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The dynamic adjustment of local government budgets: does Spain behave differently?

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Version with “track changes”

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 that Spanish municipalities do indeed make adjustments in response to fiscal shocks (i.e., the deficit is stationary in the long run). We compare our results with those obtained for US and Germany to evaluate if the viability of local finance depends on the institutional arrangement and to analyze how it affects the adjustment patterns. We observe that grants have a more important role in the adjustment process in environments where either they have an equalization objective or where there is no clear rule that determines their distribution. This fact can generate a moral hazard problem: governments tend to spend more due to the expected intervention by the central government. Own revenues have a lower adjustment capacity in environments where subcentral governments have limited fiscal autonomy. These results, however, 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

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**Corresponding author

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Deleted: 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.

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.*, 2008). 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.*, 2008), thus eroding the very benefits gained from spending decentralization. With its

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2 virtues and perils, any final evaluation of grant financing has to be country specific,
3 with the system depending on the particular details of the whole local government
4 financing system (see, e.g., Rodden *et al.*, 2003). This being the case, a promising
5 avenue for research involves evaluating the viability of local finance systems in
6 countries with different institutional arrangements. One way of conducting such an
7 evaluation is to analyze whether local government budgets undergo any adjustments
8 following a budget shock, and the role that is played by intergovernmental grants in this
9 process. According to the three perils of grant financing just mentioned, we expect to
10 observe, first, that grants that have an equalization objective will play an important role
11 in the adjustment process and that can reduce the incentive to use fiscal autonomy, on
12 the revenue and the expenditure side, to adjust after a budget shock. Nevertheless, on
13 the revenue side, the extent to which own revenues can contribute to the fiscal
14 adjustment is conditioned by their flexibility and the existence of normative restrictions.
15 Second, the lack of an objective and clear formula to determine the distribution of
16 grants allows their use to provide fiscal assistance to subcentral governments in order to
17 ensure the adjustment. Thus, discretionary grants can also reduce the incentives to
18 control expenditures, which can generate a moral-hazard problem. This effect should be
19 more pronounced when the central government cannot commit itself to a strict no bail
20 out rule.

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21 This research question has been previously addressed by Buettner and Wildasin
22 (2005) and Buettner (2007) using data for U.S. and German local governments,
23 respectively. Their results suggest that the system is viable in both countries, albeit that
24 grants were found to play a more prominent role in the absorption of revenue shocks in
25 the German case because of the role played by equalization transfers. Buettner (2007)
26 suggests that the high degree of insurance might account for the greater reliance in
27 Germany on the volatile local business tax.

Deleted: 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.

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43 In this paper we perform a similar analysis for the Spanish case. A number of
44 specific institutional characteristics suggest that Spanish municipalities constitute an
45 interesting case study (see Suárez-Pandiello, 1999, for a survey). First, as in the U.S.
46 and Germany, the municipalities are responsible for the provision of services
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2 traditionally assigned to local governments (as cited at the beginning of this paper), but
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4 they have limited responsibilities in the fields of education, health and social services.
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6 Second, since the end of the 1980s, Spanish municipalities have been able to modify
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8 the tax rates of all taxes assigned to them, albeit subject to compulsory minimum tax
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10 rates (common to all municipalities) and ceilings (which grow with population size),
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12 which might serve to constrain their responses. The main local taxes are (in the
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14 following order) a property tax, a business tax, and a motor vehicle tax. These tax bases
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16 are quite inelastic¹, which insures against large revenue shocks during downturns but
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18 also against automatic increases during times of boom². Third, vertical unconditional
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20 transfers represent a third of current revenues and are formula-based, but they have a
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22 very low equalizing power (see, e.g., Suárez-Pandiello, 1999; Bosch and Solé-Ollé,
23
24 2005). Thus, they are more relevant than in the U.S. case, but they do not share the
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26 insurance properties of German transfers. Conditional grants play an important role in
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28 the financing of capital projects (a half of all investments being funded by them) and
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30 many of them require co-funding by own-revenues. They very rarely include an
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32 equalization component, and their allocation is largely discretionary (Solé-Ollé and
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34 Sorribas-Navarro, 2008). Finally, local debt is subject to certain ceilings, involving both
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36 the ratio between debt and current revenues and the short-term financial position.
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38 However, the problems entailed in controlling these indicators effectively are
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40 enormous, and mean that successive Spanish governments have had great room to use

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

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

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2 deficits to make an adjustment³. So, in short, Spanish local governments have similar
3 responsibilities and tax possibilities to those enjoyed by the U.S. cities and what would
4 arguably seem to be a less volatile tax system than the one operating in Germany.
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6 Further, they are not subject to explicit equalization grants as their German counterparts
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8 are, while they can rely to a great extent on discretionary transfers to fund investment.
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11 The results of our analysis should show us whether these institutional differences
12 among Germany, US and Spain are reflected in different patterns of adjustment to
13 budget shocks, specially focusing on the role of grants. The methodology we adopt here
14 closely mirrors that applied by Buettner and Wildasin (2006) and Buettner (2007). To
15 trace the budget adjustment process, we use a vector error-correction model (VECM),
16 estimated with panel data drawn from a set of Spanish municipalities during the period
17 1988-2006⁴. Our results confirm, first, that Spanish municipalities do adjust in response
18 to fiscal shocks (i.e., the deficit is stationary in the long run). Second, we observe that
19 the adjustment process is conditioned by the design of intergovernmental relationships.
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21 After a revenue shock, grants play a more important role in the adjustment process
22 when they have an equalization and/or insurance component. Adjustments to
23 expenditure shocks are compensated to a larger extend by grants at institutional
24 arrangements where their allocation criteria is not based on a clear and objective rule.
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37 The rest of this paper is organized as follows. In the second section, we briefly
38 present the analytical framework used here. In the third, we describe the data and the
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41 ³ Since 2002, with the enactment of the 'Budget Stability Law', the running up of deficits by
42 any tier of government is forbidden (i.e., new debt should be used to fund past debt service).
43 Compliance with this law, however, has been minimal outside very big cities, with regional
44 governments (which are responsible for the overseeing of local debt policies) still applying the
45 older rules.

