Estudios sobre la Economía Española

Fiscal stabilisation, debt sustainability and public spending in subnational governments. The case of the Spanish regions

Carmen Marín-González
Diego Martínez-López

Estudios sobre la Economía Española 2024/02
Enero 2024

fedea

Fiscal stabilisation, debt sustainability and public spending in subnational governments. The case of the Spanish regions[*]

Carmen Marín-González
FEDEA

Diego Martínez-López
Pablo Olavide University and FEDEA

This version: 16 January 2024

Abstract

This paper focusses on the objectives guiding the fiscal policy of the Spanish regions over the period 2013-2022. Beyond the usual concerns of national governments for closing the output gap and guaranteeing debt sustainability, we have included an additional task at the subnational level, namely, the provision of public services such as health and education. The results indicate that, except for the year 2020, there is a strong policy preference for primary public spending, with a relative weight of between 40 and 60 per cent among the objectives driving fiscal policy. The preference for debt sustainability has ranged between 20 per cent (with the maximum value reached in 2013 and then again after the pandemic) and 0, depending on the model specification. And finally, the weight of stabilisation has been estimated, using previous contributions, at between 0.39 and 0.25. Additional results regarding variations across regions have been also obtained.

Keywords: fiscal policy, Spanish regions, stabilisation, debt sustainability, subnational public spending.

JEL Code: H70, H74.

[*] We are grateful Ángel de la Fuente, María Cadaval, Santiago Calvo, Ana Herrero, Santiago Lago, Joan M. Mussons and participants at the XII Meetings of AIFIL and seminar in the Universitat de Valencia for their comments and suggestions. All remaining errors are our own responsibility. Emails: cmarin@fedea.es ; dmarlop1@upo.es

1. Introduction

The conventional approach to fiscal policy rules usually involves a trade-off between the aims of macroeconomic stabilisation and debt sustainability (see, for instance, Kanda, 2011 and Carnot, 2014). Indeed, the operational way of dealing with that is based on the minimisation of a loss function in which the arguments are the output gap and the distance between the stock of public debt and some (institutional or *de facto*) benchmark. This framework has been extensively discussed in the context of national governments and even supranational currency unions (Hauptmeier and Kamps, 2022).

In this paper, we broaden this approach to include a new objective in the design of fiscal policy at the subnational level. We guess that the fiscal behaviour of regional governments is driven by different rationales than the standard ones, and our plan here is to make them explicit in a particular case.

Regional and local governments are often important providers of public services to their citizens, in addition to the traditional concern of governments for the trade-off between stabilisation and sustainability. And importantly, the priority of subnational governments attached to this task is likely to be higher than those assigned to closing the output gap or guaranteeing the sustainability of the regional public debt.

There are several reasons for this. First, in many countries spending responsibilities on health care and education are assigned to subnational entities and make up a large share of their budgets. For example, in countries such as Switzerland, Italy, Denmark, Sweden, Spain or Finland, the degree of decentralisation of health care expenditure to subnational governments is above 80 per cent (De Biase et al., 2022) while such expenditures account for more than a half of their total budgets.

Second, the proximity of voters to regional and local politicians puts intense pressure on incumbents to assign high priority to spending items that are directly related to the welfare of citizens. In other words, citizen pressure may bias subnational public policies in favour of certain key spending programs, with the subsequent negative impact on fiscal sustainability, more strongly than at supranational or national levels.

There are several channels through which this effect may well affect the political agenda in local and regional jurisdictions. One is based on the increase in political competition, both at national and subnational levels, when decentralized elections take place and partisan strategic behaviours fighting for voters at national level as well put on the table policies closely impacting on social welfare at lower tiers (Faguet, 2014). Other channel has to do with the interactions between local and regional authorities and lobbies; some authors think that the subnational governments can be more likely captured by interest groups, which are closer in decentralised environments, with implications for subnational public spending patterns under certain circumstances (Bordignon et., 2008).

Third, the plausible presence of agency problems between governments must be considered. Indeed, national governments are those committed to supranational agreements on fiscal coordination; this is the case, for instance, of the European Union with the Stability and Growth

Pact. National governments are also those mainly involved in dealing with international financial markets, whereas subnational governments, although relevant for sovereign ratings, have other aims than debt sustainability in their objective functions (Balassone and Franco, 2001; Sutherland et al., 2006), at least with differential weights in their policy designs.

And fourth, when bailout expectations are present at the subnational level, the fiscal behaviour of local/regional governments may well leave aside, at least partially, the concern for debt reductions in favour of more expenditure-oriented policies. The literature on bailouts at subnational governments is extensive, with both theoretical (Goodspeed, 2017; Martínez-López, 2022) and empirical contributions (Allers and de Natris, 2021).

Given this specific, decentralised context, the traditional bi-dimensional model, rooted in the usual trade-off between stabilisation and sustainability, is therefore unlikely to explain important facts of subnational fiscal policy formulation. Additionally, the pandemic might have modified policy preferences across tiers of government, although this is a hypothesis that will need to be confirmed in the years to come.

This paper deals with such circumstances. We initially model fiscal decision-making at the subnational level as having the two standard policy objectives (stabilisation and debt sustainability) and then expand the model to include the third one: the provision of public services. Both models have been analytically solved for the optimal fiscal policy of governments. The extended model has two versions with different decision variables: the fiscal stance, as is standard in this literature, or the optimal public expenditure, which is a novelty in this framework.

We have then calibrated the resulting models for the Spanish regions over the period 2013-2022. The aim is to capture the policy preferences that best explain Spanish regional governments´ fiscal behaviour. In a sense, we are extracting from the data the revealed preferences of regional governments regarding the relative importance assigned to stabilisation, debt sustainability and public spending.

In this calibration we also report the first -as far as we know- estimates of the cyclical balance of the Spanish regional governments for a period of more than a decade, with several stages over the business cycle and even a huge temporary shock like the Covid pandemic. The decomposition of the budget balance into cyclical and cyclically-adjusted balance is crucial to determining the fiscal stance chosen by these governments.

This calibration shows at least two interesting results from the methodological point of view. The first one is that the model with only two policy objectives (stabilisation and debt sustainability) does not work appropriately for the sample of Spanish regions. The second one is that despite arriving at the same analytical solutions in the extended model with public spending, the calibration provides some slightly different results depending on whether the decision variable is the fiscal stance or the level of public expenditure.

To the best of our knowledge, this paper is the first one dealing with fiscal policy preferences at the subnational level within the standard (or extended) framework for the analysis of fiscal policy rules. Previous papers have studied the interactions between the fiscal behaviour of

Spanish regional governments and the design of fiscal rules (see, for example, Díaz and Cuenca, 2014). Or they have discussed how regional governments respond to their stocks of public debt and the business cycle (see, for instance, Molina-Parra and Martínez-Lopez, 2016, and Castañeda et al., 2018, for the Spanish case), among other things, but not in a multiple trade-off framework with decisions on public spending, revealing in this way their policy preferences.

As a matter of fact, the very concern with stabilisation at the subnational level is a relatively new topic in the specialised literature (Kameda et al., 2021; Wilson, 2023). Although it is expected that both academics and policy-makers will pay more attention to them after the recent experience of the Covid crisis, in which fiscal support to fight the pandemic may have had an effect on the level of economic activity (Green and Loualiche, 2021; Clemens at al., 2022).

Our main findings show a remarkable importance of the provision of public spending on fiscal decision making, higher than that corresponding to the other alternative objectives. After the pandemic, however, the concern for debt sustainability seems to have come back to the highest levels at the beginning of the period under scrutiny. Notwithstanding this, debt sustainability is not a great concern for the most indebted regions, maybe as the result of bailout expectations. We could be in the presence of some problems of temporal inconsistency, increasing the risk of a future debt crisis such as those experienced by the Brazilian states or the Argentinian Provinces in several past periods.

The structure of the paper is as follows. Next, we define the theoretical framework, including both the standard model and its extension with public spending added to the arguments of the loss function. In Section 3 we calibrate the model to Spanish regional data, after computing output gaps and cyclical public balances at the regional level. Section 4 discusses the results obtained for the sample as whole and for the case of some specific regions. Finally, we conclude with some remarks on potential avenues for further research.

2. A simple fiscal policy rule for subnational governments under two theoretical frameworks

In this section we analyse the optimisation problem faced by the regional governments when their fiscal policy is at play. We shall distinguish two different theoretical frameworks, namely, the standard one with the governments choosing between stabilisation or debt sustainability, and the new one with a third policy objective as well: the provision of public spending. Our aim is not to discuss the normative implications derived from the externalities arising when the regional governments ignore the impact of their fiscal indiscipline on other governments. This will likely happen but we are only interested in gauging the intensity of the preferences for fiscal policy without managing their spillovers across governments.

2.1 The standard model

We follow here previous contributions such as Kanda (2011), Carnot (2014) and, particularly, Hauptmeier and Kamps (2022)[1]. The starting point is the well-known debt dynamics equation:

$$d_t = \left(\frac{1+i-\pi}{1+y-\pi}\right) d_{t-1} - pb_t + dda_t, \quad (1)$$

where the public debt at the end of year *t* depends on the nominal interest rate, *i*, the inflation rate, π, the nominal growth of GDP, *y*, the stock of public debt in the previous year d_{t-1}, the public primary balance pb_t and the debt-deficit adjustment dda_t. The variables referring to public debt, primary balance and adjustment are measured as fractions of nominal GDP.

This variable dda_t is a minor novelty in this paper. We think it should be considered in the debt dynamic equation given its relatively large magnitude in the recent years for the bulk of Spanish regional governments. Notwithstanding this, the algebraic expressions of the model are barely modified with respect to the canonical form and its impact is just on the ex-post calibration exercise, which significantly improved with respect to the case where dda_t is not considered.

The other novelty is that there are no spreads in interest rates. Contrary to the approach by Hauptmeier and Kamps (2022), in which the interest rates are defined as the sum of benchmark interest rates and the spread depending on the deviation of the public debt from the debt target, we do not allow for this. The main reason is that, in the context of regional Spanish governments, the presence of extraordinary financing mechanisms benefiting most regions allows borrowing at subnational level with no spreads with respect to the sovereign Spanish debt.

