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Fiscal Adjustment in Japanese Municipalities*

Hikaru Ogawa† Shun-ichiro Bessho‡

Abstract

This study examines how Japanese municipalities restore their fiscal balance after a budget shock. The results show that these fiscal adjustments mainly occur via subsequent changes in government investment, accounting for 83-100% of adjustments in permanent unit innovations in grants and own revenue. The contribution of government expenditure to balancing local budgets is much larger in Japan than in other countries. In contrast to the role of expenditure, the municipalities' own-source revenue and grants from the higher-level government play a limited role in balancing local budgets. In addition, it is observed that government investment is more volatile in Japan than in other countries. Finally, we conduct an additional analysis based on population size to study how the adjustment process varies among municipalities of different sizes.

JEL Classification. H70; H72; H77

Keywords. Dynamic fiscal adjustment, municipal policy

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1 Introduction

Regional governments have to cope with various fiscal shocks caused by economic downturns, national fiscal reforms, and the disappearance of a tax base owing to natural disasters. However, only recently, starting with the pioneering work of Buettner and Wildasin (2002, 2006; hereafter, BW), have studies attempted to quantify the dynamics of regional fiscal adjustments. Using a balanced panel data set, compiled from 1270 cities in the United States between 1972 and 1997, and a vector error-correction model (VECM), they measured how these cities adjusted to various exogenous fiscal shocks. While the VECM was developed to describe the dynamic interrelationship between stationary variables, mainly in macroeconomic fields, they were the first to apply it to analyzing impulse-response functions at the municipal level. A critical feature when applying the VECM to municipalities is the substantial grants they receive from their national government. These grants may play a crucial role in maintaining a municipality's fiscal balance. One of the findings of the BW analysis is that cities maintain an intertemporal budget balance in the face of shocks in own-source revenue and grants mainly by adjusting public expenditure. By decomposing the sample, BW confirmed that the pattern is more or less robust with respect to city size.

Several subsequent studies have applied the BW approach to other countries. For example, Rattsø (2004) used a panel data set compiled for the period 1983-1993 from 25 local governments in the county of Sør-Trøndelag in Norway. He found that, as with the United States, local public investment is the main shock absorber in Norway's local finance system. In this case, one-third of Norway's budget surplus shock is adjusted by investment in the following year. Furthermore, Navon (2006) applied the BW approach to a 1996-2002 panel data set of 193 local authorities in Israel. He showed that a reduction in grants from the government leads to a cutback in services to residents and increased deficits. He further shows that the adjustment process differs considerably across regions. For example, the budget adjustment process for the non-Jewish local authorities

is twice as long as that for the Jewish ones. Buettner (2009) applied the BW approach to examine how German municipalities adjust to fiscal shocks. Using a sample of 1102 jurisdictions for the period 1974-2000, the study finds that a substantial part of fiscal adjustment to revenue shocks occurs by offsetting the changes in grants and equalization transfers. In a recent study, Solé-Ollé and Sorribas-Navarro (2012) applied the BW approach to examining fiscal adjustments in Spain. Using a panel data set of 258 municipalities in the Catalonia region for the period 1988-2006, they observed that, as with the German municipalities, government grants play a more important role in the adjustment process. The results of the preceding studies show that, while the municipalities in some countries cope with exogenous fiscal shocks by controlling public spending, municipalities in other countries do so using grants. This suggests that further research is needed to understand the differences and similarities in the fiscal adjustment processes of different countries.

This study adopts the same approach, namely the VECM, to estimate the municipal fiscal adjustments in Japan. We use a sample of 3210 municipalities for the period 1977-2010, therefore covering more than a quarter of a century. Our analysis has the advantage of using a richer data than previous studies. More specifically, a distinguishing feature of our study is that we separate and categorize government spending into government investment and government current expenditure (consumption). Buettner (2009) broke down the revenue side into grants and fiscal equalization transfers and, thus, succeeded in determining the role of interregional fiscal equalization in Germany. In contrast, in this study, we divide the expenditure side. The trade-off faced by regional governments in allocating public expenditure between investment and current consumption is subject to intensive study, and the decision has a great impact on the efficiency, welfare, and growth of regions.[1] Changes in the composition

[1]See Keen and Marchand (1997), Matsumoto (2000), and Borck et al. (2007) for the effects of changes in the allocation of public spending in the framework of interregional competition, and Lau (1995), Devarajan et al. (1996), Rivas (2003), Chen (2006), and Giovanni and Tervala (2010) for the impact of changes in public spending composition on long-run growth.

of public spending have attracted the attention of several researchers because, while a decrease in public investment may have a negative effect on long-run regional growth, welfare might increase in the short term owing to an increase in government current expenditure, which replaces public investment. Our analysis thus contributes to clarifying the substitutability/complementarity between government investment and current expenditure. Furthermore, we try to ascertain which policy instruments are used to adjust fiscal imbalances.

In addition, by applying the analysis to Japanese municipalities, we clarify the similarities and differences in the adjustment process between unitary and federal nations, since the Japanese government system is notably different to the more decentralized systems of the United States and Germany. In particular, the local tax laws in Japan places a limit on the free choice of municipal tax rates, and the central government is involved in local loan programs. Instead, municipalities actively engage in public investment to improve their social infrastructure, since they have faced with the lack of infrastructure development in the 1970s and 1980s. Our analysis establishes how these features affect the dynamic adjustment of local budgets.

Our main findings are as follows. First, government investment plays the most important role in the adjustment process, with 44-52% of the budget shocks being adjusted through government investment in the following year.The figures explain 83-100% of adjustments in permanent unit innovations in grants and own revenue. This magnitude is quite large when compared to the magnitude of government current expenditure. For instance, a 1 yen decrease in own revenue and grants is covered by a reduction in government investment of 0.446 yen and 0.473 yen, respectively. In contrast, the response of government current expenditure is very low, explaining only 1-11% of budget shock. From a cross-country comparison, these figures show that government investment in Japan plays a relatively large role in adjusting local budgets. Second, government investment is highly volatile. A 1 yen increase in government investment accompanies a reduction in government investment by 1.001 yen in the following year, which is quite high when compared to those of other coun-

tries. In contrast, the magnitude of volatility in own revenue and grants is small. This implies that municipalities face restrictions in adjusting their fiscal balance through own revenue sources and that the higher-level government is rigid in providing grants. Third, in contrast to the role played by the expenditure side, the municipalities' own-source revenue plays a limited role in the adjustment process of local budget balancing. This is different to other countries, such as the United States, where own revenue is used to adjust fiscal imbalances. In addition, grants from the central government do not play a significant role in Japanese municipalities. Again, this is in contrast to other countries. For example, in Spain, inter-governmental transfers help to adjust fiscal imbalances through central grants, and in Germany, inter-governmental transfers are used to adjust fiscal shocks through equalization transfers.

