IEB
Institut d'Economia de Barcelona

Document de treball de l'IEB 2009/7

THE DYNAMIC ADJUSTMENT OF LOCAL GOVERNMENT BUDGETS: DOES SPAIN BEHAVE DIFFERENTLY?

Albert Solé-Ollé, Pilar Sorribas-Navarro

Fiscal Federalism

Document de treball de l'IEB

THE DYNAMIC ADJUSTMENT OF LOCAL GOVERNMENT BUDGETS: DOES SPAIN BEHAVE DIFFERENTLY?

Albert Solé-Ollé, Pilar Sorribas-Navarro

The **IEB** research program in **Fiscal Federalism** aims at promoting research in the public finance issues that arise in decentralized countries. Special emphasis is put on applied research and on work that tries to shed light on policy-design issues. Research that is particularly policy-relevant from a Spanish perspective is given special consideration. Disseminating research findings to a broader audience is also an aim of the program. The program enjoys the support from the **IEB-Foundation** and the **IEB-UB** Chair in Fiscal Federalism funded by Fundación ICO, Instituto de Estudios Fiscales and Institut d'Estudis Autonòmics.

The **Barcelona Institute of Economics (IEB)** is a research centre at the University of Barcelona which specializes in the field of applied economics. Through the **IEB-Foundation**, several private institutions (Caixa Catalunya, Abertis, La Caixa, Gas Natural and Applus) support several research programs.

Postal Address:
Institut d'Economia de Barcelona
Facultat d'Economia i Empresa
Universitat de Barcelona
C/ Tinent Coronel Valenzuela, 1-11
(08034) Barcelona, Spain
Tel.: + 34 93 403 46 46
Fax: + 34 93 403 98 32
ieb@ub.edu
http://www.ieb.ub.edu

Documents de Treball de l'IEB 2009/7

THE DYNAMIC ADJUSTMENT OF LOCAL GOVERNMENT BUDGETS: DOES SPAIN BEHAVE DIFFERENTLY?

Albert Solé-Ollé, Pilar Sorribas-Navarro *

ABSTRACT: The aim of this paper is to analyze whether Spanish municipalities adjust in response to budget shocks and (if so) which elements of the budget they are more likely to adjust. The methodology we use to answer these questions is a vector error-correction model (VECM), estimated with data from a panel of Spanish municipalities during the period 1988-2006. Our results confirm, first, that municipalities do indeed make adjustments in response to fiscal shocks (i.e., the deficit is stationary in the long run). Second, we find that most of the adjustment to a revenue shock is borne by the municipalities themselves as they proceed to cut expenditures, with a minor role being played by grant financing. By contrast, adjustments to expenditure shocks are shared on largely equal terms by the municipality –through the raising of taxes– and higher tiers of government –through the raising of grants. These results suggest that the viability of the local finance system is feasible with different institutional arrangements.

JEL Codes: H70, H72, H77

Keywords: fiscal adjustment, intergovernmental transfers, local government

Albert Solé-Ollé
Universitat de Barcelona
Facultat d'Economia i Empresa
Avda. Diagonal, 690, Torre 4ª, 2ª
08034 Barcelona (Spain)
E-mail: asole@ub.edu

Pilar Sorribas-Navarro
Universitat de Barcelona
Facultat d'Economia i Empresa
Avda. Diagonal, 690, Torre 4ª, 2ª
08034 Barcelona (Spain)
E-mail: psorribas@ub.edu

* We acknowledge the comments made by Alejandro Estller-Moré and Jordi Jofre-Monseny. This paper has benefited from the financial support of SEJ2006-15212 (Spanish Ministry of Education and Science) and the project 2005 SGR 000285 (Generalitat de Catalunya).

1. Introduction

Local governments deliver a range of public services that have a strong impact on a community's quality of life. In most countries, they are responsible for refuse collection and recycling, water delivery and sewerage, street lighting and maintenance, public transportation, capital improvement construction, police, planning and land use regulations, and recreational and cultural facilities and programs. In some places, they are also involved in the provision of education, health and social services. Many scholars and international organizations currently advocate the virtues of the provision of these services by sub-national governments and, in particular, by local governments (see, e.g., the contributions in Brosio *et al*., 2009). However, there is less agreement as to how these local services should be funded. Traditional advice from 'fiscal federalism' scholars (see, e.g., Oates, 1972) recommends relying primarily on property taxes and user charges, but the U.S. experience with the imposition of property tax limitations has demonstrated the problems associated with this approach (e.g., Downes *et al*., 1998; Bradbury, 2001). And yet, other major taxes (e.g., income taxes) are often inappropriate given the size of local governments, and so the solution in the end is either the decentralization of minor and inefficient taxes or grant financing.

In these circumstances, such intergovernmental transfers serve to attenuate the inefficiencies of local tax systems and may help smooth spending and tax policy (Sala-i-Martin and Sachs, 1992, von Hagen and Eichengreen, 1996). However, recent studies also emphasize the perils of grant financing. First, grants can create a moral-hazard problem, with local governments, aware that intergovernmental grants provide insurance against budget shocks, pursuing overly risky policies (Persson and Tabellini, 1997). Second, grants might soften the local budget constraint (e.g., Wildasin, 1997; Rodden, 2000; Inman, 2001), creating incentives to run up excessive deficits that local governments expect to be covered by future grants. Third, grant financing may diffuse accountability (Rodden, 2000) and foster rent-seeking and clientelism (Devarajan *et al.*, 2009), thus eroding the very benefits gained from spending decentralization. With its virtues and perils, any final evaluation of grant financing has to be country specific, with the system depending on the particular details of the whole local government financing system (see, e.g., Rodden *et al.*, 2003). This being the case, a promising avenue for research involves evaluating the viability of local finance systems in countries with with different institutional arrangements. One way of conducting such an evaluation is to analyze whether local government budgets undergo any adjustments following a budget shock, and the role that is played by intergovernmental grants in this process. In situations where local budgets either do not adjust (so, that the deficit is not reverted over time), adjust very slowly, or require massive fiscal assistance in order to ensure the adjustment, then there is compelling evidence that the local governmental system is not viable unless it receives interventions from the higher tiers of government. This research question has been previously addressed by Buettner and Wildasin (2005) and Buettner (2007) using data for U.S. and German local governments, respectively. Their results suggest that the system is viable in both countries, albeit that grants were found to play a more prominent role in the absorption of revenue shocks in the German case because of the role played by equalization transfers. Buettner (2007) suggests that the high degree of insurance might account for the greater reliance in Germany on the volatile local business tax.