The public primary balance can be decomposed into its usual components, namely, the structural and the cyclical parts:

$$pb_t = capb_t + \mu\, og_t, \quad (2)$$

with $capb_t$ and og_t being, respectively, the cyclically-adjusted primary balance ratio and the output gap in *t* as percentage of potential GDP; the parameter μ measures the sensitivity of budget balance to the business cycle. For later use, it is useful to define the public primary balance as:

$$pb_t = R_t - g_t, \quad (3)$$

where R_t is the total revenue available for the government (typically, shared or ceded taxes and intergovernmental transfers) and g_t is the public spending net of interest expenditures, both measured as a percentage of nominal GDP. Given the existing institutional framework for the

[1] Similar developments can be found in Escolano (2010), Hernandez de Cos et al. (2018) and Díaz et al. (2023a).

territorial financing system in Spain, R_t can be considered as exogenous for the regional government for sake of simplicity[2].

In turn, the output gap has the following dynamics:

$$og_t = \phi \, og_{t-1} - \varepsilon \, \Delta capb_t. \tag{4}$$

According to this expression, the output gap in the year t is affected by the speed ϕ with which the output gap is closed, by the fiscal multiplier ε and by the change in the cyclically-adjusted primary balance, that is, the fiscal stance.

The regional government is assumed to choose the fiscal stance ($\Delta capb_t$) to minimise the following standard loss function:

$$L = v(og_t)^2 + (1 - v)(d_t - d^*)^2. \tag{5}$$

The two arguments of this function are the usual ones: the output gap og_t and the gap existing between the public debt and the value of the public debt target d^*. For the sake of operational convenience in the calibration that follows, we assume that $d_t \geq d^*$. In any event, it seems reasonable to set up such an inequality, as it reflects the empirical fact that in recent years public debt levels are usually above their established benchmark values.

Assuming $0 < v < 1$ and $0 < (1 - v) < 1$ the parameters v and $(1 - v)$ refer to the weights of the stabilisation and debt sustainability, respectively, in the objective function guiding the behaviour of regional government. The first term shows the usual concern for bringing the economy closer to its potential growth path, reducing then the output gap. The second term focusses on standard sustainability issues, here represented by the discrepancy between the actual regional public debt ratio over GDP and a benchmark value.

This reference value may come from the existing fiscal rules but could also be linked to market expectations and/or financial derivatives with public debt as collateral, such as those related to risk premia, credit ratings and so on. The latter option would imply a more sophisticated way of dealing with sustainability, involving additional equations for interest rates at the regional level that would capture the impact of financial developments in markets for sovereign debt. As we already said above, we have left aside this second option and focussed on the benchmarks dictated by the fiscal rules.

Before the optimisation is carried out, some algebraic manipulations must be done to make it easier. Particularly, the expression (2) is inserted into (1) and then (4) is plugged into the new (1). All these changes, with again the expression (4), and taking also into account what the identity (3) states, are considered in the objective function (5). As a result, the equation to differentiate is the following expression:

[2] Concise overviews about the Spanish territorial financing system can be found in De la Fuente et al. (2016) and Romero-Caro (2023).

$$L = v(\phi og_{t-1} - \varepsilon\Delta capb_t)^2 +$$

$$+(1-v)(I - \Delta capb_t - capb_{t-1} - \mu\phi og_{t-1} + \mu\varepsilon\Delta capb_t)^2 \quad (6)$$

where

$$I = \frac{1+i-\pi}{1+y-\pi}\, d_{t-1} + dda_t - d^*.$$

After differentiating the equation (6) with respect to $\Delta capb_t$ to obtain the first-order conditions, and simplifying, we arrive at[3]

$$\Delta capb_t^{\,*} = \theta og_{t-1} - (1-v)\delta capb_{t-1} + (1-v)\delta I, \quad (7)$$

where

$$\theta = \frac{v\varepsilon - (1-v)(1-\mu\varepsilon)\mu}{v\varepsilon^2 + (1-v)(1-\mu\varepsilon)^2}\phi$$

$$\delta = \frac{1-\mu\varepsilon}{v\varepsilon^2 + (1-v)(1-\mu\varepsilon)^2}$$

This solution is clearly aligned with that of Hauptmeier and Kamps (2022), the only difference being that here we consider the inflation rate do not allow for spreads in the interest rates. Although we shall give more details below, we anticipate now that the calibration of policy preferences based on expression (5) is far away from being reasonable. Consequently, we adopt as reference model the one developed in the next section.

2.2 The extended model with public spending

One of the contributions of this paper is the inclusion of the provision of a determined level of public spending as a policy objective, together with macroeconomic stabilisation and debt sustainability. The loss function to be minimised is then:

$$L = v(og_t)^2 + \beta(\bar{g} - g_t)^2 + (1 - v - \beta)(d_t - d^*)^2. \quad (8)$$

To the previous arguments of the output gap and the gap between public debt and its target value d^*, we have added the distance between the benchmark value for primary public spending

[3] Technicalities are available upon request.

$\bar{g}$ and effective primary public spending. We assume that $\bar{g} \geq g_t$, which may be seen as a non-satiation assumption for primary public spending.

Assuming 0 < $v < 1$, 0 < $\beta < 1$ and $0 < 1 - v - \beta < 1$, the parameter β refers to the weight of the public spending provision objective. Consequently, $(1 - v - \beta)$ represents now the weight of debt sustainability in the objective function guiding the behaviour of regional government.

Here the optimal choice of the subnational governments can be approached by two ways. One is setting g_t as decision variable. This implies to follow a similar algebraic sequence than before. The equation to differentiate is the following expression:

$$L = v\left[\frac{\phi og_{t-1} - \varepsilon(R_t - g_t) + \varepsilon capb_{t-1}}{1 - \mu\varepsilon}\right]^2 + \beta(\bar{g} - g_t)^2 + (1 - v - \beta)[I - (R_t - g_t)]^2 , \qquad (9)$$

where

$$I = \frac{1 + i - \pi}{1 + y - \pi}\, d_{t-1} + dda_t - d^*$$

Then, the equation (9) is optimized with respect to g_t , reaching the following optimal level of primary public spending:

$$g_t^* = \gamma(\varepsilon R_t - \varepsilon capb_{t-1} - \phi og_{t-1}) + \alpha\beta\bar{g} - \alpha(1 - v - \beta)(I - R_t), \qquad (10)$$

where

$$\gamma = \frac{v\varepsilon}{v\varepsilon^2 + (1 - v)(1 - \mu\varepsilon)^2}$$

$$\alpha = \frac{(1 - \mu\varepsilon)^2}{v\varepsilon^2 + (1 - v)(1 - \mu\varepsilon)^2} .$$

Having arrived at this solution, some results of comparative statics offer reasonable readings[4]. The softer the conditions regarding the public debt target (lower interest rate *i*, higher value for the benchmark of public debt d^*, lower public debt in the previous period d_{t-1} or higher GDP growth rates, y), the higher the primary public spending chosen by the regional government. More resources available for the subnational authorities R_t or a higher public spending target, $\bar{g}$, lead to higher spending, g_t^*, as well.

The trade-off between policy objectives can be clearly seen by analysing the impact of the primary cyclically adjusted public balance or the output gap, both in the previous period, on the level of primary public spending. A lower concern for a weak fiscal stance and/or a minor output gap do indeed stimulate the ability of the regional government to increase public spending. This is what the partial derivatives of g_t^* with respect to $capb_{t-1}$ and og_{t-1} show: both are negative.

The other way of obtaining the optimal choice of the subnational governments is to establish the fiscal stance ($\Delta capb_t$) as decision variable. The equation to differentiate is:

[4] The technical details on the partial derivatives of g_t^* with respect to the exogenous variables are available upon request.

$$L = v(\phi og_{t-1} - \varepsilon \Delta capb_t)^2 + \beta[\bar{g} - R_t + \mu(\phi og_{t-1} - \varepsilon \Delta capb_t) + \Delta capb_t + capb_{t-1}]^2 +$$
$$+(1-\beta-v)[I - \Delta capb_t - capb_{t-1} - \mu(\phi og_{t-1} - \varepsilon \Delta capb_t)]^2 \,, \qquad (11)$$

where

$$I = \frac{1+i-\pi}{1+y-\pi}\, d_{t-1} + dda_t - d^*$$

Differentiation of expression (11) with respect to $\Delta capb_t$ and after the usual algebraic manipulations, leads to the expression (12):

$$\Delta capb_t{}^* = \theta og_{t-1} + \beta\delta(R_t - \bar{g}) - (1-v)\delta capb_{t-1} + (1-v-\beta)\delta I, \qquad (12)$$

where

$$\theta = \frac{v\varepsilon - (1-v)(1-\mu\varepsilon)\mu}{v\varepsilon^2 + (1-v)(1-\mu\varepsilon)^2}\phi$$

$$\delta = \frac{1-\mu\varepsilon}{v\varepsilon^2+(1-v)(1-\mu\varepsilon)^2}.$$

Both ways of obtaining the optimal choice of the subnational governments are equivalent. In other words, if we have the optimal public spending g_t^* chosen by the government and this is used through the expressions of the model, the fiscal stance $\Delta capb_t{}^*$ is also achieved, and vice versa.

3. Calibration

The objective of this section is to determine the coefficients of stabilisation, public expenditure, and debt sustainability in the loss function of the regional governments, that is, the value for the parameters of policy preferences *v*, β and $(1-v-\beta)$. The manner to proceed in this calibration is by using data from the Spanish regional governments and their fiscal decisions. The period covers from 2013 to 2022. During this period, these governments have faced different economic situations, including a pandemic, so the value of these parameters might have changed considerably.

For the standard model with only two policy objectives, working with the expression (7) and solving for the parameter *v*, the following expression is obtained:

$$v = \frac{(1-\mu\varepsilon)[\Delta capb_t(1-\mu\varepsilon) + \mu\phi og_{t-1} - I + capb_{t-1}]}{[\varepsilon - (1-\mu\varepsilon)\mu]\phi og_{t-1} - \Delta capb_t[\varepsilon^2 - (1-\mu\varepsilon)^2] + (1-\mu\varepsilon)(capb_{t-1} - I)} \qquad (13)$$

After the calibration of this model, exact solutions of the stabilization parameter *v* and the sustainability parameter *1-v* are achieved.