We then break down our sample. We divide our sample based on the population size to establish whether the adjustment process depends on the size of a municipality. In this additional analysis, we discuss flypaper effects, the soft-budget problem, and substitutability/complementarity between government investment and current expenditure, based on the size of the municipality.

The rest of this paper is organized as follows. In Section 2, we introduce our analytical model and data. In Section 3, we present our preliminary results to ensure the model is specified correctly. In Section 4, we show the results. An international comparison is also presented in this section. In Section 5, we perform the additional analysis, and the final section concludes the paper.

2 Framework and Data

2.1 Analytical framework

The analytical framework employed in this study is the vector error-correction model (VECM), similar to that used in Buettner and Wildasin (2006), Buettner (2009) and Solé-Ollé and Sorribas-Navarro (2012). Denoting own-source revenues (mainly tax revenues) as R_{it}, government capital expenditure (invest-

ment) as G^I_{it}, expenditures excluding public investment and debt service (hereafter government current expenditures) as G^C_{it}, net intergovernmental transfers as Z_{it}, debt service as S_{it} and fiscal deficit as D_{it}, the government's budget constraint is represented as

$$D_{it} = G^I_{it} + G^C_{it} + S_{it} - R_{it} - Z_{it}. \tag{1}$$

Buettner (2009) considered two types of intergovernmental transfers, namely fiscal equalization transfers and grants. Japanese municipalities receive various kinds of intergovernmental transfers, some of which are matching grants, while others are block grants. Here, we group the various types of intergovernmental transfers into one component. We explain the reasons for this in the next subsection. From the government's budget constraint, we express the VECM (p) of the five variables as follows:

$$\Delta Y_{it} = \gamma D_{i,t-1} + \sum_{j=1}^{p} \Gamma_j \Delta Y_{i,t-j} + u_{it}, \tag{2}$$

where $Y_{it} = (G^I_{it}, G^C_{it}, S_{it}, R_{it}, Z_{it})'$ and $b = (1, 1, 1, -1, -1)$ and thus $D_{it} = b'Y_{it}$. Here, γ and Γ_js are the parameter matrices to be estimated. In (2), p denotes the lag length.

The VECM estimation generates a number of coefficients. To interpret the estimation results, we use these coefficients to compute the present value of the impulse response for each variable with respect to innovations.[2]

2.2 Data

We use two panel data sets of Japanese municipalities. The first set (Panel A) covers a 25-year period (1977-2001), and the second (Panel B) covers a 34-year period (1977-2010). The reason for preparing two data sets is the Heisei municipal mergers. The number of municipalities was stable during the period

[2]See Appendix for more information. For more detail, see also Appendix C in Buettner (2009).

covered by the first data set: 3280 in 1971 and 3249 in 2001. The Heisei municipal merger reduced the number of municipalities from 3241 on April 1, 2002 to 1750 on April 1, 2010. Therefore, the first set covers a shorter period, but is immune to the municipal mergers. The second set covers a longer period but may be contaminated by the mergers.

To purge the effects of municipal mergers, we exclude the municipalities that were merged during the period of the first data set. This could create a sample bias, but the bias would be quite small because the number of municipalities was almost stable, as mentioned previously. The second data set covers the same municipalities included in the first set, and we merge the data retrospectively based on the municipal boundaries as of March 31, 2011.[3] There are 3210 municipalities in the first data set and 1726 in the second set.

Our data are based on the settlement of ordinary accounts. We aggregate the fiscal data for our analysis into five variables, consistent with the framework described in the previous section: own-source revenues (R_{it}), government investment (G^I_{it}), government current expenditure (G^C_{it}), net intergovernmental grants (Z_{it}), and debt service (S_{it}). Fiscal deficit (D_{it}) is computed following equation (1).

We decompose government expenditure into investment, current expenditure, and debt services. We have data on investments and debt services, and calculate the government current expenditure as expenditure excluding public investments and debt services. The reasons we differentiate between government capital expenditure and current expenditure are as follows. First, regional governments face a trade-off in allocating funds between capital and current expenditures, which has been extensively investigated in the literature. Second, Japanese local governments have implemented the government investments as

[3]The Japanese fiscal year runs from April 1 to March 31. Almost all municipal mergers were made without dividing the municipalities, but there was one exception. Kamikuisshiki village was divided into two areas in 2006. The northern area merged with Kofu city and the southern area merged with Fuji-Kawaguchiko town. We have assumed that the proper Kamikuisshiki village merged with Kofu city.

a part of fiscal stimulus packages (e.g., Bruckner and Tuladhar 2010). Local governments also play a crucial role in implementing the redistributive policy (Joumard and Kongsrud 2003, Hayashi 2010). Third, arguably related to the second point, the correlograms of the government capital and current expenditures are very different. Table 1 shows correlograms for our five variables. As shown, the autocorrelations of the four variables other than government investment decrease slowly as the lag increases. However, government investment decreases relatively rapidly.

Table 1

We group the various types of intergovernmental grants into one component, Z_{it}. This includes the central and prefectural government subsidies (CGS), local transfer tax (LTT) grants, and local allocation tax (LAT) grants. CGS and LTT grants are matching and purpose-specific grants, while LAT grants are supposed to be block and general grants. We group these transfers into one component for the following two reasons. First, the Japanese central and local governments are highly integrated (e.g., Muramatsu et al. 2001), and LAT grants are also utilized to mobilize the local governments by revising the LAT grants formula.[4] As a result, LAT grants are often seen as matching grants. Second is the data availability. We do not have data on how much CGS and LTT are expended for government investment and consumption at the municipality level.

