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Equalization Transfers and Dynamic Fiscal Adjustment: Results for German Municipalities and a US-German Comparison

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Abstract

A large panel of German municipalities is employed in order to investigate the dynamic fiscal policy adjustment of local jurisdictions using a VEC model which explicitly takes account of the intertemporal budget constraint. The results confirm that a substantial part of adjustment takes place by offsetting changes in intergovernmental transfers, in particular, in 'fiscal equalization' transfers: in present value terms about 34 cents of a one euro decrease in own revenue is compensated by subsequent changes in equalization transfers. The contribution of intergovernmental transfers to restoring fiscal balance, therefore, is about two to three times higher, compared to the case of US municipalities investigated by Buettner and Wildasin (2006). Nevertheless, budget components such as own revenues and general expenditures display larger fluctuations in the German case. This is consistent with the view that fiscal equalization transfers create a moral-hazard problem.

JEL Classification: H74, H72, H77
Keywords: Fiscal balance; Intergovernmental transfers; Local governments; Fiscal equalization

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1 Introduction

Aside from own revenues raised from local taxes and charges, local governments in most countries rely on intergovernmental revenue obtained from other governmental units, in particular from higher levels of government. The literature on fiscal federalism has justified this kind of intervention as a means to induce the local governments to provide specific types of public goods, to redistribute among lower level governments, and to ensure efficiency under conditions of intergovernmental externalities (*e.g.*, Oates, 1972 and Gordon, 1983). The macroeconomic literature has also noted that intergovernmental transfers play a role in smoothing spending and tax policy of local governments in a setting with uncertainty and limited access to debt (*e.g.*, Sala-i-Martin and Sachs, 1992 and von Hagen and Eichengreen, 1996). The more recent literature emphasizes, however, that intergovernmental transfers give rise to important questions of governance, since higher level governments allocate funds on the basis of conditions which to some extent are subject to strategic choices of local governments (*e.g.*, Bordignon, Manasse, and Tabellini, 2001, for a survey of the recent literature, see Oates, 2005).

One of the major problems with intergovernmental revenue discussed in this respect is the softening of the budget constraint with the consequence of possibly serious disincentives for fiscal policy (*e.g.*, Wildasin, 1997, Qian and Roland, 1998). For instance, the possibility to elicit further grants could lead local governments to incur deficits. If the central government cannot commit itself to a strict no bail-out rule, subsequently revenue in terms of grants will rise and eventually restore the fiscal balance. As this example shows, the design of federal fiscal relations faces a challenge in providing fiscal assistance without, however, responding too much to strategic local policies. Another problem with fiscal assistance is discussed in the context of interregional risk sharing: if intergovernmental transfers provide some form of insurance against asymmetric shocks a moral-hazard problem emerges in the sense that local governments pursue more risky policies (Persson and Tabellini, 1996 and Bucovetsky, 1997).

In order to assess the importance of governance problems with intergovernmental grants, several papers have studied exceptional cases, where lack of fiscal discipline or some major shock has actually resulted in a fiscal crisis and a "bailing out" may be observed directly. For instance, Gramlich (1976) discusses the case of the city of New York, Inman (1995) focuses on the case of

Philadelphia, Seitz (1999) and Rodden (2003) are concerned with the cases of the German states of Saarland and Bremen. Though this literature offers important insights into the workings of federal fiscal institutions if local finances have gone awry, the importance of governance problems is not confined to the rare cases of open fiscal crises. Under conditions of soft budget-constraints and moral hazard, the governance problems might simply show up in the local governments' ability to elicit funds from upper level governments without necessarily undergoing a fiscal crisis. In search of the empirical relevance of soft-budget constraints and other governance problems, this suggests broadening the viewpoint and asking whether and to what extent intergovernmental transfers can be and are used to restore short-run and long-run fiscal balance of local governments. In order to address the governance problems, it would be particularly interesting to explore whether the role of these transfers in restoring fiscal balance differs among various institutional settings and whether this has implications for local policies.

One important institutional dimension in this regard is the role of fiscal equalization. While most countries assist subnational governments by means of vertical grants, some federal countries, such as Australia, Canada, Germany, or Switzerland, entertain horizontal redistributive transfer schemes which aim at equalizing revenues across subnational governments. The corresponding equalization transfers are usually formally related to the revenue capacity of the individual jurisdictions (see Boadway, 2004, for an overview). However, little is known about the comparative performance of systems with vertical grants and fiscal equalization systems in restoring fiscal balance and about associated governance problems.

Against this background this paper sheds light on the role of intergovernmental transfers in restoring fiscal balance using a large panel of German municipalities. It builds on a VAR approach by Bohn (1991), which allows us to capture the dynamic adjustment to a fiscal shock in terms of offsetting changes in the components of the future primary surplus. Buettner and Wildasin (2006) have recently applied this approach to a sample of US municipalities and have shown that a significant fraction of revenue shocks is in fact offset by grants from federal and state governments. This result is remarkable given that US local governments enjoy a considerable degree of fiscal autonomy.

While municipalities in Germany also enjoy some autonomy in expenditures as well as in taxation they are subject to a comprehensive system of fiscal equalization transfers. These transfers are closely tied to the revenue capacity of the jurisdictions and might, therefore, be quite effective in

providing fiscal assistance in presence of revenue shocks. By contrast, the vertical grants received by US cities often relate to specific functions of government such as public welfare, education, or public transport. Given those differences, the German case offers interesting comparisons with the case of US municipalities. For example, do intergovernmental transfers play a more important role in restoring fiscal balance in the German case? If German municipalities enjoy more insurance from fiscal transfers, is the time path of spending by German municipalities smoother than that of US local governments? Or do we see some moral-hazard effects in the sense that German municipalities engage in riskier projects?

