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Do federal deficits motivate regional fiscal (im)balances?

Evidence for the Spanish case

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¿Genera el gobierno central desequilibrios fiscales en las Comunidades Autónomas a través de su déficit? Evidencia para el caso español

RESUMEN

El presente trabajo analiza las interacciones verticales y horizontales entre niveles de gobierno en cuanto al déficit público se refiere. Para ello, se estima una función de reacción fiscal para las Comunidades Autónomas en el periodo 1995-2010, prestando especial atención al impacto de los desequilibrios fiscales del gobierno central en las finanzas públicas regionales. Nuestros resultados señalan que las cuentas públicas de las autonomías se ven afectadas negativamente cuando el gobierno central incurre en mayores déficits. Como novedad, esta interacción vertical se interpreta en el contexto de los modelos de competencia vertical (yardstick competition). Asimismo, nuestros resultados indican que los déficits de las comunidades vecinas también deterioran los saldos presupuestarios regionales.

Conceptos clave: déficit público, relaciones intergubernamentales, competencia fiscal.

Códigos JEL: H62, H72, H77.

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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 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, intergovernmental relations, yardstick competition.

JEL classification: H62, H72, H77.

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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 delivered when fiscal sustainability is discussed usually support the idea that episodes of high public deficits are more prone to appear in lower levels of government compared to 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 when 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 (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 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 intertemporal decisions in favor of current consumption. Such institutional framework could be materialized at, for instance, an

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

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 not to bailout financially-troubled subnational governments.

In a sense, previous studies have 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 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).

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 imply that institutions neglect to explain fiscal behaviors 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, here we assess to what extent, if any, strategic fiscal behaviors by the key actors are interrelated to each other.

One important contribution 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 subnational public deficits. The idea is to emphasize the way through which the 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 our 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 a fiscal reaction function à la Bohn (1998) for the Spanish regional governments conveniently modified to include the federal public deficit among the regressors. The main result of this study can be briefly anticipated: 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 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 behavior 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 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 sub-national 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 position of the central government while 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.

All in all, our paper breaks the standard approach of the literature on fiscal sustainability in multi-level contexts, leaving scope for a new influence of upper levels of government on fiscal deficits of state governments. Moreover, we have straightened 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. 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

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

Table 1 summarizes the results. The first column reports the Pearson linear correlation index as a standard measure of statistical dependency. Alternatively, we also provide results from the Spearman correlation index in the second column². Overall, the pairwise comparison between deficits reveals the existence of some relationships between both fiscal imbalance measures. In general, 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-León and Baleares, where the statistical significance is not conclusive enough. Essentially, we find an area of potential further research in terms of the likely causal relationship that might be present.

2 The 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.

Table 1. Correlation analyses

State	Pearson	p-value	Spearman	p-value
Andalucía	0.7585	0.0070	0.7676	0.0005
Aragón	0.6595	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
Pais 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.

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

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

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 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 deficits to population ratio measures, have been also considered in the robustness checks (see below). As usual in panel data econometrics, the likely correlation between the region-specific unobserved effects and the remaining regressors has been carefully studied. Dynamic specifications of expression (1) have also been considered.

The model is a variation of the fiscal reaction functions estimated by Bohn (1998). For the purpose of this paper, we have adapted the conventional equation to take into consideration the behaviors at regional level. Therefore, the federal deficit is included as a likely explanation 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 states public deficits.

The vector of control variables includes economic, political and institutional determinants of fiscal balances of the Spanish regional governments (Argimón and Hernández de Cos, 2012). The business cycle is taken into account to isolate discretionary behaviors from fluctuations in the economic activity. 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 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 is also included in order to test the sustainability of states fiscal policy. 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. The effect is captured with the variable *debt_{t-1}*. 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 governments fiscal policies react to a certain debt level once the latter is already observed.

The inclusion of GDP-to-population ratio (variable *gdppop*) as control variable is intended to capture regional disparities on economic development and hence, differences in the effort to provide public services. In turn, the introduction of political factors as determinants of budget deficits have been studied in several dimensions³. In our case, we have opted for choosing those variables related to the ideological orientation of incumbents.

