our empirical findings into the scope of yardstick competition approach is the decision variable on which voters and incumbents 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 methodology differs from that followed by Besley and Case (1995) in this specific issue. Our approach takes into consideration the state public deficit as dependent variable and not the incumbent defeat as they do when include the public debt as regressor. By contrast, a more consistent comparison should be done using their estimation of state tax changes (their Table 4) and re-estimate it in terms of debt variations.

Alternatively, it is possible to think of a model without recurring to Ricardian equivalence and able to explain our results in terms of yardstick competition. Contrary to the previous assumptions, in a world with voters suffering fiscal illusion, the public deficits might not be penalised. When the taxpayers are not aware of the true cost of public debt in the form of higher future taxes, they may 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 excessive levels of public spending (over the collected tax revenues) at federal and horizontal levels as positive signals 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 (an incorrect) 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 neighbouring jurisdictions (at horizontal as well at vertical dimensions) becomes indeed crucial by determining the sense of votes whether or not to support the re-election of the politicians in office.

Our empirical results are clear. The public deficits of federal and neighbouring governments encourage the public deficit of a given regional government. This can be partially interpreted as a result of a process of yardstick competition. Higher deficits at other jurisdictions 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 these positive interactions are 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’ behaviours, which is out of the scope of this paper¹⁶.

Overall, in this section we just aimed at providing some rationale to the

¹⁶Notwithstanding 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.

empirical findings we obtained before. We have accommodated them into a new reading of the yardstick competition models, in which an additional interaction affecting fiscal behaviours of regions reaches a vertical dimension, from the federal to the state governments. As we have also shown, this is fairly compatible with the evidence of horizontal interactions as well.

6 Concluding remarks

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

While it is widely accepted that fiscal imbalances at state level are mainly driven by institutional arrangements, our results indicate that the existence of vertical and horizontal interactions are crucial factors in eroding fiscal balances. In particular, the behaviour of the central government, together with the decisions made by neighbouring jurisdictions, have a remarkable influence on the inter-temporal choices of a specific state.

We have provided a novel rationale for a better understanding of such connections on the basis of yardstick competition models. In the absence of perfect information, individuals take other jurisdictions as benchmark to assess the fiscal policy of their own government. In this context, greater deficits at federal level lead to higher deficits at state level. The same can be applied with neighbouring (by geographical and/or ideological similarities) jurisdictions.

An alternative explanation of the empirical results obtained here could be based on the so-called copycat effect followed by local and state governments. The point here is that the 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 strategic 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. Since tax autonomy at the Spanish lower levels of government appears to be unimportant, 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 the spending needs and the tax revenues is often solved using the recourse to deficit.

Another singular issue in relation with the impact of federal fiscal decisions on the state public deficits emerges from the research field of standard vertical externalities, which 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 the one currently existing in Spain, the extent to which a decrease in the income tax

rates will obviously affect the federal fiscal balance and thus, the state budget constraints, is an intriguing fact to be studied in the medium term.

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A Appendix: Tables

Table 1: Correlation analyses.

State	Pearson	p-value	Spearman	p-value
Andalucía	0.7585	0.0070	0.7676	0.0005
Aragón	0.6965	0.0027	0.7294	0.0013
Asturias	0.7059	0.0022	0.6588	0.0055
Baleares	0.5094	0.0439	0.3353	0.2043
Canarias	0.8614	0.0000	0.8971	0.0000
Cantabria	0.5598	0.0241	0.7647	0.0006
Castilla La Mancha	0.6350	0.0082	0.4735	0.0006
Castilla-León	0.3717	0.1563	0.4471	0.0825
Cataluña	0.7590	0.0007	0.7941	0.0002
C. Valenciana	0.7532	0.0008	0.7912	0.0030
Extremadura	0.6627	0.0052	0.7529	0.0008
Galicia	0.7703	0.0005	0.8441	0.0000
C. Madrid	0.7385	0.0011	0.7118	0.0020
Murcia	0.5974	0.0145	0.7382	0.0011
La Rioja	0.6228	0.0100	0.7618	0.0006
País Vasco	0.8889	0.0000	0.8588	0.0000
Navarra	0.5225	0.0379	0.5529	0.0263

Sources: BADESPE and INE. See further details on table 2.

