

**FISCAL ADJUSTMENT TO EXOGENOUS SHOCKS:  
EVIDENCE FROM SPANISH MUNICIPALITIES**

Alejandro Esteller-Moré (esteller@eco.ub.es)

Albert Solé-Ollé (asole@eco.ub.es)

Pilar Sorribas-Navarro (sorribas@eco.ub.es)

*University of Barcelona*

*Barcelona Institute of Economics (IEB)*

**ABSTRACT:** The aim of this paper is to analyse whether municipalities adjust in response to an exogenous fiscal shock and (if the answer is yes) which components of the budget are more likely to adjust in the short and in the long run. To answer this question we will have to analyse the direction of causality among the different budgetary components. The methodology used to realise this analysis is a Vector Error Correction Model and it will be applied on a panel data coming from a set of Spanish municipalities during the 90's. Our results confirm, first, that the municipalities adjust to an exogenous shock (i.e., their deficit is stationary in the long run). Second, we find the following causality relationships between budgetary components: "spend and own revenue", "grants and spend", "grants and own revenue".

*Keywords:* fiscal adjustment, (Granger) causality, local government

Corresponding address: Facultad de Ciencias Económicas (UB)

Avda. Diagonal, 690, Torre4, planta 2<sup>a</sup>

08034 - Barcelona (SPAIN)

Phone/Fax: 0034934021812 - 0034934021813

## 1. Introduction

The main purpose of this paper is to analyse whether municipalities adjust in response to an exogenous fiscal shock and (if the answer is yes) which components of the budget are more likely to adjust in the short and in the long run. We will try to answer questions as, for example: What happens when expenditures increase and revenues drop during an economic downturn, generating an unexpected deficit? Do local governments take corrective actions or let the deficit grow? How long is the adjustment process? Will this unexpected deficit be compensated by future transfers from higher layers of governments or the adjustment will be borne entirely by the local economy? And, if the adjustment is completely local, which side of the budget experiences most part of the burden, own revenues or expenditures?

To answer these questions we will have to analyse the direction of causality among different budgetary components, that is, which predicts which in the budget. This will permit us to contrast which of the following strategies set up by the literature adopt the Spanish municipalities: "expend and tax" (Barro, 1979), "tax and expend" (Brennan and Buchanan, 1980) or "interdependence of tax and expenditure decisions" (Black, 1948). Additionally, we will be able to check whether transfers cause and are caused by other budgetary components. Certainly, the traditional literature on Fiscal Federalism predicts that grants might cause expenditures and revenues (Oates, 1972). However, further hypothesis concerning the possibility of bail-outs (Wildasin, 1997) or the presence of asymmetric information between the grantor and the granted (Bordignon et al., 1996) could provoke that transfers may be caused by expenditures and revenues.

The empirical analysis will use data coming from a set of Spanish municipalities during the 90's. Municipalities finance their expenditures with a combination of own taxes, user charges, transfers and borrowing<sup>1</sup>. They enjoy a non-deniable degree of expenditure and tax autonomy and the ability of using debt in order to accommodate both cyclical shocks and investments decisions. However, municipal governments face important institutional constraints. Therefore, the observed dynamic pattern in front of a shock of local fiscal policy does not only depend on the preferences of voters and

---

<sup>1</sup> Operating transfers represent approximately a 30% of current revenues. Two thirds of own revenues come from taxes and the remaining are user charges.

politicians but also on the institutional constraints. Among the most relevant institutions that could condition the capability of adjustment in front of a shock we should cite (see Suárez, 1999 for a survey):

(i) Spanish municipalities are able to change the tax rates of all the taxes they have been assigned but there are both compulsory minimum statutory tax rates (common to all municipalities) and ceilings (the higher the higher the population size). That means that although taxes can be used as an adjustment tool, there are legal rules that constraint the possible reaction<sup>2</sup>.

(ii) The main local taxes are a property tax, a business tax, and a motor vehicle tax. In general, their bases are very inelastic, a fact that avoids big revenue shocks during downturn but that makes difficult revenue adjustment in booms. Moreover, these taxes are considered as inequitable and quite unpopular, reducing the ability of municipalities to make substantial adjustments in the tax rates in a short period of time.

(iii) A great share of operating transfers is unconditional, coming from a formula grant from the central government.<sup>3</sup> Although the formula structure suggests that it will not respond to local shocks, there is still some room for discretionary adjustment<sup>4</sup>.

(iv) Capital transfers are proportional closed-ended grants. The distribution of such grants is subject to substantial degrees of discretion by the grantor government<sup>5</sup>. Therefore, these transfers are amenable to respond in presence of local budget shocks<sup>6</sup>.

---

<sup>2</sup> Few municipalities have reached the top tax rates but in some of them (specially the big ones) the existing room is quite low.

<sup>3</sup> This grant does not equalise fiscal capacity and the only relevant expenditure needs indicator considered is population, with per capita weights increasing with population size. A little share of the funds is distributed in proportion to fiscal effort, although there is a minimum guaranteed amount of transfer.

<sup>4</sup> Although the transfer is formula based it is not entirely transparent because of guaranteed minima, a lack of data actualisation, and the exceptional special treatment of a few municipalities.

<sup>5</sup> Municipalities obtain the funds after a process of project selection based on some objective criteria (expenditure needs, financial situation) but ultimately influenced by the grantor criteria.

(v) Debt is subject to some ceilings. Debt service is limited as a proportion of current revenues and short term financial position should be sound. However, enormous problems exist to effectively control these indicators. This means that in practice autonomy in local debt policy is considerable and mainly limited by market constraints.

Ultimately, the results of our empirical analysis will show if this institutional design passes a basic survival test, that is, facilitates the adjustment process and, introduces incentives to behave efficiently. This result is of interest both to derive insights that are applicable to federations in general, and in particular for the reform of the financing system of Spanish municipalities. Public finance scholars and practitioners around the world have recently focused in a sometimes neglected topic: the effects of decentralisation on overall fiscal discipline (see, e.g., Tanzi, 1995, Rodden, 2000 and 2001, Rodden *et al.*, 2001). The main concern of such strand of the literature is whether excessive local government borrowing and associated bail-outs by central government are tied to a particular institutional design. The conclusion of these analysis suggests that important elements to insure stable financial arrangements are effective credit markets financing and enough fiscal responsibility (among other factors, see Inman, 2001, and Rodden *et al.* 2001).