First, voters' preferences for the size and scope of the government are represented by the political ideology. It has been argued that the composition of the public services provided may change between left and right wings parties. The variable *left_sh* is intended to capture such heterogeneity and its impact on deficits measuring the share of seats hold by left parties with respect to the total seats in each Parliament. The same approach is followed when introducing the variable *reg_sh* although, in this case, we account for the share of regionalist/nationalist parties in each state Parliament.

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

Second, a common hypothesis in the political economy ground links the allocation of grants to political interests in a federation. The sign of the coefficient, however, is rather ambiguous. On one hand, it seems plausible that the federal government biases fund resources to those states with similar ideology. On the other hand, states that are not aligned may enjoy a higher bargaining power when the distribution of resources is negotiated. In order to control for this effect, we include a dummy variable (*alignment*) equal to 1 if regional and central governments share the same political orientation, and 0 otherwise.

The process of fiscal decentralization in Spain has been continuous but rather asymmetric across states. We have thus included some institutional variables to capture these differences. The variable *auto* accounts for an uneven devolution in time of spending responsibilities. Specifically, some states have 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. Thus, extra efforts in public spending and their subsequent consequences on regional deficits are considered with a categorical variable 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* considers 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 ordinary territorial financing system can be found in Zabalza and López-Laborda (2014). Just for sake of simplicity, it is worth to clarify that in the foral system both regions collect all the accrued taxes within their territories and transfer a grant to the federal government for redistribution purposes and financing 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, changes in the territorial financing system have increased the regional power over tax collection, reducing the dependence on vertical transfers. Increases in fiscal autonomy over the period of study are measured with the variable *tax_auto* (defined as tax revenues relative to non-financial revenues) or, alternatively, with two dummy variables controlling for the years under 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 derived from the European Stability and Growth Pact are controlled 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 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 in this study may consult Table 2.

Table 2. Definition and source of variables

Variable	Label	Description	Source(s)
Regional deficit	defgdp	SNG budget performance. Non financial expenditures minus non financial revenues relative to GDP	BADESPEa and own calculation.
Federal deficit	f_defgdp	Central government budget performance. Non financial expenditures minus non financial revenues relative to GDP.	BADESPE and own calculation.
Regional primary balance	pbgdp	Regional deficits minus interest payments.	BADESPE and own calculation.
Federal primary balance	f_pbgdp	Federal deficits minus interest payments.	BADESPE and own calculation.
GDP	gdp	Nominal GDP.	INE b
Output gap	output_gap	Distance between real and potential GDP.	Own calculations based on Hodrick and Prescott (1997) with $\lambda=6.25$ for annual data.
Unemployment	unemp	Regional and federal unemployment rates.	INE.
Unemployment deviation	unemp_dev	Distance between regional and federal unemployment rate.	INE and own calculation.
Debt	debt-1	Lagged values of regional total debt relative to GDP.	Bank of Spain and own calculation.
GDP per capita	gdppop	Regional GDP-to-population ratio	INE and own calculation.
Population	pop	Regional and federal population levels at the beginning of year t	INE
Regional elections	SNG_elect	Dummy variable. 1 = regional electoral year	Regional Parliaments database and own calculation.
Federal elections	fed_elect	Dummy variable. 1= federal electoral year	Ministry for Home Affairs and own calculation.
Alignment	alignment	Dummy variable. 1= Regional and central governments managed by similar ideological parties	Own calculation.
Left share	left_sh	Share of left wing parties seats in each regional Parliament	Regional Parliaments database and own calculation.
Regional share	reg_sh	Share of regionalist parties seats in each regional Parliament	Regional Parliaments database and own calculation.
Autonomy	auto	Dummy variable. 1= Assumption of health and education responsibilities before 2002	Own calculation.
Foral	foral	Dummy variable. 1= Regional foral regime	Own calculation.

