A joint Initiative of Ludwig-Maximilians-Universität and Ifo Institute for Economic Research

Working Papers

THE DYNAMICS OF MUNICIPAL FISCAL ADJUSTMENT

Thiess Buettner
David E. Wildasin*

CESifo Working Paper No. 649 (1)

January 2002

Category 1: Public Finance

CESifo
Center for Economic Studies & Ifo Institute for Economic Research
Poschingerstr. 5, 81679 Munich, Germany
Phone: +49 (89) 9224-1410 - Fax: +49 (89) 9224-1409
e-mail: office@CESifo.de
ISSN 1617-9595

* We are grateful to R. Graycarek for assistance with this research. Much of this work was undertaken while the first author was a postdoctoral scholar at the University of Kentucky, whose support is gratefully acknowledged.

CESifo *Working Paper No. 649*
January 2002

THE DYNAMICS OF MUNICIPAL FISCAL ADJUSTMENT

Abstract

The dynamic fiscal policy adjustment of local jurisdictions is investigated empirically using a panel of more than 1000 U.S. municipalities over a quarter of a century. Distinguishing own revenues, grants, expenditures, and debt service, the analysis is carried out using a vector error correction model which takes account of the intertemporal budget constraint. The results indicate that a large part of the fiscal adjustment to changes in any budgetary component takes place by an offsetting change in future expenditures. In addition, the results point to an important role of grants in maintaining budget balance as lower revenues and higher expenditures including debt service are followed by significant increases in grants. Decompositions of the sample according to average city population and initial debt burden reveal significant differences across subsamples. In particular, the role of grants in maintaining budget balance is much more pronounced with large cities whereas small cities tend to rely more on own revenues. Grants also play a more important role in the adjustment of cities with an initially high debt burden.

JEL Classification: H72, H74, H77.

Thiess Buettner
Centre for European Economic Research
(ZEW) Mannheim University
L7/1
68161 Mannheim
Germany
buettner@zew.de

David E. Wildasin
Martin School of Public Policy
University of Kentucky
Lexington, KY 40506-0027
U.S.A.
wildasin@tanstaafl.gws.uky.edu

1 Introduction

Our goal in this paper is to shed new light on the dynamics of local government policymaking, with specific reference to the fiscal policies of municipal governments in the United States. The US federation, of which local governments are an important part, is a durable institutional structure which decentralizes significant portions of public-sector decisionmaking authority to subnational governments. Governments at all levels within this structure operate under a variety of constraints, and these constraints create the incentives that, in part, elicit the observed behavior of policymakers. The fiscal policies of subnational governments are important in themselves, but they also illuminate the nature of the constraints which these governments face and thus the institutional structure of the public sector itself.

Local governments in the US are numerous, diverse, and economically important.[1] The services performed by these governments, their financing, and their relationships with the national and state governments have evolved over time in a complex process involving the interplay of all branches of government (executive, legislative, and judicial) at all levels of government (federal, state, and local), all against the background of ongoing demographic, technological, economic, and social change and widely-varying local circumstances.

Policymakers at the local level face conflicting demands: resident households and local businesses demand public services, public employees demand higher compensation and better working conditions, and taxpayers want lower taxes. These and other interests impose political constraints on local policymakers. In addition, local governments face market constraints. For example, they may be able to borrow money to finance expenditures in excess of revenues, but their ability to borrow is constrained by the need to pay competitive interest rates and to maintain creditworthiness. The policymakers in one locality may target particular groups of households or businesses for favorable or unfavorable fiscal treatment, but the free movement of people and enterprises among jurisdictions means that such policies may cause entry into or exit from the locality, limiting the ability of policymakers to meet the demands of one group by imposing burdens on another. Often, higher-level governments provide financial assistance to local governments in the form of intergovernmental grants; these transfers may ease some of the budgetary constraints facing local policymakers, although sometimes fiscal transfers are accompanied by additional

[1] The Bureau of the Census publishes a quinquennial *Census of Governments*. As of the 1997 census, there were over 3,000 counties, almost 20,000 municipalities, almost 35,000 special districts, almost 14,000 school districts, and almost 17,000 townships, making almost 90,000 units of local government in total. Total public expenditure by all localities amounted to $837 billion, of which municipalities – the focus of the present analysis – accounted for $275B, school districts $257B, counties $198B, special districts $89B, and townships $28B. Total local government spending in 1997 amounted to some 10.1 % of GDP. In 1995 local government spending amounted to 26.9 % of all public expenditures in the US.

constraints, for example in the form of mandates to provide particular services or to adhere to other regulations.

Occasionally – but rarely, in US experience – local fiscal policies result in crises in which a government's financial obligations to creditors, vendors, and employees cannot be met from existing revenues. In such situations, local authorities, as units of government subordinate to states, are often subjected to special oversight mechanisms even as the state government assists the locality with additional funding to meet its most pressing contractual and public-service delivery obligations. The financial crises of New York City in the 1970s and of Philadelphia, Orange County, California, and Washington DC in the 1990s provide well-known examples of local fiscal policies gone awry, and smaller localities also encounter fiscal distress from time to time.[2] These events, though noteworthy, are nonetheless exceptions to the rule. Somehow, despite (or perhaps in part because of) the conflicting demands imposed upon them by taxpayers, interest groups, creditors, vendors, state governments, and others, local policymakers face an incentive structure that, in equilibrium, results in behavior that for the most part preserves the financial integrity of local governments. Whether the fiscal policies chosen by local governments are economically desirable according to normative criteria (efficiency, equity) is a separate and very important question. Leaving this question aside, one can observe that the institutional structure of American federalism has created a system of local governments that pass a basic survival test.

From the perspective of institutional design (or evolution), the fiscal behavior of a system of "local" governments with significant policymaking autonomy is a matter of worldwide interest, for several reasons. First, in numerous developing and transition economies, establishing a new balance of fiscal responsibilities between higher- and lower-level governments has been a major focus of policy debate for the past decade. Fiscal decentralization has accompanied economic and political reforms in such diverse countries as Russia, Ukraine, China, India, South Africa, Brazil, and Argentina, to name only a few.[3] Since high fiscal deficits often create pressures for accommodating monetary policies that

[2]See GAO (1995) for series of case studies of localities in fiscal distress, some findings of which are summarized in Holloway (1996a, 1996b). The infrequency of formal municipal bankruptcy proceedings in the US is quite remarkable. Since the passage of the Municipal Bankruptcy Act in 1937, there have been fewer than 500 bankrupty filings. Municipal bankruptcies are a miniscule fraction of all bankruptcies. Of the total of 1.2 million bankrupty proceedings commenced in the 12 months preceding Sept. 30, 2000, 6 were filed under Chapter 9 (the portion of the bankruptcy code governing municipalities). A large portion of Chapter 9 filings that do occur are accounted for by small special district (such as water or sewer districts), and bankruptcies by municipalities proper are therefore even more rare. See Administrative Office of the U.S. Courts (2000a, b, Table F-2)) and National Bankruptcy Review Commission (1997).

[3]The fiscal aspects of public-sector restructuring in central and eastern Europe, the former Soviet Union, Latin America, and South Africa, are discussed in Bird *et al.* (1995) and Bird and Vaillancourt (1998).

contribute to macroeconomic instability, the question arises as to whether autonomous subnational governments will undermine overall fiscal discipline, for example through fiscal mismanagement that necessitates bailouts from higher-level governments.[4] Very similar questions arise in the context of European monetary union, as exemplified in the well-known fiscal convergence criteria of the Maastricht Treaty, although, in this context, the "local" governments are actually the central governments of the member states. Here, too, the question arises as to whether the institutional structure of the EU, including fiscal as well as financial linkages between EU-level entities and lower-level governments with a high degree of fiscal autonomy, contains appropriate incentives for fiscal management (see, e.g., McKinnon (1997a, b)).

Since the policymaking context of US municipalities differs enormously from that of subnational governments in developing and transition economies and from that of the member states of the EU, it would be erroneous to suggest exact parallels among them. Nevertheless, there are few better opportunities for systematic statistical analysis of such institutional structures than those afforded by local governments in the US. First, these governments operate against the backdrop of certain shared fundamental institutions, such as the constitutional structure of the country, its legal system, and a variety of other historical and cultural factors, which greatly enhances the comparability of data across jurisdictions. Second, in sharp contrast to the typical macroeconomic environment where a single country is the sole unit of observation, lower-level governments offer the potential for a large number of observations. Third, in the US case, this potential can be realized because of sustained data collection efforts on the part of the US Census. As described further below, we have been able to assemble a balanced panel of fiscal data for more than 1000 municipalities for over a quarter-century. These data have been collected using consistent definitions and, though they are of course subject to imperfections, they likely represent the best available collection of fiscal data on such a large number of governmental units.[5]

Our analysis examines the process of dynamic fiscal policy adjustment, utilizing methods that have been exploited previously in macroeconomic analyses devoted to the study of intertemporal government budget constraints. One important topic of previous research (e.g., Wilcox, 1989, Trehan and Walsh,

[4]See, e.g., Prud'homme (1995), Tanzi (1996), Dillinger and Webb (1999), Rodden (1999), and references therein.