46 ⁴ The model is very similar to the vector autoregression (VAR) used by Holtz-Eakin *et al.*
47 (1989) and Dalhberg and Johansson (1998, 2000), the only difference being that the VEC model
48 includes the deficit (considered as being stationary) in the estimated equations. Other papers that
49 analyze subnational adjustment to fiscal shocks, but adopting different methodologies, include
50 those by Poterba (1994), Rattso (1999) and Darby *et al.* (2005). No such studies have been
51 undertaken of the Spanish case.

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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 were 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:

$$\Delta X_{it} = \sum_{j=1}^p A_j \Delta X_{it-j} + \gamma \phi X_{t-1} + u_{it} \quad (1)$$

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)⁵. 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

Deleted: 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($p+1$).

⁵ 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($p+1$).

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2 between the fiscal variables and do not assume that if a shock occurs in one fiscal
3 variable everything else remains constant. Thus, the GIRFs are invariant to the ordering
4 of the variables in the VECM, and thereby overcome the main problem of the traditional
5 IRF⁶. We summarize the information provided by the GIRFs when computing the
6 present value of the fiscal adjustment process.
7

8 Analytically the GIRF is defined by the following expression:
9

$$10 \quad GIRF_X(h, \delta_k, I_{t-1}) = E[X_{t+h} | \varepsilon_{kt} = \delta_k, I_{t-1}] - E[X_{t+h} | I_{t-1}] \quad (2)$$

11 where h is the number of periods ahead, δ_k represents a shock to variable k , and I_{t-1} is
12 all the information available at the time of the shock. Thus, Equation 2 states that the
13 GIRF for the vector X , h periods ahead, is the difference in the expected value (E) of
14 X_{t+h} , when taking the shock δ_k into account. Pesaran and Shin (1998) demonstrate that
15 if the innovation, ε_{kt} , has a normal distribution, $\varepsilon_{kt} \sim (0, \Sigma)$, the GIRF of a δ shock to
16 variable k can be expressed as follows:
17

$$18 \quad GIRF_X(h, I_{t-1}) = \Phi_h \Sigma e_k \sigma_{kk}^{-1} \delta_k \quad (3)$$

19 where Φ_h is the MA coefficient matrix at $t+h$, e_k is a $m \times 1$ selection vector, where m is
20 the number of endogenous variables, with unity as its k th element and zero elsewhere⁷.
21

22 3. Data and model specification

23 **Data.** We use panel data for a 19-year period (1988-2006), including annual
24 budgetary information for 258 municipalities in Catalonia, a Spanish region⁸. As in
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26 ⁶ By traditional IRF we refer to the IRF as computed by Sims (1987) and Hamilton (1994). The
27 use of the GIRF rather than the IRF constitutes the main methodological difference with respect
28 to Buettner and Wildasin (2006) and Buettner (2007).

29 ⁷ We computed the bootstrap standard errors of the coefficients of the GIRFs by conducting 100
30 replications with replacement.
31

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 grants in the adjustment process. All the variables have been deflated and are expressed in per capita terms⁹. Table 1 reports the definition of the four fiscal variables used in the analysis as well as their summary statistics.

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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

⁸ 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. We have to restrict our sample to Catalan municipalities due to the inability to have a long time series for the municipalities of other regions. However, note that since the financing system and the expenditure responsibilities of the municipalities are primarily determined by the central government, Catalan municipalities are a representative sample of all the Spanish municipalities (except from those in the Basque Country and Navarre, and to a lesser extent Canary Islands)

⁹ 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).

(2003) [and the Pesaran \(2007\) unit root statistics](#)¹⁰, which [are](#) fairly quite standard in the panel data literature and [they](#), allows for heterogeneous constants and slopes across cross-sections [and Pesaran \(2007\) controls for cross-sectional correlation](#). Results for the variables both in differences and in levels are presented in Table 2¹¹. They show that the deficit and all the variables when expressed in differences are stationary¹². 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).

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Table 2: Unit root tests

	<i>Im, Pesaran and Shin (2003)</i>			<i>Pesaran (2007)</i>	
	<i>p=0</i>	<i>p=1</i>	<i>p=2</i>	<i>f=1</i>	<i>f=2</i>
ΔR	-79.761 [0.000]	-36.531 [0.000]	-20.849 [0.000]	-29.325 [0.000]	-11.326 [0.000]
ΔG	-80.438 [0.000]	-40.142 [0.000]	-19.151 [0.000]	-34.126 [0.000]	-12.107 [0.000]
ΔE	-78.238 [0.000]	-41.960 [0.000]	-19.597 [0.000]	-35.157 [0.000]	-14.901 [0.000]
ΔDS	-5.014 [0.000]	-4.159 [0.000]	-3.542 [0.000]	-11.932 [0.000]	-8.268 [0.000]
<i>D</i>	-30.529 [0.000]	-9.500 [0.000]	-5.328 [0.000]	-16.203 [0.000]	-6.077 [0.000]
<i>R</i>	-0.156 [0.438]	0.032 [0.513]	0.654 [0.743]	3.415 [1.000]	7.488 [1.000]
<i>G</i>	-8.464 [0.000]	-5.565 [0.000]	-5.180 [0.000]	1.742 [0.913]	2.744 [0.997]
<i>E</i>	7.190 [1.000]	8.129 [1.000]	7.289 [1.000]	2.014 [1.000]	1.618 [0.947]
<i>DS</i>	-11.973 [0.000]	-9.632 [0.000]	-9.095 [0.000]	1.082 [0.860]	5.096 [1.000]

Notes: (1) *Im, Pesaran and Shin (2003)* unit root test, where $H_0: I(1)$. W_{tbar} statistic is reported, which allows for serially correlated errors. Tests for variables in levels include time effects, except for the deficit. *p*: number of lags of the dependent variable considered in the regression to allow for serial correlation in the errors. All specifications include a constant. (2) *Pesaran (2007)* unit root test, where $H_0: I(1)$. Z_{tbar} statistic is reported, which allows for serially correlated errors and cross section dependence. Test for variables in levels include a time trend, except for the deficit. *f*: number of lags of the cross section average of lagged levels and first-differences of the dependent variable considered in the regression to allow for serial and cross sectional correlation. (3) []: 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

¹⁰ [Im, Pesaran and Shin \(2003\) test belongs to the so called “first generation” panel unit root test, while Pesaran \(2007\) belongs to the “second generation”.](#) The main difference between them is that the second generation tests allow for cross-sectional dependencies.