Tax autonomy	tax_auto	Regional revenue taxes relative to total non financial revenues	Own calculation.
Financial agreements	fin_agree(year)	Dummy variables for each financial agreement (1997 and 2002) between regional and central governments	Own calculation.
Stability and Growth Pact	SGP	Dummy variable. 1=European Stability and Growth Pact in force	Own calculation.
Financing model	fin_mod	Dummy variable. 1=Change in the regional financing system (1997, 2002 and 2009)	Own calculation.
Neighboring deficits (a)	defgdp(j)	States average deficit-to-GDP ratio	Own calculation.
Neighboring deficits (b)	neigh_defgdp	Average deficits of geographically adjacent jurisdictions to a given state i	Own calculation.
Neighboring deficits (c)	ideo*defgdp(j)	Average deficits of politically aligned jurisdictions to a given state i	Own calculation.

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

^b INE: National Institute of Statistics.

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 first obtained estimates from the least squares dummy variable (LSDV) estimator. As it 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 present as a 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 the potential 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 Nickell bias (Nickell, 1981). Consequently, we estimate the model with the generalized method of moments (GMM) estimator (Arellano and Bond, 1991). Particularly, given the absence of correlation between the unobserved region-specific effects and the remaining regressors, inconsistency problems derived from the presence of such 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 is available upon request⁴.

Moreover, we have used one-step GMM estimators because of their relative advantages compared to the two-step version⁵. 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 caveats⁶.

A first battery of results is 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 agreements⁷. The estimate for β_1 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. This result suggests that states fiscal performances are directly conditioned by the behavior of the federal government. Moreover, the extent to which this impact occurs is quite similar across the columns of Table 3: around 0.20-0.25.

The estimates of the 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 *outputgap* indicates that a reduction in deficits takes place when the economy is above the potential level of output. Although the public deficits of state governments are not so strongly linked to the performance of fiscal stabilizers as at the federal level, a relatively substantial impact of business cycle on public imbalances at state level is also

4 As expected, both estimates are practically identical.

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

6 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 (2002) also shows how the power of the Sargan test to find out invalid instruments, dramatically decreases in finite samples with a high enough number of moment conditions, which is the case in this study.

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

expected. 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) during the late years of our sample.

Regarding the variable GDP per capita we find a weak positive impact on state deficits, with very low coefficients. 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 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 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 case⁸.

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 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 holds as a general result in the estimates carried out in the robustness checks described below. 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 Spain⁹. Two factors support this statement. First, the process of fiscal and political devolution of powers is recent enough to come about subnational levels suffering from 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 their start, changes in the territorial financial system was generous enough along its successive reforms that the conventional pressures for increasing expenditures did not become a worrying problem of over-borrowing.

8 By 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).

9 Obviously, 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.

Second, the federal control over 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 that. They consisted of political agreements between 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 de facto its fulfillment. Therefore, not surprisingly, the level of lagged stock of public debt has not involved any significant role conditioning the fiscal policy of states.

Regarding the coefficient of the dependent variable lagged one period ($defgdp_{t-1}$), we have attempted here to obtain some evidence on whether the fiscal behavior of states have somewhat inertia. This variable is obviously only under consideration in the dynamic specifications estimated through the GMM estimator. Again, 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 would require further analyses and 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 were also defined in terms of public deficit and their strict application was likewise very relaxed.

Table 3. State and federal public deficits. Central estimates

	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)
Economic variables						
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)
Political variables						
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)

	LSDV		RE		GMM	
Institutional variables						
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 R2	0.583	0.583	0.494	0.493		
Hausman			2.2660 [0.9862]	2.9694 [0.9655]		
Arellano-Bond:						
m1					-2.6791 [0.0074]	-2.7017 [0.0069]
m2					1.2640 [0.2062]	1.2703 [0.2064]
Sargan					145.1499 [0.0048]	143.8411 [0.0059]

Standard errors in parenthesis.

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.

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

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 state finances. Sorribas-Navarro (2011) identified implicit bailouts through the territorial financing system. Beyond the strategic use of such funds, her article evidences a shortage of resources available for subnational governments as well as 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, which occurred in 1997 and 2002.

The central estimates reported in Table 3 show that the regional financing system over 2002-2008 was positive for the sound of state public finances, with a negative impact on their public deficits. This was mainly as a result of the extraordinary yield of own and shared taxes closely related to the housing boom in particular and the economic

activity in general, like the income tax, VAT and gift taxes (de la Fuente, 2013; Barrios and Rizza, 2010), along with the higher degree of equalization enjoyed as result of the new financing agreement.