[5]Numerous studies have examined fiscal policymaking at the level of state governments; see, for example, Poterba (1994), Bohn and Inman (1996), and McCarty and Schmidt (1997). At the municipal level, data on *large* municipalities are more readily available and have been a principal subject of previous analyses; see, e.g., Inman (1989). An exception is Holtz-Eakin *et al.*(1991) which use a sample of 171 municipalities drawn randomly from the Census of Governments. Large municipalities are clearly of great importance because they account for a large fraction of total municipal fiscal activity, but, as we shall see below, their behavior differs in significant ways from that of smaller cities. In this respect, their behavior is misleading if taken as a characterization of municipalities as a generic institutional form.

1991) has been the attempt to verify whether fiscal policies are stationary or "sustainable" over time and thus consistent with long-run budget constraints. Our perspective is somewhat different from this, in that we begin with the presumption of intertemporal budget balance on the part of municipal governments and focus on the analysis of the nature of the adjustment process that maintains this balance. Suppose, for example, that municipal spending is unusually high, an event that would tend to increase the local deficit. Do municipalities with high spending tend to generate additional tax revenues in order to support this spending? Do they simply run bigger deficits for a period of time, delaying adjustments in taxes and spending? Does higher spending trigger additional transfers from higher-level governments, enabling municipalities to maintain higher spending without having to raise local taxes or accumulate local debt? Or, finally, is higher spending self-limiting, with high spending in one period followed by spending restraint in subsequent periods, reducing the need for additional revenues and for additional borrowing? Any of these types of fiscal adjustment, or some combination of all of them, is conceivable, and the same can be said about possible paths of fiscal adjustment in response to shocks in revenues, grants, or deficits.[6]

Given the complexity of the political and market constraints under which municipal authorities operate, it is difficult to justify strong prior expectations about which particular form of adjustment must dominate, and our goal here is to examine the dynamics of fiscal adjustment with a minimum of prior structure. We do this using a vector error-correction approach, outlined in Section 2. Section 3 describes our data in greater detail, and verifies in particular that they are consistent with a modelling approach relying on the stationarity of the deficit; it also describes the basic estimation approach. Section 4 presents the results of the empirical analysis, using the entire sample. These results indicate that municipalities make different types of fiscal adjustment in response to different kinds of shocks. For example, among other results, we find that shocks to municipal public spending are typically followed by offsetting expenditure changes in subsequent periods, with relatively modest adjustments in other fiscal variables; by contrast, shocks to municipal revenue tend to persist and to be followed by substantial changes in municipal spending.

[6]In common with previous macroeconomic analyses, our analysis examines the dynamic adjustment of government surpluses / deficits. The macroeconomic implications of municipal government debt policy are not a focus of interest here, however; we are as concerned with the division of dynamic fiscal adjustment between revenues and expenditures as with the net of the two. It should also be noted that most of the "action" in government debt policy in the US occurs at the Federal level. Combined state and local government surpluses have been quite stable, varying in the narrow range between 0 and 1% of GDP during the past four decades; during this same time, the Federal government surplus has exhibited far greater variability, fluctuating between 1% and -6% of GDP. Of course the state/local aggregate conceals variation among indvidual components, but in general both the magnitude and variability of state/local debt is far smaller than for Federal government debt. The latter is therefore of much greater importance for macroeconomic analysis of fiscal policy, and its time-series properties are very different, as well.

Because our sample contains a large cross-section of municipalities, it is possible to analyze sub-samples separately. Section 5 reports the results from two such analyses. In the first, cities are categorized by population size, and in the second, by their initial level of debt. For reasons of institutional structure and political economy, the incentives for fiscal adjustment facing large cities may differ significantly from those for small cities.[7] For similar reasons, the adjustment process may also differ with the current level of debt. Our analysis indicates, indeed, that the process of fiscal adjustment does differ significantly across these subsamples.

Section 6 concludes with a summary of the main findings and discusses some of the many directions for interesting future research that these findings suggest.

2 A Framework for Analysis of Fiscal Adjustment

Without imposing any prior restrictions, budgetary responses to fiscal shocks could be modelled empirically by means of a vector auto-regression capturing the development of fiscal flows like revenues, expenditures, and debt service as well as their interrelationship over time. Although responses might take place in principle at any future date, a now-standard approach in macroeconomic analysis is to fit a statistical model to the time series involved, and to argue that it captures all significant correspondences between the variables at different points in time. Thus, empirical analyses restrict attention to a limited number of periods defined by the choice of the lag length of the statistical

[7]To offer only one of many possible reasons why fiscal adjustment may vary by city size, we note that it is commonplace for states to create administrative distinctions among cities based on population size; cities of the "first class", for example, are those with the largest populations, the next size category defines the cities of the "second class", and so forth. These distinctions are used in state laws and regulations defining the powers and responsibilities of municipalities. Purely administrative considerations aside, the political and economic importance of cities may influence their policymaking, too. The preamble to the Pennsylvania Intergovernmental Cooperation Authority Act for Cities of the First Class, Laws of Pennsylvania, Act 1991-6, Session of 1991, Section 102, a law which set up elaborate financing (a "bailout") and fiscal control mechanisms for Philadelphia during its fiscal crisis in the 1990s, exemplifies the potential importance of city size: "It is hereby declared to be a public policy of the Commonwealth ... to foster the fiscal integrity of cities of the first class to assure that these cities provide for the health, safety, and welfare of their citizens; pay principal and interest owed on their debt obligations when due; meet financial obligations to their employees, vendors, and suppliers; and provide for proper financial planning procedures and budgeting practices. The inability of a city of the first class to provide essential services to its citizens as a result of a fiscal emergency is hereby determined to affect adversely the health, safety, and welfare not only of the citizens of that municipality but also of other citizens in this Commonwealth." "Cities of the first class" in Pennsylvania are those with populations in excess of 1.5 million. Philadelphia is the only city in this class; the second largest city in the state is Pittsburgh, with a population of less than .4 million. This example also illustrates how heavily-indebted cities may face political or market pressures that differ from those with low levels of debt.

model. Once an empirical model is obtained, it is possible to explore whether and how budgetary responses actually take place. However, if municipalities, on average, pursue a fiscal policy consistent with the intertemporal budget constraint, budgetary components will display a cointegrating relationship, and, hence, the deficit will be stationary (e.g., Trehan and Walsh, 1988). In order to model the adjustment to fiscal shocks, one can exploit this stochastic implication of the intertemporal budget constraint and employ a vector error-correction framework, relating the change of expenditures, revenues, and debt service to the lagged deficit. Bohn (1991) conducts such an analysis of fiscal policy at the level of the US Federal government, and we utilize a similar approach at the city level.

In contrast to the usual macro models applied to national governments, however, it is necessary to recognize that local governments obtain substantial amounts of revenue not only from own-sources like taxes, but from higher levels of government; in our sample, about 28% of municipal revenue, on average, is obtained from intergovernmental transfers. Furthermore, as already pointed out in the introduction, those transfers may be crucial in restoring the balance of the budget. We therefore explicitly decompose the revenue side of the budget into own-source and intergovernmental revenue.

Formally, the empirical analysis focuses on a four-dimensional vector of budgetary components $Y_t = (G_t, DS_t, R_t, Z_t)'$, where G_t is "primary" government expenditure, DS_t denotes the current debt service, R_t is own-source revenue, and Z_t is intergovernmental revenue. The current deficit D_t is determined by a vector product

$$D_t \equiv b'Y_t = G_t + DS_t - R_t - Z_t, \quad \text{where:} \quad b = (1, 1, -1, -1)'. \tag{1}$$

Following the literature, the empirical model assumes that the linear combination of the budgetary components implied by the current deficit is stationary, and describes the changes of the elements of the vector Y_t as a function of lagged changes of Y_t as well as of its lagged level, *i.e.* the lagged deficit

$$A(L)\,\Delta Y_t = \gamma\, b'Y_t + u_t, \tag{2}$$

where Δ is the lag operator and $A(L)$ is a polynomial in the lag operator. The lagged deficit term captures the error-correction property of the system, implying that deficits or surpluses lead to budgetary adjustments reflected in ΔY_t. Whereas this approach assumes the stationarity of the deficit, the response of the system is not constrained *a priori* and it yields insights about how each of the components of the fiscal policy vector Y_t reacts, over time, to innovations in itself or in one of the other components.