For the extended model, with public spending as argument in the loss function, we proceed as follows. Firstly, the expression for β is derived from equation (10):

$$\beta = \frac{g^* - \gamma(\varepsilon(R_t - capb_{t-1}) - \phi og_{t-1}) + \alpha(1-v)(I - R_t)}{\alpha(\bar{g} + I - R_t)} \tag{14}$$

Then, using this expression (14), it is observed that β depends linearly on *v* [5]. Therefore, it can be expressed as $\beta = A + Bv$, where the coefficients *A* and *B* are constant and according to the following expressions:

$$A = \frac{g^* + I - R_t}{\bar{g} + I - R_t} \tag{15}$$

$$\mathrm{B} = \frac{g_t[\varepsilon^2 - (1-\mu\varepsilon)^2] - \varepsilon^2 R_t + \varepsilon^2 capb_{t-1} + \varepsilon\phi og_{t-1}}{(1-\mu\varepsilon)^2(\bar{g} + I - R_t)} - \frac{I - R_t}{\bar{g} + I - R_t}, \tag{16}$$

with *I* being

$$I = \frac{1 + i - \pi}{1 + y - \pi}\, d_{t-1} + dda_t - d^*.$$

When we work with the extended model with the fiscal stance ($\Delta capb_t$) as decision variable, we can proceed with similar computations as before. Firstly, from the expression (12), it is derived the expression for β:

$$\beta = \frac{\theta og_{t-1} + (1-v)\delta I - \delta(1-v)capb_{t-1} - \Delta capb_t}{\delta(\bar{g} + I - R_t)} \tag{17}$$

Then, from the expression (14), β can be expressed as $\beta = A + Bv$, where the coefficients *A* and *B* are constant and according to the following expressions:

$$A = \frac{I - \mu\phi og_{t-1} - capb_{t-1} - \Delta capb_t(1-\mu\varepsilon)}{\bar{g} + I - R_t} \tag{18}$$

$$B = \frac{[\varepsilon + (1-\mu\varepsilon)\mu]\phi og_{t-1} - \Delta capb_t[\varepsilon^2 - (1-\mu\varepsilon)^2]}{(1-\mu\varepsilon)(\bar{g} + I - R_t)} - \frac{I - capb_{t-1}}{\bar{g} + I - R_t} \tag{19}$$

These expressions can be computed using observed regional data on the variables published by the Spanish central government (IGAE, 2023), the Bank of Spain (BDE, 2023), the Spanish

[5] The first derivative of β with respect to *v* is a constant.

National Statistical Office (INE, 2023) and from our own computations. Particularly, public spending net of interest expenditures (g_t) and public revenue (R_t) are obtained from the National Accounts statistics published by the IGAE. The level of public debt (d_{t-1}) is published by the Bank of Spain (BDE, 2023) and the implicit interest rate (i_t) is defined as the ratio between the interest expenditure in National Accounts and the public debt. The GDP nominal growth rate y_t is obtained from the Spanish Statistical Office (INE, 2023).

The cyclically-adjusted fiscal primary balance ($capb_t$) used in the equation (2) is the difference between the primary balance and the cyclical balance. The latter is estimated following the methodology of the European Commission (ECC/493/2014 and ECC/1556/2016), which is applied in Díaz *et al.* (2023b). However, this methodology has been revised to consider in a separate way the revenues provided by the SFA (Regional Financial System, acronym in Spanish) and their own regional tax collection. Given the remarkable degree of vertical and horizontal equalization of the Spanish SFA, both sources of revenue are affected by the business cycle with different intensities. In other words, the sensitivity of regional revenues with respect to the business cycle depends upon the type of revenues at play, that is, whether they come from the SFA, and consequently more aligned with the national business cycle, or they are obtained from the specifically regional taxes.

Therefore, the cyclical balance of a region *i* (cb_i) is defined as the weighted sum of two types of sources: those coming from the SFA and closely linked to the national business cycle, and those related to each region's own taxes (subindex *OT* next) and its output gap, as it is shown in the following equation:

$$cb_i = W_{SFA,i}\,\mu_{SFA,i}\,og_{ES} + \left(1 - W_{SFA,i}\right)\mu_{OT,i}\,og_i, \tag{20}$$

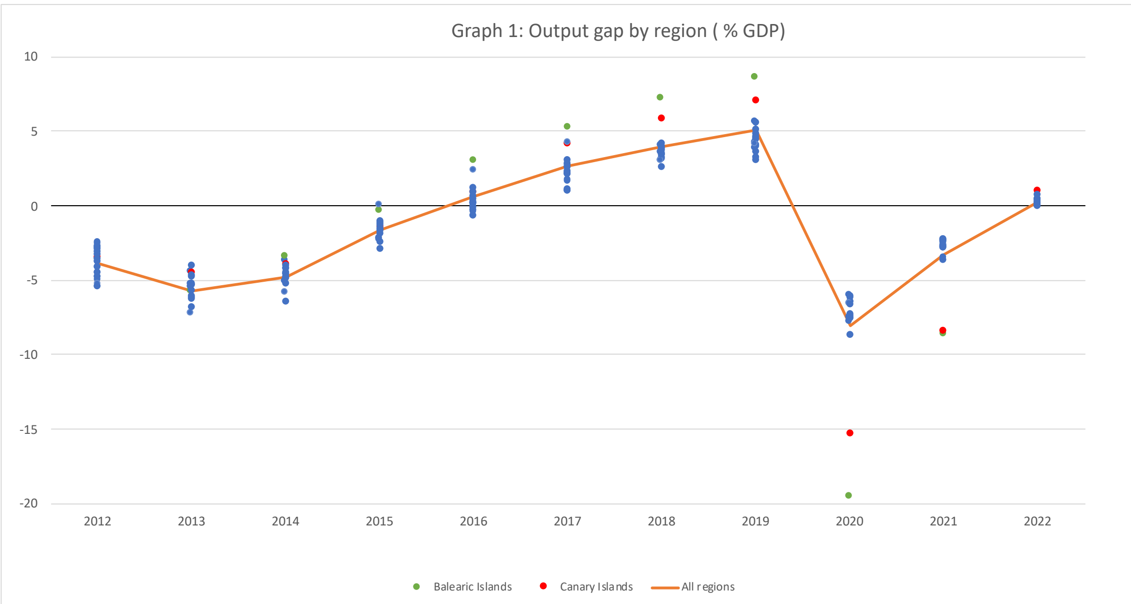
where $\mu_{SFA,i}$ is the semi-elasticity of the balance considering the revenues obtained from the SFA in region *i*, $\mu_{OT,i}$ is the semi-elasticity of the balance *i* taking account only its own taxation, og_{ES} is the national output gap and og_i output gap of each region *i* [6]. $W_{SFA,i}$ is the share of the revenues obtained from the SFA for region *i*.

[6] The regional output gap is estimated applying the Hodrick-Prescott filter to a real GDP data including forecast data from BBVA Research (2022) until 2024 to minimize the caveats of estimates at the boundaries of the sample.

Table 1 and Graph 1 show the estimated output gap for each region over the years 2012-2022. Clearly, the touristic regions of Balearic Islands and the Canary Islands presented biggest variations of the output gap in the period 2018-2021, whereas the remaining regions presented output gaps quite similar to the Spanish one.

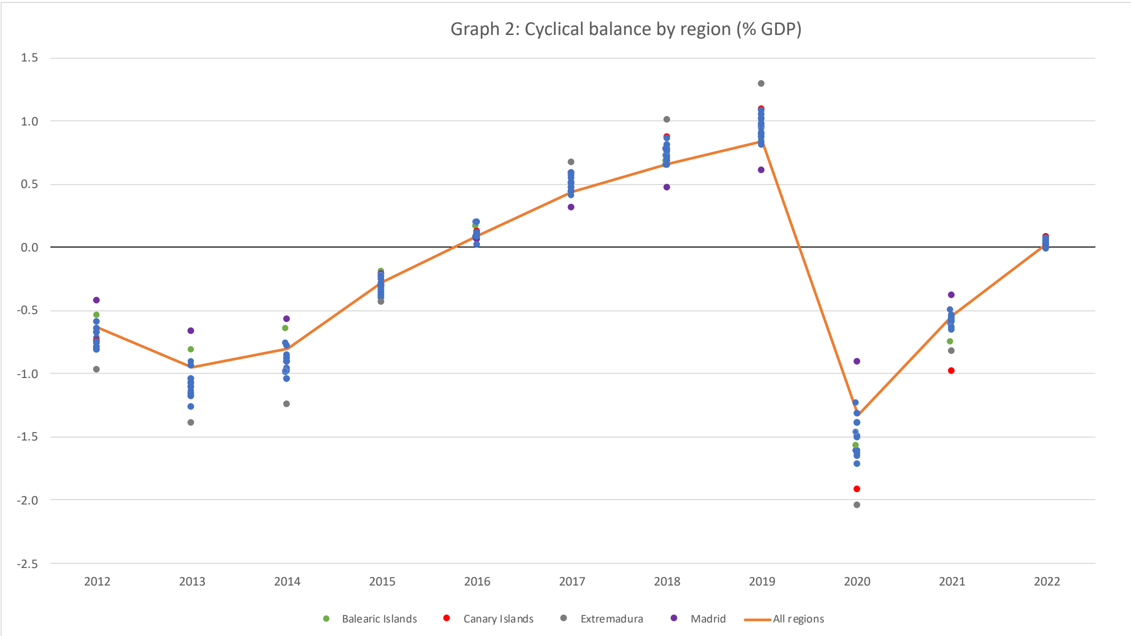
Table 1: Output gap by region (% GDP)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Andalusia	-4.2	-6.3	-4.9	-1.7	0.2	2.1	3.8	4.8	-7.6	-2.9	0.4
Aragon	-5.1	-4.5	-3.8	-2.4	-0.1	1.7	3.6	3.8	-6.1	-2.4	0.0
Asturias	-2.6	-5.3	-5.1	-2.2	-0.5	1.6	3.0	4.2	-7.8	-2.4	0.4
Balearic Islands	-3.6	-5.8	-3.4	-0.4	3.0	5.2	7.2	8.6	-19.6	-8.7	0.4
Canary Islands	-3.5	-4.6	-4.0	-1.4	0.9	4.2	5.8	7.1	-15.3	-8.4	0.9
Cantabria	-3.0	-6.1	-4.6	-2.5	-0.3	2.2	3.7	4.4	-7.4	-2.4	0.1
Castile-La Mancha	-4.8	-4.7	-6.4	-2.9	-0.2	1.0	3.2	3.0	-6.1	-2.3	0.7
Castile and Leon	-2.8	-4.8	-4.5	-1.9	0.2	1.1	3.5	3.6	-6.2	-2.4	0.1
Catalonia	-4.5	-6.2	-4.9	-1.3	1.2	3.0	4.2	5.5	-8.7	-3.7	0.0
Extremadura	-3.3	-4.0	-4.2	-1.6	-0.7	2.1	3.2	4.1	-6.5	-2.6	0.0
Galicia	-3.8	-5.4	-5.3	-1.3	0.6	2.3	3.4	4.0	-6.5	-2.3	0.3
Madrid	-2.5	-5.5	-5.2	-2.2	0.4	2.8	4.0	5.6	-7.5	-3.5	0.0
Murcia	-5.3	-7.3	-5.9	0.0	2.3	4.2	3.0	4.1	-6.6	-2.7	0.4
Navarre	-3.6	-5.3	-4.0	-1.6	0.1	2.6	3.4	4.6	-7.4	-2.4	0.3
La Rioja	-3.2	-5.7	-4.6	-1.2	0.5	1.0	2.5	3.3	-6.7	-2.7	0.0
Community of Valencia	-5.5	-6.8	-4.8	-1.6	0.1	2.8	4.0	5.0	-7.5	-2.8	0.4
Basque Country	-2.7	-5.4	-4.2	-1.1	0.9	2.5	3.7	4.6	-7.6	-2.7	0.0
All regions	-3.8	-5.7	-4.8	-1.6	0.6	2.6	4.0	5.0	-8.0	-3.3	0.2