In Spain there was some concern about financial unsustainability and bail-outs of the municipalities during the 80's. Fortunately, a reform undertaken at the end of this decade which increased municipal tax power solved these problems. Nevertheless, a general evaluation of the workings of the model in the 90's is still lacking. The urgency of this exercise is exacerbated by the recent Law of Budget Stability passed by the Spanish central government, completely forbidding deficits except in very special cases, and the on-going reform of municipal finance, that plans to abolish the local business tax without any clear alternative. How will the municipalities adjust to adverse shocks

---

<sup>6</sup> The closed-ended character means that most of the times they have no price-effect. Moreover, current practice in local government suggests that, although projects must be co-financed, they partly substitute for investment financed out of local resources. This happens because the kind of projects financed by the grantor tend to be those that would have been budgeted by the local council even without grants, and because of lack of good execution controls that allow, in some cases, that effective co-financing reduces to zero. All this means that these grants may serve to compensate communities in financial trouble.

after this reform? Can we learn something by analysing how they have adjusted during the 90's?

The methodology employed in this paper closely follows the one developed by Bohn (1991) and applied by Buettner and Wildasin (2001) to the local governments in the USA. We analyse the causality among taxes, expenditures, transfers and debt charges in a Vector Error Correction Model (VECM). The model is very similar to the Vector Autorregression (VAR) used by Holtz-Eakin *et al.* (1989) and Dalhberg and Johansson (1994), with the only difference that the VECM includes the deficit (supposed to be stationary) in the estimated equations. This specification allows us to differentiate among short term and long term causality and to trace out the adjustment process. Other papers analysing adjustment to fiscal shocks but with different methodologies are those of Poterba (1994) and Rattso (1999). There is a complete lack of similar studies in the Spanish case. In fact, only a few papers have analysed the determinants of budget choices in this case (see, e.g., Solé-Ollé, 2001).

The empirical model used will give a precise picture of the relationship among various budget components. However, we have to recognise that this empirical approach is not based on a structural model of local government's fiscal behaviour. Instead of this we rely on a reduced form model that is consistent with different theoretical hypothesis. Moreover, quite often different hypothesis give the same prediction concerning the direction of causality between budget components. Therefore, all we are able to do in this paper is to summarise different stories about causality, to see which linkages are detected in the data, and to tell if these relationships are consistent with one (o more) of the advanced hypotheses. Because of this, the paper starts in the second section with a survey of the main hypothesis about the direction of causality among the different budget variables. The third section fully develops the empirical methodology used in the paper to characterise dynamic fiscal policy. The fourth section introduces the data set, discusses the econometric techniques employed and presents the main results. Finally, the last section concludes with a tentative interpretation of the result in light of the institutional treats of Spanish municipalities (explained above) and the theoretical hypothesis about causality (to come in the next section).

## 2. Fiscal adjustment and causality: theoretical insights

In this section we survey the main theoretical hypothesis regarding causality among fiscal variables. We focus, first, on tax-expenditure linkages, and then we analyse the relationship between intergovernmental grants, on the one hand, and taxes and expenditures, on the other. This second topic is of special relevance in our empirical analysis, since we focus on dynamic fiscal adjustment made by Spanish municipalities and grants represent a sizeable share of its budget.

### *Tax-expenditure linkages:*

The relationship among these budgetary components has been widely discussed in the political economy literature. As von Furstenberg *et al.* (1986) and Holtz-Eakin *et al.* (1989) note, different hypothesis have been advanced:

1. *Taxes and expenditures are interdependent.* This hypothesis states that both budgetary components change concurrently and, therefore, causality will run both from expenditures to revenues and from revenues to expenditures. Such a pattern results if political decisions on spending and on taxes are taken simultaneously by the citizens of a jurisdiction (or by their representatives). The main theoretical model generating such behaviour is the median voter model (Black, 1948; Meltzer and Richard, 1981). Welfare-maximising oriented models, as Barro's "tax-smoothing" (1979) are also consistent with this behaviour when expenditure is not supposed to be determined exogenously but decided by politicians. We have to note that both median-voter and welfare maximising models have been widely used to derive testable implications regarding the determination of local fiscal policies<sup>7</sup>.

2. *Expenditures determine taxes.* This hypothesis states that taxes only change after expenditures have experienced an exogenous shock. The need for an increase in expenditure is generated by some special event (e.g., a war, an earthquake, a social crisis or so on). After the shock, politicians are able to convince the voters that the only way to balance the budget is through increasing taxes (Peacock and Wiseman, 1979).

---

<sup>7</sup> See Borcheding and Deacon (1973), and Wildasin (1986), cap. 4, for illustration of empirical analysis based on both approaches.

This explanation is also consistent with the fiscal illusion that arises when public goods that benefit specific social groups are funded by general taxes (Weingast *et al.*, 1981) or with co-operation problems arising among these groups or among political representatives (see, von Hagen and Harden, 1992, and Alesina and Perotti, 1995). If this is the case, the political pressures for higher spending will dominate the budgetary process, prompting excessive spending and/or deficits that will require additional (present or future) tax increases. The resulting increase in taxes or deficits will be higher the more lax are the budget rules (von Hagen, 1992) and the more fragmented is the government (Roubini and Sachs, 1989).

But just as in hypothesis 1, this pattern can also be rationalised by an intertemporal decision-making model. In fact, the “tax smoothing” model also predicts that an unanticipated rise in public spending will be followed by a rise in revenues, achieved by choosing a higher constant tax rate.

3. *Taxes determine expenditures.* This sequence of events means that expenditure increases must wait until there are enough available revenues. Different theories may help to explain this behaviour. First of all, there is the Leviathan hypothesis (Brennan and Buchanan, 1980). According to this approach, the government will attempt to maximise tax revenues, taking into account the behavioural responses to taxation. In the case of local governments, the ability to raise taxes is further reduced by the mobility of residents and factors across jurisdictional boundaries and by institutional constraints, such as the limits on the tax rates. Due to these two arguments, it is expected that this hypothesis will not hold at municipal level.