This system can be used to trace adjustments to previous periods' budgetary shocks, and, as in a vector autoregressive (VAR) system, we can compute impulse-response functions. However, as the impulse-response functions depict the response of the system to innovations in the budgetary components,

the intertemporal budget constraint has a straightforward implication for the present value of the impulse-response functions (Bohn, 1991). Defining the present value of a flow variable $X_{t+1}, X_{t+2}, ...$ as

$$PV_t(X) = \sum_{j \geq 1} (1+r)^{-j} X_{t+j}, \tag{3}$$

where r denotes the given interest rate, the intertemporal budget constraint can be written as

$$\mathsf{E}_t PV_t(R) + \mathsf{E}_t PV_t(Z) - \mathsf{E}_t PV_t(G) \;=\; B_t \;+\; G_t + DS_t - R_t - Z_t, \tag{4}$$

where E_t denotes the expectation operator as of time t and B_t is the value of the outstanding stock of debt corresponding to the debt service $DS_t = rB_t$. Accordingly, the expected present value of future primary surpluses is equal to the current value of the debt and the current deficit. To obtain a relationship in flows this expression is transformed into[8]

$$\mathsf{E}_t PV_t(\Delta R) + \mathsf{E}_t PV_t(\Delta Z) - \mathsf{E}_t PV_t(\Delta G) = G_t + DS_t - R_t - Z_t, \tag{5}$$

which states that the expected present value of all future changes in the components of the primary surplus is just sufficient to cover the current deficit including interest. Let $\widehat{X}_t$ denote the innovation in a variable X_t, *i.e.*, the change in its expected value.[9] Rewriting equation (5) in terms of innovations yields

$$\widehat{PV}_t(\Delta R) + \widehat{PV}_t(\Delta Z) - \widehat{PV}_t(\Delta G) = \widehat{G}_t + \widehat{DS}_t - \widehat{R}_t - \widehat{Z}_t. \tag{6}$$

Accordingly, the innovations in the budgetary components on the right-hand side should evoke an offsetting linear combination of innovations in the present value of the responses. As this relationship follows from the definition of the intertemporal budget constraint, one might think of it as an exact empirical relationship. However, aside from possible inconsistencies in the data, this is not necessarily the case. Whereas the underlying intertemporal budget constraint (4) assumes a given interest rate to discount future budgetary flows, the interest rate is generally not known with certainty, and it may also vary over time. In addition, as discussed further below, the data display significant variation in terms of population size, which requires scaling fiscal variables in per-capita terms. As a consequence, the appropriate discount rate is a function of both the interest rate as well as the rate of population growth and, hence,

[8]Following Bohn (1991) the transformation uses

$$r^{-1}(1+r)\left[\mathsf{E}_t PV_t(\Delta X) + X_t\right] = \mathsf{E}_t PV_t(X) + X_t.$$

[9]Formally $\widehat{X}_t$ is defined as $\widehat{X}_t \equiv \mathsf{E}_t X_t - \mathsf{E}_{t-1} X_t$.

differs from the interest rate.[10] Finally, it should be noted that B_t is more generally defined as the net fiscal debt position, but empirical data will typically fail to account in a comprehensive way for all assets held by the government. However, despite these qualifications, it turns out that the adjustment pattern found in the present study follows the prediction of equation (6) rather closely.

3 Data and Estimation Approach

3.1 Data

The empirical investigation employs annual data for individual municipalities from all over the U.S. obtained from the Census of Governments (COG). In order to trace budgetary adjustments across time the analysis focuses on a subsample of all cities reported in the COG yielding a balanced panel for 1270 cities over 26 years from 1972 to 1997.[11] The dataset comprises four fiscal variables, which are constructed from the COG classification (excluding utilities and insurance trusts) (see Table 1). There are two revenue variables, own-source revenue and intergovernmental revenue obtained from higher-level governments. There are also two variables on the expenditure side, general expenditure and net debt-service expenditures. In addition to fiscal transfers from higher-level governments, small amounts of municipal expenditures and revenues are payments to or receipts from other local governments; the net amount of these payments is included as part of general expenditure. Many municipalities hold significant interest-bearing financial assets, but, since asset values are not always reported in the data, it is not possible to determine net indebtedness. It is therefore preferable to utilize the flow of net debt service.

Table 2 presents some descriptive statistics with fiscal variables scaled in terms

[10] If population is denoted with N and if n is the rate of population growth, equation (5) can be rewritten as

$$\widetilde{PV}_t\left(\Delta\frac{R}{N}\right)+\widetilde{PV}_t\left(\Delta\frac{Z}{N}\right)-\widetilde{PV}_t\left(\Delta\frac{G}{N}\right)=\frac{G_t}{N_t}+\frac{DS_t}{N_t}-\frac{R_t}{N_t}-\frac{Z_t}{N_t}-n\frac{B_t}{N_t},$$

where $\widetilde{PV}_t(X)$ is defined as in (3) except for a discount rate $\widetilde{r}=(r-n)/(1+n)$. As compared to equation (6) there is an additional term capturing the reduction of the per-capita debt due to population growth.

[11] Although the data are available in digital form, their preparation for analysis is non-trivial, particularly because they are not coded uniformly across years. The final data have been checked for consistency with state-level aggregates reported in Census publications. The Census Bureau makes occasional revisions in these data without, however, updating the publicly-available data. Since the revisions by the Census Bureau are not reported, preliminary regressions have been run to detect influential observations. If a further inspection of these observations revealed apparent inconsistencies with previous and subsequent observations, the corresponding city was completely removed from the dataset. As a result, from the 1346 cities in the basic balanced sample 76 cities have been removed.

Table 1: Definition of Fiscal Variables

	Variable	Components (*COG categories)*
(i)	Own Revenue (R_t)	*Total Taxes, Total General Charges, Total Miscellaneous General Revenue* excluding *Interest Revenue.*
(ii)	Vertical Grants (Z_t)	*Intergovernmental Revenue from Federal Government* and *from State Governments*
(iii)	General Expenditure (G_t)	*Total General Expenditure* including *Intergovernmental Expenditure* net of *Local Intergovernmental Revenue,* and excluding *Interest on General Debt.*
(iv)	Debt Service (DS_t)	*Total Interest on General Debt* net of *Interest Revenue*
(v)	General Deficit (D_t)	(iii) + (iv) - (i) - (ii)

Table 2: Descriptive Statistics

	Mean	Std.Dev.	Min.	Max.	Median
Fiscal variables		Levels per capita, 1972-1997			
Own Revenue	0.553	0.399	0.004	7.501	0.445
General Expenditure	0.756	0.534	0.005	7.826	0.596
Vertical Grants	0.213	0.233	0.000	3.150	0.136
Debt Service (net)	0.002	0.051	-0.530	1.104	-0.000
General Deficit	-0.008	0.164	-1.771	2.464	-0.018
		Annual change per capita, 1973-1997			
Own Revenue	0.014	0.102	-1.441	1.486	0.009
General Expenditure	0.017	0.191	-2.348	2.485	0.011
Vertical Grants	0.004	0.104	-1.412	1.610	0.000
Debt Service (net)	-0.001	0.032	-0.527	0.463	-0.001
Other variables		1972-1997			
Income in $10,000 per capita	1.920	0.516	0.722	6.737	1.838
Population (in 1,000)	74.77	267.1	0.671	7922	31.38

Statistics for pooled observations for 1270 cities in prices of 1996 (deflated with common US GDP deflator). Fiscal variables in $ 1,000 per-capita.

of population size. The mean of real per-capita expenditures is $756. There is however strong variation with a standard deviation of $534. The debt service, defined net of interest earnings, shows a mean around zero. The figures for expenditure correspond to the mean values at the revenue side, i.e. own revenues of $553 and intergovernmental revenues of $213. The mean of the residual difference between the first four components (denoted as general government deficit) is at minus $8, indicating that on average the cities run a small surplus. However, there is marked variation in the sample between a deficit of as much as $2,464 and a surplus of $1,771. This variation in budget outcomes is also reflected in differences in the debt service, where some cities show high spending whereas others actually report positive net interest earnings. The fiscal variables show modest mean values of annual growth in expenditures ($17 per capita) and revenues, and again substantial variation between rather large extremes.

The bottom of Table 2 reports statistics for population and income showing that the average population size is around 75,000. Population size ranges from below 1,000 to almost 8 million (New York City) indicating strong variation in the dataset.[12] Thus, to model the fiscal adjustment process, fiscal variables are expressed in per-capita terms. However, variations in absolute population size are used in Section 5 to decompose the sample in order to determine whether there are important differences in the budgetary adjustment pattern in large and small cities.

3.2 Unit-Root Tests

The empirical literature dealing with aggregate budgetary revenue and spending data at the macroeconomic level has emphasized that the corresponding time series typically display non-stationarity. Although the basic system is formulated in first differences and thus takes account of possible non-stationarity of the individual budgetary components it is important to show that their linear relationship as expressed by the current deficit is in fact stationary. In the present context, the presence of only 26 years of data may call into question the validity of standard tests for non-stationarity at the level of the individual municipality. For that reason, unit-root testing is carried out using a statistic suggested by Im *et al.* (1997) which is based on the full set of unit-root statistics for each of the individual municipalities. As this approach assumes independence of observations, the common component is removed by

[12]The population data reported in the COG public use files do not corresponding strictly to the year of the fiscal data. In addition, they are generally not updated on an annual basis. Therefore, the population data have been smoothed by a moving average using a cubic trend polynomial (Kendall and Stuart, 1976:381f). The income figures report per–capita income for the corresponding county or county area as reported by the Bureau of Economic Analysis.