The cyclical balance computed according to the equation (20) for each regional government is shown in Table 2 and Graph 2. Extremadura is the region with the highest level of cyclical balance in boom periods and the lowest level in recessions. By contrast, Madrid is the region which the lowest cyclical balance in booms and the also the lowest negative value of cyclical balance in recessions.

	Table 2: Cyclical balance by region (% GDP)										
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Andalusia	-0.8	-1.2	-1.0	-0.3	0.1	0.5	0.8	1.0	-1.6	-0.6	0.1
Aragon	-0.7	-0.9	-0.8	-0.3	0.1	0.4	0.6	0.8	-1.2	-0.5	0.0
Asturias	-0.7	-1.1	-1.0	-0.4	0.1	0.5	0.8	1.0	-1.6	-0.6	0.0
Balearic Islands	-0.5	-0.8	-0.6	-0.2	0.2	0.5	0.7	0.8	-1.6	-0.8	0.0
Canary Islands	-0.7	-1.1	-0.9	-0.3	0.1	0.6	0.9	1.1	-1.9	-1.0	0.1
Cantabria	-0.8	-1.3	-1.0	-0.4	0.1	0.6	0.9	1.1	-1.7	-0.7	0.0
Castile-La Mancha	-0.8	-1.1	-1.0	-0.4	0.1	0.5	0.8	0.9	-1.5	-0.6	0.1
Castile and Leon	-0.7	-1.0	-0.9	-0.3	0.1	0.4	0.7	0.9	-1.4	-0.6	0.0
Catalonia	-0.6	-0.9	-0.8	-0.3	0.1	0.4	0.7	0.8	-1.3	-0.5	0.0
Extremadura	-1.0	-1.4	-1.2	-0.4	0.1	0.7	1.0	1.3	-2.0	-0.8	0.0
Galicia	-0.7	-1.1	-1.0	-0.3	0.1	0.5	0.8	1.0	-1.5	-0.6	0.0
Madrid	-0.4	-0.7	-0.6	-0.2	0.1	0.3	0.5	0.6	-0.9	-0.4	0.0
Murcia	-0.8	-1.2	-1.0	-0.2	0.2	0.6	0.7	0.9	-1.5	-0.6	0.0
Navarre	-0.8	-1.2	-0.9	-0.4	0.0	0.6	0.8	1.0	-1.7	-0.5	0.1
La Rioja	-0.7	-1.0	-0.9	-0.3	0.1	0.4	0.7	0.9	-1.4	-0.6	0.0
Community of Valencia	-0.8	-1.1	-0.9	-0.3	0.1	0.5	0.7	0.9	-1.4	-0.6	0.0
Basque Country	-0.6	-1.2	-0.9	-0.2	0.2	0.5	0.8	1.0	-1.6	-0.6	0.0
All regions	-0.6	-1.0	-0.8	-0.3	0.1	0.4	0.7	0.8	-1.3	-0.5	0.0



The parameter μ defined in Equation (2) is obtained, in turn, as the weighted sum of the semi-elasticities of the region *i* to the business cycle through the SFA ($\mu_{SFA,i}$) and through its own tax revenues $(\mu_{OT,i})$[7]:

$$\mu_i = W_{SFA,i}\, \mu_{SFA,i} + \left(1 - W_{SFA,i}\right) \mu_{OT,i} \, . \tag{21}$$

The Table 3 shows the SFA semielasticity by region ($\mu_{SFA,i}$) in the first column, the semielasticity with respect to its own taxes revenues $(\mu_{OT,i})$ in the second one and the weighted semielasticity (μ_i) in the third one. The region which presents the greatest semielasticity (μ_i) is Extremadura (0.266) and the region which lowest level of semieslasticity is Madrid (0.117).

[7] The semi-elasticity values have been computed using data from National Accounts of each tax revenue from the period 2013-2021.

Table 3: Semielasticity by region			
	SFA semielasticity	Own Taxes semielasticity	Weighted semielasticity
Andalusia	0.217	0.166	0.203
Aragon	0.179	0.129	0.165
Asturias	0.226	0.159	0.205
Balearic Islands	0.153	0.118	0.143
Canary Islands	0.216	0.157	0.197
Cantabria	0.235	0.171	0.219
Castile-La Mancha	0.215	0.166	0.202
Castile and Leon	0.201	0.147	0.187
Catalonia	0.177	0.127	0.161
Extremadura	0.284	0.220	0.266
Galicia	0.210	0.151	0.196
Madrid	0.128	0.090	0.117
Murcia	0.208	0.161	0.193
Navarre	0.000	0.225	0.225
La Rioja	0.196	0.140	0.183
Community of Valencia	0.193	0.149	0.178
Basque Country	0.000	0.215	0.215
State Government	0.183	0.135	0.166

The fiscal multiplier (ε) takes the value of 0.55 and the closing speed of the output gap (ϕ) is 0.5. The calibration of these parameters has followed Warmedinger *et al.* (2015) and Hernández de Cos *et al.* (2018), and the references included there. The debt objective at the regional level $d*$ has been set at 13 per cent of GDP, as it is indicated in the Spanish Budget Stability Act (Ley Organica de Estabilidad Presupuestaria y Sostenibilidad Financiera, LOEPSF, in Spanish).

Additionally, we have carried out a sensitivity analysis to assess the impact of changes in the fiscal multiplier ε and the persistence of output gap over time ϕ. For the first one we have used not only the central value of 0.55 but also 0.3, 0.4, 0.5, 0.6, 0.7 and 0.8. For the closing speed of the output gap we have taken as alternative values 0.25 in the first years of the period and 0.75 in 2021 and 2022; this assumption is based on the suspicion (to be confirmed in further research) that the gap originated by the temporary shock of Covid has closed relatively quickly compared to the previous one of the Great Recession, on which most of the previous estimates were based.

Considering the myriad of combinations of such as changes in the parameters, the results presented below do not change significantly with alternative parameter specifications. The differences are in the order of 2-3 percentage points, at most, in the second decimal. This is true for both models, that is, when optimizing with respect to the fiscal stance and also when choosing the primary public spending level[8]. Consequently, we are confident that our estimates of policy preferences are robust enough to be reported here.

In turn, the benchmark value for primary spending ($\bar{g}$) is computed as the sum of the lagged primary public spending (g_{t-1}) in each region and its standard deviation across the Spanish

[8] This robustness check is presented in the Annex.

regions. It involves a specific value for $\bar{g}$ in each region[9]. This formulation implies that the regions with less public expenditure in the previous year will increase their spending at a greater growth rate than the regions with higher spending.

It is reasonable to think that a process of imitation takes place, through which the levels of public expenditure across regions converge. Other alternative benchmarks for the primary spending $\bar{g}$ have been tentatively used, such as the maximum value of $\bar{g}$ for the Spanish regions plus different (marginal) increases, but the gaps to be closed were so huge in some regions that the results of calibration were implausible within the theoretical framework.

Finally, an additional assumption to complete the calibration with an exact solution is required. Particularly, two of the preference parameters can be linked to have the system of equations completely determined. Since previous empirical studies have estimated fiscal reaction functions with the standard arguments of stabilization and sustainability among the regressors, we have explored this way to obtain an evidence-based relationship between *v* and $(1 - v)$ for our calibration purposes.

With this aim, we have used the results from Cadaval and Calvo (2023). Based on the regressions by Cadaval and Calvo (2023) shown in their column (1) of table 5, the following relationship can be derived: $\frac{v}{1-v} = \frac{0.269}{0.416}$, which it is the same as $v = 0.39$. Notwithstanding this, we have also considered different values for v, in particular others between 0.39 and 0.25. In this sense, we deal with potential upward biases in Cadaval and Calvo (2023) because of omitting relevant variables in their econometric analysis, given our extended theoretical framework.

Other references (Afonso and Coelho, 2023; Vaquero-Garcia et al., 2022; Mussons, 2020, 2017; Castañeda et al., 2018) have been studied to obtain empirical approximations to relative preferences on policy objectives. But they have been discarded because the econometric specifications were far away from the theoretical framework considered here, the statistical significance was not acceptable or the sample (regions vs nationwide, and periods) was not compatible with that used in this paper.

In the next section, we show the different values for the three models proposed: the standard model (with two policy parameters: *v* and *1-v*) and the two extended models (one with public spending as decision variable and other with fiscal stance, both with three policy parameters).