A variant of this theory relies on voter fiscal illusion (Feenberg and Rosen, 1983), which states that elastic tax bases provide automatic revenue increases that are not noticed by voters (or at least, less noticed than statutory tax increases) and that, therefore, can be spent by politicians without the risk of being thrown out of office. This argument may be extended to revenue increases arising from technological advances in tax administration (Gramlich, 1989). However, this story can not be interpreted in all the situations as a political failure. For example, in the case of local governments it may happen that decentralised tax bases are rather inelastic, inefficient or inequitable (relatively to the ones kept by the federal and regional governments) and, therefore, it

may be very costly to raise taxes in the margin. Moreover, statutory limitation over tax rates may make very difficult to adjust tax revenues after a shock<sup>8</sup>. This means that local governments may be severely limited (by law or *de facto*) in the possibility of raising revenues.

Second, the intertemporal model may also be appropriate to explain the fact that taxes come before expenditures. For example, if there are borrowing restrictions (legal or derived from credit shortages) and marginal costs of raising taxes are high, expenditures (i.e., investments) will be delayed until enough savings have been accumulated. In a similar vein, a community may decide to save for anticipated future expenditures, suggesting again the appropriateness of invoking an intertemporal model.

#### *Grants-local budget linkages:*

Intertemporal links among transfers and local budgets have been analysed only in a few papers (see, e.g., Holtz-Eakin *et al.*, 1989, and Dahlberg and Johansson, 1998). These authors give few insights into the theories that can be invoked to explain the direction of causality. For example, Holtz-Eakin *et al.*, 1989 discuss the possible influence of grants on local decisions but not the possibility of reverse causality. Although this is the main topic analysed by the fiscal federalism literature, further hypothesis will be set in order to include stories that help us to understand why grants may respond to shocks in the local budget.

1. *Grants determine both expenditures and taxes.* The intuition behind this story is that the resources received by local governments from intergovernmental grants will be partly spent and partly returned to citizens in form of tax reductions. Representative voter models suggest that the response of expenditures and taxes to grants should be the same than the response to an increase in local income (Oates, 1972). Therefore, provided that the income-elasticity of public goods is not too high, increases in grants will prompt both expenditure increases and tax reductions.

---

<sup>8</sup> Note that this may be true if there are tax rates ceilings but also if minimum tax rates are compulsory, and both kinds of limitations exist in the case of Spanish municipalities. In the first case it will be difficult to adjust to negative shocks by raising taxes; in the second case it will be difficult to adjust to positive shocks by lowering taxes.



However, previous econometric work on the determinants of local expenditure suggests that grants from other levels of government affect municipalities' fiscal decisions differently than own source revenues (see Hines and Thaler, 1995, for a survey). An important empirical regularity of these studies is the so-called "flypaper effect": a unit increase in exogenous grants stimulates local spending more than a unit increase in local income (see Hines and Thaler, and Solé-Ollé, 2001, for the case of Spanish municipalities). One interpretation of this result is that political representatives want to expand the amount of spending beyond the level desired by the representative voter. The channel that allows representatives to over-expand the local budget is the lack of information (named "fiscal illusion") that voters have about the composition of the revenue budget. Contrary to the conventional model, the "flypaper hypothesis" predicts that increases in grants will be transformed in spending increases more than in tax reductions. Therefore, in this case it is even possible that grants cause expenditures but not taxes.

*2.Expenditures and taxes determine transfers.* This hypothesis states that transfers change after expenditure and tax have changed. The stories that can be invoked to justify these linkages are various. First, intergovernmental transfers may be explicitly designed in order to compensate for differences in expenditure needs, fiscal capacity and tax effort across local governments. There are many examples of such equalisation grants in different countries (see, Sha, 1994 for a survey). In this case, a local government facing an expenditure shock (i.e., an increase in expenditure needs) or a revenue shock (i.e., a drop in fiscal capacity or an increase in tax effort<sup>9</sup>) will receive more transfers from higher levels of government. However, the response of transfers may be different if the shock is idiosyncratic than if it affects all the local governments. This is because in many equalisation schemes distribution formulae works independently of the decisions governing the total amount of funds to distribute (Sha, 1994)<sup>10</sup>.

---

<sup>9</sup> In Spain an increase in tax effort has only a marginal effect on the amount of transfers received. Vid footnote 3.

<sup>10</sup> Therefore, if the formula is redistributive, a drop in *relative* fiscal capacity (or an increase in *relative* expenditure needs) will cause the transfer received to increase. However, a general drop in fiscal capacity may not have the same impact on the funds received. In fact, since sometimes the total amount of funds is tied to general economic indicators (e.g., GDP growth) there could be a reduction in total transfers distributed.

Second, expenditure needs and fiscal capacity may be also present in more discretionary transfer programs, as is the case of capital transfers in Spain. However, such transfers require local funds to complement transfers in the financing of specific projects. This opens the door to causality from local revenues to transfers received. Since it is not possible to finance the project exclusively from transfers, the more revenues you have the more projects you are able to co-finance. Casual observation suggests that local politicians do not refuse the finance of capital projects even if they do not have actually the funds to co-finance. However, the result of this process tends to be the delay of project execution until enough local funds have been raised. Certainly, it could also happen that an increase in grants predicts an increase in revenues in the following period.

Third, causality from local budgets to transfers could also arise endogenously in a model of grantor decision-making. Some recent papers view the distribution of transfers as a game in which the grantor and the grantee have asymmetric information about local conditions and performance (Bordignon et al, 1996) giving rise to problems of *adverse selection* and *moral hazard*, respectively<sup>11</sup>. In such a game local expenditure and revenue decisions will be interpreted as signals by the grantor interested in avoiding a drop in service quality. The main theoretical result from this literature and actual practice in local government finance suggests that high tax effort may be interpreted as a signal of low taxable capacity, or higher expenditure needs. Therefore, this story also suggest that expenditures and revenues could cause transfers, although the sign of the linkage is uncertain<sup>12</sup>. Moreover, information about objective conditions (e.g., size of tax bases) and the use of ‘yardsticks’ would help to mitigate the informational problem and suggest that also in this case separation among idiosyncratic and common shocks will be of interest.