In this paper we perform a similar analysis for the Spanish case. A number of specific institutional characteristics suggest that Spanish municipalities constitute an interesting case study (see Suárez-Pandiello, 1999, for a survey). First, as in the U.S. and Germany, the municipalities are responsible for the provision of services traditionally assigned to local governments (as cited at the beginning of this paper), but they have limited responsibilities in the fields of education, health and social services. Second, since the end of the 1980s, Spanish municipalities have been able to modify the tax rates of all taxes assigned to them, albeit subject to compulsory minimum tax rates (common to all municipalities) and ceilings (which grow with population size), which might serve to constrain their responses. The main local taxes are (in the following order) a property tax, a business tax, and a motor vehicle tax. These tax bases are quite inelastic[1], which insures against large revenue shocks during downturns but also against

[1] Unlike its German counterpart, Spain's local business tax (*Impuesto sobre Actividades Económicas*) is a presumptive tax, with a tax base computed using simple indicators of economic activity (e.g., surface area, electricity usage, number of workers, sectoral classification, see Jofre-Monseny and Solé-Ollé, 2008), which makes it less volatile than the German tax.

automatic increases during times of boom[2]. These taxes are considered as being inequitable and, therefore, somewhat unpopular, while preventing the municipalities from making major short-term adjustments. Third, vertical unconditional transfers represent a third of current revenues and are formula-based, but they have a very low equalizing power (see, for example, Suárez-Pandiello, 1999; Bosch and Solé-Ollé, 2005). Thus, they are more relevant than in the U.S. case, but they do not share the insurance properties of German transfers. Conditional grants play an important role in the financing of capital projects (a half of all investments being funded by them). They are proportional, closed-ended grants, which are used for funding capital expenditure projects proposed by the local government. They very rarely include an equalization component, and their allocation is largely discretionary (Solé-Ollé and Sorribas-Navarro, 2008). Finally, local debt is subject to certain ceilings, involving both the ratio between debt and current revenues and the short-term financial position. However, the problems entailed in controlling these indicators effectively are enormous, and mean that successive Spanish governments have had great room to use deficits to make an adjustment[3]. So, in short, Spanish local governments have similar responsibilities and tax possibilities to those enjoyed by the U.S. cities and what would arguably seem to be a less volatile tax system than the one operating in Germany. Further, they are not subject to explicit equalization grants as their German counterparts are, while they can rely to a great extent on transfers to fund investment.

The results of our analysis should show us whether these institutional differences in Spain are reflected in different patterns of adjustment to budget shocks to those described in these other countries. The methodology we adopt here closely mirrors that first developed by Bohn (1991) and applied by Buettner and Wildasin (2006) and Buettner (2007) to local governments. To trace the budget adjustment process, we use a vector error-correction model (VECM), estimated with panel data drawn from a set of

[2] Other local taxes are a construction tax and a tax on land value improvements, which tend to become important during housing booms, and as such are quite volatile. This would seem to modify our conclusion, therefore, regarding the elasticity of the main taxes.

[3] Since 2002, with the enactment of the 'Budget Stability Law', the running up of deficits by any tier of government is forbidden (i.e., new debt should be used to fund past debt service). Compliance with this law, however, has been minimal outside very big cities, with regional governments (which are responsible for the overseeing of local debt policies) still applying the older rules.

Spanish municipalities during the period 1988-2006[4]. Our results confirm, first, that municipalities do adjust in response to fiscal shocks (i.e., the deficit is stationary in the long run). Second, we find that most of the adjustment to a revenue shock is borne by the municipalities themselves –through the cutting of expenditure, with a minor role being played by grant financing. By contrast, adjustments to expenditure shocks are shared on largely similar terms by the municipality –through the raising of taxes– and higher tiers of government –through the raising of grants.

The rest of this paper is organized as follows. In the second section, we briefly present the analytical framework used here. In the third, we describe the data and the many tests performed to ensure the model is correctly specified. In the fourth section, we discuss the results and compare them with those obtained previously for other countries. In the final section, we conclude.

2. Analytical framework

The analytical framework employed here is similar to that employed in Buettner and Wildasin (2006) and Buettner (2007), who where the first to apply the methods previously used by Bohn (1991) and Hjelm (2001) in describing the dynamic fiscal adjustment of national governments to local government budgets. This procedure models budgetary adjustment to fiscal shocks through a vector error-correction model (VECM). If we distinguish the following four budgetary components: own-source revenues, R_{it}, grants, G_{it}, expenditures, E_{it}, and debt service, DS_{it}, we can express the VECM(p), using matrix notation, as follows:

[4] The model is very similar to the vector autoregression (VAR) used by Holtz-Eakin *et al.* (1989) and Dalhberg and Johansson (1998, 2000), the only difference being that the VEC model includes the deficit (considered as being stationary) in the estimated equations. Other papers that analyze subnational adjustment to fiscal shocks, but adopting different methodologies, include those by Poterba (1994), Rattso (1999) and Darby *et al.* (2005). No such studies have been undertaken of the Spanish case.

$$\Delta X_{it} = \sum_{j=1}^{p} A_j \Delta X_{it-j} + \gamma\phi X_{t-1} + u_{it} \qquad [1]$$

where $X_{it} = (R_{it}, E_{it}, DS_{it}, G_{it})$, $\phi = (-1, 1, 1, -1)'$ and ϕX_t is the general deficit.

Since the estimation of the VECM provides a large number of parameters, which are difficult to interpret at first sight, we compute the generalized impulse-response functions (GIRFs hereinafter), following Pesaran and Shin (1998). Prior to doing this, we use the recursive procedure proposed by Lütkepohl and Reimers (1992) to obtain the coefficients of the VAR(p+1) in levels derived from the VECM(p) and then the moving average (MA) representation of the VAR(p+1). The GIRFs project the response of each budgetary component in reaction to a shock, which is either to itself or to any other budgetary component. Moreover, the GIRFs consider the historical distribution of the residuals. That is, the GIRFs take into account the correlations between the fiscal variables and do not assume that if a shock occurs in one fiscal variable everything else remains constant. Thus, the GIRFs are invariant to the ordering of the variables in the VECM, and thereby overcome the main problem of the traditional IRF[5]. We summarize the information provided by the GIRFs when computing the present value of the fiscal adjustment process.