The other three variables are defined as usual. The own-source revenues (R_{it}) include tax revenues, fees, donations, and miscellaneous revenues. The

[4]The tendency for high integration between local and central governments in Japan is captured by the *Integrated Model* of Muramatsu et al. (2001), in which local governments are assigned a large range of tasks, competencies of the central and local governments are intertwined, and the central government steers local governments through partnerships. A typical example of a highly integrated or closed partnership between the local and central governments is the various public work projects implemented on the initiative of local authorities, with the central government monitoring day-to-day operations.

fiscal deficits (D_{it}) are calculated as $G^I_{it} + G^C_{it} + S_{it} - R_{it} - Z_{it}$. All the variables are deflated and expressed in per capita terms, as in the literature.

3 Specification

Prior to our estimation using the VECM, we need to verify whether the fiscal deficit (D_{it}) and the first differences of the other fiscal variables (G^I_{it}, G^C_{it}, S_{it}, R_{it}, Z_{it}) are stationary. We employed a panel unit root test developed by Pesaran (2007), which allows for serially correlated errors and cross-section dependence. The results, shown in Tables 2 and 3, suggest that the fiscal deficit is stationary and that the first differences of the other fiscal variables are also stationary in both data sets.[5] The result that the fiscal deficit is stationary could suggest that the fiscal deficits of the Japanese municipalities are not explosive, at least in the long run.

Table 2

Table 3

Panel data analyses typically consider municipality fixed effects. The VECM uses the variables with the first-difference and individual effects differentiated out in levels, but we use the fiscal deficit variable in levels. Thus, the existence of municipality fixed effects should be tested. In the literature (e.g., Buettner and Wildasin 2006), this hypothesis is tested using the likelihood ratio test. However, when municipality fixed effects exist, the usual fixed effect estimator is no longer consistent (e.g., Arellano 2003). As such, to check for municipality fixed effects, we utilize the Durbin-Wu-Hausman (DWH) test, which requires a consistent estimator, even when municipality fixed effects exist. To obtain such estimates, we use the one-step GMM estimation by Arellano and Bond

[5] We conduct the same panel unit root test for the sub-samples divided by population size, and obtain the same results.

(1991), which is now a standard approach (Bond 2002) when the explanatory variables include the lagged dependent variables and predetermined variables, as in our estimation equation (2). The ordinary least squares (OLS) estimator is consistent and efficient under the null that municipality fixed effects exist, but not consistent under the alternative, while the GMM estimator is consistent under both the null and the alternative.

We set the lag length to be 4, considering the time dimension of our data (25 and 34 years) in this test. Our estimation equation (2) does not include exogenous variables, so our instrumental variables are all "GMM-style" variables (Roodman 2008); in other words, the explanatory variables with 6 to 10 periods lags. To avoid the many-instruments problems caused by the long time dimension, we "collapsed" our instrumental variable set. We conduct equation-by-equation estimations using OLS and GMM, and compare the coefficient vectors. The Hansen's J statistics support the validity of the instruments. The DWH test results are shown in Table 4.

Table 4

Although the non-existence of municipality fixed effects cannot be rejected for some estimation equations, it can be rejected for three equations for Panel A. In addition, the results of the GMM estimation are implausible, perhaps because of weak instruments. Considering similar results in existing literature, we choose to conduct equation-by-equation estimations using an OLS estimation. The equations with a time trend are also estimated, but here we report only the results without the time trend because both estimations generate similar results.

For estimations using the VECM, we need to determine the lag length. Considering the time dimension of our data (25 and 34 years), we begin with a lag of four years. We then use a likelihood ratio test to possibly reduce the number of lags in all the equations at the same time. The test statistics obtained are shown in Tables 5 and 6. Since a reduction of the lag length is rejected in all

cases, we use a model with four lags.[6]

Table 5

Table 6

4 Main Results

Table 7 shows the results of the VECM estimation based on OLS estimation for Panel A (1977-2001, 3210 municipalities). Table 8 shows the same results for Panel B (1977-2010, 1726 municipalities). We assume a discount rate of 3% to calculate the present value for both panels.[7]

Table 7

Table 8

The difference between the results of the two data sets does not seem to be large. This could indicate that the municipalities did not change their fiscal adjustment behavior with regard to their own revenue, government capital and current expenditures, and debt service before and after the Heisei municipality mergers. Therefore, we focus on the results of Panel A (1977-2001, 3210 municipalities), which has more data and can avoid the possible bias caused by municipal decisions on consolidation.

We summarize the results by referring to previous discussions on evidence from the United States (Buettner and Wildasin 2006), Germany (Buettner 2009), and Spain (Solé -Ollé and Sorribas-Navarro 2012).

[6]Buettner and Wildasin (2006) also employed a lag length of four years, while Solé-Ollé and Sorribas-Navarro (2012) used a lag length of three years. Buettner (2009) employed a model with six lags, but reports that the estimates of models with four or five lags do not show major differences.

[7]Previous studies also employ a discount rate of 3%, and indicate that the qualitative results are not sensitive to different discount rates, because most of the fiscal adjustments occur during the first few years.

4.1 Subsequent adjustments

The columns in Table 7 show how innovations in one variable affect subsequent adjustments in both itself and other variables. For example, the first column reveals how a 1 yen change in own revenue in one period affects the subsequent evolution of own revenue, government investment, government current expenditure, grants, and debt service. The figures show that a 1 yen decrease in own revenue leads to an increase in future own revenue of 0.462 yen, a decrease in government investment and current expenditures of 0.446 yen and 0.014 yen, respectively, and an increase in grants of 0.085 yen. Grants do not play a significant role in offsetting own-revenue losses; the magnitude is not very large. The magnitude of the role played by grants in adjusting to a shock in own revenue is somewhat similar to of the United States, but even larger than observed in Spain and Germany, where grants do not play a significant role in offsetting negative own-revenue shocks.

The results in all columns show that innovations in the budget components tend to be partly offset by future changes in the same component. For instance, in response to a 1 yen decrease in own revenue, an adjustment of 0.462 yen comes from an offsetting change in the present value of future own revenue. Following previous studies, it is therefore instructive to calculate the response to a permanent 1 yen increase in each variable. These results are displayed in the lower part of Table 7. For example, in the first row, the figures show that 0.831 yen of the balancing adjustment to a permanent unit change in own revenue comes from government investment.