Table 2: Definition and source of variables.

Variable	Label	Description	Source(s)
Regional deficit	<i>defgdp</i>	SNG budget performance. Non financial expenditures minus non financial revenues relative to regional GDP.	BADESPE ^a 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. ^b
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-to-population ratio.	INE and own calculation.
Population	<i>pop</i>	Regional and federal population levels at the beginning of year <i>t</i> .	INE.
Regional elections	<i>SNG_elect</i>	Dummy variable. 1 = regional electoral year.	Regional Parliaments database and own calculation.
Federal elections	<i>fed_elect</i>	Dummy variable. 1 = federal electoral year.	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 governments.	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.
Neighbouring deficits (a)	<i>defgdp(j)</i>	States average deficit-to-GDP ratio.	Own calculation.
Neighbouring deficits (b)	<i>neigh_defgdp</i>	Average deficits of geographical adjacent jurisdictions to a given state <i>i</i> .	Own calculation.
Neighbouring deficits (c)	<i>ideo * defgdp(j)</i>	Average deficits of politically aligned jurisdictions to a given state <i>i</i> .	Own calculation.

^aBADESPE: Spanish fiscal database elaborated by the Institute of Fiscal Studies.

^bINE: National Institute of Statistics.

Table 3: States deficit response to vertical and horizontal interactions (I).

	LSDV		RE		2SLS	
	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)	0.103* (0.061)	0.108* (0.063)
neigh_defgdp	0.262* (0.139)	0.258* (0.139)	0.268* (0.139)	0.270** (0.133)	0.515** (0.234)	0.547** (0.223)
<i>Economic variables</i>						
outputgap	-0.060 (0.039)	-0.047 (0.043)	-0.056 (0.037)	-0.040 (0.042)	-0.030 (0.045)	-0.018 (0.048)
debt(t-1)	0.001* (0.000)	0.001* (0.000)	0.001 (0.001)	0.001 (0.001)	0.001 (0.000)	0.000 (0.000)
gdppop	0.001** (0.000)	0.001* (0.000)	0.001** (0.000)	0.001* (0.000)	0.000 (0.000)	0.000 (0.000)
<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* (0.001)
left_sh	0.017 (0.015)	0.016 (0.015)	0.017 (0.014)	0.018 (0.013)	0.017 (0.013)	0.018 (0.013)
reg_sh	0.001 (0.018)	-0.001 (0.018)	0.002 (0.008)	0.004 (0.008)	0.006 (0.012)	0.007 (0.011)
<i>Institutional variables</i>						
auto	-0.017*** (0.005)	-0.017*** (0.005)	-0.007 (0.004)	-0.006 (0.004)	-0.007 (0.004)	-0.007 (0.004)
foral	-0.021** (0.010)	-0.023** (0.009)	-0.012*** (0.003)	-0.011*** (0.003)	-0.009 (0.007)	-0.009 (0.006)
SGP	-0.005 (0.003)		-0.004 (0.003)		-0.002 (0.003)	
tax_auto	-0.006 (0.005)		-0.005 (0.005)		-0.004 (0.005)	
fin_agree(97)		0.002 (0.002)		0.003** (0.001)		0.002 (0.003)
fin_agree(02)		-0.003 (0.004)		-0.002 (0.003)		-0.000 (0.004)
constant	-0.013 (0.010)	-0.014 (0.010)	-0.025*** (0.008)	-0.027*** (0.008)	-0.017* (0.010)	-0.018* (0.010)
Observations	255	255	255	255	255	255
Adjusted R^2	0.592	0.592	0.508	0.507	0.496	0.492
Hausman			1.03 [0.9998]	1.26 [0.9995]	1.36 [0.9998]	2.13 [0.9980]
Overidentifying restrictions					0.347 [0.5561]	0.053 [0.8173]

Heteroskedasticity-robust standard errors in parentheses. P-values in brackets.

Dependent variable: States 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. Hausman: RE columns show Hausman specification test results for fixed vs random effects. 2SLS columns show Hausman specification test results for endogeneity.

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

Table 4: States deficit response to vertical and horizontal interactions (II).