Analytically the GIRF is defined by the following expression:

$$GIRF_X(h, \delta_k, \mathrm{I}_{t\text{-}1}) = \mathrm{E}[X_{t+h} | \varepsilon_{kt} = \delta_k, \mathrm{I}_{t\text{-}1}] - \mathrm{E}[X_{t+h} | \mathrm{I}_{t\text{-}1}] \qquad [2]$$

where h is the number of periods ahead, δ_k represents a shock to variable k, and I_{t-1} is all the information available at the time of the shock. Thus, equation [2] states that the GIRF for the vector X, h periods ahead, is the difference in the expected value (E) of X_{t+h}, when taking the shock δ_k into account. Pesaran and Shin (1998) demonstrate that

[5] By traditional IRF we refer to the IRF as computed by Sims (1987) and Hamilton (1994). The use of the GIRF rather than the IRF constitutes the main methodological difference with respect to Buettner and Wildasin (2006) and Buettner (2007).

if the innovation, ε_{kt}, has a normal distribution, $\varepsilon_{kt} \sim (0, \Sigma)$, the GIRF of a δ shock to variable *k* can be expressed as follows:

$$GIRF_X(h, 1, \mathrm{I}_{t\text{-}1}) = \Phi_h \Sigma e_k \sigma_{kk}^{-1} \delta_k \qquad [3]$$

where Φ_h is the MA coefficient matrix at *t+h*, e_k is a $m \times 1$ selection vector, where *m* is the number of endogenous variables, with unity as its *k*th element and zero elsewhere[6].

3. Data and model specification

Data. We use panel data for a 19-year period (1988-2006), including annual budgetary information for 258 municipalities in Catalonia, a Spanish region[7]. As in Buettner and Wildasin (2006), to maintain the parsimony of the model, we aggregate the budgetary data in four fiscal variables: own-source revenues, R_{it}, grants, G_{it}, expenditures, E_{it}, and debt service, DS_{it}. This decomposition on the revenue side allows us to estimate the role of upper tiers of government in the adjustment process. All the variables have been deflated and are expressed in per capita terms[8]. Table 1 reports the definition of the four fiscal variables used in the analysis as well as their summary statistics.

[6] We computed the bootstrap standard errors of the coefficients of the GIRFs by conducting 100 replications with replacement.

[7] This information has been provided by the Public Audit Office of Catalonia (*Sindicatura de Comptes de Catalunya*), for the period 1988-2005, and by the Spanish Ministry of Economics and Finance, for the final year, 2006. This sample does not include information about the city of Barcelona. The initial dataset contained more cross-sectional observations, but some municipalities have been removed from the sample owing to the lack of information for certain years. Although the sample contains just 256 of the 800 Catalan municipalities, its distribution by size does match that of the complete population of municipalities.

[8] We have not scaled fiscal variables in terms of income due to the lack of elasticity of the municipal revenues in Spain. This is also the scale factor used by Buettner and Wildasin (2006) and Buettner (2007).

Table 1: *Summary statistics and definition of the variables* (€ 2006 *per capita*)

		Mean	*St.Dev.*	*Definition*[1]
R	*Own Revenues*	533.988	436.905	Items I, II, III,V and VI of Revenue Budget
G	*Grants*	346.779	479.534	Items IV and VII of Revenue Budget
E	*Expenditures*	805.668	627.609	Items I, II, IV, VI and VII of Exp. Budget
DS	*Debt service*	34.496	73.276	Item III of Expenditure Budget
D	*Deficit*	-39.603	403.677	$E_{it} + DS_{it} - R_{it} - G_{it}$

Note: The definition of the fiscal variables is based in the chapters of the economic classification of the budget. *Revenues*: I: direct taxes; II: indirect taxes; III: user charges; IV: current grants; V: assets' revenues; VI: real investment sales; VII: capital grants. *Expenditures*: I: wages and salaries; II: purchases of goods and services; III: debt service; IV: current grants; VI real investment; VII: capital grants.

Model specification. Before estimating the model, it is important to check whether the basic hypothesis of the model holds, i.e., whether each of the fiscal variables in first differences as well as the deficit is stationary. We compute the Im, Pesaran and Shin (2003) unit root statistic, which is a fairly quite standard in the panel data literature and it allows for heterogeneous constants and slopes across cross-sections. The statistic is distributed standard normal under the null hypothesis of non-stationarity. Results for the variables both in differences and in levels are presented in Table 2[9]. They show that the deficit and all the variables when expressed in differences are stationary[10]. The fact that the deficit is stationary is interesting in itself, indicating that the financial arrangements of Spanish municipalities ensure that budget adjustments occur after a shock with deficits eventually being reverted. In the rest of the paper we investigate how these adjustments are made (i.e., which budget components are involved).

[9] Different orders of lag length (*p*=0,1,2) were used in computing the Im, Pesaran and Shin (2003) test to allow for serial correlation in the errors.

[10] We also report the unit root statistics of the fiscal variables in levels. These statistics show that stationarity is accepted for grants and debt service, but that it is rejected for own-source revenues and expenditures.

Table 2: *Unit root test* (*IPS test*)

	p=0	*p*=1	*p*=2
R	-0.156 [0.438]	0.032 [0.513]	0.654 [0.743]
G	-8.464 [0.000]	-5.565 [0.000]	-5.180 [0.000]
E	7.190 [1.000]	8.129 [1.000]	7.289 [1.000]
DS	-11.973 [0.000]	-9.632 [0.000]	-9.095 [0.000]
D	-30.529 [0.000]	-9.500 [0.000]	-5.328 [0.000]
ΔR	-79.761 [0.000]	-36.531 [0.000]	-20.849 [0.000]
ΔG	-80.438 [0.000]	-40.142 [0.000]	-19.151 [0.000]
ΔE	-78.238 [0.000]	-41.960 [0.000]	-19.597 [0.000]
ΔDS	-5.014 [0.000]	-4.159 [0.000]	-3.542 [0.000]

Notes: (1) *IPS*: Im, Pesaran and Shin (2003) unit root test, where H_0: I(1). W_{tbar} statistic is reported, which allows for serially correlated errors. (2) Tests for variables in levels include time effects, except for the deficit. (3) *p*: number of lags of the dependent variable considered in the regression to allow for serial correlation in the errors. (4) All tests include a constant. (5) [ ]: P-value.