Table 3: Panel Unit Root Tests

	no trend			linear trend		
lag order (p)	3	4	5	3	4	5
Own Revenue	-1.30	-1.15	-1.13	-2.11	-1.94	-2.00
Gen. Expend.	-1.62*	-1.50*	-1.43*	-2.21*	-2.03*	-1.98
Vert. Grants	-1.99*	-1.87*	-1.77*	-2.53*	-2.28*	-2.16*
Debt Service	-1.68*	-1.50*	-1.40*	-2.33*	-2.19*	-2.13*
Δ Own Revenue	-2.21*	-1.88*	-1.84*	-2.39*	-2.06*	-2.06*
Δ Gen. Expend.	-2.40*	-2.02*	-1.85*	-2.62*	-2.26*	-2.12*
Δ Vert. Grants	-2.66*	-2.21*	-2.05*	-3.08*	-2.64*	-2.58*
Δ Debt Service	-2.38*	-2.10*	-1.97*	-2.55*	-2.27*	-2.18*
General Deficit	-1.81*	-1.60*	-1.56*			

Average of augmented Dickey Fuller statistics. A star denotes significant rejection of non-stationarity at the 5 % level according to a standardization using means and variances tabulated by Im *et al.* (1997, Table 2).

subtracting the cross-sectional averages from each observation. Table 3 reports statistics for the four budgetary components, without and with a time trend. As many individual cities display substantial growth or decline in fiscal variables over the 26-year sample, it seems reasonable to assume a linear time trend, especially for revenues and expenditures. However, for the deficit, the existence of a trend would conflict with the intertemporal budget constraint. It turns out that for the revenue series stationarity is rejected, and the same is true for expenditures in tests based on higher-order serial autocorrelation. Stationarity cannot be rejected, however, for the first differences of all of the fiscal flow variables, as well as for the level of the deficit. This supports the specification of budgetary adjustments along the lines of a VECM model.

3.3 Estimation Approach

It is difficult to investigate long-run adjustments in a vector of four fiscal instruments for individual cities with only 26 years of observations. However, the large cross-sectional dimension of the dataset enhances possibilities for empirical modelling by pooling observations for individual cities.

Typically, panel data studies allow for individual effects capturing differences in the characteristics of individual units.[13] The following analysis deals essentially

[13]In samples with relatively short time series, this raises issues about properly estimating

Table 4: Specification Tests

lag length	2	3	4
indiv.eff ($\chi^2(5076)$)	4019	4186	4437
lag order reduction ($\chi^2(16)$)	1518	711.0	571.7

Likelilihood ratio statistics on cross–equation restrictions.

with first differences of fiscal flow variables, and, in this respect, will not be affected by cross-sectional differences in local characteristics. The fiscal deficit variable, however, is entered in levels. The presence of individual effects would imply that the jurisdictions converge to different (per-capita) deficit levels. Formal tests for the presence of individual effects are used below to determine whether jurisdictions are commonly converging towards the same surplus or deficit value. If no indication of individual effects is found, it is appropriate to estimate individual equations of the system (2) separately with OLS; in this case, joint estimation does not improve efficiency as the set of regressors is the same across equations.[14]

Estimation of the VECM (5) requires specification of the lag length of the model; we begin with a lag of 4 years in the differenced data, subsequently testing for possible reductions in the number of lags. As shown in Table 4, a reduction of the lag length is always rejected. This suggests employing a model with four lags. Comparing estimation with and without individual effects it turns out that joint tests reject the presence of individual effects, regardless of lag lengths.[15] As pointed out above, this indicates that cities are commonly converging towards the same level of deficit and estimation can be carried out without individual effects.[16]

the dynamic relationships. The literature on dynamic panel data has emphasized biasedness of standard panel data approaches in the presence of lagged endogenous variables and suggests the use of instrumental techniques (e.g., Holtz-Eakin *et al.*, 1991). With the rather long time period available in our sample, the Nickell (1981) bias should not be a significant problem, and it is neglected in the tests for the presence of individual effects.

[14]Avery (1977) has emphasized that in the presence of individual error components, estimation of individual equations separately is not efficient and proposed simultaneous estimation techniques (see, also, Baltagi, 1995:103pp).

[15]Testing is carried out using individual fixed effects for all equations since Hausman tests rejected the use of a random effects model for the own-source revenue and expenditure equations.

[16]As part of innovations in budgetary components may be common across jurisdictions one might also think of employing time-specific effects. But this would imply conditioning on common shocks and modeling only adjustments to idiosyncratic innovations, although the intertemporal budget constraint requires adjustments to all innovations. Moreover, the inclusion of time effects would tend to limit the comparability between the results for different

Table 5: Estimates for ECM Term

Equation	γ	(Std.err.)
Own Revenue	.098	(.013)
Gen. Expend.	$-.297$	(.018)
Debt Service	.013	(.003)
Vert. Grants	.069	(.009)

Heteroscedasticity robust standard errors in parentheses.

4 Estimation Results

Since the system is a four-dimensional vector error correction model, estimation produces a large number of parameters. Central parameters are the coefficients of the error correction term in the individual equations. As shown in Table 5, the results clearly confirm convergence towards the intertemporal budget constraint, since a higher deficit shows a positive impact on own revenues and on grants received, whereas a higher deficit shows a negative impact on expenditures. The positive impact on debt service is consistent with the fact that the deficit results in a rise in debt levels and thus creates higher debt service in the subsequent period. Given a constant rate of interest, and in the absence of population growth, the coefficient of the deficit in the debt service equation should reflect the real interest rate.[17]

While neglecting the contemporaneous relationship among variables, dynamic adjustments can be traced out using impulse-response functions, as displayed in Figures 1 and 2. The upper panel of Figure 1 depicts the responses to innovations in own revenues while the lower panel shows the responses to an innovation in grants. The decline in own revenues in the upper panel and that of grants in the lower panel indicates that only a part of an initial innovation in revenues is permanent, in particular, in the case of an innovation in grants. In both cases, we see a strong response of expenditures to increased

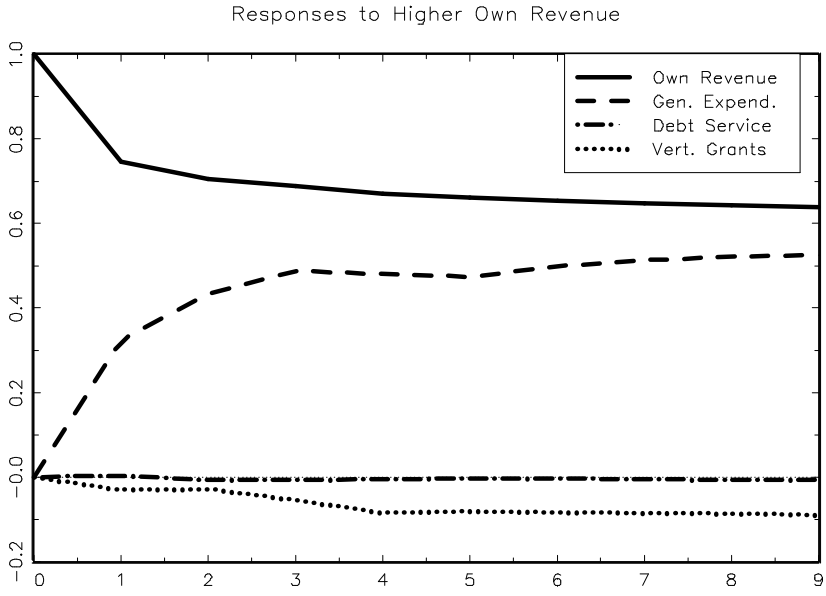
subsamples as carried out below. In any case, however, the results of estimations including fixed time effects (available upon request) do not show major qualitative differences.

[17] With a constant rate of interest r, and denoting the rate of change in population with n, the change in debt service per-capita can be expressed as

$$\Delta\left(\frac{DS_t}{P_t}\right) = \left[1 - \frac{n}{1+n}\right] r \frac{\Delta B_t}{P_{t-1}} - \frac{n}{1+n} r \frac{B_{t-1}}{P_{t-1}}.$$

As population growth shows an average rate of 0.98 % in the sample, the impact of a change in debt per capita on the debt service is less than proportional to the real interest rate (As noted earlier, even with a constant interest rate this relationship is only approximate, because of the difficulty of measuring government assets and liabilities).