The second column shows how a shock to government investment is adjusted. A 1 yen increase in government investment is followed by a 0.076 yen increase in government current expenditure and a 0.051-yen increase in grants, neither of which are statistically significant. While government current expenditure works against balancing the budget in response to an innovation in government investment, own revenue and grants respond have a positive effect on balancing the budget, although not all that much. The distinctive feature is that a 1 yen

increase in government investment is followed by a 1.001 yen decrease in future investment. Thus, future government investment plays an excessively important role in offsetting innovations to investments, because own revenue and grants are not sufficient to adjust to local budget shocks caused by changes in government investment.

A 1 yen innovation in government current expenditure (third column) is followed by a decrease in future current expenditure of 0.420 yen and in government investment of 0.436 yen. The role of grants in balancing the budget in response to a change in government consumption is positive, but rather limited (0.147).

An innovation in grants (fourth column) is mainly balanced by investment and offsetting changes in grants themselves. The response of own revenue is very small, explaining less than 5% and explaining 8.9% of the permanent increase. This suggests the existence of strong flypaper effects, which we discuss later.

The response of own-source revenue is low in Spain as well, explaining 6.6% of the permanent increase. However, in the United States, the response of own-source revenue to a 1 dollar innovation in central grants is one digit larger than in the case of Japan and Spain. Here, 0.144 dollars explain 27.3% of the permanent increase. The responses in the German municipalities resemble those in Spanish municipalities. In this case, the responses of own-source revenue to a 1 euro innovation in central grants and equalization transfers are 0.02 euro and 0.04 euro, explaining 4.3% and 8.8% of the permanent increase, respectively.

The fifth column shows the responses to innovations in debt services. A 1 yen increase in debt services is followed by a 0.366 yen decrease in future debt services. Grants improve the fiscal balance, but play a small role. Here, 9.8% explains 16.7% of the permanent increase. This financial deterioration is covered by significant decreases in government investment (-0.526). However, fiscal imbalances are not fully covered by these responses, which affect the primary surplus. We discuss this in more detail later.

4.2 Responsiveness

Each row in Table 7 tells us how responsive that variable is to changes to itself and other variables. The second row is noteworthy in that government investment responds most significantly, adjusting between 0.436 and 0.526 yen of a unit innovation in other fiscal variables. The responsiveness of government investment is relatively larger than that of government current expenditure, and is larger than in the United States, Germany, or Spain. For instance, government expenditure adjusts about 0.338-0.508 dollars of a 1 dollar change in the United States. In Germany, the same adjustment is 0.274-0.531 euros, and in Spain, 0.261-0.289 euros.

While government investment is highly responsive to fiscal shocks in Japan, the country's own revenue is less responsive. The first row shows that Japan's own revenue does not work to adjust fiscal imbalances caused by exogenous innovations in other variables. Here, the absolute values range between 0.021 and 0.057 yen. Own revenue in other countries plays a more aggressive role, adjusting 0.144-0.162 dollars of innovations in other variables in the United States, 0.085-0.515 euros in Spain, and 0.020-0.185 euros in Germany. The effect in Japan is because the country's municipal tax system is less flexible than in other countries, as pointed out by Mochida (2001, pp.96-97).[8]

4.3 Flypaper effect

The fourth column in Table 7 is related to the flypaper effect, according to which, local government expenditure increases significantly. Some estimates increase by almost 100% when the local government receives a grant from the central government.

The study on Spain shows that the response of own-source revenue to a 1 euro innovation in central grants is low (just 0.018 euro, explaining 6.6% of

[8]Municipalities appear to have options when setting tax rates and the tax base. However, in practice, this flexibility is limited. For instance, under local public finance law, they cannot apply for permission for debt financing when they set their tax rates below the standard tax rate, which means most municipalities apply the same standard tax rate.

the permanent increase). In this case, the greater part of changes in grants is absorbed by public expenditure, providing evidence of the flypaper effect. This result differs from the United States. There, the response of own-source revenue to a 1 dollar innovation in central grants is one digit larger than the Spanish case, namely 0.144 dollars, explaining 27.3% of the permanent increase. As explained previously, the responses of own-source revenue to innovations in central grants in Germany resemble those of Spain, again showing possible evidence of the flypaper effect.

Compared to these countries, Japan provides evidence of a relatively strong flypaper effect.[9] The figures in the fourth column show that the response of own-source revenue to a 1 yen innovation in central grants is negative, but just -0.041 yen. These figures are one digit smaller than in the United States, but almost the same as Spain and Germany. This implies that an increase in grants-in-aid sticks strongly to government expenditure. Specifically, the figures show that the responses of government investment and current expenditure explain 100.4% and 4.1% of the permanent increases, respectively. This indicates that the response of government investment explains just all of a permanent unit increase in grants. In other words, the grants stick to government investment, but not to government current expenditure. This difference is partly because "mandatory" expenses, such as personnel expenses and social assistance expenses, account for a large share of current expenditure, while public investment as a capital outlay can be adjusted more flexibly.

4.4 Soft-budget constraints

The fourth row in Table 7 is related to soft-budget constraints. In the United States, grants from a higher-level government respond significantly to innovations in municipal own-source revenue and expenditure. A 1 dollar innovation in own-source revenue and public expenditure results in a 0.086 dollar decrease and

[9]The flypaper effect has been observed in Japanese municipalities using different methods. For example, see Nagamine (1995) and Doi (1996, 2000).

a 0.082 dollar increase in grants, respectively, from the higher-level government. The response of grants to innovations in debt services is quite modest, being just half of that for the other variables. These results imply that municipalities have the potential to induce transfers from higher-level governments through their own-source revenue and local expenditure decisions. Similar evidence of government expenditure is reported in Spain: a 1 euro increase in public expenditure increases government grants by 0.158 euro. In addition, government grants in Spain respond quite significantly to innovations in debt services: a 1 euro increase in debt services increases grants by 0.229 euro. However, higher-level government grants do not respond significantly to innovations in own-source revenue. The evidence for Germany gives different results: here, government grants do not respond to innovations in own-source revenue and public expenditure, and the German municipalities do not induce grants from higher-level governments by expanding their expenditure.