In ensuring the proper specification of the VECM, the first aspect to consider is the optimal lag length of the variables included in the model. The empirical literature has shown that the dynamic relationship between local government revenues and expenditures mainly takes place in a period of between two to four years (Holtz-Eakin *et al*, 1989; Dahlberg and Johansson, 1998 and 2000). Moreover, Dahlberg and Johansson (2000) report that the estimation techniques that are generally adopted tend to reject too often a true null of no significance of the lags. Given the size of our sample and the empirical evidence, here, in order to specify the lag length of the model, we begin with three lags and test for a possible reduction in the number of lags in all the equations simultaneously. As the results in Table 3 show, a reduction of the lag length is always rejected.

A second aspect of the model specification to consider is whether municipality-fixed effects are actually required. There is some theoretical controversy as regards the need to include them in the equations, since this would mean that we allow each municipality to converge to a different level of deficit, and thus some converge to deficits that are different from zero. Here, nevertheless, we decided to test the need to include them in the estimation. As shown in Table 3, we reject the presence of municipality-fixed effects, which means that all municipalities converge to the same level of deficit[11].

[11] This test has been performed after estimating the equations by OLS, since the time dimension of our sample suggests that the Nickell (1981) bias should not be a major problem. Moreover, the performance of the GMM estimator with a relatively small number of municipalities is questionable.

Thus, each of the equations is estimated by OLS without these municipality-fixed effects. We also present some additional results when including year-fixed effects, which should control for those budget shocks that are common to all the municipalities (see section 4 for interpretation). Finally, each of the four equations has been estimated equation by equation. Given that the set of regressors is the same in all the equations, this procedure is asymptotically efficient and joint estimation does not improve efficiency (Baltagi, 1995).

Table 3: *Specification tests*

	a.- *Municipality-fixed effects?*	
	With lag length= 3	*With lag length*= 2
$\chi^2(1{,}032)$	953.57 [0.961]	857.28 [1.000]
	b.- *Lag order*	
	$3 \rightarrow 2$	$2 \rightarrow 1$
$\chi^2(16)$	66.94 [0.000]	87.13 [0.000]

Note: (1) Likelihood-ratio statistics on cross-equation restrictions; (2) [ ]: P-value.

4. Empirical results

As we can see in Table 4, the estimated coefficients of the error correction term, i.e., the long-run reaction, show that Catalan municipalities converge toward the inter-temporal budget constraint. A higher deficit has a positive impact on revenues and a negative impact on expenditures. On the revenue side, not only do own-source revenues react to an increase in the deficit, but grants do also. Thus, the adjustment is carried out simultaneously by municipalities and by upper tiers of government.

Table 4: *Estimates for the error correction term*

Equation	γ
Own Revenues (*R*)	0.294^{***} (0.102)
Expenditures (*E*)	-0.523^{***} (0.164)
Grants (*G*)	0.358^{***} (0.149)
Debt service (*DS*)	0.021^{**} (0.010)

Notes: (1) Heteroscedasticity robust standard errors in parentheses. (2) ***, ** & * = statistically significant at the 99, 95 and 90% levels.

Table 5 reports the present value of the GIRFs[12] computed from the estimates of the VECM[13] by fixing the discount rate at 3% and considering a ten-year period[14]. The top panel in Table 5 reports the responses of all the components to a shock of each of them (thus allowing the adjustment to be made to the variable that has experienced the shock too), while the bottom panel presents the response to a permanent increase in one of the variables for all the other variables.

Table 5: *Present value generalized impulse response functions*

	Innovation to:			
Response of:	*R*	*E*	*G*	*DS*
Own Revenues (*R*)	-0.709***	0.085**	-0.018	0.515*
	(0.038)	(0.042)	(0.016)	(0.286)
Expenditures (*E*)	0.261***	-0.729***	0.289***	-0.080
	(0.036)	(0.027)	(0.049)	(0.496)
Grants (*G*)	-0.007	0.158***	-0.726***	0.229
	(0.046)	(0.047)	(0.062)	(0.332)
Debt service (*DS*)	0.024	-0.027	0.003	-0.450**
	(0.015)	(0.017)	(0.008)	(0.129)
	Response to permanent increase			
Own Revenues (*R*)		0.314**	-0.066	0.776*
		(0.047)	(0.041)	(0.169)
Expenditures (*E*)	0.896***		1.055***	-0.121
	(0.029)		(0.030)	(0.220)
Grants (*G*)	-0.026	0.583***		0.345
	(0.036)	(0.035)		(0.301)
Debt service (*DS*)	0.082	-0.099	0.011	
	(0.078)	(0.063)	(0.016)	

Notes: (1) Generalized Impulse Response Functions, GIRF (Pesaran and Shin, 1998). (2) Bootstrap standard errors: 100 replications with replacement. (3) ***, ** & * = statistically significant at the 99, 95 and 90% levels.

[12] Each column of the table shows the present value response of all fiscal variables to a shock recorded in a given fiscal variable. Each row in the table captures how responsive a given fiscal variable is to shocks to itself and to other fiscal variables.

[13] Table A1 in the appendix reports the estimated coefficients used to compute the GIRFs.

[14] We report the generalized impulse-response function considering a 10-year period since the GIRFs show that at that point all the adjustment has been realized. After that point, the GIRFs are nearly flat lines. As a robustness check we have also computed the GIRFs considering a 20-year period and obtained substantially the same results. We have also computed the present value of the GIRFs with different discount rates and the qualitative results do not change significantly. This can be explained by the fact that the largest share of the adjustment takes place quite quickly during the first few years of the period considered.