The empirical results of this paper's analysis support an important role of fiscal equalization for budget balance. The degree of fiscal assistance provided by intergovernmental revenue is much more significant than in the US counterpart studied by Buettner and Wildasin (2006). At the same time, however, we find rather strong fluctuations in expenditures and revenues, which relate to the strong reliance of municipalities on the business tax. In fact, the results suggest that insurance provided by the system of equalization transfers might induce the municipalities to rely much more on the volatile business tax rather than using property or land taxes as the US counterparts.

The paper is set up as follows. The investigation approach is outlined in Section 2. Section 3 describes the data in greater detail and verifies that they are consistent with the modeling approach. Section 4 present results of the empirical analysis for Germany and Section 5 offers some comparisons with the US case. Section 6 provides the conclusions.

2 Empirical Representation of Fiscal Adjustment

In order to model the budgetary adjustment pattern in a comprehensive way without much prior restrictions an investigation approach pioneered by Bohn (1991) rests on a vector error-correction model which captures the development of budget components like revenues, expenditures, and debt service as well as their interrelationship over time. To use an error-correction framework rather than a simple autoregressive approach reflects the intertemporal budget constraint: as the empirical analysis deals with fiscal policy *ex post*, the empirical approach rests on the stochastic implication of the intertemporal budget constraint that budgetary components like expenditures, revenues, and debt service display a co-integrating relationship, and, hence, the deficit needs to be stationary

(*e.g.*, Trehan and Walsh, 1988). Whereas Bohn (1991) is concerned with the analysis of the fiscal policy of the US federal government, Buettner and Wildasin (2006) study fiscal adjustment in the context of US local governments which obtain substantial amounts of revenue not only from own sources like taxes, but from higher levels of government. As already pointed out in the introduction, this revenue is of particular importance when it comes to assess the softness of local governments' budget constraints and other governance problems.

While Buettner and Wildasin (2006) distinguish the primary surplus into three components comprising general government expenditures, own-source revenues, and grants, due to the importance of fiscal equalization in the German context the current paper extends their approach: it distinguishes (horizontal) intergovernmental transfers related to the system of fiscal equalization from other forms of (vertical) intergovernmental transfers referred to as grants. This helps us to discern the specific contribution of the two types of transfers in the adjustment towards fiscal balance.

Formally, the analysis considers three components of the expenditure side of the budget, *i.e.* general expenditures (G_t), current debt service (S_t), and fiscal-equalization transfers (T_t), as well as two components of the revenue side, *i.e.* own revenues (R_t) and grants (I_t). Whereas grants are strictly non-negative, fiscal-equalization transfers will be positive or negative depending on whether the municipality is a net contributor or net receiver of transfers. Stacking these five components into a vector

$$Y_t = (R_t, G_t, I_t, T_t, S_t)', \tag{1}$$

the current deficit D_t is determined by a vector product

$$D_t \equiv b'Y_t \quad \text{where:} \quad b = (-1, 1, -1, 1, 1)'. \tag{2}$$

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

$$A(L)\,\Delta Y_t = \gamma\, b'Y_{t-1} + u_t, \tag{3}$$

where Δ is the difference 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.

The empirical estimate of system (3) can be used to trace the fiscal adjustment to temporary imbalances, *i.e.* to surpluses or deficits, which cannot be traced back statistically to previous changes in the budget components. As usual in VAR analysis this adjustment can be depicted by impulse-response functions. Actually, postulating a discount rate we can compute the *present value* of the impulse-response of each variable with respect to shocks in every other variable. As is shown in Buettner and Wildasin (2006), the presence of the intertemporal budget constraint implies that the present value of the impulse-response functions (Bohn, 1991) will just offset the triggering, initial innovations. Thus, the present value of the future changes in the primary surplus should equal unity for unit innovations in expenditures and minus unity for unit innovations in revenues. While this is an implication of the budget constraint, it is not an exact empirical relationship. First of all, 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 the size of municipalities, 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 (*cf.* Buettner and Wildasin, 2006, for details). Finally, it should be noted that in the presence of assets B_t stands for the net fiscal debt position, which is difficult to determine from available data. Nevertheless, despite these qualifications, under reasonable assumptions the empirical results generally conform with this implication of the intertemporal budget constraint, as we will see below.

The empirical model does not deal with fiscal adjustments carried out before any deficit arises. Instead, the model focuses on the adjustment to a change in any budget component which is not immediately offset in the same period by itself or any other budget component such that at the end of the period a deficit or surplus results. In this context, it is important to note that the empirical model captures the fiscal adjustment to innovations regardless of their cause. To explore whether the adjustment pattern is consistent with the actual responses to observed local shocks we add some indicators of those shocks to the system and test whether and how these shocks are, in fact, correlated with the forecast errors.