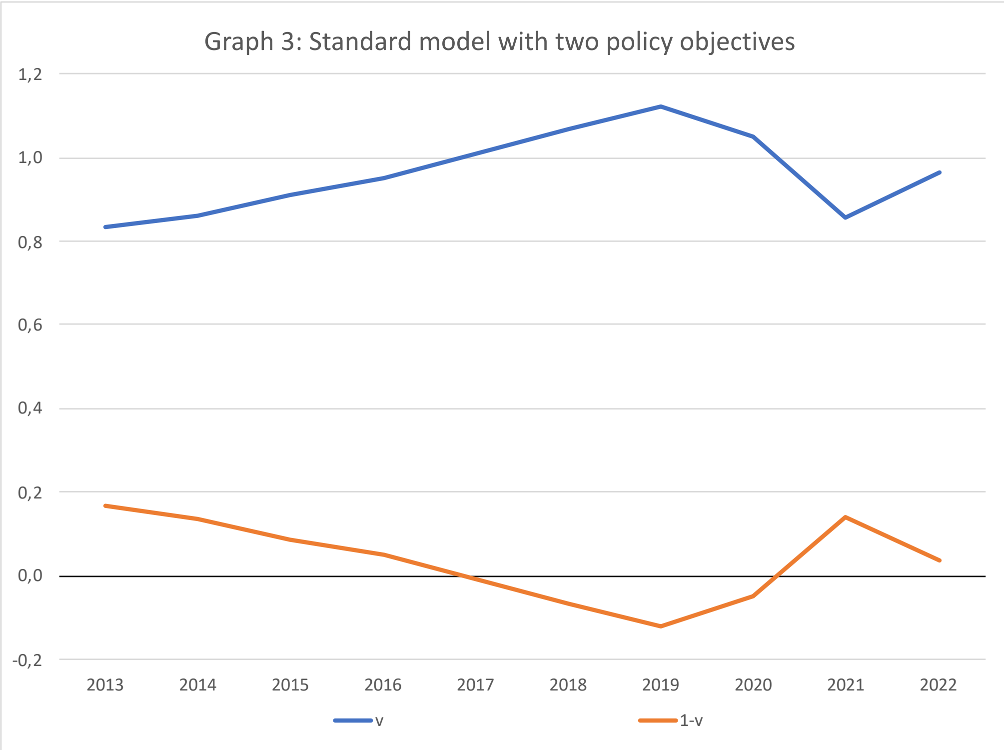
4. Results

The results can be analysed from two perspectives: one regarding the set of Spanish regions as a group and the other considering the remarkable heterogeneity of the Spanish regions, with specific cases at play, and more detailed explanations by subperiods. Regarding first the results found for the Spanish regions in the case of the standard model, Graph 3 shows the highly extreme values of the parameters *v* and *1-v*. The parameter *v*, related with fiscal stabilisation, took values above 0.8 for the whole period 2013-2022. This parameter increased from 2013 to

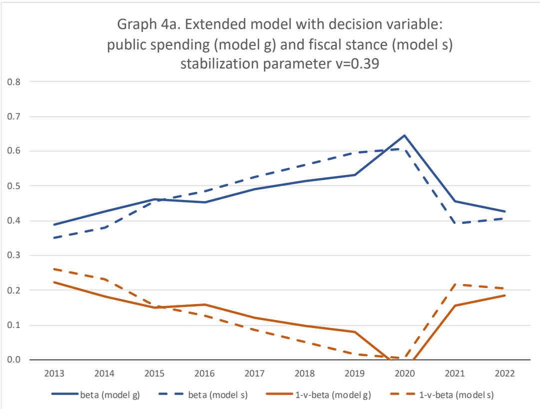
[9] Strictly speaking, a subindex *i* should be added in $\bar{g}$ but for the sake of simplicity in notation, we have dismissed that option.

2019 until values greater than 1 and decreased from 2019 to 2021 until a level of 0.8. In 2022, the value of *v* was nearly 1.

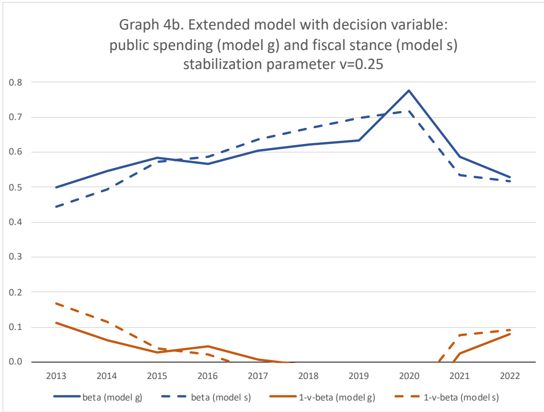
The parameter *1-v* is the mirror image from the parameter *v.* This parameter took values under 0.2 during the whole period and in some years presented a value less than zero. It can be interpreted that the standard model is not appropriate to analyse regional government policies. We think that the stabilisation parameter *v* could be measuring the effects of a mixture of policies including public spending and policies to enhance the economic growth. Consequently, we guess it is necessary to include a new policy objective, namely, primary public spending, into the fiscal policy rule.



In this new framework, we distinguish the extended model with the public spending as decision variable (called *model g*) and the extended model with the fiscal stance as decision variable (*model s*). Next, the results of these two models are reported, together with an additional sensitivity analysis in which *v* takes values of 0.39 (Graph 4a) or 0.25 (Graph 4b) during the whole period.



Graph 4a. Extended model with decision variable: public spending (model g) and fiscal stance (model s) stabilization parameter v=0.39



Graph 4b. Extended model with decision variable: public spending (model g) and fiscal stance (model s) stabilization parameter v=0.25

Clearly, the regional governments presented a remarkable preference for public spending (blue line in Graph 4a and Graph 4b). This parameter took values of 0.4-0.5 in 2013 and increased until a maximum of 0.7-0.8 in the year 2020. For the years 2021 and 2022, the public spending parameter decreased to levels close to those of 2013. The debt sustainability parameter (orange line) took values of 0.1-0.2 in 2013 and decreased until extreme values under zero in 2020. This year, however, must be left aside as the Covid-19 pandemic entailed a huge shock.

Both models, depicted with continuous lines for model *g* and dotted lines for model *s*, present similar results. Although the algebraic resolution of the model is identical regardless of the decision variable taken, when the calibration is performed some differences arise. This might be an indication that the theoretical model used as benchmark requires some adjustments to fit completely the Spanish regional federalism. In line with Koethenbuerger (2011), we guess that the presence of an intense equalization, a non-negligible vertical fiscal gap and other issues affecting the regional budget constraint such as extraordinary financing mechanisms are likely explanations behind the fact that, with actual data, choosing public spending is not the same as choosing the fiscal stance.

The results across regions are shown in Graph 5. The y-axis takes values between 0 and 1 to ease the comparation. We have classified the regions in three groups depending on the values of the public spending and the debt sustainability parameters. The first group includes the regions with public spending parameters greater than the debt sustainability parameters during the whole period. This is the case of Balearic Islands, Castile-La Mancha, Murcia, Community of Valencia, and Catalonia. These regions had high public spending parameters of 0.5-0.6 and debt sustainability parameters near zero.

The second group is formed by the regions with similar values of the parameters of public spending and debt sustainability for the years 2013-2014 and a remarkable divergence between both until the Covid-19 pandemic. Indeed, as the time goes by, the public spending parameter presented levels of 0.5-0.6, and even more, while the sustainability parameter took values near zero. This is the case of Andalusia, Aragon, Asturias, Cantabria, Castile and Leon, Extremadura, Galicia, and La Rioja. It can be interpreted that these regions presented a certain concern for debt sustainability at the beginning, which then almost disappeared during the period 2015-2022.

In both groups, part of the explanation can be rooted in the financial assistance provided by the central government through the extraordinary financing mechanisms[10]. Under such a financial shelter, initially thought as temporary but then transformed into permanent, the regions have been exposed to an implicit, but strong, incentive to borrow.

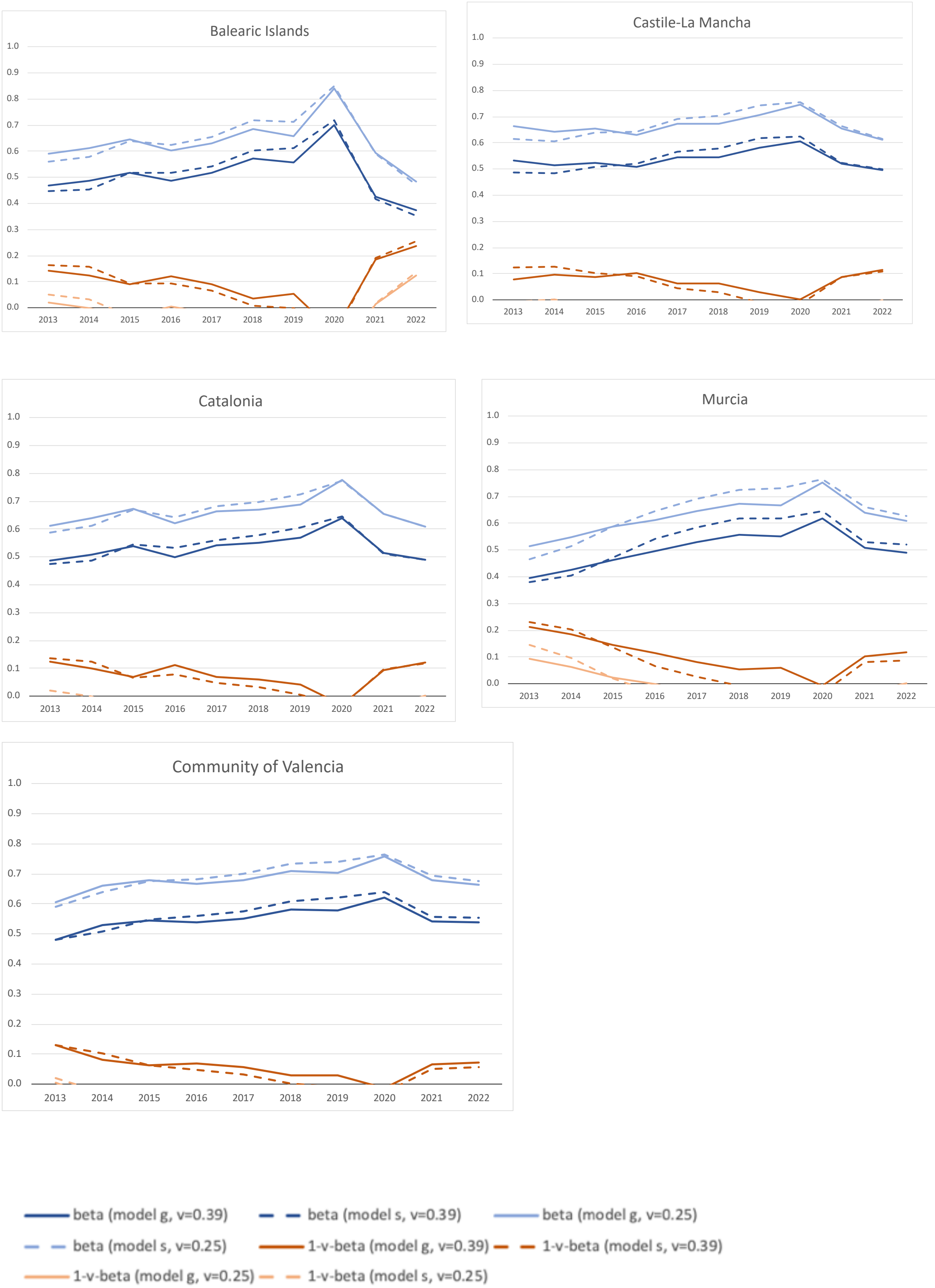
The third group is formed by Canary Islands, Madrid, Basque Country, and Navarre. These regions presented high levels of debt sustainability parameters (almost 1) in 2013-2014. The parameter values of policy preferences for debt sustainability and public spending crossed over several times in the period considered. In 2020, again, a peak level close to 1 for public spending was reached. As these regions are financing their deficits in conventional capital markets, they have always weighed up the importance of debt sustainability, coming back to their relatively high parameters of policy preference for that after the Covid-19 crisis.