	LSDV		RE		2SLS	
	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)	0.065 (0.068)	0.086 (0.075)
defgdp(j)	0.737*** (0.177)	0.729*** (0.178)	0.622*** (0.162)	0.593*** (0.139)	0.674*** (0.246)	0.627*** (0.235)
<i>Economic variables</i>						
outputgap	-0.041 (0.037)	-0.033 (0.040)	-0.028 (0.035)	-0.018 (0.039)	-0.025 (0.042)	-0.019 (0.043)
debt(t-1)	0.000 (0.000)	0.000 (0.000)	0.001** (0.000)	0.001** (0.000)	0.001*** (0.000)	0.001*** (0.000)
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)
<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** (0.001)
left_sh	0.014 (0.013)	0.015 (0.013)	0.018 (0.014)	0.018 (0.015)	0.018** (0.007)	0.017** (0.007)
reg_sh	0.004 (0.016)	0.004 (0.016)	0.007 (0.009)	0.008 (0.008)	0.008 (0.005)	0.008 (0.005)
<i>Institutional variables</i>						
auto	-0.013** (0.005)	-0.013** (0.005)	-0.007* (0.004)	-0.007* (0.004)	-0.007*** (0.002)	-0.007*** (0.002)
foral	-0.024*** (0.009)	-0.023*** (0.008)	-0.013*** (0.003)	-0.013*** (0.003)	-0.013*** (0.002)	-0.013*** (0.002)
SGP	-0.003 (0.003)		-0.003 (0.003)		-0.003 (0.002)	
tax_auto	0.000 (0.005)		-0.000 (0.004)		0.000 (0.003)	
fin_agree(97)		0.001 (0.002)		0.002 (0.002)		0.002 (0.003)
fin_agree(02)		-0.001 (0.004)		-0.001 (0.004)		-0.001 (0.003)
constant	0.001 (0.010)	-0.000 (0.010)	-0.018** (0.007)	-0.019*** (0.007)	-0.017** (0.006)	-0.019*** (0.007)
Observations	255	255	255	255	255	255
Adjusted R^2	0.631	0.631	0.546	0.546	0.547	0.547
Hausman			35.21 [0.0001]	29.34 [0.0011]	0.007 [1.0000]	0.023 [1.0000]
Overidentifying restrictions					0.268 [0.6046]	0.023 [0.8783]

Heteroskedasticity-robust standard errors in parentheses. P-values in brackets.

Dependent variable: States 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. Hausman: RE columns show Hausman specification test results for fixed vs random effects. 2SLS columns show Hausman specification test results for endogeneity.

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

Table 5: States deficit response to vertical and horizontal interactions (III).

	LSDV		RE		2SLS	
	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)	0.102* (0.060)	0.101 (0.068)
ideo*defgdp(j)	0.303*** (0.109)	0.299*** (0.111)	0.267** (0.106)	0.263*** (0.098)	0.989** (0.455)	0.995** (0.439)
<i>Economic variables</i>						
outputgap	-0.077** (0.037)	-0.066 (0.042)	-0.068** (0.034)	-0.051 (0.040)	-0.030 (0.052)	-0.028 (0.055)
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	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.000 (0.000)	0.000 (0.000)
<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)	0.035** (0.015)	0.033** (0.014)
reg_sh	0.007 (0.017)	0.005 (0.017)	0.000 (0.008)	0.002 (0.008)	0.002 (0.010)	0.001 (0.009)
<i>Institutional variables</i>						
auto	-0.016*** (0.004)	-0.016*** (0.004)	-0.006 (0.004)	-0.006 (0.004)	-0.007** (0.003)	-0.007** (0.003)
foral	-0.024*** (0.009)	-0.026*** (0.008)	-0.013*** (0.003)	-0.012*** (0.003)	-0.009* (0.005)	-0.009* (0.005)
SGP	-0.006** (0.003)		-0.005* (0.003)		-0.003 (0.003)	
tax_auto	-0.006 (0.005)		-0.005 (0.004)		0.001 (0.006)	
fin_agree(97)		0.002 (0.002)		0.003* (0.002)		0.000 (0.003)
fin_agree(02)		-0.004 (0.004)		-0.002 (0.004)		-0.002 (0.004)
constant	-0.021** (0.009)	-0.021** (0.009)	-0.030*** (0.006)	-0.032*** (0.007)	-0.025*** (0.008)	-0.024*** (0.009)
Observations	255	255	255	255	255	255
Adjusted R^2	0.599	0.599	0.516	0.515	0.439	0.438
Hausman			15.639 [0.0478]	27.662 [0.0011]	2.74 [0.9971]	3.34 [0.9926]
Overidentifying restrictions					0.212 [0.6449]	0.487 [0.4851]

Heteroskedasticity-robust standard errors in parentheses. P-values in brackets.