Main results. Several of our results are to be remarked. First, a 1€ positive (negative) shock[15] to own-source revenues is followed by a reduction (increase) in future own revenues of 71 cents[16] and an increase (decrease) in future expenditures of 26 cents (first column of Table 5). Grants and debt service do not react to an innovation in own revenues. If we sum up the reaction of own revenues and expenditures, we estimate that an additional euro of own revenues offsets 97 cents in the primary surplus. In the Spanish case, therefore, grants do not play any role in offsetting own-source revenues losses, while the adjustments that follow a deficit attributable to a revenue shortfall are borne entirely by the municipalities themselves. This is at odds both with the U.S., where grants offset 9 cents of own-source revenue shocks (Buettner and Wildasin, 2006), and with Germany, where equalization grants offset 15 cents of the shock (Buettner, 2007). This might reflect the low equalization power of the main unconditional grant that Spanish municipalities receive (Suárez, 1999; Bosch and Solé-Ollé, 2005) as well as the fact that many of the grants are earmarked as capital grants, the sum of which has to be matched by a municipality's resources.

Second, the GIRFs also predict that an innovation to grants (third column) will be balanced by the response of the variable that experiences the shock, i.e. grants and expenditures. The response of own-source revenues to an innovation to grants is very low (just 2 cents, explaining 7% of the permanent increase), providing evidence of a very strong flypaper effect, which has been already obtained for Spain using different methodologies (e.g., Solé-Ollé, 2001; Bosch and Solé-Ollé, 2005). This result also differs markedly from that reported for the U.S. –where own revenues offset 14 cents of a grant shock and represented roughly a quarter of the adjustment–, but is more similar to that reported for Germany, where the revenues offset 4 cents of the innovation in grants (9% of the permanent increase). The several constraints operating on local taxes in both countries might explain this result.

[15] Note that having computed the GIRFs, we do not then analyze the effect of a shock on one fiscal variable assuming that the other fiscal variables remain constant, but rather we take into account the correlation between the fiscal variables.

[16] This means that the level of own-source revenues, after the adjustment process, is 29 cents above the level before the shock occurred.

Third, when a 1€ innovation affects expenditures, the budget is balanced by a 73 cents reduction in future expenditures and by an increase of 8 and 16 cents in future own-source revenues and grants, respectively. So, while higher tiers of government play no role in absorbing revenue shocks, their role is of paramount importance in the adjustment that follows an expenditure shock. Once again, this result is extreme: own-source revenues in Spain play a similar role to that reported in Germany (where they offset 6 cents of an expenditure shock), but they have much less influence than in the U.S. (where they offset 16 cents of the shock). In the U.S. and Germany, however, grants play the same role in offsetting expenditure shocks (8 cents, approximately), which is much lower than in the Spanish case. Here again this might be due to the nature of intergovernmental grants in Spain. On the one hand, the main driver of unconditional grants is weighted population, with weights rising steeply with population size. On the other hand, capital grants are disproportionally allocated to municipalities facing population growth pressures (Solé-Ollé and Sorribas-Navarro, 2008), since these jurisdictions are the ones that can most readily justify the inadequacy of past facilities. Thus, in Spain, spending shocks arising from urban growth are partially offset by the higher tiers of government.

Fourth, we observe that a great share of the fiscal adjustment (70%) is held by the future value of the fiscal variable that experiences the shock. This figure is very similar to those reported in the case of spending for the U.S. and Germany. However, revenues and grants are less volatile in Germany (57% and 55%) and, particularly so, in the U.S. (35% and 47%). The higher volatility of Spanish local own-source revenues could be due to the fact that although the three main local taxes are quite stable (recall that these are the property tax, the business tax and the motor vehicle tax), this might not be the case of other taxes and user charges which are more closely linked to the real estate cycle (i.e., construction tax, tax on land transactions, building permits, etc.). In the case of grants, this might reflect the impact of capital grants, which are highly volatile, since they are not automatic.

Fifth, given this strong reversion effect, it could be interesting to compute the response to a 1€ permanent increase in each fiscal variable[17]. As we can see at the bottom of Table 5, a 1€ permanent increase in own-source revenues is basically followed by a spending decrease of a similar magnitude (recall that the other effects - top panel - were not statistically significant). Spanish grants, thus, provide less insurance than their German counterparts (34% of the permanent increase), but also even less than U.S. grants (13%). A permanent increase of 1€ in spending is followed by an increase in own-source revenues and grants of proportions 1/3 and 2/3. Note again that this suggests that higher tiers of government match local resources in a 2 to 1 proportion in order to finance additional expenditure needs, which we speculate are related to the urban expansion process. This proportion is just 1 to 1 in Germany and 1 to 2 in the U.S.. Intergovernmental grants in Germany and, especially, in Spain seem to be quite biased towards funding additional local expenses (particularly compared to the U.S. case). This might have generated, at least in the Spanish case, a moral-hazard problem, with municipalities having the incentive to undertake excessive expansion since additional capital spending will always be financed (at least in the long run) by higher tiers of government (Solé-Ollé and Viladecans, 2008). Finally, a permanent increase in grants leads to a higher level of spending, a situation that also occurs to a great extent in Germany, though not in the U.S..

Additional results. In order to clarify the above results, we have performed some additional analyses. To save space, we only discuss the most interesting results and report the coefficients referred to in Table 6. First, we re-estimated the VECM including time effects so as to capture the common innovations in fiscal variables. Hence, in this case, the parameters estimated only describe the adjustment of budget components to idiosyncratic shocks. The estimated coefficients of the error correction term and the present values of the GIRFs show that Catalan municipalities converge toward the intertemporal budget constraint, also when they experience an idiosyncratic shock, with estimates of the error correction parameter that are very similar to those obtained earlier. Thus, it seems that the viability of local financial systems does not depend on the type of shock (common or idiosyncratic) experienced.

[17] We compute the response to a permanent increase dividing the GIRF by the permanent component of the innovation. That is, in the case of a shock to own-source revenues, we divide the estimated response of the other fiscal variables by (1-0.709).