This group of regions, however, deserves a further analysis. Their revealed preferences for fiscal policy objectives are far away from the relatively stable pattern shown by the other regions. We guess that their special territorial financing system (in the case of Navarre, Basque Country and Canary Islands) might be affecting their fiscal decisions in a differential way. And in the case of Madrid, issues of political economy (in the last years the regional government has become the leader of low-taxation and liberalization policies) and the externalities derived from its condition of capital of the nation and the strong agglomeration economies, might well be impacting the design and application of its fiscal policy.

[10] The central government adopted in 2012 several measures to reduce the commercial loans of regional and local levels. These measures included the supplier payments plan (FFPP for its acronym in Spanish) and the autonomous liquidity fund (FLA for its acronym in Spanish), amongst others. These financing mechanisms increased the liquidity of the regions and permitted them to reduce the delays or even the defaults in the payments to suppliers. Consequently, the regions have benefited from borrowing with the central government at very low interest rates when the markets demanded them very high spreads.

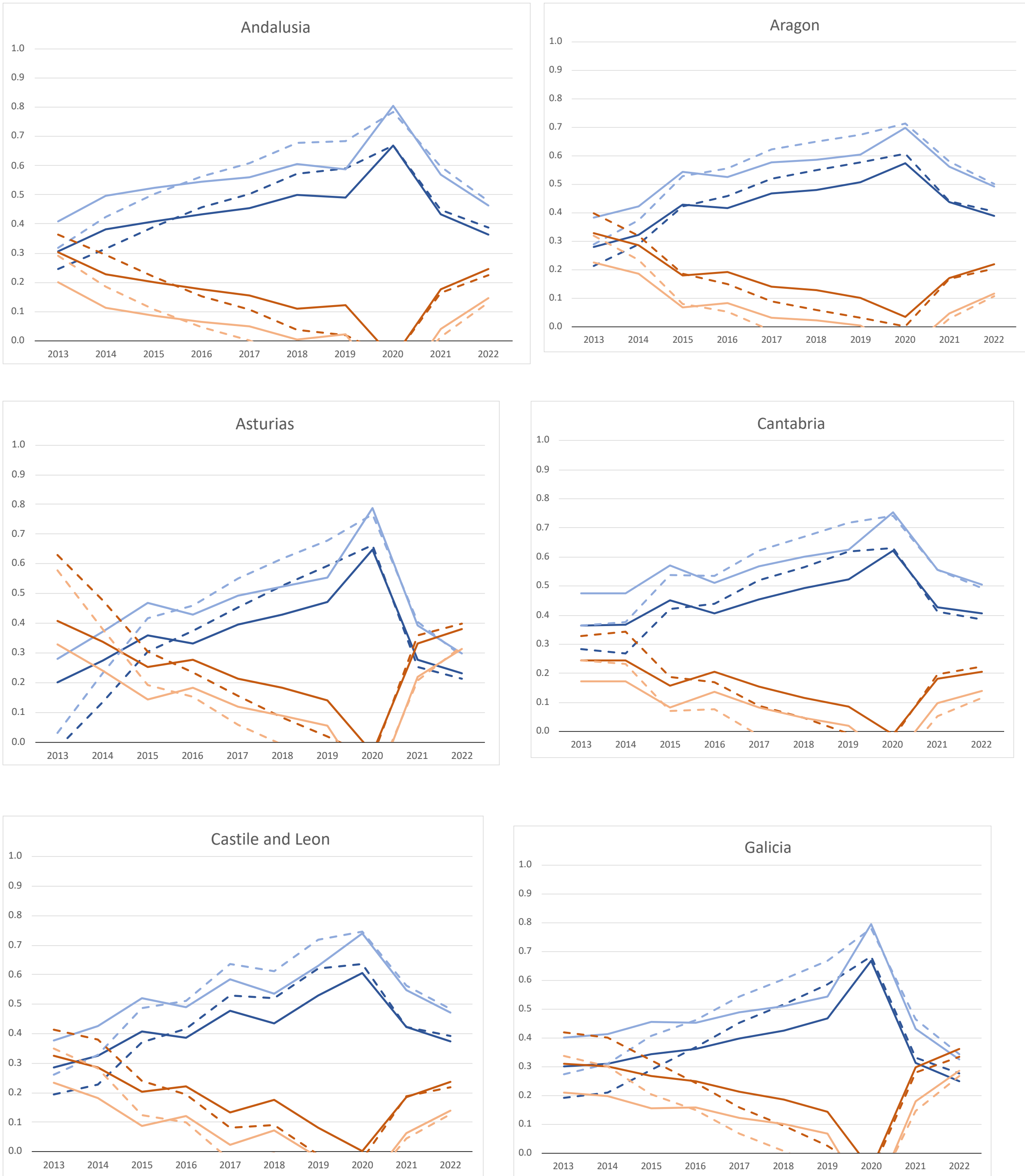
Graph 5. Extended model by region.

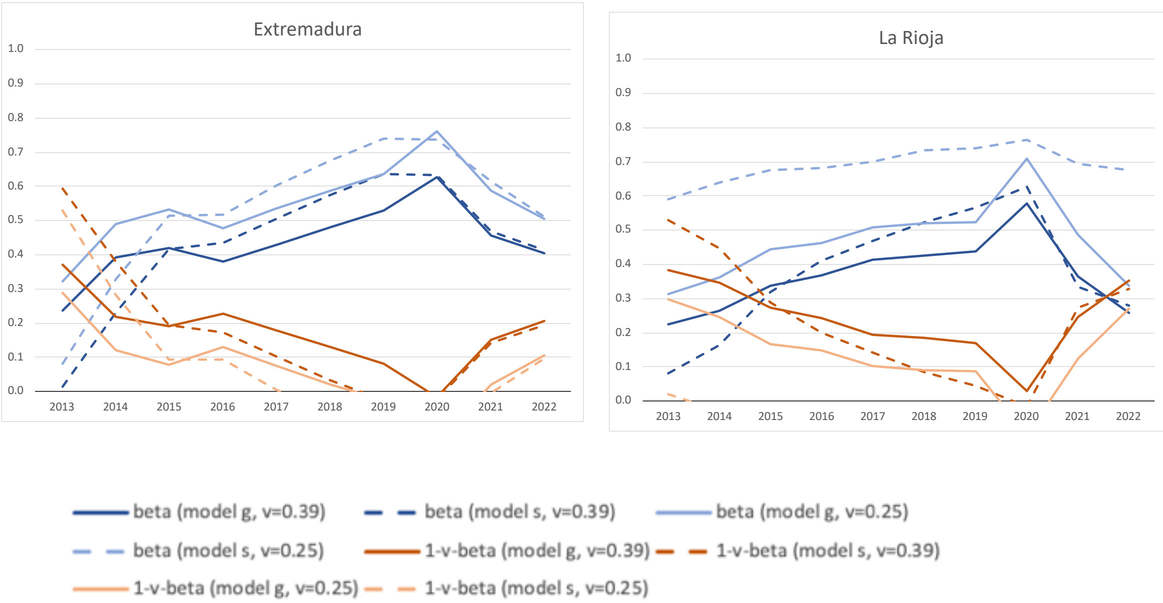
Group 1. High preferences for primary public spending



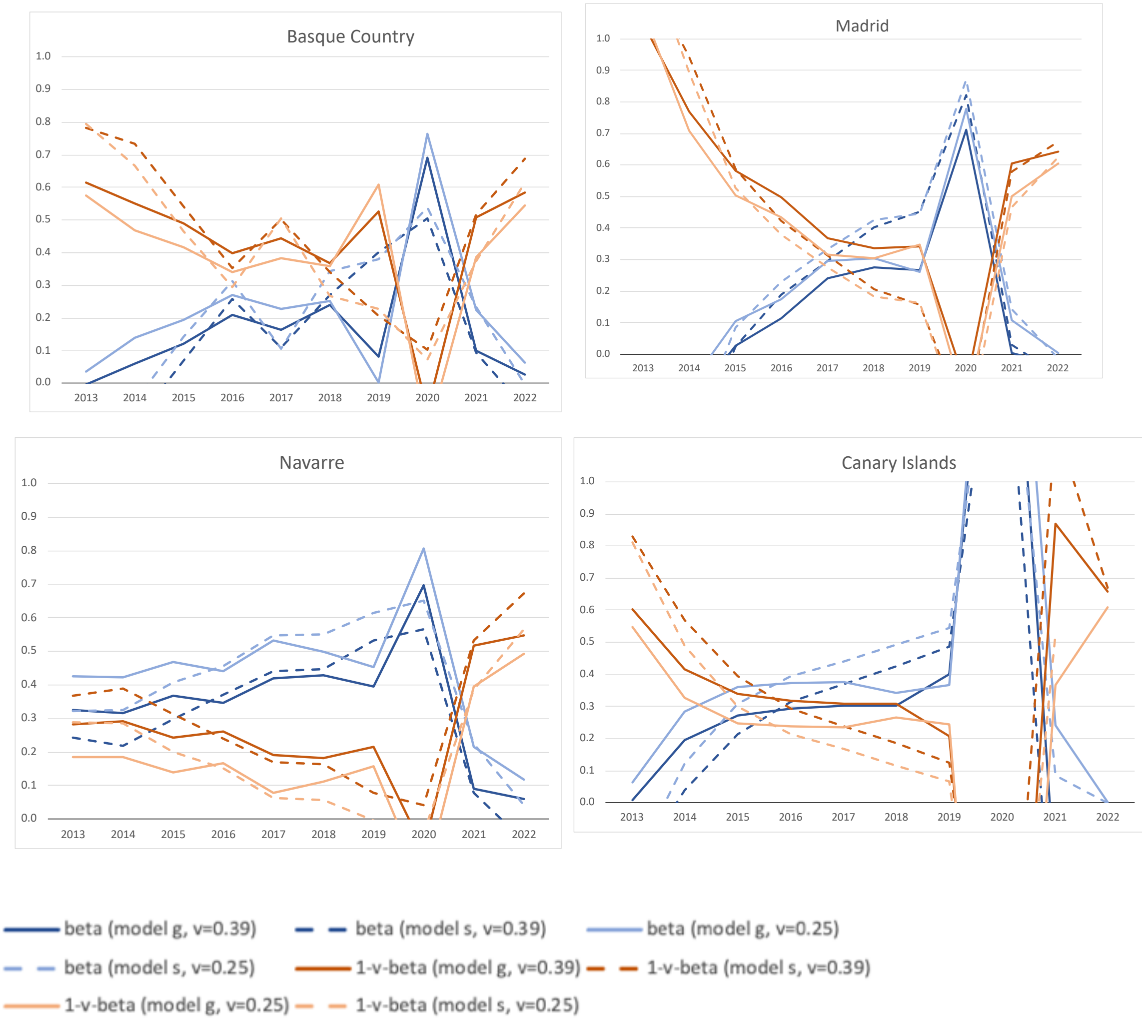
Graph 5. Extended model by region (continued).