¹¹ 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.

¹² We also report the unit root statistics of the fiscal variables in levels. These statistics show that stationarity is [rejected for own revenues and expenditures for all specifications and tests performed. However, the rejection of stationarity for grants and debt service depends on whether the test controls for cross-sectional correlation](#).

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2 has shown that the dynamic relationship between local government revenues and
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4 expenditures mainly takes place in a period of between two to four years (Holtz-Eakin
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6 *et al*, 1989; Dahlberg and Johansson, 1998 and 2000). Moreover, Dahlberg and
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8 Johansson (2000) report that the estimation techniques that are generally adopted tend
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10 to reject too often a true null of no significance of the lags. Given the size of our sample
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12 and the empirical evidence, here, in order to specify the lag length of the model, we
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14 begin with three lags and test for a possible reduction in the number of lags in all the
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16 equations simultaneously. As the results in Table 3 show, a reduction of the lag length is
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18 always rejected¹³.

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20 A second aspect of the model specification to consider is whether municipality-
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22 fixed effects are actually required. There is some theoretical controversy as regards the
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24 need to include them in the equations, since this would mean that we allow each
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26 municipality to converge to a different level of deficit, and thus some converge to
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28 deficits that are different from zero. Here, nevertheless, we decided to test the need to
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30 include them in the estimation. As shown in Table 3, we reject the presence of
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32 municipality-fixed effects, which means that all municipalities converge to the same
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34 level of deficit¹⁴. Thus, each of the equations is estimated by OLS without these
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36 municipality-fixed effects. Finally, each of the four equations has been estimated
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38 equation by equation. Given that the set of regressors is the same in all the equations,
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40 this procedure is asymptotically efficient and joint estimation does not improve
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42 efficiency (Baltagi, 1995).

Deleted: 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).

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46 ¹³ As a robustness check, we have estimated the model with 4 lags and the GIRF computed are not significantly different from those obtained with 3 lags.

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48 ¹⁴ 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.

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 (<i>R</i>)	0.294*** (0.102)
Expenditures (<i>E</i>)	-0.523*** (0.164)
Grants (<i>G</i>)	0.358*** (0.149)
Debt service (<i>DS</i>)	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 GIRFs¹⁵ computed from the estimates of the VECM¹⁶ by fixing the discount rate at 3% and considering a ten-year period¹⁷. The

¹⁵ 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.

¹⁶ Table A1 in the appendix reports the estimated coefficients used to compute the GIRFs.

¹⁷ 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

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*

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

Main results. Several of our results are to be remarked. First, a 1€ positive (negative) shock¹⁸ to own-source revenues is followed by a reduction (increase) in future own revenues of 71 cents¹⁹ 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

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.

¹⁸ 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.

¹⁹ This means that the level of own-source revenues, after the adjustment process, is 29 cents above the level before the shock occurred.

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2 in own revenues. If we sum up the reaction of own revenues and expenditures, we
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4 estimate that an additional euro of own revenues offsets 97 cents in the primary surplus.
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6 In the Spanish case, therefore, grants do not play any role in offsetting own-source
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8 revenues losses, while the adjustments that follow a deficit attributable to a revenue
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10 shortfall are borne entirely by the municipalities themselves. This is at odds both with
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12 the U.S., where grants offset 9 cents of own-source revenue shocks (Buettner and
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14 Wildasin, 2006), and with Germany, where equalization grants offset 15 cents of the
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16 shock (Buettner, 2007). This might reflect the low equalization power of the main
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18 unconditional grant that Spanish municipalities receive as well as the fact that many of
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20 the grants are earmarked as capital grants, the sum of which has to be matched by a
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22 municipality's resources. These results provide empirical evidence that grants have a
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24 more important role in the adjustment process when they have an equalization objective.

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

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48 Third, when a 1€ innovation affects expenditures, the budget is balanced by a 73
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50 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, since in both cases fiscal autonomy is restricted), 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. There is empirical evidence that capital grants, given their discretionary allocation, are disproportionately allocated to municipalities facing population growth pressures, mainly caused by urban growth. (Solé-Ollé and Sorribas-Navarro, 2008), since these jurisdictions are the ones that can most readily justify the inadequacy of past facilities. This might have generated 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).

Deleted: On the one hand, the main driver of unconditional grants is weighted population, with weights rising steeply with population size. On the other hand, c

Deleted: 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

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2 estate cycle (i.e., construction tax, tax on land transactions, building permits, etc.). In
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4 the case of grants, this might reflect the impact of capital grants, which are highly
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6 volatile, since they are not automatic and their discretionary allocation.

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8 Fifth, given this strong reversion effect, it could be interesting to compute the
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10 response to a 1€ permanent increase in each fiscal variable²⁰. As we can see at the
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12 bottom of Table 5, a 1€ permanent increase in own-source revenues is basically
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14 followed by a spending decrease of a similar magnitude (recall that the other effects -
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16 top panel - were not statistically significant). Spanish grants, thus, provide less
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18 insurance than their German counterparts (34% of the permanent increase), but also
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20 even less than U.S. grants (13%). A permanent increase of 1€ in spending is followed
21
22 by an increase in own-source revenues and grants of proportions 1/3 and 2/3. Note again
23
24 that this suggests that higher tiers of government match local resources in a 2 to 1
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26 proportion in order to finance additional expenditure needs, which we speculate are
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28 related to the urban expansion process. This proportion is just 1 to 1 in Germany and 1
29
30 to 2 in the U.S.. Intergovernmental grants in Germany and, especially, in Spain seem to
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32 be quite biased towards funding additional local expenses (particularly compared to the
33
34 U.S. case), reaction that can arise a moral hazard problem. Finally, a permanent increase
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36 in grants leads to a higher level of spending, a situation that also occurs to a great extent
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38 in Germany, though not in the U.S..