Dependent variable: States 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. Hausman: RE columns show Hausman specification test results for fixed vs random effects. 2SLS columns show Hausman specification test results for endogeneity.

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

Table 6: States deficit response to vertical and horizontal interactions (III).

	LSDV		RE		2SLS		GMM	
	defgdp (I)	defgdp (II)	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)	0.103* (0.061)	0.108* (0.063)	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)	0.515** (0.234)	0.547** (0.223)	0.404*** (0.125)	0.405*** (0.124)
<i>Economic variables</i>								
outputgap	-0.060 (0.039)	-0.047 (0.043)	-0.056 (0.037)	-0.040 (0.042)	-0.030 (0.045)	-0.018 (0.048)	-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)	0.001 (0.000)	0.000 (0.000)	-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)	0.000 (0.000)	0.000 (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)	-0.002 (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)	0.017 (0.013)	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)	0.006 (0.012)	0.007 (0.011)	-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)	-0.007 (0.004)	-0.007 (0.004)		
foral	-0.021** (0.010)	-0.023** (0.009)	-0.012*** (0.003)	-0.011*** (0.003)	-0.009 (0.007)	-0.009 (0.006)		
SGP	-0.005 (0.003)		-0.004 (0.003)		-0.002 (0.003)		-0.005* (0.003)	
tax_auto	-0.006 (0.005)		-0.005 (0.005)		-0.004 (0.005)		-0.002 (0.008)	
fin_agree(97)		0.002 (0.002)		0.003** (0.001)		0.002 (0.003)		0.001 (0.001)
fin_agree(02)		-0.003 (0.004)		-0.002 (0.003)		-0.000 (0.004)		-0.005 (0.004)
constant	-0.013 (0.010)	-0.014 (0.010)	-0.025*** (0.008)	-0.027*** (0.008)	-0.017* (0.010)	-0.018* (0.010)	-0.013 (0.010)	-0.012 (0.010)
Observations	255	255	255	255	255	255	238	238
Adjusted R ²	0.592	0.592	0.508	0.507	0.496	0.492		
Hausman			1.03 [0.9998]	1.26 [0.9995]	1.36 [0.9998]	2.13 [0.9980]		
Overidentifying restrictions					0.347 [0.5561]	0.053 [0.8173]		
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]

Heteroskedasticity-robust standard errors in parentheses (except for GMM specifications). P-values in brackets.
 Dependent variable: States 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. Hausman: RE columns show Hausman specification test results for fixed vs random effects. 2SLS columns show Hausman specification test results for endogeneity.
 * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7: States deficit response to vertical and horizontal interactions with unemployment (I).