Figure 1: Impulse Responses, Innovation in Revenues



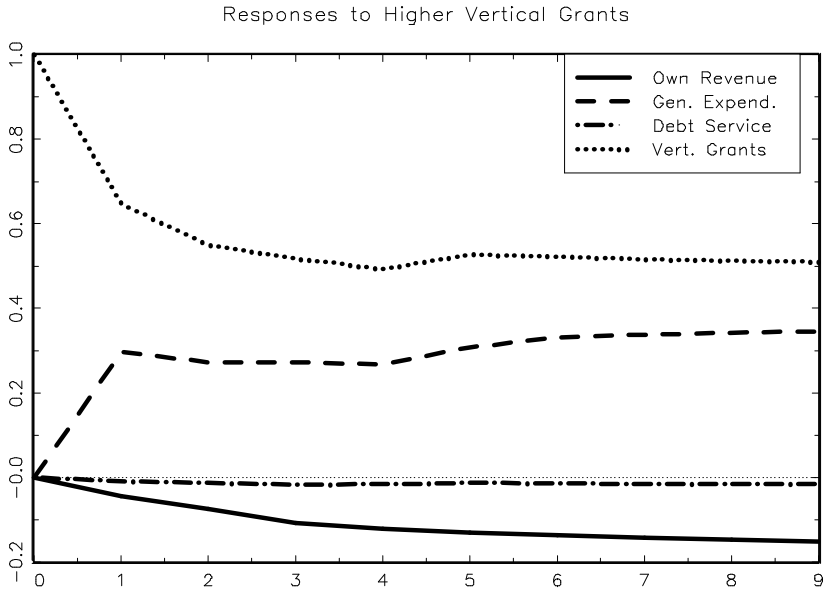
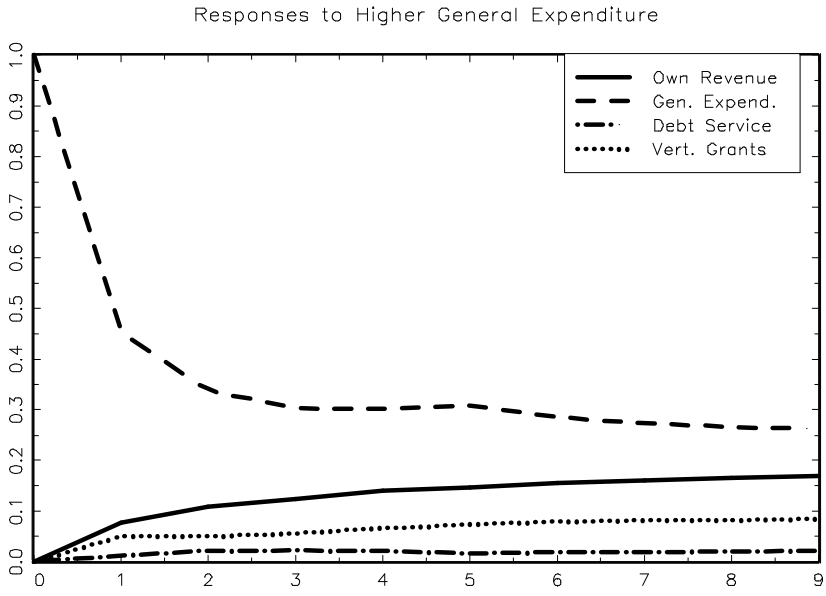
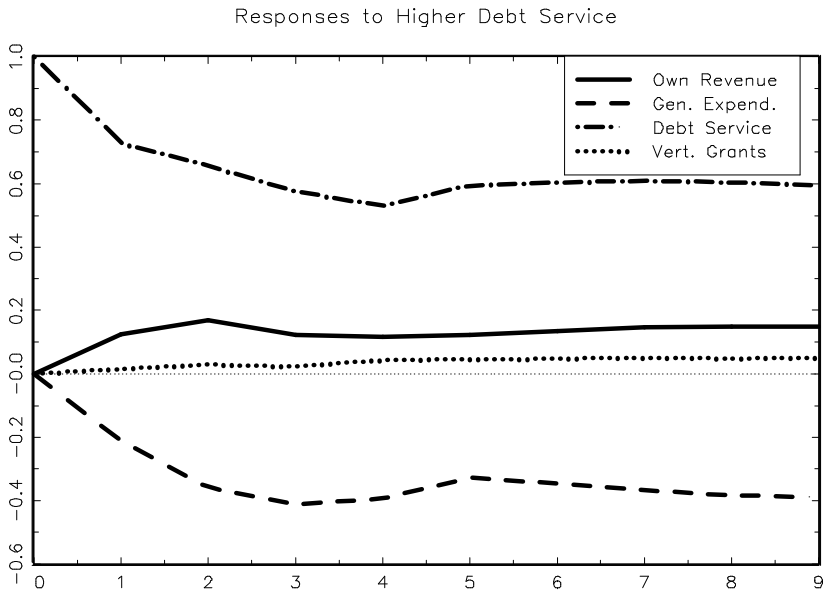


Figure 2: Impulse Responses, Innovation in Expenditures





revenues, indicating that most of additional *permanent* revenues are translated into higher expenditures. In addition, a significant part of the permanent increase in grants is used to reduce the tax burden. Note, however, that the responses take three periods to show up, indicating that assessing the reactions to grants from contemporaneous correlation might be misleading (Holtz-Eakin *et al.*, 1991).

Figure 2 reports the impulse-response functions for innovations in general expenditures and in debt service. As the top panel of this figure shows, a very large part of an innovation to expenditures leads to downward adjustments of future expenditures rather than to adjustments of revenues. This finding, together with the results shown in the top panel of Figure 1, suggests that governments regard adjustments by altering expenditures as "less costly" than adjustments to own revenues. This conforms also with the strong adjustment of expenditures to shocks in debt service, as shown in the bottom panel of Figure 2.

As the adjustment takes place mainly in the first three periods after a shock, Figures 1 and 2 already display the long-term responses. However, as discussed in Section 2, it is also instructive to calculate the total fiscal responses in present-value terms. For this purpose, we fix the discount rate at 3 %.[18]

The columns of Table 6 show the long-run impact of unit innovations in per-capita values of the fiscal variables, expressed in present-value terms. The table also displays standard errors obtained by sampling from the normal joint distribution of the VECM estimates and computing the corresponding distribution in the impulse-response functions as suggested by Sims (1987) and Hamilton (1994:337).[19]

It is instructive to review the findings reported in Table 6 from two different perspectives. Reading down the columns of the table shows how innovations in any one fiscal variable affect the subsequent adjustments of itself and the other variables. Comparing across the rows indicates which fiscal variables tend to be more responsive or sensitive to changes in the others. Consider first the own revenue column. It shows that an innovation to own revenues by \$1 leads to an increase in future expenditure by 50.8 cents and to reductions of own revenues and grants by 34.8 cents and 8.6 cents respectively. As part of the adjustment to a change in each of the fiscal variables takes the form of an offsetting change in its own future value, it is helpful to assess the response to a *permanent* \$1 increase in each variable. Dividing by the permanent component

[18]The qualitative results are not sensitive to the precise value of the discount rate.

[19]Sims (1987) argues that a possible deficiency of this approach is that it ignores the randomness of the estimated covariance matrix of the errors. However, in the current context, this estimate is obtained from a large cross-section as in seemingly unrelated regression analysis. Note that the sampling is carried out using a heteroscedasticity consistent estimate of the variance-covariance matrix of the VECM.

Table 6: Implied Present Value Responses

Response	Innovation to			
	Own Revenue	Gen. Expend.	Vert. Grants	Debt Service
Own Revenue	-.348 (.026)	.162 (.019)	-.144 (.023)	.145 (.037)
Gen. Expend.	.508 (.027)	-.716 (.020)	.338 (.027)	-.370 (.037)
Vert. Grants	-.086 (.012)	.082 (.010)	-.473 (.017)	.049 (.016)
Debt Service	-.005 (.005)	.019 (.004)	-.015 (.004)	-.387 (.014)
	response to permanent increase			
Own Revenue		.571 (.040)	-.273 (.044)	.236 (.059)
Gen. Expend.	.780 (.021)		.641 (.043)	-.604 (.063)
Vert. Grants	-.131 (.019)	.287 (.033)		.079 (.026)
Debt Service	-.008 (.008)	.068 (.014)	-.028 (.008)	

Standard errors in parentheses obtained by sampling from the normal joint distribution of the VECM estimates based on a heteroscedasticity consistent estimate of the variance-covariance matrix.

of the innovation in own revenues $(1 - .348)$, it turns out that 78.0 cents of a permanent increase in own revenues are translated into higher spending (cf. the bottom panel of Table 6), whereas intergovernmental grants are reduced by 13.1 cents.

Following the predictions of equation (6), the innovations in each of the budgetary components will be fully balanced in the present value of changes in own revenues, grants, and expenditures, which make up the primary surplus. Indeed, summing across the first three rows in the first column the estimated response to an additional dollar of own revenues is offsetting as much as 94.2 cents by changes in the primary surplus. Computing the present value of adjustments in the primary surplus to innovations in expenditures and grants yields similar figures of 95.9 % and 95.5 %, respectively. For innovations in debt service the sum of the present value of changes in expenditures, revenues, and grants is much lower (56.4 %). But, here, future changes in the debt service play a major role in balancing the budget, indicating strong temporal fluctuations in the debt service. With regard to permanent increases in the debt service the present value response of the primary surplus amounts to 91.9 %. Given that the intertemporal budget constraint holds only approximately in empirical data, as the true interest rate, its time path, and the amount of non-interest bearing assets of the municipalities are not known, these figures are indicative of reasonable properties of the empirical model of municipal fiscal adjustment.