By contrast, a clear conclusion on the strategic use of funds attending the variable alignment can not be drawn. The negative sign of the coefficients indicate a better performance of those states sharing political orientation with the central government. However, their statistical significance is not generalized.

The entry in force of the Stability and Growth Pact (variable *SGP*) affected negatively the regional public deficits, although marginally. The variable *foral* has also a negative impact on state public deficits and is quantitatively more important than *SGP*¹⁰.

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

4. Robustness checks

Given the fact that the scope of our research is wide enough to close any discussion only with the results reported so far, we have carried out a number of robustness checks to ensure the reliability of our empirical results.

4.1. Potential endogeneity (i.e., 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 to the widely accepted fact that fiscal indiscipline at subnational level may be indeed materialize at federal bailouts, with the corresponding impact on fiscal balances at the upper level. The second one refers to the negative financial externality as a result of increases in the risk premia of subnational public debt on the credibility of federal bonds and, hence, on the interest payments of federal government.

Our results suggest that 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 implicit bailouts on the federal fiscal imbalances¹¹. Moreover, on the basis that these implicit bailouts mainly took place through changes in the territorial financing system, our econometric estimates have already taken these adjustments into account with dummies that explicitly control for them.

The second issue refers to the potential contagion effect in terms of risk premium from the state to the 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, deeper analyses show evidence of the opposite, i. e. financial stress in regions lead to an increase in 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) considering its lagged value as regressor. Tables 4 and 5 report estimates with the federal public deficit lagged one period (f_defgdp_{t-1}) and with the variable in levels and lagged as well, respectively. The coefficients of federal deficit are still statistically significant and around 0.20 - 0.25, similar than for our central estimates. The coefficient of the federal deficit in $t-1$ is moderately lower than that of the current federal deficit, except in the GMM specification.

11 A 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).

Table 4. State and lagged federal public deficits

	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)
Economic variables						
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)
Political variables						
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)
Institutional variables						
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 R2	0.521	0.521	0.416	0.414		
Hausman			5.1047 [0.8251]	8.9849 [0.4387]		
Arellano-Bond:						
m1					-2.1928 [0.0283]	-2.1771 [0.0295]
m2					0.8407 [0.4005]	0.8636 [0.3878]
Sargan					1672387 [0.0001]	1673799 [0.0001]

Standard errors in parenthesis.

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.

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

Table 5. State and lagged and current federal public deficits

	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)
Economic variables						
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)
Political variables						
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)
Institutional variables						
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 R2	0.596	0.602	0.511	0.518		
Hausman			3.2561 [0.9717]	3.0718 [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 parenthesis.

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.

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

4.2. Business cycle alternatives

Up to now, we have measured the regional economic cycles using non-observable variables per se. Output gaps are therefore 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). Such failure may be particularly important in our case since the last years of GDP series are 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 determinates the smoothness of the estimated function (known as λ)¹².

Next, we reestimate our central specification after substituting the variable output gap by either (i) the regional level of unemployment (*unemp*) and (ii) the deviation of such level from the national one (*unemp_dev*)¹³. Tables 6 and 7 show that the coefficients of the federal public deficit are 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. However, it is important to note that they are around 0.20, which is in excellent agreement with the coefficients shown in Table 3.

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

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

Table 6. State and federal public deficits with unemployment (I)

	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)
Economic variables						
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)
Political variables						
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)
Institutional variables						
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(97)		-0.002 (0.003)		-0.001 (0.002)		-0.005** (0.003)
fin_agree(02)		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 R2	0.580	0.586	0.491	0.498		
Hausman			3.3569 [0.9485]	4.1614 [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 [0.0030]	146.8929 [0.0036]

Standard errors in parenthesis.

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.

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

Table 7. State and federal public deficits with unemployment (II)

	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)
Economic variables						
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)
Political variables						
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)
Institutional variables						
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 R2	0.574	0.578	0.483	0.488		
Hausman			2.4011 [0.9834]	2.9633 [0.9657]		
Arellano-Bond:						
m1					-2.5603 [0.0105]	-2.5940 [0.0095]
m2					1.3975 [0.1623]	1.3689 [0.1710]
Sargan					146.1834 [0.0041]	144.5249 [0.0053]

Standard errors in parenthesis.