The response of government grants in Japan is mixed. On the one hand, the response of grants to innovations in government current expenditure has the same features as Spain and the United States. A 1 yen increase in government current expenditure leads to a 0.147 yen increase in grants, suggesting that the municipalities might induce grants by expanding current expenditure. However, a 1 yen increase in government investment yields a 0.051 yen increase in grants, but this is not statistically significant. The change is negative when based on the Panel B (longer period) data set. Thus, these results do not necessarily support the existence of a soft-budget problem associated with public investment.

The soft-budget problem in Japan is currently a controversial topic. While some studies suggest the problem exists (e.g., Akai et al. 2003, Doi and Ihori 2006), others do not (e.g., Nishikawa and Yokoyama 2004). Our results indicate that municipal budgets are hard for capital expenditure, but soft for current expenditure. This difference may be due to the autocorrelation of government investment decreasingly rapidly as the lag increases, while that of current expenditure does not. That is, for municipal governments, government investment is often once-off, but current expenditure shocks tend to persist because cur-

rent expenditure includes expenses for personnel and welfare, which are seen as "mandatory" expenses. The central government, understanding this difference, may tend to support municipalities hit by current expenditure shocks.

4.5 Primary Surplus

Summing up the first four rows in Table 7, we calculate the adjustments in primary surplus to innovations in policy variables. In the United States, a 1 dollar increase in own-source revenue results in an offsetting change by 0.94 dollars in primary surplus, showing that the primary balance improves by fractions of a percentage (0.06 dollars). The adjustments in primary surplus to an innovation in public expenditure and grants are not much: -0.041 dollars and +0.045 dollars, respectively. The changes in primary surplus to innovations in policy variables in Spain are only half those of the United States and may be negligible; a 1 euro innovation in own revenue, government expenditure, and grants each changes the primary surplus by +0.023 euro, -0.028 euro, and +0.033 euro, respectively. The absolute value of changes in Germany is also close to unity; a unit innovation in own-source revenue, government expenditure, grants, and equalization transfers each result in an offsetting change by -0.993, 0.989, -0.986, and 0.984 euro, respectively.

The size of adjustments in primary surplus in Japan denotes a tendency similar to that in other countries. From Table 9, obtained by adding the fiscal responses of the first four rows of Table 7 and 8, we see that the absolute values of the changes are close to unity in all cases except debt services. This implies that the response of primary surplus is satisfactory-to-negligible.[10] However, the results using Panel B, a longer sample period, show a somewhat different

[10]From Table 9, it seems that fiscal balance is not restored by innovations in debt services. However, as Buettner (2009) mentions, this reflects temporal fluctuations in debt services. With regard to Japan, since the estimate of the present value of future changes in debt services in response to a 1 yen increase is -0.366 yen, 0.634 yen of a unit innovation in debt services is permanent. Since the present value of a change in primary surplus is 0.534 yen, the figures conform closely to the predictions based on intertemporal budget constraints.

picture. In this case, the absolute values of the changes in primary surplus are smaller than in the Panel A data set. This might reflect the fact that, while the average fiscal deficit per capita had a tendency to increase until 2003, it decreased between 2003 and 2008 under the policy, by Koizumi and subsequent administrations, that capped the issuance of government bonds.

Table 9

4.6 Volatility

More than 70% of adjustments in Spain are reportedly held by the future value of the fiscal variables that experienced the shock. Of these, public expenditure is the most volatile, with 72.9% of adjustments to public expenditure shocks being held by the future value of the variable. Much of this is also true for the volatility of public expenditure in the United States (0.716) and Germany (0.851).

Government investment is the most volatile among the other policy variables in Japan. However, the band of fluctuations in Japan is much wider, which is unique to the country. Table 7 shows that government investment is highly volatile (-1.001).

Government current expenditure is less volatile than government investment (-0.420). Japan's own-source revenue is less volatile than that of Germany (-0.569) and Spain (-0.709), with a value of -0.462, but similar to the United States (-0.348). The volatility of grants (-0.528) is an intermediate position among that of the other countries: the United States (-0.473), Spain (-0.726), and Germany (-0.546).

4.7 Complementarity and substitutability

In our analysis, we divide public expenditure into government capital and current expenditures. This enables us to examine whether government investment complements or substitutes government current expenditure, and vice versa.

Evidence shows that the two items constituting government expenditure affect each other, but that the effect of innovation is asymmetric. On the one hand, a 1 yen increase in government investment increases government current expenditure by 0.076 yen, and on the other hand, a 1 yen increase in government current expenditure reduces government investment by 0.436 yen.

This might reflect the effects of public investment on fiscal-revenue expansion. Public investment stimulates the economic activities that make room for municipalities to increase their current expenditure. However, at the same time, the increase in current expenditure tightens financial conditions, thus forcing municipalities to reduce public investment.

5 Additional Results: Effects of Municipal Size

The process of adjustments may be influenced by the size of the municipality associated with the fiscal institution. Thus, we replicate our analysis after classifying the municipalities into four categories: cities, including Tokyo's wards, and towns/villages with large, medium, and small populations. Cities are defined as having a population of not less than 50 thousand and are jurisdictions that satisfy certain prerequisites; towns/villages are jurisdictions with a population of less than 50 thousand.[11] The fiscal institutions associated with the municipalities vary between cities and towns/villages. For instance, unlike towns and villages, cities are delegated a part of the authority for urban planning and welfare policies. More specifically, ordinance-designated cities have a broader tax base and wider authority than towns and villages, including, for example, the right to operate a public lottery.

Table 10

[11] Municipality population sizes changed during the sample period, so we divided the sample municipality sizes by the population size of 1977, the first year of the sample period.