The results indicate that jurisdictions do not respond solely with the components of their primary surplus to innovations in budgetary components shocks. A small but statistically significant fraction of additional grants, 2.8 cents out of a permanent increase by $1, is used to lower the debt burden. In addition, an increase in expenditures is followed by an increase in debt service by 6.8 cents per dollar of additional permanent expenditures. Note that these figures imply quite substantial changes in terms of the stock of the debt.

Generally, the results show that changes in the components of the budget tend to be partly offset by future changes in the same component. This is particularly true for expenditures, where more than two thirds of a change are balanced with an offsetting change in the present value of future expenditures. Considering permanent innovations in budgetary components, Table 6 displays a key role of expenditures for fiscal adjustment. Accordingly, three quarters of a dollar in additional own revenues and almost two thirds of a dollar in additional grants, are balanced with a corresponding expenditure increase. Also, changes in the debt service are balanced much more with a corresponding change in expenditures than in own revenues. Nevertheless, smaller but still significant parts of the adjustment are obtained by changes in own revenues and grants, in the sense that lower revenues and higher expenses are balanced with significant future increases in own revenues as well as grants.

Although the estimates do not indicate the actual response to income, it is of interest to relate the response to grants to the discussion of the "flypaper" effect, which argues that the public sector's propensity to spend out of local personal income is much lower than the propensity to spend out of grants (for overviews see Gramlich, 1977, and Hines and Thaler, 1997). The results in Table 6 indicate that the response in spending to a permanent increase in grants by one dollar amounts to 64 cents, which generally is in accordance with the results in the literature (see Hines and Thaler, 1997). This result differs, however, from Holtz–Eakin *et al.* (1991) who use a panel VAR with nine-years to estimate the relationship between the levels of fiscal variables, and do not find a positive effect of grants on spending.

Reading across the rows in Table 6, one can see that each fiscal variable adjusts in the expected direction to innovations in the others, but by varying degrees. Own revenues, for example, adjust more strongly to expenditures than to grants or debt service. The third row, showing the response of grants, is of particular interest. Note that fiscal transfers from higher-level governments respond quite significantly to changes in own revenues and expenditures but not very strongly to debt service burdens. The fact that transfers respond negatively to own revenues and positively to expenditures is consistent with several common but quite distinct (and not mutually exclusive) hypotheses about intergovernmental fiscal relations. One hypothesis would be that higher-level governments have implemented programs of fiscal transfers that subsidize local expenditures and "tax" local revenues. For example, with a

program of matching grants, higher municipal expenditures would result in larger transfers. The responses revealed in the table would then reflect the operation of these policies. Another hypothesis, related but distinct, would be that the institutions of intergovernmental fiscal relations are structured in such a way that shocks to local fiscal variables, perhaps arising from exogenous fluctuations in local economic conditions, trigger offsetting adjustments by higher-level governments that use either automatic or discretionary transfer mechanisms to help insure localities from such shocks, thus pooling "fiscal risks" among cities. In accordance with this view, our results confirm that revenue shocks are partly offset by vertical grants. As a third hypothesis, one might conjecture that higher-level governments adapt their fiscal transfer policies so as to assist cities that are experiencing "fiscal stress", as indicated by positive innovations in expenditures and negative innovations in revenues. The responses displayed in the table might then suggest that localities face "soft" budget constraints that enable them to manipulate their policies so as to induce accommodating fiscal transfers. Whichever of these hypotheses may be true – and a standard VAR or VECM is not designed to distinguish among them – it is important to note that the mechanisms of fiscal adjustment differ among fiscal variables: the response of fiscal transfers to debt service is substantially smaller in magnitude than the response to local spending and revenues. We shall discuss this issue further in the next section.

5 Sample Decompositions

The results in the preceding section have revealed a number of interesting features of the dynamics of fiscal adjustment for US municipalities. However, although it is certainly useful and instructive to study the entire sample of cities, our data set is sufficiently large that further analysis can be undertaken. In this section, we examine subsets of municipalities in an attempt to uncover potentially important differences in the nature of the adjustment process for different types of cities. We explore two potentially important dimensions: city size and the initial debt burden of the cities.

5.1 Fiscal Adjustment and City Size

The dataset shows remarkably strong variation in terms of population size. The cross-sectional nature of this variation is highlighted by the finding that 86% of the variation in population in 1997 can be explained in a regression on the 1972 figures. If the sample is decomposed by average population size over the entire sample period, does one find important differences in the adjustment pattern across city size?

Table 7: Decomposition with Respect to City Size

Response	Innovation to							
	Own Revenue		Gen. Expend.		Vert. Grants		Debt Service	
				small cities (bottom 25%)				
Own Revenue	-.420	(.047)	.204	(.040)	-.188	(.049)	.306	(.082)
Gen. Expend.	.443	(.049)	-.696	(.039)	.262	(.051)	-.319	(.084)
Vert. Grants	-.075	(.023)	.056	(.018)	-.502	(.029)	-.018	(.034)
Debt Service	-.002	(.008)	.015	(.006)	-.012	(.007)	-.337	(.027)
	response to permanent increase							
Own Revenue			.673	(.070)	-.378	(.097)	.462	(.117)
Gen. Expend.	.765	(.044)			.525	(.094)	-.482	(.129)
Vert. Grants	-.130	(.040)	.184	(.059)			-.027	(.051)
Debt Service	-.004	(.014)	.050	(.020)	-.025	(.014)		
				medium-sized cities (25th–75th percentiles)				
Own Revenue	-.300	(.034)	.137	(.020)	-.102	(.022)	.087	(.047)
Gen. Expend.	.561	(.035)	-.752	(.023)	.380	(.031)	-.423	(.047)
Vert. Grants	-.083	(.015)	.082	(.012)	-.473	(.023)	.043	(.021)
Debt Service	-.003	(.008)	.018	(.006)	-.010	(.007)	-.402	(.019)
	response to permanent increase							
Own Revenue			.529	(.048)	-.194	(.043)	.146	(.078)
Gen. Expend.	.801	(.024)			.721	(.040)	-.707	(.082)
Vert. Grants	-.118	(.022)	.319	(.038)			.072	(.035)
Debt Service	-.004	(.012)	.070	(.025)	-.019	(.014)		
				large cities (top 75%)				
Own Revenue	-.320	(.062)	.115	(.031)	-.132	(.039)	.058	(.079)
Gen. Expend.	.511	(.069)	-.696	(.039)	.404	(.057)	-.298	(.084)
Vert. Grants	-.112	(.026)	.148	(.023)	-.424	(.040)	.180	(.037)
Debt Service	-.014	(.010)	.029	(.007)	-.033	(.008)	-.408	(.025)
	response to permanent increase							
Own Revenue			.380	(.075)	-.230	(.071)	.098	(.132)
Gen. Expend.	.752	(.048)			.702	(.069)	-.503	(.144)
Vert. Grants	-.165	(.044)	.487	(.060)			.304	(.063)
Debt Service	-.021	(.015)	.096	(.026)	-.057	(.015)		

Sample decomposition based on the quartiles of the long-run distribution of population. Standard errors in parentheses obtained by sampling from the normal joint distribution of the VECM estimates based on a heteroscedasticity consistent estimate of the variance-covariance matrix.

Results from estimating the system separately for cities in three size groups are reported in Table 7. The first group (the bottom quartile of cities by size) consists of 318 cities with populations between 1 and 15 thousand, the second group consists of 635 cities with populations between 15 and 62 thousand, and the third group (the top quartile by size) comprises 317 cities with populations between 63 thousand and 7.4 millions. This table reveals several important differences in the adjustment patterns of cities of different sizes, which, given the rather small standard errors, generally exceed reasonable confidence intervals.

Looking first at the first column of this table, we note that small cities tend to respond to an innovation in revenues more with a reduction of future revenues than with higher spending, as compared with medium size and large cities. As reported in the second column, small cities also raise own revenues more in response to an innovation in expenditures than large jurisdictions. For example, small jurisdictions respond to a permanent expenditure increase of $1 with an increase in own revenues of about 67 cents whereas large jurisdictions raise their own revenues by only 38 cents.

By contrast, large cities rely much more on transfers from higher-level governments to finance permanent increases in expenditures. For small municipalities, only about 18% of a permanent increase in spending is financed by increased grants, whereas the corresponding figure for large municipalities is almost 49%. It is interesting to compare these adjustment responses to the average shares of expenditures financed by grants. Larger jurisdictions, on average, depend more on grants: grants as a share of expenditures are 31% for large cities and only 26% for small cities. For large cities, then, *innovations* in municipal expenditures are even more substantially financed by increased intergovernmental transfers than the already relatively high *average* share of grants in total expenditures suggests. Conversely, for smaller cities, innovations in municipal expenditures are even less substantially financed through transfers than is indicated by the relatively low share of grants in total expenditures. Expressed somewhat differently, the "marginal" response of grants to innovations in expenditures magnifies the existing "average" differential importance of grants in the finances of cities in different size categories.