Deleted: 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).

39
40 **Additional results.** In order to clarify the above results, we have performed some
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42 additional analyses. To save space, we only discuss the most interesting results and
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44 report the coefficients referred to in Table 6. First, we re-estimated the VECM including
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46 time effects so as to capture the common innovations in fiscal variables. Hence, in this

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49 ²⁰ We compute the response to a permanent increase dividing the GIRF by the permanent
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51 component of the innovation. That is, in the case of a shock to own-source revenues, we divide
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53 the estimated response of the other fiscal variables by (1-0.709).

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, that the viability of local financial systems does not depend on the type of shock (common or idiosyncratic) experienced.

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

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

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2 overall amount of grants to municipalities does not respond to the evolution in overall
3 local tax revenues²¹, but that grants do respond (to some extent) to revenue shocks that
4 are specific to a given municipality. In the case of capital grants, this might occur
5 because a municipality dedicates greater efforts in applying for project grants after a
6 revenue shortfall; in the case of current grants, this might be due to the equalization
7 component, which despite its obvious shortcomings, could play some role in insuring
8 against asymmetric shocks²². This result might also be due to very ad-hoc interventions
9 by the central government in terms of their providing help to certain municipalities with
10 revenue difficulties.
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19 Third, given the importance of grants in the adjustment process we have
20 estimated the VECM disaggregating grants in current and capital grants²³. We observe
21 in Table 6 that capital grants are more responsive than current grants. For example,
22 when expenditures experience a 1€ shock, capital grants increase by 12 cents whereas
23 current grants only increase by 4 cents. This difference, in absolute values, is even
24 greater when we scale the response of grants by their quantitative importance. On
25 average, capital grants provide around 1/3 of total resources granted. The importance of
26 the reaction of capital grants is even higher in the case of an idiosyncratic shock (17 vs.
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37 ²¹ If grants tend to offset idiosyncratic shocks rather than general shocks, they should
38 increase/decrease after a common positive/negative revenue shock. Note, for instance, that in
39 Spain, the overall pool of unconditional grants to municipalities is indexed to the growth of
40 central government revenues (see Suarez, 1999), which means that unconditional grants tend to
41 fall during a downturn (when both municipal and central revenues decline). So, without
42 significant ad-hoc interventions to provide more resources to the local sector, it is quite natural
43 to see a decrease in the overall amount of grants during a downturn, exacerbating the pro-
44 cyclical nature of local own-source revenues.

45 ²² The main reason for this different reaction is that equalization grants are allocated according
46 to the relative position of municipalities. This relative position will more likely change when an
47 idiosyncratic shock occurs than when there is a common shock to all municipalities. However,
48 the reaction of this grant (that is the main current grant) is of a minor magnitude.

49 ²³ In general, the qualitative results provided by the estimation when adding one new variable
50 are similar, although the precision of the estimates is not as great. Detailed results are available
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4 cents). This result suggests that capital grants are the ones that generate the moral hazard problem.

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 size²⁴. 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 inhabitants²⁵. 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 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.

²⁴ 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.

²⁵ 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.

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.

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, which have great room for discretionary allocation. This reliance on grants might have given rise to a 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).

Our results provide empirical evidence that the fiscal adjustment pattern is conditioned by the institutional arrangements. We observe that grants have a more important role in the adjustment process when they have an equalization objective (as in Germany) or when there is no clear and objective rule that determines their allocation (as in Spain, capital grants). Own revenues have a lower adjustment capacity when

Deleted: 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.

Deleted: 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

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subcentral governments have constrained fiscal autonomy on them (as in Spain and Germany).

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Appendix:

Table A1: Detailed estimation results for the basic model

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

Note: Heteroscedasticity robust standard errors in parenthesis.

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The dynamic adjustment of local government budgets: does Spain behave differently?

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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 that Spanish municipalities do indeed make adjustments in response to fiscal shocks (i.e., the deficit is stationary in the long run). We compare our results with those obtained for US and Germany to evaluate if the viability of local finance depends on the institutional arrangement and to analyze how it affects the adjustment patterns. We observe that grants have a more important role in the adjustment process in environments where either they have an equalization objective or where there is no clear rule that determines their distribution. This fact can generate a moral hazard problem: governments tend to spend more due to the expected intervention by the central government. Own revenues have a lower adjustment capacity in environments where subcentral governments have limited fiscal autonomy. These results, however, 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

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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.*, 2008). 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.*, 2008), thus eroding the very benefits gained from spending decentralization. With its