We now discuss the differences and similarities across the four categories. The clearest feature in Table 10 is that government investment is the main policy instrument used to adjust to fiscal shocks, irrespective of municipality size. It is therefore not surprising that government investment is highly volatile in all categories. In addition, some of our main results discussed in the previous section do not depend on the size of municipalities. For instance, own revenue does not play a significant role in adjusting to fiscal shocks, and does not respond to an innovation in grants, implying that the flypaper effects seem to exist in all categories. The same results are evident in the Panel B data set. The complementarity/substitutability between government investment and current expenditure is in line with the previous section in that a decrease in government investment follows an increase in current expenditure.[12]

However, we do observe some differences among municipalities of different sizes. First, a notable difference is the larger fluctuations in own revenue in smaller municipalities. For instance, in response to a 1 yen increase in own revenue, cities and large municipalities decrease their future own revenue by 0.068 yen and 0.108 yen, respectively. However, medium and small municipalities decrease their own revenue by 0.355 yen and 0.413 yen, respectively. This might be related to the tax items the large and small municipalities rely on. The revenue share of corporate inhabitant tax, which is levied by the municipality where a corporation has business establishments, is relatively large in the larger municipalities. In contrast, smaller municipalities tend to rely on property tax. It is natural that the business-related tax revenue is more prone to shocks than property tax revenue. Thus, tax revenues are strongly influenced by short-term shocks, but make a relatively quick recovery in larger municipalities. For instance, a negative revenue shock will reduce corporate inhabitant tax revenue

[12] As shown in the second column, the response of current expenditure to an innovation in government investment is negative in cities and large and medium towns/villages. However, the response of current expenditure in small municipalities is positive, which seems to have a significant impact on the response of current expenditure to innovations in government investment, as shown in Table 7.

to larger municipalities for a given year, but since this does not last long, they avoid having to reduce their future own revenue. On the other hand, once a negative shock hits smaller municipalities, the decrease in own revenue persists. This is because the share of property tax revenues in their budget is relatively high and decreases in property tax revenue do not recover promptly.

Second, as shown in the first column, an innovation in own revenue induces larger municipalities to increase government investment and current expenditure by more than in smaller municipalities. While a 1 yen increase in own revenue increases government investment in small and medium municipalities by 0.350 yen and 0.585 yen, respectively, it increases investment in large municipalities and cities by 0.633 yen and 0.810 yen, respectively. The response of current expenditure shows the same tendency as government investment. In other words, larger municipalities show a larger response in current expenditure to innovations in grants. The mechanism behind this finding can be connected with the grants scheme. The LAT grants from the central government are reduced by an amount (75% at the municipal level) proportional to the increase in the tax revenue. Hence, the smaller municipalities, which receive the central grants, do not increase public expenditure on the same level as the revenue increase because they recognize that the central government grants will be reduced with the increase in tax revenue. In contrast, the larger (and richer) municipalities tend not to receive grants, or receive fewer grants. These municipalities are not as concerned about the reduction in grants, and thus, they increase their government expenditure in response to the increase in revenue.

Third, the fourth row in the second column in Table 10 shows little evidence that larger municipalities can induce grants from a higher-level government by expanding government investment. However, a municipality with a small population might have an incentive to increase its government investment excessively, as this increase will be financed by the central government. The second column in Table 10 show that a 1 yen increase in government investment increases the grants in small municipalities by 0.047 yen. Furthermore, the third column reveals that municipalities in all categories induce grants by expanding current

expenditure. Specifically, in small municipalities, a 1 yen increase in current expenditure increases the grants from the higher-level government by 0.437 yen. This observation could be consistent with the standard argument that the central government tends to support small municipalities with a weak financial base, where "mandatory" expenses, such as personnel and welfare, constitute a high percentage of their budgets. In this case, foreseeing central government aid, these municipalities take opportunistic actions.[13]

Finally, the last row shows that a 1 yen innovation in all variables has a bigger influence on the primary surplus in municipalities with a larger population. For instance, in cities, a 1 yen increase in grants results in an offsetting change of 0.906 yen in primary surplus, indicating that the primary balance improves by 0.094 yen. In contrast, the improvement in the primary balance in small municipalities is 0.042, which is only half the size of cities. This tendency is also observed in the Panel B data set, and so it is considered a steady pattern.

6 Concluding Remarks

In this study, we examined the dynamic adjustment of municipal budgets in Japan using the VECM and compared the results to similar results for the United States, Germany, and Spain. Our main findings are summarized below.

First, Japanese municipalities respond to fiscal shocks mainly by adjusting their expenditure. Specifically, government investment plays a more prominent role than government current expenditure; 44.6-47.3% of an innovation in own revenue and grants is adjusted through government investment in the following year, explaining 83-100% of the permanent increase. In contrast, government current expenditure plays a limited role in balancing the local budget. Government investment in Japan is highly responsive, which contrasts significantly with the situation in the United States, Germany, and Spain.

Second, in contrast to the role played by the spending side, the municipalities' own-source revenue plays a limited role in balancing the local budget. This

[13]However, this result is weakened to a certain degree in the Panel B data set.

is in contrast to the case of the United States, where own revenue is used to adjust fiscal imbalances. In addition, grants from the central government do not play a significant role in Japanese municipalities. This contrasts with Spain and Germany, where intergovernmental fiscal transfers do play a role in adjusting fiscal imbalances, through central grants in the former, and through equalization transfers in the latter.

Third, government investment is highly volatile compared to that observed in other countries. In contrast, the magnitude of the volatility in own revenue and grants is relatively small, implying that the municipalities face restrictions in adjusting fiscal balances through own-revenue sources, and that the higher-level government is relatively rigid in providing grants.

Fourth, the complementarity/substitutability between government investment and current expenditure is somewhat mixed. On the one hand, a 1 yen increase in government current expenditure leads to a reduction of 0.436 yen in government investment. On the other hand, a 1 yen increase in government investment leads to an increase of 0.076 yen in government current consumption.

Fifth, an international comparison shows that municipalities are likely to have soft budgets, but that this is not the case in Japan. However, an additional analysis shows that, while larger municipalities have no incentive to expand their government investment, and therefore induce grants from the higher-level government, small municipalities might do so. Furthermore, the figures show that small municipalities have a strong incentive to expand current expenditure to induce grants from the central government. This might be because the system of LAT grants, which aims to close the fiscal gap among municipalities, induces opportunistic behavior in small municipalities.

Finally, the responses of government investment explain almost everything about permanent unit increases in grants, providing evidence of the flypaper effect. Specifically, grants do not stick to government current expenditure, but are likely to stick to government expenditure, regardless of the size of the municipality.