Fourth, the linkage from local budgets to transfers could also arise if the local government does not see the total amount of resources as fixed, but considers that the

---

<sup>11</sup> See for a survey on these issues Wellisch, 2000, chapter 10.

<sup>12</sup> At first sight, this story seems most applicable to discretionary than to formula grants. However, in the long run also distribution formulae can be considered as endogenous and be therefore modelled similarly.

central government will provide a bail-out in the future if the local financial situation deteriorates enough (Inman, 2001). Two different scenarios could arise from the equilibrium of such a “bail-out” game (Rodden, 2001): (i) local governments know that the central government is resolute and will not provide bail-outs and, therefore, they do not issue excessive debt (or do not let service quality to deteriorate) and, at the end, do not receive the bail-out, (ii) the no bail-out statement of the central government is not credible, localities behave irresponsible and, finally, the bail-out comes. The possibility of an inefficient equilibrium of type (ii) depends, as Inman (2001) and Rodden (2001) observe, on country-specific institutional factors (e.g., reliance on transfers versus own revenues, local tax power, efficiency of credit markets, etc.) and on traits of individual municipalities, as for example its size (Wildasin, 2000). This argument may be of application not only to episodic bail-out situations (of which there are no examples in the Spanish case<sup>13</sup>) but to the on-going process of transfer-setting, as long grantors have some discretion in the distribution of funds. Therefore, interpreted in this vein, this story tells us that causality will run from higher expenditures and lower revenues (i.e., higher deficit) to transfers. Also in this case the linkages may be different in the case of idiosyncratic and common shocks, and may be different for different types of localities (e.g., big and small, poor and rich, etc.).

### *3. Transfers and local budgets are interdependent*

Hypotheses 1 and 2 are not incompatible. One can find situations where hypothesis 1 is supporting with and without finding support for hypothesis 2. However, if one expects that irrespective of the accomplishment of hypothesis 2, some effects of transfers on local budgets will be detected (hypothesis 1).

Which of these stories is most appropriate to explain the reality of fiscal adjustment made by municipalities is something that only the empirical analysis will be able to tell us. In addition to that, we will try to disentangle if the causality between revenues and expenditures happens only in the short run or extends also to the long run relationship

---

<sup>13</sup> In fact, there are no bankruptcies documented in the Spanish case. But de-facto bankruptcies are quite common. These do not tend to materialise in non-sustainable long-term debt levels but, for example, in growing delays in the payment to providers or in substantial deterioration of service quality.

among the variables. Due to space limitation we do not discuss this possibility, but no doubt exists that as the direction of causality may differ in the short and in the long run<sup>14</sup>, the explanations for this causality may also differ according to the time horizon of the analysis.

**TABLE 1: SUMMARY OF THE MAIN THEORETICAL HYPOTHESIS REGARDING CAUSALITY**

	<i>Taxes</i>	<i>Expenditures</i>	<i>Grants</i>
<i>Taxes cause</i>		1. Leviathan 2. voter fiscal illusion 3. Institutional limits on taxes	1. Equalisation grants 2. Discretionary grants 3. Asymmetric information 4. Bail-out
<i>Expenditures cause</i>	1. Unexpected event 2. Fiscal illusion 3. Soft budget rules, fragmented government 4. Tax smoothing		1. Equalisation grants 2. Discretionary grants 3. Bail-out
<i>Grants cause</i>	1. Representative voter model	1. Representative voter model 2. Flypaper effect	

### 3. Empirical framework

Assuming that the deficit is stationarity (i.e. budgetary items display a cointegration relationship), a way commonly used in the literature to model empirically budgetary adjustment to fiscal shocks and the causality relationship among the different components of the budget, is through a vector error-correction model (VECM)<sup>15</sup>. We distinguish the following four budgetary components: own revenues,  $R_t$ , grants,  $G_t$ ,

<sup>14</sup> For example, it is credible that in the short run a municipality could follow a Leviathan behaviour (taxes determine expenditures), but it is not reliable that this behaviour could be maintained in the long run, due to the electoral process, yardstick or tax competition among others.

<sup>15</sup> See Bohn (1991), Buettner and Wildasin (2001).

non-financial expenditures,  $E_t$ , and debt service,  $DS_t$ , and express the VECM as follows:

$$\Delta R_t = \sum_{i=1}^m \beta_i^1 \Delta R_{t-i} + \sum_{i=1}^m \alpha_i^1 \Delta G_{t-i} + \sum_{i=1}^m \delta_i^1 \Delta E_{t-i} + \sum_{i=1}^m \lambda_i^1 \Delta DS_{t-i} + \gamma^1 D_{t-1} + u_t \quad (1)$$

$$\Delta G_t = \sum_{i=1}^m \beta_i^2 \Delta R_{t-i} + \sum_{i=1}^m \alpha_i^2 \Delta G_{t-i} + \sum_{i=1}^m \delta_i^2 \Delta E_{t-i} + \sum_{i=1}^m \lambda_i^2 \Delta DS_{t-i} + \gamma^2 D_{t-1} + u_t \quad (2)$$

$$\Delta E_t = \sum_{i=1}^m \beta_i^3 \Delta R_{t-i} + \sum_{i=1}^m \alpha_i^3 \Delta G_{t-i} + \sum_{i=1}^m \delta_i^3 \Delta E_{t-i} + \sum_{i=1}^m \lambda_i^3 \Delta DS_{t-i} + \gamma^3 D_{t-1} + u_t \quad (3)$$

$$\Delta DS_t = \sum_{i=1}^m \beta_i^4 \Delta R_{t-i} + \sum_{i=1}^m \alpha_i^4 \Delta G_{t-i} + \sum_{i=1}^m \delta_i^4 \Delta E_{t-i} + \sum_{i=1}^m \lambda_i^4 \Delta DS_{t-i} + \gamma^4 D_{t-1} + u_t \quad (4)$$

where  $D_t$  is general deficit defined as:

$$D_t = E_t + DS_t - R_t - G_t \quad (5)$$

Here we have a 4-equations, 4-variables model in which each variable is explained by its own lagged values, plus past values of the remaining variables and an error correction term. This model describes the dynamics of budgetary fiscal adjustment, differentiating among the reactions in the short run, captured by the coefficients of the variables expressed in first differences, and the reactions in the long run, captured by the error correction term. In relation to the debt service equation, Bohn (1991) demonstrated that in the absence of population growth, given a constant rate of interest, the coefficient of the deficit should reflect the real interest rate. Moreover, this specification allows to examine whether lagged values of one variable explain another variable, i.e., it describes the causality relationships of the budgetary components over time. In order to analyse these nexus in the short run, we perform the (Granger) causality test (Granger, 1969). Testing, for instance, if expenditures do not cause own revenues, is a test of the hypothesis that the coefficients of the expenditures on the revenue equation (1) are jointly insignificant,  $\delta_1^1 = \delta_2^1 = \delta_3^1 = 0$ . This test is carried out using a standard Wald test.

## 4. Data and estimation

### 4.1.Data

To analyse the causality relationships among the different components of the budget and their adjustment to fiscal shocks, we use a 8 years panel, from 1992 to 1999, with information on four fiscal variables for 137 municipalities of the province of Barcelona<sup>16</sup>. Thus, we have a panel with 1.096 observations, but, as there are variables expressed in first differences and it is a dynamic panel with three lags of the endogenous and of the explanatory variables, four years are lost.

**TABLE 2: SUMMARY STATISTICS**

	<i>Mean</i>	<i>Max.</i>	<i>Min.</i>	<i>Std.Dev.</i>
<i>Levels per capita, 1992-1999</i>				
Revenues	81.371	323.087	22.392	36.496,44
Grants	34.177	222.181	5.941	19.514,9
Expenditures	98.248	296.191	33.395	36.103,86
Debt service	4.127	29.352	18	3.472,24
General deficit	-13.174	130.973	-227.562	23.796,63
<i>Annual differences per capita, 1992-98</i>				
Revenues	1.838	213.701	-219.540	33.211,36
Grants	160	182.043	-112.204	20.734,51
Expenditures	2.032	175.542	-184.328	31.084,83
Debt service	-411	7.814	-21.076	1.550,92

On the revenue side we distinguish among own revenues,  $R_t$ , that include current, capital and financial revenues, and the revenues obtained from higher levels of

---

<sup>16</sup> All this information has been provided by the SIEM, studied realised yearly by the Diputaci3n of Barcelona (supramunicipal council). This sample does not include information about the city of Barcelona. The initial dataset had more cross-section observations, but some municipalities have been removed from the sample due to either the lack of information for some years or the inconsistency of the observations over time.

governments,  $G_t$ , which are quite important at municipal level<sup>17</sup>. On the expenditure side there are also two variables: general expenditures,  $E_t$ , which includes current and capital expenditure, and the debt service,  $DB_t$ . All the variables have been deflated and expressed in per capita terms. We have not scaled fiscal variables in terms of income due to the lack of elasticity of the municipal revenues. Table 2 reports the summary statistics of the four fiscal variables used in the analysis.

## 4.2. Unit-root test

Before estimating the model, it is important to check whether the basic hypothesis of the model holds, that is, whether the general deficit is stationary. Using panel data, the unit root test proposed by Dickey and Fuller (1979) cannot be performed because it provides biased estimators<sup>18</sup>. Breitung and Meyer (1994) demonstrated that subtracting the first observations from both sides of the Dickey-Fuller equation, under the null hypothesis of a unit root test, the bias disappears. This correction implies that cross-section observations are cointegrated at different levels. This procedure was expanded allowing for different dynamics across groups by Levin and Lin (1993). Im et al. (1997) developed another unit-root statistic that solves the bias problem by subtracting cross-section means from both sides of the equation.

The unit root statistics obtained by the method developed by Levin and Lin (L/L) and Im et al (I/P/S) are reported in Table 3. From them we conclude that stationarity is accepted for general deficit and grants, but it is rejected for expenditures, debt service, and revenues, when the serial correlation of the test is higher. Nevertheless, for the first differences of the four fiscal variables we cannot reject stationarity. Thus, these results support the specification of the dynamic adjustment by means of a VECM model.

---

<sup>17</sup> See footnote 1.

<sup>18</sup> See Nickell (1981).

**TABLE 3: UNIT ROOT TEST**

<i>Lag order</i>	1		2	
	<i>L/L</i>	<i>I/P/S</i>	<i>L/L</i>	<i>I/P/S</i>
Revenues	-6.266*	-1.978*	-2.949*	-0.210
Grants	-2.346*	-2.534*	-15.147*	-19.594*
Expenditures	0.700	0.147	-1.216	-1.412
Debt service	1.981	3.068	1.681	-1.245
General deficit	-1.964*	-2.480*	-10.642*	-3.944*
$\Delta$ Revenues	-31.768*	-10.128*	-15.87*	-11.94*
$\Delta$ Grants	-27.641*	-8.540*	-19.14*	-9.87*
$\Delta$ Expenditures	-9.876*	-6.120*	-8.71*	-5.72*
$\Delta$ Debt service	-19.421*	-14.583*	-16.42*	-12.55*

Note: \* significant rejection of nonstationarity at the 5% level

### 4.3. Estimation and results

Following Breitung and Meyer (1994), in order to obtain unbiased estimators, we have estimated each equation of the VECM by OLS subtracting the first observation of each variables. Before we analyse the relationships among the different budgetary components and how they adjust to fiscal shocks, we have to determine the optimal lag length of the variables included in the VECM. Although theoretically responses to fiscal shocks may take place at any future date, empirically we have to explore the relationship and responses of budgetary components during a limited period of time, defined by the choice of the lag length. As the empirical literature has shown that fiscal adjustment is mainly realised in a period of 2 or 3 years<sup>19</sup>, to specify the lag length of the model, we begin with 3 lags and, using the maximum log-likelihood ratio test, we check for possible reductions, which are not accepted as it is shown in Table 4.