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3 virtues and perils, any final evaluation of grant financing has to be country specific,
4 with the system depending on the particular details of the whole local government
5 financing system (see, e.g., Rodden *et al.*, 2003). This being the case, a promising
6 avenue for research involves evaluating the viability of local finance systems in
7 countries with different institutional arrangements. One way of conducting such an
8 evaluation is to analyze whether local government budgets undergo any adjustments
9 following a budget shock, and the role that is played by intergovernmental grants in this
10 process. According to the three perils of grant financing just mentioned, we expect to
11 observe, first, that grants that have an equalization objective will play an important role
12 in the adjustment process and that can reduce the incentive to use fiscal autonomy, on
13 the revenue and the expenditure side, to adjust after a budget shock. Nevertheless, on
14 the revenue side, the extent to which own revenues can contribute to the fiscal
15 adjustment is conditioned by their flexibility and the existence of normative restrictions.
16 Second, the lack of an objective and clear formula to determine the distribution of
17 grants allows their use to provide fiscal assistance to subcentral governments in order to
18 ensure the adjustment. Thus, discretionary grants can also reduce the incentives to
19 control expenditures, which can generate a moral-hazard problem. This effect should be
20 more pronounced when the central government cannot commit itself to a strict no bail
21 out rule.
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37 This research question has been previously addressed by Buettner and Wildasin
38 (2005) and Buettner (2007) using data for U.S. and German local governments,
39 respectively. Their results suggest that the system is viable in both countries, albeit that
40 grants were found to play a more prominent role in the absorption of revenue shocks in
41 the German case because of the role played by equalization transfers. Buettner (2007)
42 suggests that the high degree of insurance might account for the greater reliance in
43 Germany on the volatile local business tax.
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53 In this paper we perform a similar analysis for the Spanish case. A number of
54 specific institutional characteristics suggest that Spanish municipalities constitute an
55 interesting case study (see Suárez-Pandiello, 1999, for a survey). First, as in the U.S.
56 and Germany, the municipalities are responsible for the provision of services
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3 traditionally assigned to local governments (as cited at the beginning of this paper), but
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5 they have limited responsibilities in the fields of education, health and social services.
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8 Second, since the end of the 1980s, Spanish municipalities have been able to modify
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10 the tax rates of all taxes assigned to them, albeit subject to compulsory minimum tax
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12 rates (common to all municipalities) and ceilings (which grow with population size),
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14 which might serve to constrain their responses. The main local taxes are (in the
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16 following order) a property tax, a business tax, and a motor vehicle tax. These tax bases
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18 are quite inelastic¹, which insures against large revenue shocks during downturns but
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20 also against automatic increases during times of boom². Third, vertical unconditional
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22 transfers represent a third of current revenues and are formula-based, but they have a
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24 very low equalizing power (see, e.g., Suárez-Pandiello, 1999; Bosch and Solé-Ollé,
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26 2005). Thus, they are more relevant than in the U.S. case, but they do not share the
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28 insurance properties of German transfers. Conditional grants play an important role in
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30 the financing of capital projects (a half of all investments being funded by them) and
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32 many of them require co-funding by own-revenues. They very rarely include an
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34 equalization component, and their allocation is largely discretionary (Solé-Ollé and
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36 Sorribas-Navarro, 2008). Finally, local debt is subject to certain ceilings, involving both
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38 the ratio between debt and current revenues and the short-term financial position.
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40 However, the problems entailed in controlling these indicators effectively are
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42 enormous, and mean that successive Spanish governments have had great room to use
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54 ¹ Unlike its German counterpart, Spain's local business tax (*Impuesto sobre Actividades*
55 *Económicas*) is a presumptive tax, with a tax base computed using simple indicators of
56 economic activity (e.g., surface area, electricity usage, number of workers, sectoral
57 classification, see Jofre-Monseny and Solé-Ollé, 2008), which makes it less volatile than the
58 German tax.

59 ² Other local taxes are a construction tax and a tax on land value improvements, which tend to
60 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.

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3 deficits to make an adjustment³. So, in short, Spanish local governments have similar
4 responsibilities and tax possibilities to those enjoyed by the U.S. cities and what would
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deficits to make an adjustment³. 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 discretionary transfers to fund investment.

The results of our analysis should show us whether these institutional differences among Germany, US and Spain are reflected in different patterns of adjustment to budget shocks, specially focusing on the role of grants. The methodology we adopt here closely mirrors that applied by Buettner and Wildasin (2006) and Buettner (2007). To trace the budget adjustment process, we use a vector error-correction model (VECM), estimated with panel data drawn from a set of Spanish municipalities during the period 1988-2006⁴. Our results confirm, first, that Spanish municipalities do adjust in response to fiscal shocks (i.e., the deficit is stationary in the long run). Second, we observe that the adjustment process is conditioned by the design of intergovernmental relationships. After a revenue shock, grants play a more important role in the adjustment process when they have an equalization and/or insurance component. Adjustments to expenditure shocks are compensated to a larger extent by grants at institutional arrangements where their allocation criteria is not based on a clear and objective rule.

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

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.

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.

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 were 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:

$$\Delta X_{it} = \sum_{j=1}^p A_j \Delta X_{it-j} + \gamma \phi X_{t-1} + u_{it} \quad (1)$$

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)⁵. 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

⁵ 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($p+1$).

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3 between the fiscal variables and do not assume that if a shock occurs in one fiscal
4 variable everything else remains constant. Thus, the GIRFs are invariant to the ordering
5 of the variables in the VECM, and thereby overcome the main problem of the traditional
6 IRF⁶. We summarize the information provided by the GIRFs when computing the
7 present value of the fiscal adjustment process.
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10 Analytically the GIRF is defined by the following expression:
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$$13 \quad GIRF_X(h, \delta_k, I_{t-1}) = E[X_{t+h} | \varepsilon_{kt} = \delta_k, I_{t-1}] - E[X_{t+h} | I_{t-1}] \quad (2)$$

14 where h is the number of periods ahead, δ_k represents a shock to variable k , and I_{t-1}
15 all the information available at the time of the shock. Thus, Equation 2 states that the
16 GIRF for the vector X , h periods ahead, is the difference in the expected value (E) of
17 X_{t+h} , when taking the shock δ_k into account. Pesaran and Shin (1998) demonstrate that
18 if the innovation, ε_{kt} , has a normal distribution, $\varepsilon_{kt} \sim (0, \Sigma)$, the GIRF of a δ shock to
19 variable k can be expressed as follows:
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$$22 \quad GIRF_X(h, 1, I_{t-1}) = \Phi_h \Sigma e_k \sigma_{kk}^{-1} \delta_k \quad (3)$$

23 where Φ_h is the MA coefficient matrix at $t+h$, e_k is a $m \times 1$ selection vector, where m is
24 the number of endogenous variables, with unity as its k th element and zero elsewhere⁷.
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36 3. Data and model specification

37 *Data.* We use panel data for a 19-year period (1988-2006), including annual
38 budgetary information for 258 municipalities in Catalonia, a Spanish region⁸. As in
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57 ⁶ By traditional IRF we refer to the IRF as computed by Sims (1987) and Hamilton (1994). The
58 use of the GIRF rather than the IRF constitutes the main methodological difference with respect
59 to Buettner and Wildasin (2006) and Buettner (2007).
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⁷ We computed the bootstrap standard errors of the coefficients of the GIRFs by conducting 100
replications with replacement.

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 grants in the adjustment process. All the variables have been deflated and are expressed in per capita terms⁹. Table 1 reports the definition of the four fiscal variables used in the analysis as well as their summary statistics.