Group 2. Similar preferences for public spending and debt sustainability in 2013-2014





Graph 5. Extended model by region (continued).
Group 3. High preferences for debt sustainability



5. Concluding remarks

This paper has dealt with government preferences over fiscal policy at the subnational level. As a novelty, we have broadened the standard approach in which the usual discussion is framed. As it is well known, under the traditional view, it is assumed that national governments must choose between closing the output gap (the stabilisation objective) or keeping under control their stocks of public debt (the debt sustainability objective). This implies the minimisation of the loss function of fiscal policy defined over these two variables.

However, things are quite different when regional and local governments are involved since they face other spending responsibilities and a rather different institutional context than that of national governments. In particular, subnational governments are mainly in charge of public expenditures such as health care, education and social services, whose dynamics and political economy implications are beyond the other spending functions carried out by central governments.

Additionally, subnational governments are less committed to debt sustainability and fiscal discipline because of their lower responsibility in raising resources from capital markets and fulfilling the international legal obligations as Member States of a monetary union such as the Eurozone.

Consequently, we have extended the textbook framework of fiscal policy rules to the subnational environment. And we have proceeded with a new and enlarged loss function to be minimised by governments that are concerned not only with stabilisation and sustainability issues but also with providing a determined level of public spending to their citizens. In this context, we have obtained the optimal level of primary public spending that, among other things, depends on the policy preferences for the three objectives. Equivalently, the model can also be solved for the fiscal stance of the regional government as decision variable.

This simple theoretical model has been calibrated for the Spanish regions over the period 2013-2022. In order to approach appropriately the fiscal decisions of the regional governments, original estimates of the regional business cycle and the cyclically-adjusted public balances of the Spanish regions have been computed and used. Moreover, the decade under consideration has allowed us to consider not only the usual fluctuations over the cycle but also the potential impact of a couple of regional elections and, remarkably, the huge shock provoked by the pandemics of Covid-19.

The results of the calibration have been analysed for the set of Spanish regions and taking into consideration its notable heterogeneity across them as well. Considering the model which optimises on public spending, except for the year 2020, the policy parameter of primary public spending (β) has moved between 0.40 and 0.53. In turn, the sustainability parameter of ($1 - v - \beta$) has evolved between the 0.08 and 0.22. Based on previous contributions, we have set up the value for the policy preference for stabilization (v) in 0.39. Recall that all these policy preferences are bounded to add up to 1.

When we reduce the parameter of stabilization v to 0.25 to correct potential upward biases in its estimation, the parameter of policy preference for primary public spending ranges between 0.5 and 0.63 and that of debt sustainability between 0.11 and 0. Alternatively, if the calibration is made on the basis of the model optimizing the fiscal stance, the values for the parameters of policy preferences are rather similar to the previous ones.

There appears to be a break between the years just before the pandemic and those that follow it. Indeed, since 2013 an upward trend in the concern for public spending is found until 2019. But in 2021-2022 a substantial correction is obtained, with values of β coming back to levels of 2013. The opposite happens with the policy parameter of debt sustainability: the decreasing profile between 2013 and 2019 is reverted in 2021 and 2022 to reach the higher values of 2013.

When specific regions are considered over several time spans, a general finding arises: the most indebted regions are those with less policy preference for debt sustainability. In the paper we guess that this result could be related to the fact that these regions, given their high levels of public indebtedness, have internalised the expectation of being bailed out. The causation might well be in the opposite sense: the lower their preference for debt sustainability, the higher their stocks of debt, and that cannot be discarded in some cases. But, in general, these regions would not be among the most indebted at the beginning of the period, and this is not the case. To describe a pattern for the concern for stabilisation is, however, more complex, especially after the pandemic.

Our main general policy implication is to highlight the relevance of knowing the objectives driving the fiscal policy of subnational governments as a necessary condition to design or reform appropriately territorial financing systems and, more importantly nowadays, new frameworks of fiscal governance. This way, the consequences of setting up incentives for fiscal discipline not aligned with those of regional governments at least need to be known, and the Spanish case is a good example to be considered in other latitudes.

Several avenues can be outlined for further research. One is to check whether the change in the policy preferences in favour of stabilisation after the pandemic will persist in the future. Will it imply more involvement of subnational governments in macroeconomic policy to smooth the business cycle? Or the concern for public spending will be recovered? Other extension of the paper could precisely study the underlying factors behind the policy preference for public spending, especially at the subnational level and likely rooted in political economy issues.

Annex. Robustness check

In this section, we show a sensibility analysis of the parameters β and $1 - \upsilon - \beta$ when the extended model is simulated using different values for the fiscal multiplier (ε) and the closing speed of output gap (ϕ). Particularly, we take alternative values for the fiscal multiplier from 0.3 to 0.8, and for the closing speed of output gap (ϕ) from 0.25 over the period 2013-2020 and 0.75 for 2021 and 2022. As the results reported in the next tables show, our estimates of policy preferences are robust enough in both extended models (the one with public spending as decision variable and the model with fiscal stance as decision variable).

Table A1. Spanish regions. Public spending parameter (β). Model s. Stability parameter v=0.39 and $\phi = 0.5$

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$\varepsilon = 0.3$	0,37	0,40	0,47	0,49	0,52	0,55	0,58	0,60	0,41	0,41
$\varepsilon = 0.4$	0,37	0,39	0,46	0,49	0,53	0,55	0,58	0,61	0,41	0,41
$\varepsilon = 0.5$	0,36	0,38	0,46	0,48	0,53	0,56	0,59	0,61	0,40	0,41
$\varepsilon = 0.6$	0,35	0,38	0,45	0,48	0,53	0,56	0,60	0,61	0,39	0,41
$\varepsilon = 0.7$	0,33	0,37	0,45	0,48	0,53	0,57	0,61	0,60	0,38	0,41
$\varepsilon = 0.8$	0,32	0,36	0,45	0,47	0,53	0,57	0,61	0,60	0,37	0,41

Table A2. Spanish regions. Debt sustainability parameter (1-v-β). Model s. Stability parameter v=0.39 and $\phi = 0.5$

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$\varepsilon = 0.3$	0,24	0,21	0,14	0,12	0,09	0,06	0,03	0,01	0,20	0,20
$\varepsilon = 0.4$	0,24	0,22	0,15	0,12	0,08	0,06	0,03	0,00	0,20	0,20
$\varepsilon = 0.5$	0,25	0,23	0,15	0,13	0,08	0,05	0,02	0,00	0,21	0,20
$\varepsilon = 0.6$	0,26	0,23	0,16	0,13	0,08	0,05	0,01	0,00	0,22	0,20
$\varepsilon = 0.7$	0,28	0,24	0,16	0,13	0,08	0,04	0,00	0,01	0,23	0,20
$\varepsilon = 0.8$	0,29	0,25	0,16	0,14	0,08	0,04	0,00	0,01	0,24	0,20

Table A3. Spanish regions. Public spending parameter (β). Model g. Stability parameter v=0.39 and $\phi = 0.5$

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$\varepsilon = 0.3$	0,40	0,44	0,47	0,46	0,49	0,51	0,52	0,63	0,47	0,43
$\varepsilon = 0.4$	0,40	0,43	0,47	0,46	0,49	0,51	0,52	0,64	0,47	0,43
$\varepsilon = 0.5$	0,39	0,43	0,46	0,45	0,49	0,51	0,53	0,64	0,46	0,43
$\varepsilon = 0.6$	0,39	0,42	0,46	0,45	0,49	0,51	0,53	0,65	0,45	0,43
$\varepsilon = 0.7$	0,38	0,42	0,46	0,45	0,49	0,52	0,54	0,65	0,45	0,43
$\varepsilon = 0.8$	0,37	0,42	0,45	0,44	0,49	0,52	0,54	0,65	0,44	0,43

Table A4. Spanish regions. Debt sustainability parameter (1-v-β). Model g. Stability parameter v=0.39 and $\phi = 0.5$

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$\varepsilon = 0.3$	0,21	0,17	0,14	0,15	0,12	0,10	0,09	-0,02	0,14	0,18
$\varepsilon = 0.4$	0,21	0,18	0,14	0,15	0,12	0,10	0,09	-0,03	0,14	0,18
$\varepsilon = 0.5$	0,22	0,18	0,15	0,16	0,12	0,10	0,08	-0,03	0,15	0,18
$\varepsilon = 0.6$	0,22	0,19	0,15	0,16	0,12	0,10	0,08	-0,04	0,16	0,18
$\varepsilon = 0.7$	0,23	0,19	0,15	0,16	0,12	0,09	0,07	-0,04	0,16	0,18
$\varepsilon = 0.8$	0,24	0,19	0,16	0,17	0,12	0,09	0,07	-0,04	0,17	0,18