	LSDV		RE		2SLS	
	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)
f_defgdp	0.135** (0.057)	0.157*** (0.060)	0.145*** (0.055)	0.167*** (0.057)	0.102* (0.061)	0.102 (0.062)
neigh_defgdp	0.280** (0.128)	0.253* (0.131)	0.283** (0.120)	0.260** (0.119)	0.530** (0.223)	0.542** (0.221)
<i>Economic variables</i>						
unemp	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 (0.000)	0.000 (0.000)
gdppop	0.001** (0.000)	0.001** (0.000)	0.001*** (0.000)	0.001** (0.000)	0.000 (0.000)	0.000 (0.000)
<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	0.011 (0.015)	0.011 (0.015)	0.012 (0.014)	0.013 (0.014)	0.015 (0.013)	0.015 (0.013)
reg_sh	-0.001 (0.017)	-0.001 (0.017)	0.002 (0.009)	0.004 (0.008)	0.006 (0.011)	0.007 (0.011)
<i>Institutional variables</i>						
auto	-0.017*** (0.005)	-0.017*** (0.005)	-0.007* (0.004)	-0.007 (0.004)	-0.007* (0.004)	-0.007* (0.004)
foral	-0.020** (0.010)	-0.022** (0.009)	-0.012*** (0.003)	-0.011*** (0.003)	-0.009 (0.006)	-0.009 (0.006)
SGP	-0.003 (0.003)		-0.003 (0.002)		-0.002 (0.003)	
tax_auto	-0.006 (0.005)		-0.004 (0.005)		-0.003 (0.005)	
fin_agree(97)		0.004** (0.002)		0.004*** (0.001)		0.003 (0.003)
fin_agree(02)		-0.001 (0.003)		-0.000 (0.002)		0.000 (0.003)
constant	-0.014 (0.010)	-0.017* (0.010)	-0.026*** (0.008)	-0.030*** (0.008)	-0.017 (0.011)	-0.019* (0.011)
Observations	255	255	255	255	255	255
Adjusted R^2	0.592	0.595	0.507	0.511	0.495	0.495
Hausman			3.27 [0.9745]	3.95 [0.9497]	1.87 [0.9989]	2.06 [0.9983]
Overidentifying restrictions					0.000 [0.9871]	0.003 [0.9595]

Heteroskedasticity-robust standard errors in parentheses. P-values in brackets.

Dependent variable: States 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. Hausman: RE columns show Hausman specification test results for fixed vs random effects. 2SLS columns show Hausman specification test results for endogeneity.

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

Table 8: States deficit response to vertical and horizontal interactions with unemployment (II).

	LSDV		RE		2SLS	
	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)
f_defgdp	0.170*** (0.051)	0.196*** (0.054)	0.171*** (0.044)	0.195*** (0.049)	0.106* (0.062)	0.106* (0.064)
neigh_defgdp	0.310** (0.130)	0.289** (0.134)	0.304** (0.123)	0.287** (0.121)	0.559*** (0.205)	0.588*** (0.198)
<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 (0.000)	0.000 (0.000)
gdppop	0.001** (0.000)	0.001 (0.000)	0.001** (0.000)	0.001** (0.000)	0.000 (0.000)	0.000 (0.000)
<i>Political variables</i>						
alignment	-0.001 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.002* (0.001)
left_sh	0.013 (0.015)	0.014 (0.015)	0.014 (0.014)	0.016 (0.014)	0.015 (0.013)	0.017 (0.013)
reg_sh	-0.001 (0.017)	-0.002 (0.017)	0.003 (0.009)	0.005 (0.008)	0.006 (0.011)	0.008 (0.011)
<i>Institutional variables</i>						
auto	-0.012 (0.010)	-0.011 (0.010)	-0.007* (0.004)	-0.007 (0.004)	-0.007* (0.004)	-0.007* (0.004)
foral	-0.018* (0.010)	-0.020** (0.009)	-0.011*** (0.003)	-0.011*** (0.003)	-0.009 (0.006)	-0.008 (0.006)
SGP	-0.003 (0.003)		-0.003 (0.002)		-0.002 (0.002)	
tax_auto	-0.007 (0.005)		-0.005 (0.005)		-0.003 (0.005)	
fin_agree(97)		0.003* (0.002)		0.004*** (0.001)		0.002 (0.003)
fin_agree(02)		-0.001 (0.003)		-0.000 (0.002)		0.000 (0.003)
constant	-0.009 (0.010)	-0.011 (0.011)	-0.022*** (0.008)	-0.025*** (0.008)	-0.015 (0.009)	-0.016* (0.009)
Observations	255	255	255	255	255	255
Adjusted R^2	0.589	0.591	0.504	0.506	0.491	0.488
Hausman			2.79 [0.9859]	3.11 [0.9788]	2.28 [0.9972]	3.02 [0.9954]
Overidentifying restrictions					0.013 [0.9089]	0.034 [0.8547]

Heteroskedasticity-robust standard errors in parentheses. P-values in brackets.

Dependent variable: States 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. Hausman: RE columns show Hausman specification test results for fixed vs random effects. 2SLS columns show Hausman specification test results for endogeneity.

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

Table 9: State and federal public deficits-to-population ratio.