Table 1: Definition of Fiscal Variables

	Variable	*Description*
(i)	Own Revenues (R_t)	local taxes excl. revenue sharing, charges and user fees, fines, profits, other revenue incl. rents and royalties
(ii)	General Expenditures (G_t)	compensation of employees, pensions, current expenses, subsidies, investment, investment subsidies
(iii)	Grants (I_t)	grants excluding equalization grants, including revenue sharing grants (income tax, VAT), and reimbursements of welfare aid
(iv)	Equalization Transfers (T_t)	contributions to state fiscal-equalization system, county contribution, net of state equalization grants
(v)	Debt Service (DS_t)	interest payments, net of interest revenue
(vi)	Deficit (D_t)	(ii) + (iv) + (v) - (i) - (iii)

3 Data and Specification Testing

The empirical investigation employs annual data for the complete set of municipalities in a major German state (Baden-Württemberg). After removing nine municipalities with data problems, the sample consists of 1102 jurisdictions over a time period of 27 years from 1974 to 2000. In terms of both the cross-sectional and the time-series dimension the dataset complements nicely with the sample of 1270 US municipalities investigated by Buettner and Wildasin (2006) over a time period of 26 years (1972 to 1997).

For the purposes of this study the budget of the municipalities is characterized by five fiscal variables, constructed from the official budget statistics which is adhering to a uniform mandatory classification. Table 1 gives a rough description; details including the German designation and the official code in the classification plan are provided in the Appendix. There are two revenue variables, own-source revenues and grants and three variables on the expenditure side: general expenditures, (net) equalization transfers and (net) debt-service expenditures. Because the municipalities vary in size, fiscal variables are used in per-capita terms.

Table 2: Descriptive Statistics

Variables	Mean	Std.Dev.	Min.	Max.
Own Revenues	.593	.261	-.117	5.90
General Expenditures	.984	.327	.208	5.67
Grants	.530	.205	.037	4.36
Equal.Transfers	.057	.148	-.687	1.89
Debt Service (net)	.030	.042	-.365	.434
Deficit	-.051	.216	-3.73	2.10
Population (in 1,000)	8.73	24.9	.093	617.
Employment per Capita	.240	.152	.007	2.87
Unemployment Rate	5.56	1.91	.800	13.3
Neg. Business Tax Rev.	.003	.058	0	1

Statistics for pooled observations. Figures refer to 1102 municipalities in the state of Baden-Württemberg in €1,000 per-capita and in prices of 2000. Fiscal variables and population are reported annually for the period 1974-2000, figures for employment and unemployment are only available for the period 1980-2000.

Table 2 presents descriptive statistics. The mean of inflation adjusted per-capita expenditures excluding debt service is €984. On the revenue side of the budget the largest component is own revenues but also grants are quite important. Note that even though the mean of the equalization transfers is positive, the minimum is negative reflecting a municipality with low taxing capacity, which is a net receiver of fiscal-equalization transfers. The mean of the residual difference between the first five components (equivalent to the deficit) is at minus €51 per capita, indicating that on average the cities run a small surplus. However, there is marked variation in the sample. This variation in budget outcomes is also reflected in differences in the debt service, where some cities show rather large interest expenses whereas others actually report net interest earnings.

Table 2 also provides statistics on some control variables which are used below in order to explore the source of the fiscal shocks. This includes local employment per capita and the local unemployment rate. The analysis further employs a dummy variable capturing exceptional situations where the local business tax revenue is negative. These are cases where, for instance, a major local company went bankrupt such that tax prepayments have to be refunded, or where a major company has appealed against a tax assessment at some date, won its case, and received a refund. Occasionally, the total amount of refunds is larger than the current receipts. About 80 such events are reported

in the dataset. Note that despite autonomy in setting the tax rate, tax collection is centralized at the state level which also participates in the revenue; the local government has no influence on tax administration including the determination of prepayments and refunds. Given the nature of these events we use their occurrence as an indicator of a major revenue shock to the municipality.

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 in the form of integration of order one. The basic system developed above takes account of this possible form of non-stationarity of the individual budgetary components as it is formulated in first differences.[4] Only the deficit is entered in levels, which is, however, stationary if the linear relationship implied is a co-integrating relationship as the macroeconomics literature suggests. In order to check whether the current deficit as well as the other variables employed are in fact stationary, unit-root testing is carried out using a procedure suggested by Im *et al.* (2002), which is based on the full set of unit-root statistics for each of the individual municipalities. Because this approach assumes independence of observations, the common component is removed by subtracting the cross-sectional averages from each observation. Table 3 reports statistics for the five budgetary components. Since individual cities show different developments over the 27-year sample, it is appropriate to assume a linear time trend in tests for variables in levels. However, the existence of a trend in the deficit would conflict with the intertemporal budget constraint. It turns out that for the own-revenue series non-stationarity cannot be rejected, and the same is true for the other

[4]The set of estimation equations is

$$\Delta R_{i,t} = \gamma^1 D_{t-1} + a_0^1 + \sum_{k=1}^{p} a_{1,k}^1 \Delta R_{i,t-k} + \sum_{k=1}^{p} a_{2,k}^1 \Delta G_{i,t-k} + \sum_{k=1}^{p} a_{3,k}^1 \Delta I_{i,t-k} + \sum_{k=1}^{p} a_{4,k}^1 \Delta T_{i,t-k} + \sum_{k=1}^{p} a_{5,k}^1 \Delta S_{i,t-k} + u_{i,t}^1$$

$$\Delta G_{i,t} = \gamma^2 D_{t-1} + a_0^2 + \sum_{k=1}^{p} a_{1,k}^2 \Delta R_{i,t-k} + \sum_{k=1}^{p} a_{2,k}^2 \Delta G_{i,t-k} + \sum_{k=1}^{p} a_{3,k}^2 \Delta I_{i,t-k} + \sum_{k=1}^{p} a_{4,k}^2 \Delta T_{i,t-k} + \sum_{k=1}^{p} a_{5,k}^2 \Delta S_{i,t-k} + u_{i,t}^2$$