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.

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

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) have recently argued that in the presence of strong equalization across territories (as in the Spanish case), the use of regional GDP to assess the soundness of state public finances might not be 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 used the primary balance instead of the total public deficit (the new variables begin then with the letter *p*). As it is well known, the primary balances do not consider interest payments to compute the public deficit; thus, 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 summarize the new estimates from which it is clear that the impact of federal public deficit on state fiscal imbalances remains unchanged, both in terms of statistical significance and magnitude. With respect to the remaining control variables, it is worth noting that the coefficient of dependent variable lagged one period is significantly positive when the total deficit and the primary deficit, expressed in per capita terms, are considered. As briefly stated before, 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 the understanding of these results.

Table 8. State and federal public deficits-to-population ratio

	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)
Economic variables						
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)
Political variables						
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)
Institutional variables						
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 R2	0.581	0.580	0.514	0.513		
Hausman			1.7022 [0.9954]	1.8506 [0.9936]		
Arellano-Bond:						
m1					-2.1448 [0.0320]	-2.1518 [0.0314]
m2					0.8019 [0.4226]	0.8020 [0.4226]
Sargan					163.1611 [0.0002]	162.7184 [0.0002]

Standard errors in parenthesis.

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.

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

Table 9. State and federal public primary deficits-to-GDP ratio (I)

	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)
Economic variables						
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)
Political variables						
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)
Institutional variables						
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 R2	0.580	0.579	0.471	0.473		
Hausman			1.1930 [0.9988]	1.5523 [0.9967]		
Arellano-Bond:						
m1					-2.6840 [0.0073]	-2.6985 [0.0070]
m2					1.3152 [0.1884]	1.3265 [0.1817]
Sargan					149.5156 [0.0023]	147.4579 [0.0033]

Standard errors in parenthesis.

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.

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

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

	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)
Economic variables						
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)
Political variables						
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)
Institutional variables						
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 R2	0.568	0.567	0.487	0.485		
Hausman			1.5159 [0.9970]	1.8535 [0.9936]		
Arellano-Bond:						
m1					-2.1502 [0.0315]	-2.1564 [0.0311]
m2					0.8451 [0.3981]	0.8462 [0.3974]
Sargan					1677061 [0.0001]	166.5407 [0.0001]

Standard errors in parenthesis.

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.

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

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 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 into account that incumbents are likely to incur on higher deficits when opting for reelection (Hodler, 2011; Maskin and Tirol, 2014). These two new variables are considered in the Table 11. 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).

Moreover, we have grasped additional links between the state public deficits 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 to refer to those 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 high significant and negative coefficient for the variable *fin_mod* as 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. State and federal public primary deficits-to-GDP ratio (III)

	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)
Economic variables						
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)
Political variables						
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)
Institutional variables						
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)
constant	-0.003 (0.002)	-0.003** (0.002)	-0.002* (0.001)	-0.003** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)
Observations	255	255	255	255	238	238
Adjusted R2	0.584	0.587	0.501	0.506		
Hausman			2.2609 (0.9989)	2.6690 (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 parenthesis

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.

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

5. Discussion

The previous section has clearly stated that the federal public deficits positively affect the state public deficits. The remaining questions now are: what is the rationale behind these findings? What is the channel through which the public imbalances at federal level may encourage state 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 of this study.

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 it 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 not 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.

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 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, in a sense, result in states 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 opposite¹⁴. 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.

Following this approach, 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 a 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,

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

based on expectations of higher grants from the federal government. Indeed, as we show later, 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. 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 a 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-Peñas (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 useful to explain why and how.

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 it 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 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 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

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 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 reference: 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, as we have done in the previous section.

Second, a new and more complex debate on the interactions between the federal and the 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 below.

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 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 explain our results in terms of yardstick competition. Contrary to the previous assumptions, in a world with voters suffering fiscal illusion, 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 as well as vertical dimensions) becomes indeed crucial by determining the sense of votes whether or not to support the re-election of the politicians in office. In our 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 a 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 paper¹⁵.