<sup>19</sup> See Holtz-Eakin et al. (1989).



**TABLE 4: SPECIFICATION TESTS**

<i>Lag order</i>	2 - 1	3 - 2
Revenues	3212.716**	3222.414**
Grants	3164.816**	3078.624**
Expenditures	3284.102**	3206.510**
Debt service	2364.456**	2347.836**

Note: \* & \*\* significantly different from zero at the 90 and 95% levels

**TABLE 5: ESTIMATED COEFFICIENTS OF THE VECM**  
( $N=137, T=4, N*T=548$ )

<i>Dependent variable</i>	$\Delta R_t$	$\Delta G_t$	$\Delta E_t$	$\Delta DS_t$	$\Delta R_t$	$\Delta G_t$	$\Delta E_t$	$\Delta DS_t$
$\Delta R_{t-1}$	-0.7463 (0.0945)**	0.0318 (0.0572)	0.0660 (0.0815)	0.0273 (0.0044)**	-0.3593 (0.1078)**	0.0643 (0.0677)	-0.0043 (0.0975)	0.0207 (0.0052)**
$\Delta R_{t-2}$	-0.4289 (0.0807)**	0.0639 (0.0489)	0.0924 (0.0696)	0.0181 (0.0037)**	-0.1640 (0.0852)*	0.0963 (0.0535)*	0.0585 (0.0771)	0.0128 (0.0041)**
$\Delta R_{t-3}$	-0.1871 (0.0592)**	0.0123 (0.0358)	0.0861 (0.0510)*	0.0148 (0.0027)**	-0.0553 (0.0584)	0.0346 (0.0367)	0.0802 (0.0529)	0.0119 (0.0028)**
$\Delta G_{t-1}$	-0.0076 (0.1150)	-0.4935 (0.0696)**	-0.0554 (0.0991)	0.0301 (0.0053)**	0.4251 (0.1252)**	-0.4145 (0.0787)**	-0.0931 (0.1134)	0.0218 (0.0060)**
$\Delta G_{t-2}$	-0.1367 (0.1097)	-0.4610 (0.0664)**	-0.2740 (0.0946)**	0.0190 (0.0051)**	0.1574 (0.1106)	-0.4168 (0.0695)**	-0.2907 (0.1001)**	0.0127 (0.0053)*
$\Delta G_{t-3}$	0.0191 (0.0990)	-0.1174 (0.0599)*	-0.0760 (0.0853)	-0.0052 (0.0046)	0.1456 (0.0953)	-0.0731 (0.0599)	-0.0710 (0.0863)	-0.0079 (0.0046)*
$\Delta E_{t-1}$	0.0306 (0.0991)	-0.0702 (0.0600)	-0.5439 (0.0855)**	-0.0265 (0.0046)**	-0.3632 (0.1108)**	-0.1244 (0.0696)*	-0.4966 (0.1003)**	-0.0195 (0.0053)**
$\Delta E_{t-2}$	0.1307 (0.0855)	-0.0534 (0.0518)	-0.2268 (0.0737)**	-0.0160 (0.0039)**	-0.1338 (0.0887)	-0.0846 (0.0557)	-0.2030 (0.0803)*	-0.0107 (0.0042)*
$\Delta E_{t-3}$	-0.0868 (0.0646)	-0.0224 (0.0391)	-0.2071 (0.0557)**	-0.0032 (0.0030)	-0.2108 (0.0630)**	-0.0531 (0.0396)	-0.2110 (0.0570)**	-0.0004 (0.0030)
$\Delta DS_{t-1}$	0.4250 (0.9228)	-0.0784 (0.5586)	-0.5189 (0.7956)	-0.0353 (0.0430)	0.8185 (0.9060)	0.3225 (0.5698)	0.1787 (0.8205)	-0.0578 (0.0437)
$\Delta DS_{t-2}$	-0.6365 (0.9932)	-0.4695 (0.6012)	-1.6706 (0.8564)*	-0.0451 (0.0463)	-0.6108 (0.9680)	-0.5537 (0.6088)	-1.6140 (0.8766)*	-0.0394 (0.0467)
$\Delta DS_{t-3}$	-1.5145 (0.8079)*	-0.1783 (0.4890)	0.2363 (0.6966)	-0.0601 (0.0376)	-1.5506 (0.7653)*	-0.2277 (0.4813)	0.3875 (0.6931)	-0.0657 (0.0369)*
$D_{t-1}$	-0.0709 (0.0885)	0.0075 (0.0536)	-0.2673 (0.0763)**	0.0466 (0.0041)**	0.4765 (0.1146)**	0.0833 (0.0720)	-0.3129 (0.1038)**	0.0360 (0.0055)**
$T_1$	--	--	--	--	4294.7 (2563.4)*	58.27 (1612.3)	-5936.3 (2321.6)**	146.95 (123.90)
$T_2$	--	--	--	--	15848.4 (2570.3)**	-757.75 (1616.6)	-1957.9 (2327.8)	-408.43 (124.24)**
$T_3$	--	--	--	--	19241.0 (2728.2)**	8361.12 (1715.9)**	5799.7 (2470.9)**	-558.16 (131.87)**
$T_4$	--	--	--	--	10312.2 (2995.1)**	176.99 (1883.8)	7.6768 (2712.6)	-167.78 (144.77)
Adjusted -R <sup>2</sup>	0.3403	0.2851	0.3155	0.1162	0.4324	0.3161	0.3307	0.1580
F.statistic	24.5160	19.1854	22.0096	6.9935	25.2915	16.8035	17.8912	7.4173
$\lambda_{TE}$	--	--	--	--	72.359**	26.882**	16.138**	30.537**

Notes: \* & \*\* significantly different from zero at the 90 and 95% levels

Table 5 reports the estimated coefficients of the VECM, with and without time effects. The introduction of time effects captures the common innovations in budgetary components, and hence, the parameters estimated will only describe the adjustment to idiosyncratic shocks. Using the Wald test ( $\lambda_{ET}$ ), we accept the hypothesis that the time effects are significantly different from zero in the four equations of the model.