$$\Delta I_{i,t} = \gamma^3 D_{t-1} + a_0^3 + \sum_{k=1}^{p} a_{1,k}^3 \Delta R_{i,t-k} + \sum_{k=1}^{p} a_{2,k}^3 \Delta G_{i,t-k} + \sum_{k=1}^{p} a_{3,k}^3 \Delta I_{i,t-k} + \sum_{k=1}^{p} a_{4,k}^3 \Delta T_{i,t-k} + \sum_{k=1}^{p} a_{5,k}^3 \Delta S_{i,t-k} + u_{i,t}^3$$

$$\Delta T_{i,t} = \gamma^4 D_{t-1} + a_0^4 + \sum_{k=1}^{p} a_{1,k}^4 \Delta R_{i,t-k} + \sum_{k=1}^{p} a_{2,k}^4 \Delta G_{i,t-k} + \sum_{k=1}^{p} a_{3,k}^4 \Delta I_{i,t-k} + \sum_{k=1}^{p} a_{4,k}^4 \Delta T_{i,t-k} + \sum_{k=1}^{p} a_{5,k}^4 \Delta S_{i,t-k} + u_{i,t}^4$$

$$\Delta S_{i,t} = \gamma^5 D_{t-1} + a_0^5 + \sum_{k=1}^{p} a_{1,k}^5 \Delta R_{i,t-k} + \sum_{k=1}^{p} a_{2,k}^5 \Delta G_{i,t-k} + \sum_{k=1}^{p} a_{3,k}^5 \Delta I_{i,t-k} + \sum_{k=1}^{p} a_{4,k}^5 \Delta T_{i,t-k} + \sum_{k=1}^{p} a_{5,k}^5 \Delta S_{i,t-k} + u_{i,t}^5.$$

Table 3: Panel Unit Root Tests

lag order (p)	4	5	6
Own Revenues	-2.03*	-1.98	-1.82
Gen. Expend.	-2.15*	-2.06*	-1.89
Grants	-2.09*	-1.99	-1.88
Eq. Transfers	-1.89	-1.85	-1.67
Debt Service	-1.98	-1.95	-1.78
Deficit	-2.25*	-2.15*	-1.93*
Δ Own Revenues	-2.30*	-2.13*	-1.89*
Δ Gen. Expend.	-2.47*	-2.27*	-2.00*
Δ Grants	-2.40*	-2.15*	-1.92*
Δ Eq. Transfers	-2.29*	-2.12*	-1.83*
Δ Debt Service	-2.14*	-2.05*	-1.85*

Average of augmented Dickey Fuller statistics. With the exception of the deficit, tests for variables in levels include a linear trend. 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.* (2002, Table 3).

variables in tests based on higher-order serial autocorrelation.[5] Non-stationarity can be rejected, however, for the deficit, which supports the view of the deficit as a co-integrating relationship. As the lower part of the table shows, non-stationarity can also be rejected for the first differences of all of the five budgetary components. This supports the specification of budgetary adjustments along the lines of the vector error-correction model.

The large cross-sectional dimension of the dataset enhances possibilities for empirical modeling by pooling observations for individual cities. Typically, panel-data studies allow for individual effects capturing differences in the characteristics of individual units.[6] The following analysis deals

[5]Note that as in Buettner and Wildasin (2006) the optimal lag length according to the Akaike criterion differs between individual municipalities, but in the majority of cases is not larger than 6.

[6]The literature on dynamic panel data has emphasized biasedness of standard panel data approaches in samples with relatively short time series in the presence of lagged endogenous variables and suggests the use of instrumental variable techniques (*e.g.*, Holtz-Eakin *et al.*, 1991). But, with 27 years of observation 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.

Table 4: Specification Tests

lag length	3	4	5	6
indiv.eff ($\chi^2(5505)$)	2507	2730	3064	3476
lag order reduction ($\chi^2(25)$)	2445	1615	992.0	551.8

Likelihood ratio statistics on cross-equation restrictions.

essentially with first differences of fiscal flow variables; only the fiscal deficit variable is entered in levels. Thus, the presence of individual effects would imply that the jurisdictions converge to different (per-capita) deficit levels. If no indication of individual effects is found the set of regressors is the same across equations. Then, it is appropriate to estimate individual equations of the system (3) separately with OLS, because joint estimation does not improve efficiency (Avery, 1977, and Baltagi, 1995:103pp).

Estimation of the VECM (3) requires specification of the lag length of the model. Given the limited overall time dimension of the dataset (27 years), we begin with a lag of 6 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 would suggest to employ a model with six lags. But, since estimates of models with four and five lags did not show major differences in the impulse-response functions the results presented in the following are obtained from the more parsimonious specification with four lags.

Comparing estimation with and without individual effects it turns out that joint tests reject the presence of fixed individual effects, regardless of lag length (see Table 4). As pointed out above, this indicates that municipalities are commonly converging towards the same level of deficit in per-capita terms and estimation can be carried out without individual effects.[7]

[7]Because innovations in budgetary components may share a common effect 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.