The table also reveals striking differences in response to higher debt service. Whereas small jurisdictions tend to finance additional debt service both by raising revenues and cutting spending rather symmetrically, larger jurisdictions rely much less on increases in own revenues.

The importance of intergovernmental transfers in fiscal adjustments by large cities is also revealed by comparisons of figures in the third row of each panel. Across all size categories, grants tend to offset innovations in other fiscal variables, falling as revenues (both own-source and intergovernmental) rise and rising as expenditures and debt service increase. However, these effects become more pronounced with increasing city size, and are markedly higher for

large cities, especially for innovations in expenditures and debt service. The response of fiscal transfers to a permanent innovation in debt service is particularly noteworthy. For small- and medium-sized cities, this effect is essentially negligible, but for large cities, almost a third of an innovation in debt service is offset by transfers from higher-level governments.

Evidently, then, grants play an unusually important role in the fiscal adjustment process for large cities. It is tempting to view this finding as evidence of a soft budget constraint for these cities. However, as noted at the end of the previous section, there are other possible interpretations of this evidence. For example, suppose that state-level policymakers want to encourage local law-enforcement or public-health authorities to use new technologies and equipment in order to upgrade public services. One might conjecture that such initiatives are most easily implemented by encouraging or requiring certain actions on the part of a relatively few large municipalities, the costs of which are then absorbed, in part, by the state government, in the form of additional transfers. This might be especially true for initiatives that involve large capital expenditures and that are financed, in the first instance, by higher levels of borrowing by large cities. The present analysis cannot determine whether the differences in the dynamics of fiscal adjustment for large and small cities reflect soft budget constraints, selective implementation of higher-level policy initiatives through large municipalities, selective pooling of fiscal risks for large cities, or still other possible factors. It does, however, demonstrate that the fiscal adjustment process for large cities, especially in its intergovernmental dimensions, is quite different from that for small and medium-sized cities. Evidently, the institutional structure of intergovernmental fiscal relations differs quite substantially among cities of different sizes. One implication of this finding is that empirical analysis of large cities, useful though it may be because of their quantitative importance, may lead to findings that are unrepresentative of municipalities in general.

5.2 Fiscal Adjustment and Debt Levels

Whereas the intertemporal budget constraint is basically compatible with any initial level of the debt, governments – or the political and market participants who constrain their behavior – might have preferences about the level of their debt. In particular, in a stochastic setting, where the local budget is subject to considerable fluctuations, governments may try to avoid a large amount of debt. This could be part of a precautionary policy which aims at reducing the risk of not being able to follow a certain policy agenda in the future. For these reasons, one might expect that budgetary adjustments will differ across jurisdictions depending on their initial debt burden; in particular, cities with high initial debt burdens might adjust to innovations in fiscal variables in such a way as to reduce their debt, while those with lower debt levels might

have more flexibility to let expenditures rise or to let own-source revenues fall. Transfers from higher-level governments might also be more forthcoming for cities with higher debt levels, at least if municipal budget constraints are somewhat "soft".

Since the net asset position of a government is difficult to assess from the available data, a sample decomposition is carried out based on a ranking of cities according to the sizes of their *initial* (net) debt-service/income ratio. In contrast to population size differences, which show only minor changes over time, the level of debt service is much less persistent. Therefore, it would be misleading to carry out a decomposition of the sample based on long-run averages. The model using four lags in differences describes the response to innovations from 1977 to 1997, so the decomposition is carried out using the debt-service to income ratio in 1976. As with population size, the sample is decomposed into three subsamples. The first consists of 318 cities with a debt-service/income ratio of between -2.2% and -0.05%, the second consists of 635 cities with a ratio between -0.05 % and 0.13 %, and the third comprises 317 cities with a debt service income ratio between 0.13% and 5.3%. Note that this decomposition displays almost no overlap with the previous decomposition according to population size, indicating that there is no strong association between average city size and the debt-service burden criterion.[20]

Table 8 reports the results from estimating the system separately for three subsamples decomposed by size of initial debt-service burden. It shows a number of interesting differences, in particular, between the cities with a high debt-service burden as compared to the reference group with a medium burden. Cities with a high initial debt-service burden tend to use a larger part of an innovation to revenues to reduce future revenues and to reduce debt. In comparison, cities with a medium debt-service burden tend to respond more with an increase in spending. In cities with a higher initial debt-service burden, an innovation in grants is used to a larger extent to expand expenditures and to reduce debt. Whereas the response in debt service to additional revenues supports a view of high debt-service jurisdictions attempting to reduce debt, this view is contradicted by the finding that additional expenditures are financed to a considerable extent by increasing debt service. But, the stronger response of debt service to expenditure might also indicate that municipalities tend to use expenditure reductions to finance debt reduction.

Perhaps most striking are the results relating to changes in grants and to debt service itself, as shown in the third row of each table. For cities with a high debt-service burden, vertical grants play a larger role in fiscal adjustment. This is particularly apparent from figures for permanent innovations, where we find that almost 17% of an innovation in own revenues is offset by a re-

[20]For instance, from the 317 cities in the high-debt-service category, 79 fall in the large population group, 151 belong to the medium size group and 87 fit in the small city group. Also formal testing on the contingency table did not reject the hypothesis of no association.

Table 8: Decomposition with Respect to Debt-Service Burden

Response	Innovation to							
	Own Revenue		Gen. Expend.		Vert. Grants		Debt Service	
	small debt-service burden (bottom 25%)							
Own Revenue	-.359	(.044)	.139	(.030)	-.143	(.036)	.102	(.052)
Gen. Expend.	.493	(.046)	-.745	(.034)	.300	(.047)	-.374	(.055)
Vert. Grants	-.063	(.021)	.043	(.017)	-.480	(.033)	.017	(.027)
Debt Service	.012	(.011)	.004	(.010)	-.006	(.012)	-.433	(.027)
	response to permanent increase							
Own Revenue			.547	(.073)	-.275	(.069)	.180	(.089)
Gen. Expend.	.770	(.038)			.577	(.072)	-.659	(.099)
Vert. Grants	-.098	(.033)	.169	(.061)			.031	(.047)
Debt Service	.018	(.018)	.017	(.041)	-.011	(.022)		
	medium debt-service burden (25th–75th percentiles)							
Own Revenue	-.309	(.042)	.191	(.041)	-.197	(.046)	.104	(.061)
Gen. Expend.	.554	(.041)	-.704	(.039)	.297	(.046)	-.449	(.061)
Vert. Grants	-.080	(.017)	.067	(.018)	-.464	(.027)	-.007	(.025)
Debt Service	-.002	(.007)	.019	(.005)	-.013	(.005)	-.412	(.018)
	response to permanent increase							
Own Revenue			.645	(.076)	-.368	(.083)	.176	(.102)
Gen. Expend.	.802	(.026)			.553	(.081)	-.762	(.103)
Vert. Grants	-.116	(.024)	.227	(.064)			-.012	(.042)
Debt Service	-.003	(.010)	.065	(.017)	-.024	(.010)		
	high debt-service burden (top 75%)							
Own Revenue	-.394	(.044)	.153	(.024)	-.081	(.030)	.270	(.073)
Gen. Expend.	.465	(.050)	-.711	(.030)	.422	(.042)	-.240	(.075)
Vert. Grants	-.101	(.024)	.110	(.016)	-.465	(.030)	.113	(.033)
Debt Service	-.021	(.009)	.028	(.006)	-.022	(.008)	-.334	(.027)
	response to permanent increase							
Own Revenue			.529	(.049)	-.152	(.058)	.405	(.102)
Gen. Expend.	.768	(.044)			.789	(.054)	-.360	(.116)
Vert. Grants	-.166	(.043)	.382	(.039)			.169	(.049)
Debt Service	-.034	(.016)	.097	(.022)	-.041	(.016)		

Sample decomposition based on the initial ratio of net debt service per capita to income per capita. Standard errors in parentheses obtained by sampling from the normal joint distribution of the VECM estimates based on a heteroscedasticity consistent estimate of the variance-covariance matrix.

duction in transfers and more than a third of an innovation in expenditures is financed by higher grants. With regard to the response to an innovation in debt service, note first that for cities with a high debt-service burden, a larger part of an innovation in the debt service reflects a permanent increase (for the top category of cities, only one-third of a debt-service innovation is offset by subsequent reductions in debt-service, whereas there is a more than 40% offset for others). These more-persistent innovations are financed with additional transfers from higher-level governments to a substantial degree (almost 17%) whereas no effect is found for the reference group of cities with medium levels of the debt service (about -1%, an order-of-magnitude difference).