Table 6: *Present value generalized impulse response functions: selected coefficients*

	Innovation to own revenues			*Innovation to expenditures*			
Response of	*Grants*	*Current Grants*(2)	*Capital Grants*(2)	*Grants*	*Current Grants*(2)	*Capital Grants*(2)	*Own revenues*(2)
All sample	-0.007	0.008	-0.015*	0.158***	0.042*	0.117***	0.085**
	(0.046)	(0.051)	(0.009)	(0.047)	(0.025)	(0.041)	(0.042)
Small mun(1)	-0.038*	-0.011*	-0.019**	0.178***	0.038*	0.141***	0.038**
	(0.023)	(0.006)	(0.009)	(0.039)	(0.021)	(0.039)	(0.019)
Response of	*Idiosyncratic innovation to own rev.* (3)			*Idiosyncratic innovation to expenditures*(3)			
Response of	*Grants*	*Current Grants*	*Capital Grants*	*Grants*	*Current Grants*(2)	*Capital Grants*(2)	*Own revenues*(2)
All sample	-0.054*	-0.015*	-0.023**	0.213***	0.038*	0.169***	0.087**
	(0.029)	(0.009)	(0.011)	(0.052)	(0.023)	(0.045)	(0.041)
Small mun(1)	-0.074***	-0.027*	-0.021***	0.226***	0.040*	0.189***	0.066***
	(0.031)	(0.015)	(0.009)	(0.054)	(0.022)	(0.049)	(0.028)

Notes: (1) Each cell in this row has been obtained by estimating the model with a different sample; (2) The coefficients of current and capital grants has been estimated from a model which includes both variables at the same time; (3) Results obtaining after controlling for time-effects.

Second, we do not observe substantial differences in the adjustment pattern following an idiosyncratic shock. It should only be mentioned that grants are slightly more responsive to an idiosyncratic shock than to shocks that affect all the municipalities. For example, we show in Table 6 how a 1€ positive (negative) idiosyncratic innovation in revenues is followed by a statistically significant reduction (increase) of 5 cents in grants (recall that the response to general shocks was nearly zero), and a 1€ positive (negative) idiosyncratic innovation in expenditures is followed by an increase (decrease) in grants of 21 cents (recall that this was just 16 cents in the case of a general shock). In the case of revenues, this should be interpreted as evidence that the overall amount of grants to municipalities does not respond to the evolution in overall local tax revenues[18], but that grants do respond (to some extent) to revenue shocks that are specific to a given municipality. In the case of capital grants, this might occur because a municipality dedicates greater efforts in applying for project grants after a revenue shortfall; in the case of current grants, this might be due to the equalization component, which despite its obvious shortcomings, could play some role in insuring against asymmetric shocks.

[18] If grants tend to offset idiosyncratic shocks rather than general shocks, they should increase/decrease after a common positive/negative revenue shock. Note, for instance, that in Spain, the overall pool of unconditional grants to municipalities is indexed to the growth of central government revenues (see Suarez, 1999), which means that unconditional grants tend to fall during a downturn (when both municipal and central revenues decline). So, without significant ad-hoc interventions to provide more resources to the local sector, it is quite natural to see a decrease in the overall amount of grants during a downturn, exacerbating the pro-cyclical nature of local own-source revenues.

This result might also be due to very ad-hoc interventions by the central government in terms of their providing help to certain municipalities with revenue difficulties.

Third, given the importance of grants in the adjustment process we have estimated the VECM disaggregating grants in current and capital grants[19]. We observe in Table 6 that capital grants are more responsive than current grants. For example, when expenditures experience a 1€ shock, capital grants increase by 12 cents whereas current grants only increase by 4 cents. This difference, in absolute values, is even greater when we scale the response of grants by their quantitative importance. On average, capital grants provide around 1/3 of total resources granted. The importance of the reaction of capital grants is even higher in the case of an idiosyncratic shock (17 vs. 4 cents).

Fourth, since the adjustment pattern can be conditioned by the institutional environment, we have replicated the analysis considering only the smaller municipalities. In Spain, the institutional environment across municipalities varies with population size[20]. We qualify a municipality as small if it has less than 5000 inhabitants. We have fixed this as our threshold in order to obtain a representative sample of municipalities with the same institutional environment. Moreover, around 85% of Spanish municipalities have less than 5000 inhabitants[21]. The main difference between the two samples is the slightly higher response of grants to shocks affecting small municipalities. Thus, the role of upper tiers of government in the fiscal adjustment process is more important in small municipalities than it is in their larger counterparts. As Table 6 shows, when own-source revenues experience a 1€ shock in a small municipality, future grants fall 4 cents (7 cents in the case of an idiosyncratic shock). A positive 1€ expenditure shock in a small municipality implies an increase in future grants and own-source revenues of 18 and 4 cents, respectively (23 and 7 cents in the presence of an idiosyncratic shock). The importance of the upper tiers of government in

[19] In general, the qualitative results provided by the estimation when adding one new variable are similar, although the precision of the estimates is not as great. Detailed results are available upon request.

[20] We identify the following four institutional environments depending on the size of the municipality's population: i) 5000 or fewer; ii) more than 5000 but fewer than 20000; iii) more than 20000 but fewer than 50000; and iv) more than 50000 inhabitants.

[21] In our sample 148 (of the 258) are small municipalities. We did not perform the analysis separately for the other institutional environment as we had few observations for each sample.

the case of small municipalities could reflect a combination of factors. First, they have lower maximum ceilings on tax rates, which serve to constrain any reaction they might make through using their own-source revenues. Second, capital investment might be more volatile in small municipalities, due to the lumpiness of capital improvement projects. Third, they will almost certainly experience greater difficulties in obtaining credit.

5. Conclusions

In this paper we have traced the dynamic adjustment process of local budgets in Spain. We have found that municipalities do adjust after a budget shock, and manage to balance their budgets after a period of some years. Municipalities respond to revenue shocks by adjusting both revenues and spending, with intergovernmental grants being of limited importance and only then in the case of idiosyncratic shocks. Grants do not seem to insure the entire local sector against revenue shocks, although they can provide some coverage for asymmetric shocks. The level of insurance is similar (but lower) to that provided in the U.S. but is quite at odds with the situation in Germany. Clearly, by not being insured against revenue shortfalls, Spanish municipalities might not face the perverse incentives to abuse overly volatile sources of revenue (i.e., the local business tax) identified by Buettner (2007). Despite their high degree of autonomy, Spanish local governments have managed to keep the deficit under control, so that the system does in fact appear viable.