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

		Mean	St.Dev.	Definition ¹
R	<i>Own Revenues</i>	533.988	436.905	Items I, II, III, V and VI of Revenue Budget
G	<i>Grants</i>	346.779	479.534	Items IV and VII of Revenue Budget
E	<i>Expenditures</i>	805.668	627.609	Items I, II, IV, VI and VII of Exp. Budget
DS	<i>Debt service</i>	34.496	73.276	Item III of Expenditure Budget
D	<i>Deficit</i>	-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

⁸ 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. We have to restrict our sample to Catalan municipalities due to the inability to have a long time series for the municipalities of other regions. However, note that since the financing system and the expenditure responsibilities of the municipalities are primarily determined by the central government, Catalan municipalities are a representative sample of all the Spanish municipalities (except from those in the Basque Country and Navarre, and to a lesser extent Canary Islands)

⁹ 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).

(2003) and the Pesaran (2007) unit root statistics¹⁰, which are fairly quite standard in the panel data literature and they allows for heterogeneous constants and slopes across cross-sections and Pesaran (2007) controls for cross-sectional correlation. Results for the variables both in differences and in levels are presented in Table 2¹¹. They show that the deficit and all the variables when expressed in differences are stationary¹². 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).

Table 2: *Unit root tests*

	<i>Im, Pesaran and Shin (2003)</i>			<i>Pesaran (2007)</i>	
	<i>p=0</i>	<i>p=1</i>	<i>p=2</i>	<i>f=1</i>	<i>f=2</i>
ΔR	-79.761 [0.000]	-36.531 [0.000]	-20.849 [0.000]	-29.325 [0.000]	-11.326 [0.000]
ΔG	-80.438 [0.000]	-40.142 [0.000]	-19.151 [0.000]	-34.126 [0.000]	-12.107 [0.000]
ΔE	-78.238 [0.000]	-41.960 [0.000]	-19.597 [0.000]	-35.157 [0.000]	-14.901 [0.000]
ΔDS	-5.014 [0.000]	-4.159 [0.000]	-3.542 [0.000]	-11.932 [0.000]	-8.268 [0.000]
<i>D</i>	-30.529 [0.000]	-9.500 [0.000]	-5.328 [0.000]	-16.203 [0.000]	-6.077 [0.000]
<i>R</i>	-0.156 [0.438]	0.032 [0.513]	0.654 [0.743]	3.415 [1.000]	7.488 [1.000]
<i>G</i>	-8.464 [0.000]	-5.565 [0.000]	-5.180 [0.000]	1.742 [0.913]	2.744 [0.997]
<i>E</i>	7.190 [1.000]	8.129 [1.000]	7.289 [1.000]	2.014 [1.000]	1.618 [0.947]
<i>DS</i>	-11.973 [0.000]	-9.632 [0.000]	-9.095 [0.000]	1.082 [0.860]	5.096 [1.000]

Notes: (1) *Im, Pesaran and Shin (2003)* unit root test, where $H_0: I(1)$. W_{tbar} statistic is reported, which allows for serially correlated errors. Tests for variables in levels include time effects, except for the deficit. *p*: number of lags of the dependent variable considered in the regression to allow for serial correlation in the errors. All specifications include a constant. (2) *Pesaran (2007)* unit root test, where $H_0: I(1)$ Z_{tbar} statistic is reported, which allows for serially correlated errors and cross section dependence. Test for variables in levels include a time trend, except for the deficit. *f*: number of lags of the cross section average of lagged levels and first-differences of the dependent variable considered in the regression to allow for serial and cross sectional correlation. (3) []: 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

¹⁰ Im, Pesaran and Shin (2003) test belongs to the so called “first generation” panel unit root test, while Pesaran (2007) belongs to the “second generation”. The main difference between them is that the second generation tests allow for cross-sectional dependencies.

¹¹ 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.

¹² We also report the unit root statistics of the fiscal variables in levels. These statistics show that stationarity is rejected for own revenues and expenditures for all specifications and tests performed. However, the rejection of stationarity for grants and debt service depends on whether the test controls for cross-sectional correlation.

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3 has shown that the dynamic relationship between local government revenues and
4 expenditures mainly takes place in a period of between two to four years (Holtz-Eakin
5 *et al*, 1989; Dahlberg and Johansson, 1998 and 2000). Moreover, Dahlberg and
6 Johansson (2000) report that the estimation techniques that are generally adopted tend
7 to reject too often a true null of no significance of the lags. Given the size of our sample
8 and the empirical evidence, here, in order to specify the lag length of the model, we
9 begin with three lags and test for a possible reduction in the number of lags in all the
10 equations simultaneously. As the results in Table 3 show, a reduction of the lag length is
11 always rejected¹³.
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25 A second aspect of the model specification to consider is whether municipality-
26 fixed effects are actually required. There is some theoretical controversy as regards the
27 need to include them in the equations, since this would mean that we allow each
28 municipality to converge to a different level of deficit, and thus some converge to
29 deficits that are different from zero. Here, nevertheless, we decided to test the need to
30 include them in the estimation. As shown in Table 3, we reject the presence of
31 municipality-fixed effects, which means that all municipalities converge to the same
32 level of deficit¹⁴. Thus, each of the equations is estimated by OLS without these
33 municipality-fixed effects. Finally, each of the four equations has been estimated
34 equation by equation. Given that the set of regressors is the same in all the equations,
35 this procedure is asymptotically efficient and joint estimation does not improve
36 efficiency (Baltagi, 1995).
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56 ¹³ As a robustness check, we have estimated the model with 4 lags and the GIRF computed are
57 not significantly different from those obtained with 3 lags.

58 ¹⁴ This test has been performed after estimating the equations by OLS, since the time dimension
59 of our sample suggests that the Nickell (1981) bias should not be a major problem. Moreover,
60 the performance of the GMM estimator with a relatively small number of municipalities is
questionable.

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 GIRFs¹⁵ computed from the estimates of the VECM¹⁶ by fixing the discount rate at 3% and considering a ten-year period¹⁷. The

¹⁵ 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.

¹⁶ Table A1 in the appendix reports the estimated coefficients used to compute the GIRFs.

¹⁷ 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

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*

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

Main results. Several of our results are to be remarked. First, a 1€ positive (negative) shock¹⁸ to own-source revenues is followed by a reduction (increase) in future own revenues of 71 cents¹⁹ 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

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.