Table 5: Deficit Effects (Error-Correction Terms)

Equation	γ	(Std.err.)
Own Revenues	.061	(.019)
Gen. Expend.	−.453	(.021)
Grants	.053	(.012)
Transfers	−.080	(.005)
Debt Service	.032	(.002)

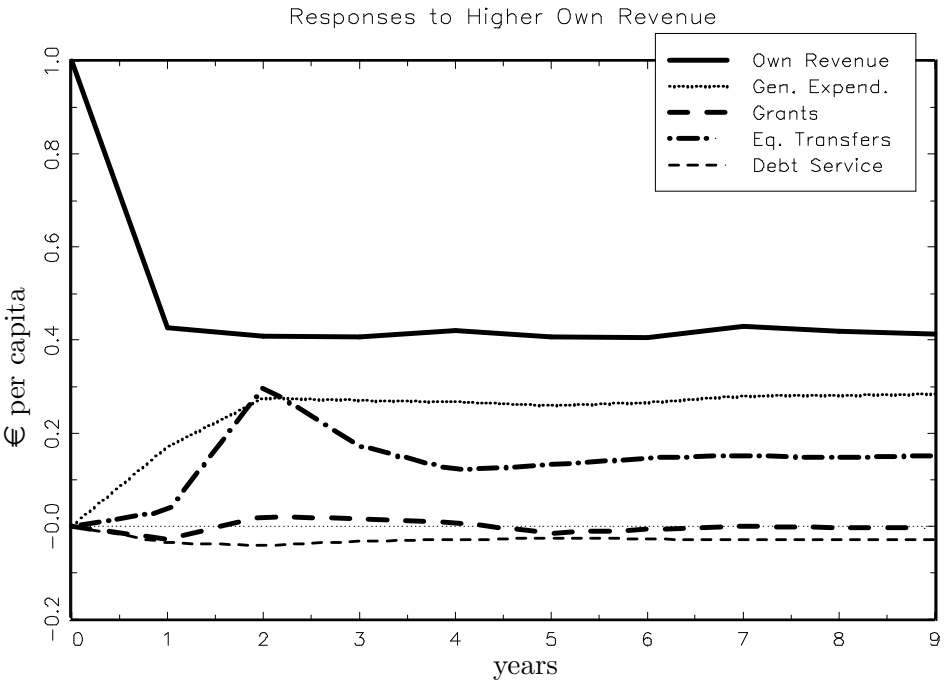
Heteroscedasticity robust standard errors in parentheses.

4 Estimation Results

As is shown in Table 5 the results for the parameter vector γ of system (3) clearly confirm the error-correction mechanism, since a higher deficit exerts a positive impact on own revenues and on grants received, whereas it has a negative impact on general expenditures as well as on equalization transfers. Note that equalization transfers are negative for municipalities with low revenue capacity; the negative impact of the deficit, thus, implies that they receive more funds in subsequent periods. The positive impact on debt service is consistent with the fact that the deficit results in a rise in debt 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 and the figure of around 0.03 seems broadly consistent with this view. It is also interesting to note the substantial differences in the size of the error-correction parameter. Whereas a higher deficit in the previous period by €1 shows a limited albeit significant impact on current changes in own revenues by 6.1 cents the impact on general expenditures is larger by a factor of 7 to 8.

As indicated above, the dynamic adjustment can be traced out using simulations in the fashion of impulse-response functions. To provide an example, Figure 1 depicts the responses to an innovation in own revenues. It shows that in the period following an exceptionally large amount of revenue, revenue drops strongly suggesting that about half of the variation in own revenues is only temporary. Nevertheless, some significant adjustment takes place in other components of the budget. First of all, general expenditures start to grow consistent with a "tax and spend" sequence. In addition,

Figure 1: Impulse Responses to an Innovation in Own Revenue



equalization transfers show a strong increase, in particular, in the second period after the revenue shock. This reflects a specific detail of the fiscal-equalization system: the taxing capacity, which is decisive for fiscal-equalization transfers, is actually calculated based on tax revenue (adjusted for tax effort) two years ago.[8]

To obtain a comprehensive view of fiscal adjustment it is instructive to calculate the total fiscal responses in present-value terms. For this purpose, following Bohn (1991) and Buettner and Wildasin (2006) the discount rate is fixed at 3%. The columns of Table 6 show the long-run impact of innovations in per-capita values of the fiscal variables, expressed in present-value terms.[9] For instance, the results in the first column show how fiscal balance is maintained if there is an increase in own revenue by one euro which results in a current deficit reduction (or in a surplus increase). According

[8]Cf. §6 of the Finanzausgleichgesetz (Fiscal Equalization Act) of the state of Baden-Württemberg.

[9]Standard errors are 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).

Table 6: Implied Present Value Responses

Response	Innovation to Own Reven.		Gen. Expen.		Grants		Eq. Transf.		Debt Serv.	
Own Revenues	-0.569⋆	(.021)	0.063⋆	(.012)	-0.040⋆	(.011)	-0.020	(.015)	0.185⋆	(.055)
Gen. Expend.	0.274⋆	(.019)	-0.851⋆	(.013)	0.355⋆	(.018)	-0.531⋆	(.020)	-0.991⋆	(.082)
Grants	-0.004	(.008)	0.028⋆	(.008)	-0.546⋆	(.015)	-0.057⋆	(.014)	-0.447⋆	(.053)
Eq. Transfers	0.146⋆	(.006)	-0.047⋆	(.004)	0.045⋆	(.004)	-0.530⋆	(.008)	0.042	(.026)
Debt Service	-0.029⋆	(.002)	0.033⋆	(.002)	-0.023⋆	(.002)	0.030⋆	(.003)	-0.323⋆	(.019)
	response to permanent change									
Own Revenues			0.425⋆	(.059)	-0.088⋆	(.024)	0.043	(.032)	0.273⋆	(.081)
Gen. Expend.	0.634⋆	(.023)			0.782⋆	(.022)	-1.129⋆	(.046)	-1.464⋆	(.109)
Grants	-0.009	(.017)	0.190⋆	(.044)			-0.121⋆	(.031)	-0.661⋆	(.074)
Eq. Transfers	0.338⋆	(.012)	-0.314⋆	(.046)	0.098⋆	(.010)			0.062	(.038)
Debt Service	-0.067⋆	(.004)	0.224⋆	(.028)	-0.052⋆	(.005)	0.064⋆	(.006)		

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. A star denotes significance at the 5 % level.

to the point estimates own revenues will decline in the future by 57 cents, general expenditures will increase by 27 cents, and equalization transfers will increase by 15 cents – all in present value terms.