The adjustments made following an expenditure shock are, however, of a quite distinct nature. Here, grants play a more prominent role than own revenues, which contrasts markedly with the situation in Germany (where the two play a largely similar role) and in the U.S., where own-source revenues play the main role. We have shown that this reflects the greater reliance on ear-marked capital grants in Spain. Thus, while Spanish municipalities are perfectly autonomous and quite capable of funding their current spending, they are highly dependent on intergovernmental assistance when it comes to funding their capital spending. It might be argued, however, that most Spanish municipalities are too small to avoid being credit constrained and, as such, they need capital grants to fund their infrastructure projects. If this is indeed the case, the intervention of higher tiers of government is vital to ensure the viability of local government. We show, however, that while it is true that smaller municipalities are more dependent on grants to make adjustments to their budgets, their behavior does not differ that markedly from that of the larger municipalities. Finally, we speculate that this greater reliance on grants might have given rise to another type of moral-hazard problem: additional infrastructure needs generated by population growth are disproportionately funded by higher tiers of government, inducing municipalities to foster urban expansion without considering the full fiscal consequences of these policies (Solé-Ollé and Viladecans, 2007).

Appendix:

Table A1: *Detailed estimation results for the basic model*

	R_{it}	E_{it}	G_{it}	DS_{it}
$D_{it\text{-}1}$	0.294***	-0.523***	0.358**	0.021**
	(0.101)	(0.164)	(0.149)	(0.010)
$\Delta R_{it\text{-}1}$	-0.453***	-0.348**	0.230	0.008
	(0.099)	(0.162)	(0.141)	(0.011)
$\Delta E_{it\text{-}1}$	-0.218***	-0.476***	-0.313**	-0.002
	(0.084)	(0.145)	(0.142)	(0.010)
$\Delta G_{it\text{-}1}$	0.307***	-0.214	-0.499***	-0.004
	(0.086)	(0.144)	(0.143)	(0.009)
$\Delta DS_{it\text{-}1}$	-1.055	-0.281	-0.115	0.011
	(0.666)	(0.897)	(0.670)	(0.174)
$\Delta R_{it\text{-}2}$	-0.252***	-0.485***	-0.022	0.028***
	(0.094)	(0.160)	(0.123)	(0.009)
$\Delta E_{it\text{-}2}$	-0.159**	-0.068	0.007	-0.024***
	(0.072)	(0.110)	(0.103)	(0.008)
$\Delta G_{it\text{-}2}$	0.195**	-0.203*	-0.390***	0.013*
	(0.076)	(0.116)	(0.120)	(0.007)
$\Delta DS_{it\text{-}2}$	-0.019	0.674	-0.685	-0.101
	(0.623)	(0.845)	(0.734)	(0.074)
$\Delta R_{it\text{-}3}$	-0.132***	-0.321***	-0.076	0.007
	(0.051)	(0.112)	(0.098)	(0.007)
$\Delta E_{it\text{-}3}$	-0.061	0.008	0.024	-0.006
	(0.045)	(0.072)	(0.083)	(0.005)
$\Delta G_{it\text{-}3}$	0.093*	-0.192**	-0.268**	-0.000
	(0.050)	(0.080)	(0.104)	(0.004)
$\Delta DS_{it\text{-}3}$	1.524***	3.108***	1.021	-0.075
	(0.433)	(0.985)	(0.699)	(0.085)
Constant	45.897***	17.739*	38.837***	17.194***
	(4.943)	(9.133)	(7.180)	(1.231)
Obs.	3,870	3,870	3,870	3,870
R-squared	0.325	0.425	0.463	0.085

Note: Heteroscedasticity robust standard errors in parenthesis.

References

Baltagi, B.H. (1995): *Econometric Analysis of Panel Data*. Wiley, New York.

Bohn, H. (1991): "Budget balance through revenue of spending adjustment", *Journal of Monetary Economics*, 27, pp.333-359.

Bosch-Roca, N. & Solé-Ollé, A. (2005): "On the Relationship between Authority Size and the Costs of Providing Local Services: Lessons for the Design of Intergovernmental Transfers in Spain", *Public Finance Review*, 33 (3), 343-384

Bradbury, K.L. (2001): "Property tax limits and local fiscal behavior: did Massachussetts Cities and Towns spend too little on town services under proposition 21/2?", *Journal of Public Economics* 80/2, 287-311.

Brosio, G. & Ahmad, E. (2009): *Handbook of Fiscal Federalism* vol. II, Edward Elgar, forthcoming.

Buettner, T. (2007): "Equalization Transfers and Dynamic Fiscal Adjustment: Results for German Municipalities and a US-German Comparison", IFIR Working Paper No.2007-07.

Buettner, T., & Wildasin, D. E. (2006). The dynamics of municipal ¯scal adjustment. *Journal of Public Economics*, 90, 1115-1132

Dahlberg, M & Johansson, E. (2000) "An Examination of the Dynamic Behavior of Local Governments using GMM Bootstrapping Methods", *Journal of Applied Econometrics*, 15, 401-416.

Dahlberg, M. & Johansson, E. (1998): "The revenues-expenditures nexus: panel data evidence from Swedish municipalities", *Applied Economics*, 30, pp.1379-1386.

Darby, J., Muscatelli, V.A. & Roy, G. (2005): "Fiscal consolidation and decentralisation: a tale of two tiers", *Fiscal Studies*, 26(2), 169-195.

Downes, T.A., Dye, R.F. & McGuire, T.J. (1998): "Do limits matter? Evidence of the effects of tax limitations on student performance," *Journal of Urban Economics* 43(3), 401-417.

Hamilton, J.D. (1994): *Time Series Analysis*. Princeton University Press, Princeton.

Hjelm, G. (2001): "The dynamic response of the budget balance to tax, spending and output shocks: does model specification matter", mimeo, Lund University.

Holz-Eakin, D., Newey, W. & Rosen, H.S. (1989): "The revenue-expenditure nexus: evidence from local government data", *International Economic Review*, 30, 415-429.

Im, K.S., Pesaran, M. H., & Shin, Y. (2003): "Testing for Unit Roots in Heterogeneous Panels", *Journal of Econometrics*, 115, pp. 53-74.

Inman, R.P. (2001): “Transfers and bailouts: institutions for enforcing local fiscal discipline”, *Constitutional Political Economy,* 12, pp.141-160.

Jofre-Monseny, J. & Solé-Ollé, A. (2009): “Tax Differentials in Intraregional Firm Location: Evidence from New Manufacturing Establishments in Spanish Municipalities”, *Regional Studies*, forthcoming.