**TABLE 6: (GRANGER) CAUSALITY IN THE SHORT RUN**

<i>Variable</i>	<i>R</i>	<i>G</i>	<i>E</i>	<i>DS</i>	<i>R</i>	<i>G</i>	<i>E</i>	<i>DS</i>
	<i>Without time effects</i>				<i>With time effects</i>			
Revenues eq.	.-	2.711	9.932**	4.001	.-	12.962**	22.231**	5.364
Grants equation	2.963	.-	1.485	0.687	4.544	.-	3.650	1.533
Expenditures eq.	3.040	10.360**	.-	4.253	3.917	10.470**	.-	4.350
Debt service eq.	46.835**	43.453**	34.056**	.-	24.558**	24.802**	15.471**	.-

Note: \* & \*\* significantly different from zero at the 90 and 95% levels

The main results of the Granger causality test, reported in Table 6, are:

(i) *Expenditures cause revenues and not the reverse.* As we have seen in section 2, there are four possible explanations of this causality relationship: 1) the existence of an unexpected event that generates an increase in expenditures, 2) the existence of fiscal illusion, 3) soft budget rules and fragmented governments, and 4) tax smoothing.

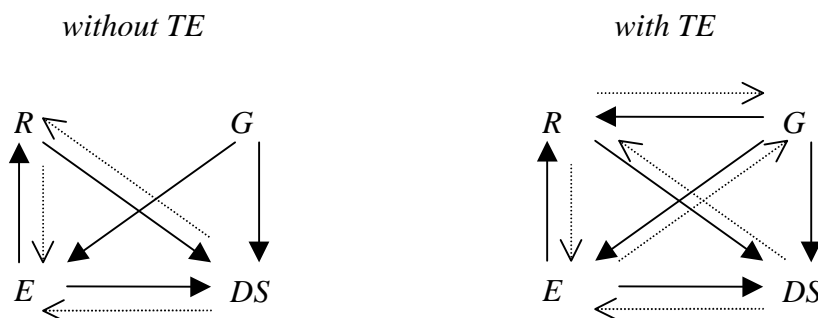
(ii) *Grants cause revenues (with time effects, only).* This relationship, that only holds in front of an idiosyncratic shock, can be explained by the voters model, which implies that part of the grant is returned to the citizens in form of a tax reduction, or because the grant is given to co-finance a project that needs to rise own revenues.

(iii) *Grants cause expenditures.* The nexus among these two budgetary components can confirm either the voter model or the flypaper hypothesis, but both of them have the same implication, that is, an increase in the amount of revenues obtained from other levels of governments stimulates local spending.

(iv) Fourth, *Revenues, grants and expenditure cause debt service*. This relationship could be explained by the fact that revenues, grants and expenditures determine the level of public debt, and public debt determines the debt service, given an interest rate.

(v) Finally, *none budgetary component causes grants*. Hence, grants are completely exogenous and none of the hypothesis that state that grants change after expenditures and taxes have changed holds, in the case of the Spanish municipalities. Therefore, there does not exist in the short run evidence of bailing-out nor the transfer are conditions on budgetary items in order to overcome potential problems of asymmetric information.

**GRAPHIC 1: CAUSALITY RELATIONSHIPS IN THE SHORT RUN**



Graphic 1 displays the short run linkages of the budgetary components obtained by the Granger causality test. We have also added, using discontinuous lines, the nexus among the variables that, although they do not (Granger) cause the other, at least one of the lag values included in the VECM is significantly different from zero.

The estimated coefficients of the error correction term,  $D_{t-1}$ , reported in table 7 show that, in the long run depending on whether the shock is common or idiosyncratic, the adjustment is carried out in a different way. In the case of a common shock, neither revenues nor grants response and hence, the adjustment is only carried out by a reduction in expenditures and an increase in the debt service. On the other hand, a higher deficit generated by a idiosyncratic shock has a negative effect on expenditure and a positive effect on own revenues and debt service. Thus, the estimated long run coefficients asserts convergence towards the intertemporal budget constraint. It is worth

to notice that grants do not react to any type of shock and hence, do not play any role in this convergence process, although the probability of reacting is higher when the shock is idiosyncratic.

**TABLE 7: ADJUSTMENT IN THE LONG RUN**

$\hat{\gamma}$	<i>Without TE</i>	<i>with TE</i>
Revenues eq.	-0.0709	0.4765**
Grants equation	0.0075	0.0833
Expenditures eq.	-0.2673**	-0.3129**
Debt service eq.	0.0466**	0.0360**

Notes: \* & \*\* significantly different from zero at the 90 and 95% levels

## 5. Conclusions

The aim of this study was to analyse the dynamic fiscal response of the municipalities in the long and short run in front of an unexpected shock. The interest of the study is motivated by the recent pass of a law that impedes that municipalities incur in a deficit, so-called Law of Budget Stability. To empirically analyse the process of fiscal adjustment a panel of data corresponding to 137 municipalities of the province of Barcelona for the period 1992-1999. The methodology used has been a Vector Error Correction Model.

Our methodology assumes that the deficit is stationary. In order to assert such hypothesis for our data, we carried a unit-root test for panel data, which confirmed its stationarity. That is, though in the short run there may be exogenous shocks that rise the level of deficit, in the long run it always converges to its original level. This result is also confirmed by the coefficients of the error correction term, which implies that expenditures are the budgetary item that bears most of the adjustment process. Interestingly enough, we also observe that in the long run revenues respond in front of a shock only when that shock is idiosyncratic, while transfers do not react neither to common nor to idiosyncratic ones (though, in this case, the probability of reaction is slightly higher). The fact that the budget of the municipalities is intertemporally

balanced suggests that the macroeconomic stability properties aimed by the Law of Budget Stability are already achieved by the own process of dynamic adjustment of the municipalities.

The results we have obtained in the short run, first, confirm the causality hypothesis "expend and tax". That is, we reject the hypothesis of a Leviathan behaviour by the municipalities. As the literature on Fiscal Federalism suggests, this is due to the fact that decentralisation process restrains the powers of the Leviathan (Brennan and Buchanan, 1980). This result stresses the importance of carrying out empirical analysis of causality by layers of government. We also have to reject the hypothesis of "interdependence between revenue and expenditures", that is, we have to reject that municipal decision-making is conducted by the median voter. Second, our results verify the most common hypothesis with regard to the effects of revenue and expenditure on grants (Oates, 1972), while the reverse direction of causality, either due to the probability of bailing-out or to problems of asymmetric information, does not hold.