¹⁸ 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.

¹⁹ This means that the level of own-source revenues, after the adjustment process, is 29 cents above the level before the shock occurred.

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3 in own revenues. If we sum up the reaction of own revenues and expenditures, we
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5 estimate that an additional euro of own revenues offsets 97 cents in the primary surplus.
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7 In the Spanish case, therefore, grants do not play any role in offsetting own-source
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9 revenues losses, while the adjustments that follow a deficit attributable to a revenue
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11 shortfall are borne entirely by the municipalities themselves. This is at odds both with
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13 the U.S., where grants offset 9 cents of own-source revenue shocks (Buettner and
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15 Wildasin, 2006), and with Germany, where equalization grants offset 15 cents of the
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17 shock (Buettner, 2007). This might reflect the low equalization power of the main
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19 unconditional grant that Spanish municipalities receive as well as the fact that many of
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21 the grants are earmarked as capital grants, the sum of which has to be matched by a
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23 municipality's resources. These results provide empirical evidence that grants have a
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25 more important role in the adjustment process when they have an equalization objective.
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32 Second, the GIRFs also predict that an innovation to grants (third column) will
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34 be balanced by the response of the variable that experiences the shock, i.e. grants and
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36 expenditures. The response of own-source revenues to an innovation to grants is very
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38 low (just 2 cents, explaining 7% of the permanent increase), providing evidence of a
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40 very strong flypaper effect, which has been already obtained for Spain using different
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42 methodologies (e.g., Solé-Ollé, 2001; Bosch and Solé-Ollé, 2005). This result also
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44 differs markedly from that reported for the U.S. –where own revenues offset 14 cents of
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46 a grant shock and represented roughly a quarter of the adjustment–, but is more similar
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48 to that reported for Germany, where the revenues offset 4 cents of the innovation in
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50 grants (9% of the permanent increase). The several constraints on fiscal autonomy
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52 operating on local taxes in both countries might explain this result.
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58 Third, when a 1€ innovation affects expenditures, the budget is balanced by a 73
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60 cents reduction in future expenditures and by an increase of 8 and 16 cents in future

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3 own-source revenues and grants, respectively. So, while higher tiers of government play
4 no role in absorbing revenue shocks, their role is of paramount importance in the
5 adjustment that follows an expenditure shock. Once again, this result is extreme: own-
6 source revenues in Spain play a similar role to that reported in Germany (where they
7 offset 6 cents of an expenditure shock, since in both cases fiscal autonomy is restricted),
8 but they have much less influence than in the U.S. (where they offset 16 cents of the
9 shock). In the U.S. and Germany, however, grants play the same role in offsetting
10 expenditure shocks (8 cents, approximately), which is much lower than in the Spanish
11 case. Here again this might be due to the nature of intergovernmental grants in Spain.
12 There is empirical evidence that capital grants, given their discretionary allocation, are
13 disproportionately allocated to municipalities facing population growth pressures, mainly
14 caused by urban growth, (Solé-Ollé and Sorribas-Navarro, 2008), since these
15 jurisdictions are the ones that can most readily justify the inadequacy of past facilities.
16 This might have generated a moral-hazard problem, with municipalities having the
17 incentive to undertake excessive expansion since additional capital spending will
18 always be financed (at least in the long run) by higher tiers of government (Solé-Ollé
19 and Viladecans, 2008).

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43 Fourth, we observe that a great share of the fiscal adjustment (70%) is held by
44 the future value of the fiscal variable that experiences the shock. This figure is very
45 similar to those reported in the case of spending for the U.S. and Germany. However,
46 revenues and grants are less volatile in Germany (57% and 55%) and, particularly so, in
47 the U.S. (35% and 47%). The higher volatility of Spanish local own-source revenues
48 could be due to the fact that although the three main local taxes are quite stable (recall
49 that these are the property tax, the business tax and the motor vehicle tax), this might
50 not be the case of other taxes and user charges which are more closely linked to the real
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3 estate cycle (i.e., construction tax, tax on land transactions, building permits, etc.). In
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5 the case of grants, this might reflect the impact of capital grants, which are highly
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7 volatile, since they are not automatic and their discretionary allocation.
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10 Fifth, given this strong reversion effect, it could be interesting to compute the
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12 response to a 1€ permanent increase in each fiscal variable²⁰. As we can see at the
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14 bottom of Table 5, a 1€ permanent increase in own-source revenues is basically
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16 followed by a spending decrease of a similar magnitude (recall that the other effects -
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18 top panel - were not statistically significant). Spanish grants, thus, provide less
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20 insurance than their German counterparts (34% of the permanent increase), but also
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22 even less than U.S. grants (13%). A permanent increase of 1€ in spending is followed
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24 by an increase in own-source revenues and grants of proportions 1/3 and 2/3. Note again
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26 that this suggests that higher tiers of government match local resources in a 2 to 1
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28 proportion in order to finance additional expenditure needs, which we speculate are
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30 related to the urban expansion process. This proportion is just 1 to 1 in Germany and 1
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32 to 2 in the U.S.. Intergovernmental grants in Germany and, especially, in Spain seem to
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34 be quite biased towards funding additional local expenses (particularly compared to the
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36 U.S. case), reaction that can arise a moral hazard problem. Finally, a permanent increase
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38 in grants leads to a higher level of spending, a situation that also occurs to a great extent
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40 in Germany, though not in the U.S..
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48 ***Additional results.*** In order to clarify the above results, we have performed some
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50 additional analyses. To save space, we only discuss the most interesting results and
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52 report the coefficients referred to in Table 6. First, we re-estimated the VECM including
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54 time effects so as to capture the common innovations in fiscal variables. Hence, in this
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²⁰ 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).

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, that the viability of local financial systems does not depend on the type of shock (common or idiosyncratic) experienced.