	LSDV		RE		2SLS	
	defpop (I)	defpop (II)	defpop (I)	defpop (II)	defpop (I)	defpop (II)
f_defpop	0.152*** (0.054)	0.160*** (0.055)	0.155*** (0.052)	0.162*** (0.052)	0.116* (0.066)	0.111* (0.065)
neigh_defpop	0.337** (0.137)	0.339** (0.138)	0.340** (0.140)	0.344** (0.137)	0.508** (0.256)	0.549** (0.243)
<i>Economic variables</i>						
outputgap	-0.796 (0.909)	-0.703 (1.000)	-0.705 (0.912)	-0.554 (1.011)	-0.395 (0.951)	-0.213 (1.005)
debt(t-1)	0.020** (0.008)	0.019** (0.008)	0.020* (0.011)	0.019* (0.010)	0.016* (0.009)	0.015* (0.008)
gdppop	0.008 (0.007)	0.006 (0.008)	0.007 (0.005)	0.005 (0.005)	0.004 (0.007)	0.001 (0.007)
<i>Political variables</i>						
alignment	-0.032 (0.020)	-0.037* (0.021)	-0.033 (0.025)	-0.038 (0.025)	-0.032 (0.021)	-0.036 (0.022)
left_sh	0.467 (0.295)	0.456 (0.297)	0.375 (0.261)	0.381 (0.259)	0.355 (0.255)	0.353 (0.250)
reg_sh	0.215 (0.376)	0.183 (0.382)	0.164 (0.118)	0.184* (0.112)	0.185 (0.203)	0.206 (0.196)
<i>Institutional variables</i>						
auto	-0.298*** (0.082)	-0.304*** (0.082)	-0.141* (0.073)	-0.137* (0.070)	-0.142* (0.073)	-0.141** (0.069)
foral	-0.365* (0.211)	-0.400** (0.187)	-0.245*** (0.060)	-0.241*** (0.056)	-0.216* (0.116)	-0.207* (0.110)
SGP	-0.079 (0.064)		-0.080* (0.044)		-0.055 (0.057)	
tax_auto	-0.088 (0.108)		-0.049 (0.092)		-0.033 (0.100)	
fin_agree(97)		0.019 (0.033)		0.025 (0.025)		0.023 (0.050)
fin_agree(02)		-0.075 (0.075)		-0.059 (0.058)		-0.028 (0.080)
constant	-0.255 (0.204)	-0.248 (0.205)	-0.382** (0.155)	-0.388** (0.151)	-0.299 (0.193)	-0.287 (0.189)
Observations	255	255	255	255	255	255
Adjusted R^2	0.597	0.597	0.536	0.535	0.531	0.528
Hausman			0.92 [0.9999]	0.68 [1.0000]	0.51 [1.0000]	0.93 [1.0000]
Overidentifying restrictions					0.058 [0.8097]	0.002 [0.9667]

Heteroskedasticity-robust standard errors in parentheses. P-values in brackets.

Dependent variable: States 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. Hausman: RE columns show Hausman specification test results for fixed vs random effects.

2SLS columns show Hausman specification test results for endogeneity.

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

Table 10: State and federal public primary deficits-to-GDP ratio (I).