Appendix

We compute the present value of impulse responses following Buettner (2009). Our estimation equations are

$$\Delta Y_{it} = \gamma D_{i,t-1} + \sum_{j=1}^{p} \Gamma_j \Delta Y_{i,t-j} + u_{it}, \tag{3}$$

where $Y_t = (G_t^I, G_t^C, S_t, R_t, Z_t)'$, $b_t = (1, 1, 1, -1, -1)$ and thus $D_t = b_t' Y_t$. The transition of the fiscal deficit is:

$$D_{i,t-1} = b' \Delta Y_{i,t-1} + D_{i,t-2} \tag{4}$$

Following Bohn (1991) and Buettner (2009), the VECM can be represented as a first-order VAR:

$$X_{it} = \mathbf{B} X_{i,t-1} + v_{it}$$

where

$$\mathbf{B} \equiv \begin{bmatrix} \Gamma_1 + \gamma b' & \Gamma_2 + \gamma b' & \Gamma_3 + \gamma b' & \Gamma_4 + \gamma b' & \gamma \\ \mathbf{I} & \mathbf{0} & \mathbf{0} & \mathbf{0} & 0 \\ \mathbf{0} & \mathbf{0} & \mathbf{I} & \mathbf{0} & \vdots \\ \mathbf{0} & \mathbf{0} & \mathbf{0} & \mathbf{I} & 0 \\ 0 & 0 & 0 & b' & 1 \end{bmatrix},$$

$$X_{it} \equiv \begin{bmatrix} \Delta Y_{it} \\ \Delta Y_{i,t-1} \\ \Delta Y_{i,t-2} \\ \Delta Y_{i,t-3} \\ D_{i,t-4} \end{bmatrix}, \quad v_{it} \equiv \begin{bmatrix} u_{it} \\ 0 \\ \vdots \\ \vdots \\ 0 \end{bmatrix}.$$

Based on this rearrangement, the prediction of the k-period ahead value created by an innovation to period t can be written as:

$$\hat{X}_{i,t+k} = \mathbf{B}^k v_{it}.$$

When we set v_{it} as v_k, whose k-th element is unity and others are zero, to represent a unit innovation, the present value of the impulse response in the m-th budget component is:

$$\hat{\pi}(m,k) = \sum_{n \geq 1} h_m \rho^n \mathbf{B}^n v_k = h_m \rho \mathbf{B} [1 - \rho \mathbf{B}]^{-1} v_k,$$

where h_m is a selection vector with unity as its m-th element and zeros elsewhere, and ρ is a discount factor.

References

[1] Akai, Nobuo, Motohiro Sato, and Koji Yamashita. 2003. *Economics of Local Allocation Tax* (in Japanese), Yuhikaku Publishing.

[2] Arellano, Manuel. 2003. *Panel Data Econometrics.* Oxford University Press.

[3] Arellano, Manuel, Stephen Bond. 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies* 58, 277-297.

[4] Bond, Stephen R. 2002. Dynamic panel data models: a guide to micro data methods and practice. *Portuguese Economic Journal* 1, 141-162.

[5] Borck, Rainald, Marco Caliendo, and Viktor Steiner. 2007. Fiscal competition and the composition of public spending: theory and evidence, *FinanzArchiv* 63, 264-277.

[6] Brückner, Markus and Anita Tuladhar. 2010. Public investment as a fiscal stimulus: Evidence from Japan's regional spending during the 1990s. *IMF Working Paper* 10/110.

[7] Buettner, Thiess and David E. Wildasin. 2002. The dynamics of municipal fiscal adjustment. CESifo Working Paper Series 649, CESifo Group Munich.

[8] Buettner, Thiess and David E. Wildasin. 2006. The dynamics of municipal fiscal adjustment. *Journal of Public Economics* 90, 1115-1132.

[9] Buettner, Thiess. 2009. The contribution of equalization transfers to fiscal adjustment: Empirical results for German municipalities and a US-German comparison. *Journal of Comparative Economics* 37, 417-431.

[10] Chen, Been-Lon. 2006. Economic growth with an optimal public spending composition, *Oxford Economic Papers* 58, 123-136.

[11] Devarajan, Shantayanan, Vinaya Swaroop, and Heng-fu Zou. 1996. The composition of public expenditure and economic growth, *Journal of Monetary Economics* 37, 313-344.

[12] Doi, Takero. 1996. Flypaper effect in Japanese urban expenditure, *Financial Review* 40, 95-119.

[13] Doi, Takero. 2000. Flypaper and spillover effects in Japanese urban expenditure, *Mita Journal of Economics* 93, 75-90.

[14] Doi, Takero and Toshihiro Ihori. 2006. Soft-budget constraints and local expenditures, CIRJE Discussion Papers F-422, University of Tokyo.

[15] Hayashi, Masayoshi. 2010. Redistribution and local public finance. *Public Finance Review* 6(1), 31-54.

[16] Joumard, Isabelle and Kongsrud, Per Mathis, 2003. Fiscal relations across government levels. *OECD Economic Studies* 36, 155-229.

[17] Lau, Sau-Him. 1995. Welfare-maximizing vs. growth-maximizing shares of government investment and consumption, *Economics Letters* 47, 351-359.

[18] Mochida, Nobuki. 2001. Revenue, expenditure and intergovernmental transfers in Japan, in Muramatsu, Michio, Farrukh Iqbal and Ikuo Kume, *Local Government and Economic Development in Japan*, Oxford University Press.

[19] Muramatsu, Michio, Farrukh Iqbal, Ikuo Kume. 2001. *Local Government Development in Post-War Japan.* Oxford University Press.

[20] Nagamine, Junichi. 1995. Japanese local finance and "institutinalized" flypaper effect. *Public Finance* 50, 420-441.

[21] Navon, Guy. 2006. Budgetary dynamics in the local authorities in Israel. *Israel Economic Review* 2, 19-52.

[22] Nishikawa, Masashi and Akira Yokoyama. 2004. Incentive for tax collecting in local government, (in Japanese), *JCER Economic Journal* 50, 165-179.

[23] Pesaran, H. Hashem. 2007. A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics* 22, 265-312.

[24] Rattsø, Jørn. 2004. Fiscal adjustment under centralized federalism: Empirical evaluation of the response to budgetary shocks, *FinanzArchiv* 60, 240-261

[25] Rivas, Luis. 2003. Income taxes, spending composition and long-run growth, *European Economic Review* 47, 477-503.