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

<i>Response of</i>	<i>Innovation to own revenues</i>			<i>Innovation to expenditures</i>			
	<i>Grants</i>	<i>Current Grants⁽²⁾</i>	<i>Capital Grants⁽²⁾</i>	<i>Grants</i>	<i>Current Grants⁽²⁾</i>	<i>Capital Grants⁽²⁾</i>	<i>Own revenues⁽²⁾</i>
All sample	-0.007 (0.046)	0.008 (0.051)	-0.015* (0.009)	0.158*** (0.047)	0.042* (0.025)	0.117*** (0.041)	0.085** (0.042)
Small mun ⁽¹⁾	-0.038* (0.023)	-0.011* (0.006)	-0.019** (0.009)	0.178*** (0.039)	0.038* (0.021)	0.141*** (0.039)	0.038** (0.019)

<i>Response of</i>	<i>Idiosyncratic innovation to own rev.⁽³⁾</i>			<i>Idiosyncratic innovation to expenditures⁽³⁾</i>			
	<i>Grants</i>	<i>Current Grants</i>	<i>Capital Grants</i>	<i>Grants</i>	<i>Current Grants⁽²⁾</i>	<i>Capital Grants⁽²⁾</i>	<i>Own revenues⁽²⁾</i>
All sample	-0.054* (0.029)	-0.015* (0.009)	-0.023** (0.011)	0.213*** (0.052)	0.038* (0.023)	0.169*** (0.045)	0.087** (0.041)
Small mun ⁽¹⁾	-0.074*** (0.031)	-0.027* (0.015)	-0.021*** (0.009)	0.226*** (0.054)	0.040* (0.022)	0.189*** (0.049)	0.066*** (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 (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

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3 overall amount of grants to municipalities does not respond to the evolution in overall
4 local tax revenues²¹, but that grants do respond (to some extent) to revenue shocks that
5 are specific to a given municipality. In the case of capital grants, this might occur
6 because a municipality dedicates greater efforts in applying for project grants after a
7 revenue shortfall; in the case of current grants, this might be due to the equalization
8 component, which despite its obvious shortcomings, could play some role in insuring
9 against asymmetric shocks²². This result might also be due to very ad-hoc interventions
10 by the central government in terms of their providing help to certain municipalities with
11 revenue difficulties.
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25 Third, given the importance of grants in the adjustment process we have
26 estimated the VECM disaggregating grants in current and capital grants²³. We observe
27 in Table 6 that capital grants are more responsive than current grants. For example,
28 when expenditures experience a 1€ shock, capital grants increase by 12 cents whereas
29 current grants only increase by 4 cents. This difference, in absolute values, is even
30 greater when we scale the response of grants by their quantitative importance. On
31 average, capital grants provide around 1/3 of total resources granted. The importance of
32 the reaction of capital grants is even higher in the case of an idiosyncratic shock (17 vs.
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46 ²¹ If grants tend to offset idiosyncratic shocks rather than general shocks, they should
47 increase/decrease after a common positive/negative revenue shock. Note, for instance, that in
48 Spain, the overall pool of unconditional grants to municipalities is indexed to the growth of
49 central government revenues (see Suarez, 1999), which means that unconditional grants tend to
50 fall during a downturn (when both municipal and central revenues decline). So, without
51 significant ad-hoc interventions to provide more resources to the local sector, it is quite natural
52 to see a decrease in the overall amount of grants during a downturn, exacerbating the pro-
53 cyclical nature of local own-source revenues.

54 ²² The main reason for this different reaction is that equalization grants are allocated according
55 to the relative position of municipalities. This relative position will more likely change when an
56 idiosyncratic shock occurs than when there is a common shock to all municipalities. However,
57 the reaction of this grant (that is the main current grant) is of a minor magnitude.

58 ²³ In general, the qualitative results provided by the estimation when adding one new variable
59 are similar, although the precision of the estimates is not as great. Detailed results are available
60 upon request.

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3 4 cents). This result suggests that capital grants are the ones that generate the moral
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5 hazard problem.
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8 Fourth, since the adjustment pattern can be conditioned by the institutional
9 environment, we have replicated the analysis considering only the smaller
10 municipalities. In Spain, the institutional environment across municipalities varies with
11 population size²⁴. We qualify a municipality as small if it has less than 5 000 inhabitants.
12 We have fixed this as our threshold in order to obtain a representative sample of
13 municipalities with the same institutional environment. Moreover, around 85% of
14 Spanish municipalities have less than 5 000 inhabitants²⁵. The main difference between
15 the two samples is the slightly higher response of grants to shocks affecting small
16 municipalities. Thus, the role of upper tiers of government in the fiscal adjustment
17 process is more important in small municipalities than it is in their larger counterparts.
18 As Table 6 shows, when own-source revenues experience a 1€ shock in a small
19 municipality, future grants fall 4 cents (7 cents in the case of an idiosyncratic shock). A
20 positive 1€ expenditure shock in a small municipality implies an increase in future
21 grants and own-source revenues of 18 and 4 cents, respectively (23 and 7 cents in the
22 presence of an idiosyncratic shock). The importance of the upper tiers of government in
23 the case of small municipalities could reflect a combination of factors. First, they have
24 lower maximum ceilings on tax rates, which serve to constrain any reaction they might
25 make through using their own-source revenues. Second, capital investment might be
26 more volatile in small municipalities, due to the lumpiness of capital improvement
27 projects. Third, they will almost certainly experience greater difficulties in obtaining
28 credit.
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58 ²⁴ We identify the following four institutional environments depending on the size of the
59 municipality's population: i) 5 000 or fewer; ii) more than 5 000 but fewer than 20 000; iii) more
60 than 20 000 but fewer than 50 000; and iv) more than 50 000 inhabitants.

²⁵ 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.

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.

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, which have great room for discretionary allocation. This reliance on grants might have given rise to a 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).

Our results provide empirical evidence that the fiscal adjustment pattern is conditioned by the institutional arrangements. We observe that grants have a more important role in the adjustment process when they have an equalization objective (as in Germany) or when there is no clear and objective rule that determines their allocation (as in Spain, capital grants). Own revenues have a lower adjustment capacity when

subcentral governments have constrained fiscal autonomy on them (as in Spain and Germany).

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Appendix:

Table A1: Detailed estimation results for the basic model

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

Note: Heteroscedasticity robust standard errors in parenthesis.