	LSDV		RE		2SLS	
	pbgdp (I)	pbgdp (II)	pbgdp (I)	pbgdp (II)	pbgdp (I)	pbgdp (II)
f.pbgdp	0.145*** (0.051)	0.166*** (0.056)	0.148*** (0.046)	0.169*** (0.050)	0.111 (0.070)	0.102 (0.068)
neigh_pbgdp	0.300** (0.137)	0.299** (0.138)	0.295** (0.138)	0.295** (0.133)	0.487* (0.268)	0.568** (0.244)
<i>Economic variables</i>						
outputgap	-0.075* (0.040)	-0.063 (0.043)	-0.074** (0.038)	-0.060 (0.043)	-0.047 (0.048)	-0.032 (0.049)
debt(t-1)	0.000 (0.000)	0.000 (0.000)	0.000 (0.001)	0.000 (0.001)	0.000 (0.000)	0.000 (0.000)
gdppop	0.001* (0.000)	0.000 (0.000)	0.001** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
<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* (0.001)
left_sh	0.014 (0.015)	0.013 (0.015)	0.015 (0.013)	0.016 (0.013)	0.015 (0.014)	0.016 (0.013)
reg_sh	0.001 (0.018)	-0.002 (0.018)	0.003 (0.008)	0.005 (0.008)	0.006 (0.012)	0.008 (0.012)
<i>Institutional variables</i>						
auto	-0.016*** (0.005)	-0.016*** (0.005)	-0.007 (0.004)	-0.006 (0.004)	-0.007 (0.004)	-0.007* (0.004)
foral	-0.021** (0.010)	-0.023*** (0.009)	-0.013*** (0.003)	-0.012*** (0.003)	-0.011 (0.007)	-0.010 (0.007)
SGP	-0.005 (0.003)		-0.005* (0.003)		-0.003 (0.003)	
tax_auto	-0.007 (0.005)		-0.005 (0.005)		-0.004 (0.005)	
fin_agree(97)		0.002 (0.002)		0.003* (0.001)		0.002 (0.003)
fin_agree(02)		-0.003 (0.004)		-0.003 (0.003)		-0.001 (0.004)
constant	-0.004 (0.010)	-0.003 (0.010)	-0.017** (0.007)	-0.017*** (0.007)	-0.012 (0.010)	-0.011 (0.009)
Observations	255	255	255	255	255	255
Adjusted R^2	0.592	0.592	0.492	0.492	0.486	0.478
Hausman			0.69 [1.0000]	0.87 [0.9999]	1.09 [0.9999]	1.55 [0.9996]
Overidentifying restrictions					0.034 [0.8545]	0.073 [0.7863]

Heteroskedasticity-robust standard errors in parentheses. P-values in brackets.

Dependent variable: States primary 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. Hausman: RE columns show Hausman specification test results for fixed vs random effects.

2SLS columns show Hausman specification test results for endogeneity.

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

Table 11: State and federal public primary deficits-to-population ratio (II).

	LSDV		RE		2SLS	
	pbpop (I)	pbpop (II)	pbpop (I)	pbpop (II)	pbpop (I)	pbpop (II)
f_pbpop	0.134** (0.054)	0.143** (0.055)	0.137*** (0.051)	0.147*** (0.052)	0.113 (0.072)	0.102 (0.068)
neigh_pbpop	0.374*** (0.136)	0.378*** (0.137)	0.375*** (0.144)	0.380*** (0.140)	0.508* (0.285)	0.584** (0.262)
<i>Economic variables</i>						
outputgap	-1.166 (0.929)	-1.064 (1.014)	-1.079 (0.920)	-0.905 (1.015)	-0.685 (1.013)	-0.419 (1.050)
debt(t-1)	0.013 (0.009)	0.011 (0.009)	0.013 (0.012)	0.011 (0.011)	0.010 (0.009)	0.008 (0.008)
gdppop	0.007 (0.007)	0.005 (0.008)	0.006 (0.005)	0.004 (0.005)	0.003 (0.007)	0.000 (0.007)
<i>Political variables</i>						
alignment	-0.034* (0.020)	-0.039* (0.021)	-0.035 (0.026)	-0.041 (0.026)	-0.035 (0.022)	-0.039* (0.022)
left_sh	0.412 (0.296)	0.399 (0.299)	0.344 (0.255)	0.356 (0.251)	0.331 (0.256)	0.332 (0.250)
reg_sh	0.203 (0.375)	0.167 (0.383)	0.156 (0.114)	0.184* (0.106)	0.179 (0.207)	0.213 (0.197)
<i>Institutional variables</i>						
auto	-0.298*** (0.084)	-0.305*** (0.084)	-0.145* (0.074)	-0.139* (0.072)	-0.146** (0.074)	-0.144** (0.069)
foral	-0.411** (0.206)	-0.450** (0.184)	-0.267*** (0.055)	-0.261*** (0.053)	-0.244** (0.117)	-0.230** (0.110)
SGP	-0.076 (0.063)		-0.075* (0.043)		-0.054 (0.060)	
tax_auto	-0.100 (0.109)		-0.071 (0.093)		-0.052 (0.102)	
fin_agree(97)		0.022 (0.034)		0.029 (0.025)		0.029 (0.050)
fin_agree(02)		-0.071 (0.076)		-0.052 (0.058)		-0.018 (0.080)
constant	-0.129 (0.199)	-0.115 (0.198)	-0.268* (0.140)	-0.271** (0.135)	-0.210 (0.183)	-0.191 (0.179)
Observations	255	255	255	255	255	255
Adjusted R^2	0.589	0.588	0.514	0.513	0.511	0.506
Hausman			0.69 [1.0000]	0.67 [1.0000]	0.52 [1.0000]	0.72 [1.0000]
Overidentifying restrictions					0.012 [0.9125]	0.019 [0.8909]