Table A5. Spanish regions. Public spending parameter (β). Model s. Stability parameter v = 0.39 and $\phi = 0.25$ in 2013-2020 and $\phi = 0.75$ in 2021-2022										
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$\varepsilon = 0.3$	0.39	0.41	0.48	0.49	0.52	0.54	0.57	0.59	0.40	0.40
$\varepsilon = 0.4$	0.38	0.41	0.47	0.49	0.52	0.55	0.57	0.59	0.38	0.40
$\varepsilon = 0.5$	0.37	0.40	0.47	0.49	0.52	0.55	0.58	0.59	0.37	0.39
$\varepsilon = 0.6$	0.37	0.40	0.47	0.49	0.52	0.55	0.58	0.58	0.36	0.39
$\varepsilon = 0.7$	0.36	0.40	0.47	0.48	0.52	0.55	0.58	0.58	0.34	0.39
$\varepsilon = 0.8$	0.35	0.40	0.47	0.48	0.52	0.56	0.59	0.57	0.33	0.39

Table A6. Spanish regions. Debt sustainability parameter (1-v-β). Model s. Stability parameter v = 0.39 and $\phi = 0.25$ in 2013-2020 $\phi = 0.75$ in 2021-2022										
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$\varepsilon = 0.3$	0.22	0.20	0.13	0.12	0.09	0.07	0.04	0.02	0.21	0.21
$\varepsilon = 0.4$	0.23	0.20	0.14	0.12	0.09	0.06	0.04	0.02	0.23	0.21
$\varepsilon = 0.5$	0.24	0.21	0.14	0.12	0.09	0.06	0.03	0.02	0.24	0.22
$\varepsilon = 0.6$	0.24	0.21	0.14	0.12	0.09	0.06	0.03	0.03	0.25	0.22
$\varepsilon = 0.7$	0.25	0.21	0.14	0.13	0.09	0.06	0.03	0.03	0.27	0.22
$\varepsilon = 0.8$	0.26	0.21	0.14	0.13	0.09	0.05	0.02	0.04	0.28	0.22

Table A7. Spanish regions. Public spending parameter (β). Model g. Stability parameter v = 0.39 and $\phi = 0.25$ in 2013-2020 and $\phi = 0.75$ in 2021-2022										
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$\varepsilon = 0.3$	0.42	0.45	0.48	0.46	0.49	0.50	0.51	0.62	0.46	0.42
$\varepsilon = 0.4$	0.41	0.45	0.48	0.46	0.49	0.50	0.51	0.63	0.45	0.42
$\varepsilon = 0.5$	0.41	0.45	0.48	0.46	0.49	0.50	0.51	0.63	0.43	0.41
$\varepsilon = 0.6$	0.41	0.45	0.48	0.46	0.49	0.50	0.51	0.63	0.42	0.41
$\varepsilon = 0.7$	0.40	0.45	0.48	0.45	0.49	0.50	0.52	0.62	0.41	0.41
$\varepsilon = 0.8$	0.40	0.45	0.48	0.45	0.48	0.50	0.52	0.62	0.40	0.41

Table A8. Spanish regions. Debt sustainability parameter (1-v-β). Model g. Stability parameter v = 0.39 and $\phi = 0.25$ in 2013-2020 $\phi = 0.75$ in 2021-2022										
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$\varepsilon = 0.3$	0.19	0.16	0.13	0.15	0.12	0.11	0.10	-0.01	0.15	0.19
$\varepsilon = 0.4$	0.20	0.16	0.13	0.15	0.12	0.11	0.10	-0.02	0.16	0.19
$\varepsilon = 0.5$	0.20	0.16	0.13	0.15	0.12	0.11	0.10	-0.02	0.18	0.20
$\varepsilon = 0.6$	0.20	0.16	0.13	0.15	0.12	0.11	0.10	-0.02	0.19	0.20
$\varepsilon = 0.7$	0.21	0.16	0.13	0.16	0.12	0.11	0.09	-0.01	0.20	0.20
$\varepsilon = 0.8$	0.21	0.16	0.13	0.16	0.13	0.11	0.09	-0.01	0.21	0.20

References

Afonso, A., & Coelho, J. C. (2023). Public finances solvency in the Euro Area. *Economic Analysis and Policy*, 77, 642-657.

Allers, M. A., & de Natris, J. G. (2021). Preventing Local Government Defaults: No-Bailout Policy and Its Alternatives (pp. 187-207). Springer International Publishing.

Balassone, F., & Franco, D. (2002). Fiscal federalism and the Stability and Growth Pact: a difficult union. Economic Welfare, *International Business and Global Institutional Change*, 138.

BBVA Research (2022). "Observatorio regional". December 2022.

Bank of Spain (BDE, 2023). "General Government Statistics. Regional (autonomous) government subsector".

BOE (2023). Ley Orgánica 2/2012, de 27 de abril, de Estabilidad Presupuestaria y Sostenibilidad Financiera. https://www.boe.es/buscar/act.php?id=BOE-A-2012-5730.

Bordignon, M., Colombo, L., & Galmarini, U. (2008). Fiscal federalism and lobbying. *Journal of Public Economics*, 92(12), 2288-2301.

Cadaval, M., & Calvo, S. (2023). Indisciplina fiscal y mecanismos extraordinarios de liquidez. *Papeles de Economía Española*, 175, 121-136.

Castañeda, J. E., Herrero-Alcalde, A., Tránchez-Martín, J. M., & Vila-Vila, J. (2018). Stabilizing the economy in a multilevel government: the role of Spanish regional governments. *Applied Economic Analysis*, 26(77), 53-75.

Carnot, N. (2014). Evaluating Fiscal policy. A rule of thumb. *Economic Papers 526 | August 2014*. European Commission.

Clemens J., Hoxie, P. G., & Veuger, S. (2022). Was Pandemic fiscal relief effective fiscal stimulus? Evidence from aid to state and local governments. *NBER Working paper series*. Working Paper 30168.

De Biase, P., Dougherty, S., & Lorenzoni, L. (2022). *Ageing and the long-run fiscal sustainability of health care across levels of government*. OECD.

De La Fuente, A., Thöne, M., & Kastrop, C. (2016). *Regional financing in Germany and Spain: comparative reform perspectives*. Fedea Policy Papers - 2016/05.

Díaz, C, & Cuenca, A. (2014). *Consolidación fiscal y reglas fiscales en las Comunidades Autónomas españolas*. Documento de Trabajo/Working Paper DT-E-2014-01, Universidad de La Laguna.

Díaz, M., Marín, C. & Martínez, D. (2023a). Determining factors and future scenarios for the Spanish public debt. EEE2023/17. FEDEA.

Díaz, M., Marín, C. & Martínez, D. (2023b). El saldo estructural de las CC.AA., 2021-2022. Estudios sobre la Economía Española EEE2023/22. FEDEA.

Escolano, J. (2010). "A Practical Guide to Public Debt Dynamics, Fiscal Sustainability, and Cyclical Adjustment of Budgetary Aggregates", IMF, Fiscal Affairs Department.

Faguet, J. P. (2014). Decentralization and governance. *World Development*, 53, 2-13.

Goodspeed, T. J. (2017). Bailouts and soft budget constraints in decentralized government: A synthesis and survey of an alternative view of intergovernmental grant policy. *Hacienda Pública Española/Review of Public Economics*, 220 (2), 113-134.

Green, D., & Loaliche, E. (2021). State and local government employment in the COVID-19 crisis. *Journal of Public Economics.* 193. 104321.

Hauptmeier, S., & Kamps, C. (2022). Debt policies in the aftermath of COVID-19—The SGP's debt benchmark revisited. *European Journal of Political Economy*, 75, 102187.

Hernández de Cos P., López-Rodríguez, D., & Pérez, J. J. (2018). The Challenges of Public Deleveraging. *Documentos Ocasionales Nº 1803*. Banco de España.

Intervención General de la Administración del Estado (IGAE, 2023). National Accounts. State Government.

Kameda, T., Namba, R., & Tsuruga, T. (2021). Decomposing local fiscal multipliers: Evidence from Japan. *Japan and the World Economy*, 57, 101053.

Kanda, D. (2011). Modeling Optimal Fiscal Consolidation Paths in a Selection of European Countries. *IMF Working paper*. WP/11/164.

Koethenbuerger, M. (2011): How do local governments decide on public policy in fiscal federalism? Tax vs. expenditure optimization. *Journal of Public Economics*, 95 (11–12), 1516-1522.

Martínez-López, D. (2022). Subnational borrowing and bailouts: When the federal government looks at the votes (differently) and its borrowing matters. *Journal of Public Economic Theory*, *24*(3), 609-633.

Molina-Parra, A., & Martínez-López, D. (2016). Do federal deficits motivate regional fiscal (im) balances? Evidence for the Spanish case. *Journal of Regional Science*, 58(1), 224-258.

Mussons, J.M. (2017): Fiscal Decentralization and the cycle in Spain: an empirical analysis of fiscal policy responses. *Journal of Economic Policy*, 23(3), 305-344.

Mussons, J. M. (2020). Fiscal responsiveness to public debt: An analysis of regional debt limit uncertainty in Spain. *Hacienda Publica Española*, 233, 55-83.

Romero-Caro, F. J. (2023). Horizontal cooperation and financial relations in Spain: An analysis on how the Autonomous Communities set the agenda for the reform of territorial financing. *Revista de Estudios Políticos*, 199, 133-164. doi: https://doi.org/10.18042/cepc/rep.199.05

Spanish National Statistical Office (INE, 2023). Spanish regional accounts.

Sutherland, D., Price, R., & Joumard, I. (2006). Fiscal rules for sub-central governments: Design and impact. *OECD*.

Vaquero-García, A., Cadaval-Sampedro, M., & Lago-Peñas, S. (2022). Do political factors affect fiscal consolidation? Evidence from Spanish regional governments. *SAGE Open*, 12(1), 1-9.

Warmedinger, T., Checherita-Westphal, C. & Hernández de Cos, P. (2015). Fiscal Multipliers and Beyond". *Hacienda Pública Española - Review of Public Economics*, 215, 139-168.

Wilson, M. (2023). State government saving over the business cycle. *Regional Science and Urban Economics*, *98*, 103862.