6 Conclusion

As is well-known, non-structural time-series analyses of the sort we have undertaken here cannot be used to estimate or test for specific structural relationships. They must therefore be interpreted with considerable caution. Although the empirical results confirm that the changes in some budgetary components precede significant future adjustments in others, we are not able to identify the cause of those correspondences. For example, we have seen that changes in grants are followed by expenditures by large municipalities. Without further analysis, we cannot, for instance, determine whether (i) new programs of intergovernmental transfers give rise to additional municipal spending (the policies of higher-level governments drive those of lower-level governments), (ii) municipal government policymakers demand support from higher-level governments for expenditures that they plan to carry out (lower-level governments drive the policies of higher-level governments), or (iii) fundamental shifts in municipal conditions (e.g., flight of the middle class from core cities) raise demands for municipal expenditures (e.g., social services spending) and create incentives for higher-level governments to assist in the financing of those expenditures. As noted earlier, these types of hypotheses are not mutually exclusive, and different hypotheses may have greater or lesser validity with respect to different specific categories of expenditures, intergovernmental transfer programs, etc. The significant relationships that we have found are nevertheless suggestive and, by providing evidence of empirical relationships that exist in the data, they indicate promising directions for further analysis. Many of these relationships have not previously been discerned.

The results point to an important role of expenditures in maintaining intertemporal budget balance. This is particularly true for innovations in expenditures themselves, where more than two thirds of a change is balanced with an offsetting change in the present value of future expenditures. But also for innovations in other budgetary components, including debt service, a significant part of adjustment towards budget balance is due to expenditures. Neverthe-

less, changes in budgetary components are also followed by adjustments on the revenue side. Not only are own revenues raised after an increase in expenditures; grants from higher-level governments have also been shown to be quite sensitive to changes in municipal spending. Indeed, intergovernmental transfers seem to "cushion" the process of fiscal adjustment for municipalities more generally, in the sense that higher "primary" expenditures, higher debt service, and lower revenues are followed by higher grants. While the causation underlying this significant response cannot be determined from the analysis, the role of grants in the fiscal adjustment process raises important questions about the design of the vertical fiscal relationships. Since municipalities evidently use "external" funds to balance their budget, it is possible that this apparent softening of budget constraints distorts local policy decisions.

A decomposition according to the average population size of the cities documents significant differences in the estimated responses across subsamples. In particular, in response to changes in expenditures, as well as in debt service, small cities tend to rely more on own revenues whereas large cities restore budget balance more by raising revenue from grants. Although these differences may partly reflect the larger budget share of grants in larger cities, the differences in the response is much larger than the difference in the budget share would suggest. Hence, if vertical grants distort policy choices, this effect may be particularly relevant for larger cities.

Distinguishing cities according to their initial debt burden, we again find differences in the adjustment to budgetary changes. As cities with a large debt burden tend to use both own revenues and grants relatively more to reduce future debt service, there is some support for a convergence in debt levels. Together with the finding that municipalities converge to small surpluses, this seems to suggest that municipalities on average follow a disciplined and cautious fiscal policy. However, this interpretation conflicts with the finding of a higher propensity of cities with large debt to raise future debt service in response to additional expenditures. At any rate, similar to the case of large cities, grants are generally found to play a more important role in maintaing budget balance in cities with a high debt burden.

The statistical methods that we have used do not test for the importance of any particular institutional, economic, or other determinants of municipal fiscal adjustment, but rather shed light on the empirically-relevant contours of the underlying institutions as revealed in the dynamic adjustment process. The findings presented here open up many questions for further analysis. Why should expenditures and revenues play different roles in the dynamic adjustment process for municipalities? Why should intergovernmental transfers interact with municipal finances as they do? Why should fiscal adjustment for large cities differ from that of small cities? As indicated in some of the preceding discussion, there are many interesting hypotheses that might be examined in an attempt to explain these and other empirical results revealed in our

analysis. An enhanced view of the empirical landscape should be of value in discriminating among competing theoretical models of local government policymaking in a federal structure, and, ultimately, in understanding better the complex institutional structures, interacting with underlying economic, demographic, and technological fundamentals, that produce the observed dynamic fiscal adjustment process.

References

Administrative Office of the U.S. Courts (2000a), *Bankruptcy Basics*, Revised Second Edition (Washington: Administrative Office of the U.S. Courts, Bankruptcy Judges Division).

Administrative Office of the U.S. Courts (2000b), *Annual Report of the Director*, (Washington: Administrative Office of the U.S. Courts).

Avery, R. B. (1977), "Error Components and Seemingly Unrelated Regressions", *Econometrica*, 45, 199–209.

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

Bird, R. M. and F. Vaillancourt (1998), "Fiscal Decentralization in Developing Countries: An Overview" in R. M. Bird and F. Vaillancourt (eds.) *Fiscal Decentralization in Developing Countries*.

Bird, R. M., R. D. Ebel, and C. I. Wallich (1995), "Fiscal Decentralization: From Command to Market" in R. M Bird, R. D. Ebel, and C. I. Wallich (eds.), *Decentralization of the Socialist State: Intergovernmental Finance in Transition Economies*.

Bohn, H. (1991), "Budget Balance Through Revenue or Spending Adjustment", *Journal of Monetary Economics*, 27, 333–359.

Bohn, H. and R.P. Inman. (1996), "Balanced–Budget Rules and Public Deficits: Evidence from U.S. States", *Carnegie–Rochester Conference Series on Public Policy*, 45, 13–76.

Dillinger, W. and S. Webb (1999), "Fiscal Management in Federal Democracies: Argentina and Brazil", *Policy Research Working Paper* 2121, World Bank.

General Accounting Office (1995), Background Studies on Boston, Cleveland, New York, ..., unpublished.

Gramlich, E. (1977), "Intergovernmental Grants: a Review of the Empirical Literature, in: Oates, W. (ed.), *The Political Economy of Fiscal Federalism*, Heath: Lexington.

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

Hines, J, and R. Thaler (1995), "The Flypaper Effect", *Journal of Economic Perspectives*, 9, 217-226.

Holloway, G. M. (1996a), "District Government: Information on its Fiscal Condition and the Authority's First Year of Operations", GAO report T-AIMD-96-126.

Holloway, G. M. (1996b), "District Government: Information on its Fiscal Condition", GAO report T-AIMD-96-133.

Holtz–Eakin, D., Newey, W., and H. Rosen (1991), "The Revenue–Expenditure Nexus: Evidence from Local Government Data", *International Economic Review*, 30, 415–429.

Im, K. S., Pesaran, M. H., and Y. Shin (1997), "Testing for Unit Roots in Heterogeneous Panels", revised version of *DAE Working Paper Series*, 9526, University of Cambridge, December, 1997.

Inman, R.P. (1989), "The Local Decision to Tax", *Regional Science and Urban Economics 19*, 455-491.

Kendall, M. and A. Stuart (1976), *The Advanced Theory of Statistics*, Vol.III, Hafner: New York.

McCarty, T. A. and S. J. Schmidt (1997), "A Vector Autoregression Analysis of State-Government Expenditure", *American Economic Review 87 (2)*, 278–282.

McKinnon, R. (1997a), "EMU As a Device for Collective Fiscal Retrenchment", *American Economic Review 87 (2)*, 227-229.

McKinnon, R. (1997b), "Monetary Regimes, Government Borrowing Constraints, and Market-Preserving Federalism: Implications for EMU", in T. Courchene (ed.), *The Nation State in a Global/Information Era: Policy Challenges* (Kingston, Ontario: John Deutsch Institute).

National Bankruptcy Review Commission (1997), *Bankruptcy: The Next Twenty Years* (Washington: National Bankruptcy Review Commission).

Nickell, S. (1981), "Biases in Dynamic Models with Fixed Effects", *Econometrica*, 49, 1417–1426.

Poterba, J. M. (1994), "State Responses to Fiscal Crisis: the Effects of Budgetary Institutions and Policy", *Journal of Political Economy*, 102, 799–821.

Prud'homme, R. (1995), "On the Dangers of Fiscal Decentralization" *World Bank Research Observer 10*.

Rodden, J. (1999) "The Dilemma of Fiscal Federalism: Hard and Soft Budget Constraints Around the World", unpublished.

Sims, C. A. (1987), "Comment on D. E. Runkle, Vector Autoregression and Reality", *Journal of Business & Economic Statistics*, 5, 443–449.

Tanzi, V. (1996) "Fiscal Federalism and Decentralization: A Review of Some Efficiency and Macroeconomics Aspects", in M. Bruno and B. Pleskovic (eds.), *Annual World Bank Conference on Development Economics*. Washington DC: The World Bank, 295–316.

Trehan, B., and C. E. Walsh (1988), "Common Trends, the Government's Budget Constraint, and Revenue Smoothing", *Journal of Economic Dynamics and Control*, 12, 425–444.

Trehan, B., and C. E. Walsh (1991), "Testing Intertemporal Budget Constraints: Theory and Applications to U.S. Federal Budget and Current Account Deficits", *Journal of Money, Credit, and Banking*, 23, 206–223.

Wilcox, V. (1989) "The Sustainability of Government Deficits: Implications of the Present Value Borrowing Constraint", *Journal of Money, Credit, and Banking*, 21, 291–306.