Given the intertemporal budget constraint, the innovations in each of the budgetary components should be fully balanced in the present value of future changes in the components of the primary surplus. Summing across the first four rows in the first column of Table 6 we note that the present values of the changes is offsetting as much as 99 $(= 57 + 27 + 0 + 15)$ cents of a change in revenue by one euro. Computing the present value of adjustments in the primary surplus to innovations in general expenditures, grants, and equalization transfers yields similar figures:

Unit innovation to	Own Rev.	Gen. Exp.	Grants	Equal.Tr.	Debt Serv.
PV of change in prim. surplus	-0.992	0.989	-0.986	0.984	0.687

Only for innovations in debt service the sum of the present value of changes in the primary surplus differs from unity (in terms of absolute value). However, this result reflects temporal fluctuations in

the debt service. Because the point estimate for the present value of future changes in debt service in response to a unit increase in debt service is -0.323, out of a unit innovation in debt service only about .677 ($= 1 - 0.323$) euros are permanent. Contrasting the latter figure to the present value of estimated changes in the primary surplus, the close conformity with the predictions from the intertemporal budget constraint reappears. Given that the intertemporal budget constraint holds only approximately in empirical data, as the true discount rate, its time path, and the amount of non-interest bearing assets of the municipalities are not known, the close conformity of the empirical results with these predictions is indicative of quite reasonable properties of the empirical model.

Generally, the results show that innovations to the components of the budget tend to be partly offset by future changes in the same component. This is particularly true for general expenditures, where about 85 cents of the necessary adjustment in response to higher expenditures by one euro comes from an offsetting change in the present value of future expenditures; as already noted above, the corresponding figure for own revenue is 57 cents. Since all budget components display those fluctuations, albeit at a different scale, it is instructive to re-scale responses such that the figures report the response to a permanent unit innovation. In the lower panel Table 6 reports corresponding figures. Again, the results point to a key role of general expenditures in restoring fiscal balance. Almost two thirds (63 cents) of the balancing adjustment to a permanent unit change in own revenues comes from general expenditures. However, also equalization transfers are important, making up a third (34 cents) of the necessary adjustment. Grants not related to the fiscal-equalization system show less response, in fact, the estimated response to a change in own revenues is not significantly different from zero. The responses to innovations in expenditures give a mixed picture: additional general expenditures tend to trigger an increase in grants, but changes in other spending obligations such as equalization transfers and debt service are followed by reductions in grants. The latter effects are possibly related to the role played by matching grants: if transfer obligations and debt service are financed with cuts in general expenditures, the amount of (matching) grants acquired possibly declines.

While the present values of the impulse-response function depict the adjustment to unpredicted changes in the various budget components, it has been left open so far what the sources of those unpredicted changes actually are. This limits our ability to interpret the empirical response as an adjustment in local fiscal policies, mainly, because a fiscal shock might not just show up in

Table 7: Significance of Conditioning Variables

	Equations				
Conditioning Variables	Own Reven.	Gen.Expend.	Grants	Eq.Transfers	Debt Serv.
Period-specific effects	309 (21)⋆	865 (21)⋆	766 (21)⋆	2987(21)⋆	584 (21)⋆
Change in local employment[a]	69.0 (1) ⋆	14.5 (1) ⋆	5.32 (1) ⋆	12.6 (1) ⋆	2.95 (1)
Change in local unemployment[a]	1.14 (1)	2.03 (1)	0.69 (1)	1.20 (1)	5.31 (1) ⋆
Negative business tax rev.	105.4 (1) ⋆	.260 (1)	.452 (1)	1.89 (1)	2.05 (1)

Likelihood-ratio statistics for restricting the respective set of conditioning variables to zero. [a] Period-specific effects included as further conditioning variables. Significance at the 5 % level is marked with a star, degrees of freedom in parentheses.

one but in several budget components, simultaneously. To provide some insights into the possible sources of the unpredicted changes, further information about the time-period, the conditions in the local economy, and about specific tax revenue shocks are included by means of additional conditioning variables in our basic model. Their significance for each of the budget components under consideration is reported by means of likelihood-ratio statistics in Table 7, which summarize the gain in the predictive power from the inclusion of additional variables.[10] The first row of Table 7 reports statistics for the inclusion of period-specific effects. These effects capture all changes in the conditions faced by all municipalities such as growth, unemployment, or financial market conditions. A particularly strong effect is found for equalization transfers. This might indicate that equalization transfers do not only provide fiscal assistance and insurance against shocks but also inject period specific shocks into the local jurisdictions' budgets. The following rows reports results where, in addition, some local indicator of possible fiscal shocks is entered. While local employment shows a much weaker predictive power it exerts significant effects simultaneously on several of the budget components. Changes in local unemployment are mostly insignificant and only exert a weak impact on debt service. But as is evident from the last row, unusually large tax refunds which turn the business tax revenue negative do qualify as a source of own-revenue shocks. The indicator used

[10]More precisely, the likelihood-ratio statistics indicate whether implicit restrictions in the basic, unconditional model can be rejected on statistical grounds.

to capture major shocks to the business tax is a dummy variable which is positive in the presence of massive tax refunds rendering the (net) business tax revenues negative. As discussed above, those cases take place, rarely, but occasionally, due to the specifics of the business tax. While the negative business tax revenue dummy has a rather strong predictive power for unpredicted revenue shocks it does not exert any significant immediate impact on the other budget components. This supports the interpretation of the impulse responses to an innovation in own revenues as dynamic fiscal adjustment to a revenue shock.