Heteroskedasticity-robust standard errors in parentheses. P-values in brackets.

Dependent variable: States primary 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. Hausman: RE columns show Hausman specification test results for fixed vs random effects.

2SLS columns show Hausman specification test results for endogeneity.

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

Table 12: States deficit response to vertical and horizontal interactions with political cycles.

	LSDV		RE		2SLS	
	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)	defgdp (I)	defgdp (II)
f_defgdp	0.180*** (0.048)	0.221*** (0.054)	0.179*** (0.041)	0.220*** (0.044)	0.116* (0.068)	0.127* (0.070)
neigh_defgdp	0.239* (0.136)	0.219 (0.136)	0.248* (0.137)	0.232* (0.128)	0.512** (0.238)	0.539** (0.222)
<i>Economic variables</i>						
outputgap	-0.062 (0.042)	-0.044 (0.045)	-0.058 (0.041)	-0.037 (0.046)	-0.029 (0.048)	-0.017 (0.050)
debt(t-1)	0.001* (0.000)	0.001* (0.000)	0.001 (0.001)	0.001 (0.001)	0.001 (0.000)	0.000 (0.000)
gdppop	0.001** (0.000)	0.001* (0.000)	0.001*** (0.000)	0.001** (0.000)	0.000 (0.000)	0.000 (0.000)
<i>Political variables</i>						
alignment	-0.001 (0.001)	-0.002* (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.002* (0.001)
left_sh	0.016 (0.014)	0.016 (0.014)	0.016 (0.015)	0.018 (0.014)	0.017 (0.014)	0.018 (0.013)
reg_sh	-0.000 (0.017)	-0.003 (0.017)	0.001 (0.009)	0.003 (0.008)	0.005 (0.012)	0.007 (0.011)
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)	-0.000 (0.001)	0.000 (0.001)
<i>Institutional variables</i>						
auto	-0.017*** (0.005)	-0.017*** (0.005)	-0.006 (0.004)	-0.006 (0.004)	-0.007 (0.004)	-0.006 (0.004)
foral	-0.021** (0.010)	-0.023*** (0.009)	-0.012*** (0.004)	-0.011*** (0.003)	-0.009 (0.007)	-0.009 (0.006)
SGP	-0.005 (0.003)		-0.005* (0.003)		-0.003 (0.003)	
tax_auto	-0.007 (0.006)		-0.006 (0.005)		-0.005 (0.005)	
fin_agree(97)		0.005* (0.002)		0.005*** (0.001)		0.003 (0.003)
fin_agree(02)		-0.002 (0.004)		-0.001 (0.004)		0.000 (0.004)
fin_mod	-0.002 (0.001)	-0.003* (0.002)	-0.002 (0.001)	-0.003* (0.001)	-0.001 (0.002)	-0.001 (0.002)
constant	-0.014 (0.010)	-0.016 (0.010)	-0.026*** (0.009)	-0.029*** (0.009)	-0.018 (0.011)	-0.019* (0.011)
Observations	255	255	255	255	255	255
Adjusted R^2	0.591	0.593	0.513	0.515	0.500	0.497
Hausman			1 [1.0000]	1.27 [1.0000]	1.50 [1.0000]	2.99 [0.9991]
Overidentifying restrictions					0.858 [0.3542]	0.175 [0.6758]

Heteroskedasticity-robust standard errors in parentheses. P-values in brackets.

Dependent variable: States 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. Hausman: RE columns show Hausman specification test results for fixed vs random effects. 2SLS columns show Hausman specification test results for endogeneity.

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