Devarajan, S., Khemani, S. & Shah, S. (2009): “Political economy and service delivery”, *Handbook of Fiscal Federalism* vol. II, Edward Elgar, forthcoming.

Lütkepohl, H. & Reimers, H. E.: (1992): “Granger-causality in cointegrated VAR processes. The case of the term structure”, *Economics Letters*, 40(3), 263-268.

Nickell, S. (1981): "Biases in dynamic models with fixed effects", *Econometrica,* Vol.49, pp.1417-26.

Oates, W. E. (1972): *Fiscal Federalism,* Harcourt Brace, New York.

Persson, T., & Tabellini, G. (1996): “Federal fiscal constitutions: risk-sharing and moral hazard”, *Econometrica*, 64, 623-646.

Pesaran, M. H., & Shin, Y. (1998): "Generalized impulse response analysis in linear multivariate models", *Economic Letters*, 58, pp. 17-29.

Poterba, J. (1994): “State responses to fiscal crises: the effects of budgetary institutions and politics”, *Journal of Political Economy,* 102, pp.799-821.

Rattso, J. (1999): “Fiscal adjustment with vertical fiscal imbalance: empirical evaluation of administrative fiscal federalism in Norway”, Mimeo, Department of Economics, Norwegian University of Science and Technology, Trondheim.

Rodden, J. (2000): “Fiscal behaviour with rational bailout expectations in the German states”, Workshop on European Fiscal Federalism in Comparative Perspective, Center for European Studies, Harvard University, Cambridge, MA.

Rodden, J., Litvack, J. & Eskeland, G. (eds.) (2003): *Decentralisation and the challenge of hard budget constraints,* MIT Press, Cambridge MA.

Sala-i-Martin, X., & Sachs, J. (1992): “Fiscal federalism and optimum currency areas: evidence for Europe from the United States”, in M. B. Canzoneri (Ed.), *Establishing a central bank*. Cambridge MA: Cambridge University Press.

Sims, C. A. (1987): “Comment on D. E. Runkle, Vector Autoregression and Reality”, *Journal of Business and Economic Statistics*, 5, 443-449.

Solé-Ollé, A. & Sorribas-Navarro, P. (2008): "The effects of partisan alignment on the allocation of intergovernmental transfers. Differences-in-differences estimates for Spain", *Journal of Public Economics,* 92 (12), 2302-2319

Solé-Ollé, A. (2001): “Determinantes del gasto público local: ¿necesidades de gasto o capacidad fiscal?”, Revista de Economía Aplicada, IX(25), 115-156.

Solé-Ollé, A. and Viladecans-Marsal, E. (2007): “Economic and political determinants of urban expansion: Exploring the local connection”, Document de Treball de l’IEB, 2007-05.

Suárez-Pandiello, Javier (1999). “Fiscal federalism in Spain. The decentralisation: An unfinished work”. *Económica*, XLV(3): 7-39.

von Hagen, J., & Eichengreen, B. (1996): “Federalism, fiscal restraints, and European monetary union”, *American Economic Review,* 86, 134-138.

Wildasin, D. E. (1997): “Externalities and bailouts: hard and soft budget constraints inintergovernmental fiscal relations”, Policy Research Working Paper No. 1843, World Bank.

2007

2007/1. Durán Cabré, J.Mª.; Esteller Moré, A.: "An empirical analysis of wealth taxation: Equity vs. tax compliance"
2007/2. Jofre-Monseny, J.; Solé-Ollé, A.: "Tax differentials and agglomeration economies in intraregional firm location"
2007/3. Duch, N.; Montolio, D.; Mediavilla, M.: "Evaluating the impact of public subsidies on a firm's performance: A quasi experimental approach"
2007/4. Sánchez Hugalde, A.: "Influencia de la inmigración en la elección escolar"
2007/5. Solé-Ollé, A.; Viladecans-Marsal, E.: "Economic and political determinants of urban expansion: Exploring the local connection"
2007/6. Segarra-Blasco, A.; García-Quevedo, J.; Teruel-Carrizosa, M.: "Barriers to innovation and public policy in Catalonia"
2007/7. Calero, J.; Escardíbul, J.O.: "Evaluación de servicios educativos: El rendimiento en los centros públicos y privados medido en PISA-2003"
2007/8. Argilés, J.M.; Duch Brown, N.: "A comparison of the economic and environmental performances of conventional and organic farming: Evidence from financial statement"

2008

2008/1. Castells, P.; Trillas, F.: "Political parties and the economy: Macro convergence, micro partisanship?"
2008/2. Solé-Ollé, A.; Sorribas-Navarro, P.: "Does partisan alignment affect the electoral reward of intergovernmental transfers?"
2008/3. Schelker, M.; Eichenberger, R.: "Rethinking public auditing institutions: Empirical evidence from Swiss municipalities"
2008/4. Jofre-Monseny, J.; Solé-Ollé, A.: "Which communities should be afraid of mobility? The effects of agglomeration economies on the sensitivity of firm location to local taxes"
2008/5. Duch-Brown, N.; García-Quevedo, J.; Montolio, D.: "Assessing the assignation of public subsidies: do the experts choose the most efficient R&D projects?"
2008/6. Solé-Ollé, A.; Hortas Rico, M.: "Does urban sprawl increase the costs of providing local public services? Evidence from Spanish municipalities"
2008/7. Sanromà, E.; Ramos, R.; Simón, H.: "Portabilidad del capital humano y asimilación de los inmigrantes. Evidencia para España"
2008/8. Trillas, F.: "Regulatory federalism in network industries"

2009

2009/1. Rork, J.C.; Wagner, G.A.: "Reciprocity and competition: is there a connection?"
2009/2. Mork, E.; Sjögren, A.; Svaleryd, H.: "Cheaper Child Care, More Children"
2009/3. Rodden, J.: "Federalism and Inter-Regional Redistribution"
2009/4. Ruggeri, G.C.: "Regional Fiscal Flows: Measurement Tools"
2009/5. Wrede, M.: "Agglomeration, tax competition, and fiscal equalization"
2009/6. Jametti, M.; von Ungern-Sternberg, T.: "Risk selection in natural disaster insurance"

UNIVERSITAT DE BARCELONA

ieb@ub.edu
www.ieb.ub.edu

Fiscal Federalism

Document de treball de l'IEB