5 US - German Comparison

Let us finally compare the results with the findings for US municipalities by Buettner and Wildasin (2006). Comparing the descriptive statistics given above with those for US municipalities reported by Buettner and Wildasin (2006) we note first, that the fraction of general expenditures financed with grants is 28 % in the US, but no less than 50 % in the German case. This suggests that own revenues are much more important in the US case. One might object against this comparison that the municipalities in the US investigated by Buettner and Wildasin show a much larger population size with a mean of 75 thousand inhabitants, compared to 8.7 thousands in the German data. But also when comparing small US municipalities with the German cities[11] we still observe a significantly lower share of grants in the US case (for small cities Buettner and Wildasin, 2006, report a figure of 26 %).

For convenience, the present value responses for the basic sample of US municipalities as well as for small municipalities as presented in Buettner and Wildasin (2006) are displayed in Table 8. A first interesting difference is that the fluctuation of primary budget components, such as own revenues and general expenditures, is lower in the case of the US: 35 cents of a one dollar innovation in own revenues are balanced with offsetting changes in future revenue, and 72 cents out of a unit innovation in general expenditures are offset by future changes in expenditures (for small municipalities: 42 and 70 cents, respectively). As noted above, the corresponding figures for the German municipalities are 57 and 85 cents, respectively. The stronger fluctuation in revenue likely

[11]The group of US municipalities categorized as small cities in Buettner and Wildasin (2006) consists of cities between 1 and 15 thousand inhabitants.

Table 8: Implied Present Value Responses for US Municipalities

Response	Innovation to			
	Own Revenues	Gen. Expend.	Vert. Grants	Debt Service
Own Revenues	-.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 Revenues		.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)	
		responses for small US cities		
Own Revenues	-.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 Revenues		.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)	

Source: Buettner and Wildasin, 2006.

reflects the much lower importance of property taxes for the finances of German municipalities which, in contrast, rely much more on the rather unstable business income tax.[12]

Note that Buettner and Wildasin (2006) also tested whether the forecast errors can be assigned to observed shocks and found that national trends in tax revenues are reasonable proximate determinants of innovations in own revenues. This suggests that not only in the German but also

[12]In 2000 the revenue share of the business tax in own revenues is about 44.1 %. While there is no general property tax, the share of the land tax is about 16.2 %. For comparison, according to the 1997 Census of Government US municipalities report a share of corporation taxes in own source revenue of about 1.9% whereas the share of property tax revenue is reported with 28.9%.

in the US case the response to own revenue innovations can be interpreted as depicting the fiscal adjustment to revenue shocks. Therefore, it is most interesting to compare the fiscal response to revenue innovations, *i.e.* to compare the first columns in Tables 6 and 8.

This comparison offers some interesting differences: In the German case, equalization transfers play an important role in the adjustment towards fiscal balance: if own revenues temporarily decline by 1 euro, equalization transfers decline by 15 cents in present value terms. In the US case, a one dollar revenue shortfall would only trigger an increase in grants by about 9 cents in present value terms. However, differences in revenue fluctuations obscure a direct comparison. But, focusing on permanent changes in own revenues, we see that in the German case a much larger fraction of a revenue change is compensated by offsetting equalization transfers. Whereas in the US case grants rise only by about 13 cents in present value terms if revenues permanently decline by one dollar, in the German case the contribution of fiscal equalization to restoring fiscal balance amounts to no less than 34 cents. This shows that intergovernmental transfers do, in fact, play a more important role in the German case in restoring fiscal balance in the presence of temporary as well as permanent revenue shocks.

The findings of a higher degree of fluctuations in primary budget components and of a larger fraction of revenue changes compensated by offsetting equalization transfers might well be related, however. While German municipalities do have a land tax at their disposal where they have the autonomy to set the tax rate, they tend to rely heavily on the rather volatile business tax.[13] US municipalities which enjoy much less fiscal assistance by intergovernmental revenue rely much more on property taxes. While a thorough analysis of the choice of the revenue structure is beyond the scope of the current paper, we may note that the empirical differences observed are, at least, in accordance with theoretical concerns that the large degree of insurance provided by the system of equalization grants results in a moral-hazard problem: the riskier local tax base might be adopted partly because localities are insured against the revenue risks.

[13]The volatility of the business tax relates first of all to the volatility in profits. This volatility is amplified by the existence of tax-allowances which make the business tax progressive. Revenue fluctuations also result from the fact that the business tax is paid ex-ante, which results in frequent tax rebates and arrears.

6 Conclusions

This paper has developed an empirical model of the adjustment path towards fiscal balance for German municipalities. The model operates under a minimum of prior restrictions, such that, except for the implications of the intertemporal budget constraint, no additional structure is imposed. Due to the specifics of the fiscal institutions under which German municipalities operate the analysis distinguishes not only general expenditures, own revenues, and debt service, but also two separate components capturing intergovernmental transfers: grants and fiscal-equalization transfers, where the latter capture the net-transfer obligations to the fiscal-equalization system. The results obtained are consistent with the intertemporal budget constraint as the present value of all future changes in the primary surplus calculated using a fixed discount rate is matching quite closely with the initial disturbance of fiscal balance regardless of which budget component is actually considered.