The current state of the paper needs further developments. First, we have to calculate the short and long run multipliers for each component of the budget. Second, we have to obtain the impulse-response function. Given the pass of the Law of Budget Stability which forbids deficits, the impulse-response function will provide us with information about how long the municipalities have to incur in a deficit in order to recover from a downturn. The longer the period, the more severe the predicted consequences of the law.

## 6. References

- Alesina, A. and Perotti, R. (1995): "The political economy of budget deficits", *NBER Working Paper* 4367, Cambridge, MA.
- Barro, J.R. (1979): "On the determination of public debt", *Journal of Political Economy*, 87, pp.940-971.
- Black, D. (1948): "On the rationale of group decision-making", *Journal of Political Economy*, 56, pp.23-34.
- Brennan, J. and Buchanan, J. (1980): *The power to tax: analytical foundations of the fiscal constitution*, Cambridge University Press, Cambridge, MA.
- Bohn, H. (1991): "Budget balance through revenue of spending adjustment", *Journal of Monetary Economics*, 27, pp.333-359.
- Breitung, J. and Meyer, W. (1994): "Testing for unit roots in panel data: are wages on different bargaining levels cointegrated?", *Applied Economics*, 1994, Vol.26, pp.353-361.
- Buettner, T. (2001): "The dynamics of municipal fiscal adjustment", *CESifo Working Paper*, Munich.
- Dahlberg, M. and Johansson, E. (1998): "The revenues-expenditures nexus: panel data evidence from Swedish municipalities", *Applied Economics*, 30, pp.1379-1386.
- Gramlich, E. (1989): "Budget deficits and national savings: are politicians endogenous?", *Journal of Economic Perspectives*, 3, pp.23-35.
- Granger, C. (1969): "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods", *Econometrica*, 37, pp.424-438.
- Hines, J. and Thaler, R. (1995): "The flypaper effect", *Journal of Economic Perspectives*, 9, pp.217-226.
- Holz-Eakin, D., Newey, W. and Rosen, H.S. (1989): "The revenue-expenditure nexus: evidence from local government data", *International Economic Review*, 30, pp.415-429.
- Im, K.S., Pesaran, M. H., and Shin, Y. (1997): "Testing for Unit Roots in Heterogeneous Panels", revised version of DAE Working Paper Series, 9526, University of Cambridge.
- Inman, R.P. (2001): "Transfers and bailouts: institutions for enforcing local fiscal discipline", *Constitutional Political Economy*, 12, pp.141-160.
- Kornai, J. (1986): "The soft budget constraint", *Kyklos*, 39, pp.3-30.
- Levin, A. and Lin. C. (1993): "Unit root test in panel data: new results", Working Paper pp.93-56, Department of Economics, University of San Diego, California.
- Meltzer, A. and Richard, S. (1981): "A rational theory of the size of government", *Journal of Political Economy*, 89, pp.914-927.
- Nickell, S. (1981): "Biases in dynamic models with fixed effects", *Econometrica*, Vol.49, pp.1417-26.
- Peacock, A. and Wiseman, J. (1979): "Approaches to the analysis of government expenditure growth", *Public Finance Quarterly*, 7, pp.3-23.

- Poterba, J. (1994): "State responses to fiscal crises: the effects of budgetary institutions and politics", *Journal of Political Economy*, 102, pp.799-821.
- Rattso, J. (1999): "Fiscal adjustment with vertical fiscal imbalance: empirical evaluation of administrative fiscal federalism in Norway", Mimeo, Department of Economics, Norwegian University of Science and Technology, Trondheim.
- Rodden, J. (2000): "Fiscal behaviour with rational bailout expectations in the German states", Workshop on European Fiscal Federalism in Comparative Perspective, Center for European Studies, Harvard University, Cambridge, MA.
- Rodden, J. (2001): "And the last shall be first: federalism and fiscal outcomes in Germany", Mimeo, Department of Political Science, MIT, Cambridge, MA.
- Rodden, J., Litvack, J. and Eskeland, G. (eds.) (2001): *Decentralisation and the challenge of hard budget constraints*, MIT Press, Cambridge MA, forthcoming.
- Roubini, N. and Sachs, J. (1989): "Political and economic determinants of budget deficits in industrial democracies", *European Economic Review*, 33, pp.903-938.
- Sims, C.A., (1980): "Macroeconomics and Reality", *Econometrica*, Vol. 48(1), pp.1-48.
- Solé-Ollé, A. (2001): "Determinantes del gasto público local: ¿necesidades de gasto o capacidad fiscal?", *Revista de Economía Aplicada*, Vol.IX(25), pp. 115-156.
- Tanzi, V. (1995): "Fiscal federalism and decentralization: a review of some efficiency and macroeconomic aspects", in *World Bank Annual Conference on Development Economics*, World Bank, Washington D.C.
- Von Furstenberg, G., Green, R.J. and Jeong, J.H. (1986): "Tax and spend or spend and tax", *Review of Economics and Statistics*, 68, pp.179-188.
- Von Hagen, J. and Harden, I. (1992): "Budgeting procedures and fiscal performance in the European Communities", *Economic Papers* 96, Commission of the European Communities.
- Von Hagen, J., Bordignon, M., Dahlberg, M., Grewal, B., Petterson, P. And Seitz, H. (2000): "Subnational government bailouts in OECD countries: four case studies", *Inter-American Development Bank Working Paper* R-399.
- Weingast, B., Shepsle, K. and Johnsen, C. (1981): "The political economy of benefits and costs: a neoclassical approach to distributive politics", *Journal of Political Economy*, 89, pp.642-664.
- Wellisch, D. (2001): *Theory of Public Finance in a Federal State*, Cambridge University Press.
- Wildasin, D. (1997): "Externalities and bailouts: hard and soft budget constraints in intergovernmental fiscal relations", Mimeo, Vanderbilt University.