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 the new variable $defgd_p_i$ 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.

15 Notwithstanding 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.

Table 12. State and federal public deficits with horizontal interactions (I)

	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)
Economic variables						
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)
Political variables						
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)
Institutional variables						
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 R2	0.631	0.631	0.546	0.546		
Hausman			35.2109 [0.0001]	29.3447 [0.0011]		
Arellano-Bond:						
m1					-2.4730 [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 parenthesis.

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.

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

A second approach to horizontal interactions involves building more specific measures for such 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 Baleares and Canarias we have taken the average of 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. State and federal public deficits with horizontal interactions (II)

	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)
Economic variables						
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)
Political variables						
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)
Institutional variables						
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 R2	0.592	0.592	0.508	0.507		
Hausman			1.0274 [0.9998]	1.2632 [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 parenthesis.

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.

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

Following 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. State and federal public deficits with horizontal interactions (III)

	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)
Economic variables						
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)
Political variables						
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)
Institutional variables						
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 R2	0.599	0.599	0.516	0.515		
Hausman			15.6393 [0.0478]	27.6617 [0.0011]		
Arellano-Bond:						
m1					-2.6912 [0.0071]	-2.7024 [0.0069]
m2					1.1410 [0.2539]	1.1448 [0.2523]
Sargan					146.7397 [0.0037]	145.6504 [0.0044]

Standard errors in parenthesis.

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.

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

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 reading of the yardstick competition models, in which an additional interaction affecting fiscal behaviors 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. Potential research avenues for further studies have been also pointed out.

6. Concluding remarks

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 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 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 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 the central government as benchmark to measure the quality of fiscal policy within their own jurisdiction. In this context, greater deficits at federal level lead to higher deficits at state level. The same can be applied with neighboring (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 previously 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 sub-national 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 on the income tax rates will affect the federal fiscal balance and thus, the states budget constraints, is an intriguing fact to be studied in the medium term.

7. 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* 85(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 setting. *Labour Economics* 15(5), 885-914.
- Barrios, S. and D. Martínez-López (2014). Fiscal equalisation schemes and subcentral government borrowing. Working Papers Collection A: Public Economics, governance and decentralization 1401, GEN – Governance and Economics research Network, Universidade de Vigo.
- Barrios, S. and P. Rizza (2010). Unexpected changes in tax revenues and the stabilisation function of fiscal policy. Evidence for the European Union, 1999-2008. European Economy – Economic Papers 404, Directorate General for Economic and Monetary Affairs (DG ECFIN), European Commission.
- 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. Washington, D.C.: The 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 Series No. CWP04/2, Institute for Fiscal Studies, London.
- 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. (2002). On testing overidentifying restrictions in dynamic panel data models. *Economic Letters* 77(2), 211-220.
- 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 and New York: Cambridge University Press.
- Breton, A. (2006). Modelling vertical competition. In E. Ahmad and G. Brosio (Eds.), *Handbook of Fiscal Federalism*, pp. 86-105. 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.
- Eslava, M. (2011). The political economy of budget deficits: A survey. *Journal of Economic Surveys* 25(4), 645-673.
- 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), 86-110.
- Goodspeed, T. (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(1), 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. (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*. New York: Springer-Verlag.
- Lago-Peñas, 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 of HBS, mimeo.
- 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*. New York: Cambridge University Press.
- Rodden, J., G. S. Eskeland, and J. Litvack (2003). *Fiscal decentralization and the challenge of hard budget constraints*. Cambridge, MA.: 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. <http://www.standardandpoors.com/ratings/articles/en/us/?articleType=HTML&assetID=1245337778747>.

Van Hecke, A. (2013). Vertical debt spillovers in EMU countries. *Journal of International Money and Finance* 37(October), 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, Washington D.C.

Zabalza, A. and J. López-Laborda (2014). The uneasy coexistence of the Spanish foral and common regional finance systems. Wp No. 2014-2, Instituto Valenciano de Investigaciones Económicas (IVIE), Valencia.

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