For all budget components temporary fluctuations are observed in the sense that current changes in a component are offset with future changes in the same variable. Thus, an increase in own revenues is followed by a reduction, a decline in general expenditures is offset by a future increase *etc.* Focusing on permanent innovations, about two thirds of the adjustment is actually carried out by changing general expenditures. But also equalization transfers play an important role in restoring fiscal balance: a third (34 cents) of the necessary adjustment takes place by offsetting changes in equalizations transfers. In order to explore whether and how the unpredicted changes in the budget components are associated with exogenous shocks we added various indicators of local shocks to the system, capturing employment conditions as well as large tax refunds related with the business tax. The results suggest that, at least, the empirical response to an innovation in own revenues can be interpreted as revealing the dynamic fiscal adjustment in response to a revenue shock.

A comparison with the case of US municipalities investigated by Buettner and Wildasin (2006) shows that intergovernmental transfers do, in fact, play a more important role in restoring fiscal balance in the German case in the presence of temporary as well as permanent revenue shocks. Whereas in the US case investigated by Buettner and Wildasin (2006) intergovernmental transfers rise only by about 13 cents in present value terms if revenue permanently declines by one dollar, in the German case the contribution of intergovernmental transfers in restoring fiscal balance is about

two to three times higher.

Despite the large degree of insurance, however, budgetary fluctuations tend to be larger in Germany, in particular own revenues and general expenditures are more volatile. Given that the German municipalities rely heavily on a rather unstable business tax but do not show much tax effort with regard to land taxation, these results point to a moral-hazard effect of fiscal equalization: the larger degree of fiscal assistance provided by the system of equalization grants in Germany might induce the municipalities to rely on the highly volatile business tax rather than to use property taxes as the US municipalities.

Appendix

A Data Sources and Definitions

The basic dataset consists of all 1111 municipalities (Gemeinden) of the state of Baden–Württemberg in the period from 1974 to 2000. 9 municipalities were removed because of data problems. With the exception of the price index all data are obtained from the state's statistical office (Statistisches Landesamt).

Own revenues includes revenue from the business tax (net of transfers related to the business tax revenue sharing with state and federal governments), revenues from land and other taxes, exclusive of revenue from income taxes and sales taxes, as the latter are subject to a revenue sharing system. In addition own revenues includes charges and user fees, fines as well as rents and royalties.

General expenditure include the compensation of employees including social security contributions as well as pensions, furthermore all current expenses excluding interest expenses and contributions to the revenue sharing and fiscal-equalization systems.

Grants comprise all sorts of unconditional and conditional or targeted grants including revenue sharing grants but excluding grants related to the fiscal-equalization system.

Equalization transfers consist of contributions to state fiscal-equalization system, including county contributions, net of state equalization grants received.

Debt service is defined by the interest payments net of interest revenue.

Table 9 reports the German designation as well as the official classification code.

Table 9: Definition of Fiscal Variables, German Designation

Variable	Description(German)	Code
(1)	(2)	(3)
General Expenditure		
+	Personalausgaben insgesamt	4
+	Ausg. sächl.Verw.-u.Betr.Aufw.insg.	5/6
–	Ausg.Erst.Verw.-Btr.Ausg.inn.Ver.	679
–	A.Vw.Hh/Kalkulator.Kosten insg.	68
+	Ausg.Zuweis.u.Zuschüsse insg.	7
+	Ausgaben/Allgemeine Zuweisungen	82
+	Weitere Finanzausgaben	84
+	Ausgaben/Baumaßnahmen	94/95/96
+	Ausg.Zuweis.u.Zusch.f.Invest.insg.	98
Grants		
+	Gemeindeanteil an der Einkommenst.	010
+	Gemeindeanteil an der Umsatzsteuer	012
+	Einnahmen/Zuweisungen u.Umlag.insg.	04/05/06/07
–	Einnahmen/Schluesselzuweisungen	04
+	Einn./Erst.f.Ausg.d.Verw.Hh.insg.	16
+	Einn./Zuw.U.Zusch.F.Lauf.Zw.insg.	17
+	Einnahmen/Schuldendiensthilf.insg.	23
+	Einn./Ersatz v.sozialen Leist.insg.	24/25
+	Einn.Zuweis.u.Zusch.f.Invest.insg.	36
Equalization Transfers		
	Ausgaben/Allgemeine Umlagen insg.	83
–	Einnahmen/Schlüsselzuweisungen	04
Debt Service		
+	A.Vw.Hh/Zinsausgaben insgesamt	80
–	Zinseinnahmen insg.	20
+	Sonstige Ausg.Kreditbesch.kosten	990
Own Revenues		
+	Realsteuern insg.	00
-	Steuerbeteil.Gewerbesteuerumlage	810
+	Andere Steuern insg.	02
+	Steuerähnliche Einnahmen insg.	03
+	Einn./Gebühr.Entgelte,Zwg.Abgab.	10/11/12
+	Einnahmen aus Verkauf	13
+	Einnahmen/Mieten und Pachten	14
+	Sonst.Verwalt.-u.Betriebseinnahm.	15
+	Gewinnant.v.Wirtsch.untern.Konz.abg.	21
+	Weitere Finanzeinnahmen insg.	26
+	Einn./Beiträge u.ähnliche Entgelte	35

Column (2) reports the German designations. Column (3) reports the corresponding official classification code (Gemeindehaushaltsverordnung für Baden-Württemberg, Gruppierungsplan).

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