[26] Roodman, David. 2008. How to do xtabond2? An introduction to difference and system GMM in Stata. *Stata Journal* 9, 86-136.

[27] Solé-Ollé, Albert and Pilar Sorribas-Navarro. 2012. The dynamic adjustment of local government budgets: Does Spain behave differently? *Applied Economics* 44, 3203-3213.

[28] Giovanni, Ganelli and Juha Tervala. 2010. Public infrastructures, public consumption, and welfare in a new-open-economy-macro model, *Journal of Macroeconomics* 32, 827-837.

[29] Matsumoto, Mutsumi. 2000. A note on the composition of public expenditure under capital tax competition, *International Tax and Public Finance* 7, 691-697.

[30] Keen, Michael and Maurice Marchand. 1997. Fiscal competition and the pattern of public spending *Journal of Public Economics* 66, 33-53.

Lags	0	1	2	3	4
Own revenues	1.000	0.975	0.960	0.946	0.929
Investment	1.000	0.762	0.657	0.596	0.552
Current expend.	1.000	0.965	0.951	0.940	0.922
Grants	1.000	0.976	0.956	0.946	0.933
Debt services	1.000	0.948	0.930	0.907	0.882

Table 1: Correlogram

Lag order(p)	1		2		3	
Own revenues	-2.664	***	-2.204		-2.285	
Expenditures	-3.177	***	-2.978	***	-2.665	***
Investments	-3.337	***	-3.091	***	-2.498	*
Current expend.	-2.855	***	-2.667	***	-2.554	**
Grants	-2.573	**	-2.343		-2.076	
Debt service	-2.427		-2.157		-2.093	
Deficit	-3.545	***	-3.152	***	-2.740	***
Δ Own revenues	-3.933	***	-2.680	***	-2.309	
Δ Expenditures	-4.130	***	-3.497	***	-3.223	***
Δ Investments	-4.220	***	-3.746	***	-2.949	***
Δ Current expend.	-4.095	***	-3.233	***	-3.264	***
Δ Grants	-4.006	***	-3.258	***	-3.055	***
Δ Debt service	-3.783	***	-2.873	***	-2.743	***

Table 2: Panel Unit Root Test (1977-2001, 3210 municipalities)

Note.$*$, $**$, and $***$ indicate significant difference at 10, 5 and 1 percent levels, respectively.

Lag order(p)	1		2		3	
Own revenues	-2.322		-2.045		-2.267	
Expenditures	-3.320	***	-2.973	***	-2.805	***
Investments	-3.535	***	-3.199	***	-2.951	***
Current expend.	-2.891	***	-2.515	*	-2.379	
Grants	-2.616	**	-2.243		-2.094	
Debt service	-2.350		-2.059		-1.960	
Deficit	-3.270	***	-2.801	***	-2.567	**
Δ Own revenues	-4.775	***	-3.746	***	-3.200	***
Δ Expenditures	-5.045	***	-4.024	***	-3.518	***
Δ Investment	-5.147	***	-4.215	***	-3.610	***
Δ Current expend.	-5.044	***	-3.812	***	-3.374	***
Δ Grants	-4.644	***	-3.598	***	-3.197	***
Δ Debt service	-4.380	***	-3.350	***	-2.867	***

Table 3: Panel Unit Root Test (1977-2010, 1726 municipalities)

Note.$*$, $**$, and $***$ indicate significant difference at 10, 5 and 1 percent levels, respectively.

	Panel A: 1977-2001		Panel B: 1977-2010	
	Test statistics	p-value	Test statistics	p-value
Own Revenues	22.36	0.38	34.84	0.03
Investments	28.45	0.13	124.93	0.00
Current expend.	65.63	0.00	79.94	0.00
Grants	57.40	0.00	70.28	0.00
Debt services	20.80	0.47	29.16	0.11

Table 4: DWH tests for municipal-fixed effects

Lag order(p)	4$\rightarrow$ 3	3$\rightarrow$ 2
$\chi^2(16)$	124231.8 [0.000]	125032.8 [0.000]
Municipality-fixed effects?	with lag length = 4	with lag length = 3
$\chi^2(12836)$	20880.4 [0.000]	20715.6 [0.000]

Table 5: Specification Test (1977-2001, 3210 municipalities)

Note. The log-likelihood statistics on cross-equation restrictions are reported. The p-values are in parentheses.

Lag order(p)	4→ 3	3→ 2
$\chi^2(16)$	69049.6 [0.000]	69529.4 [0.000]
Municipality-fixed effects?	with lag length = 4	with lag length = 3
$\chi^2(12836)$	11305.4 [0.000]	11338.0 [0.000]

Table 6: Specification Test (1977-2010, 1726 municipalities)

Note. The log-likelihood statistics on cross-equation restrictions are reported. The p-values are in parentheses.

	Innovation to				
Response of	Revenue	Invest.	Current	Grants	Debt Ser.
Own revenue	-0.462	0.057	0.021	-0.041	0.022
	(0.044)	(0.023)	(0.024)	(0.023)	(0.036)
Investments	0.446	-1.001	-0.436	0.473	-0.526
	(0.081)	(0.072)	(0.080)	(0.076)	(0.144)
Current expend.	0.014	0.076	-0.420	-0.018	0.113
	(0.073)	(0.047)	(0.053)	(0.040)	(0.069)
Grants	-0.085	0.051	0.147	-0.528	0.098
	(0.050)	(0.062)	(0.059)	(0.065)	(0.134)
Debt Service	-0.136	0.223	0.224	-0.166	-0.366
	(0.058)	(0.076)	(0.068)	(0.073)	(0.113)
	Response to permanent increase				
Own revenue		2.054	0.036	-0.089	0.031
		(18.888)	(0.040)	(0.048)	(0.053)
Investments	0.831		-0.752	1.004	-0.831
	(0.147)		(0.114)	(0.101)	(0.186)
Current expend.	0.024	2.516		-0.041	0.173
	(0.135)	(27.131)		(0.086)	(0.090)
Grants	-0.158	2.927	0.254		0.167
	(0.092)	(22.326)	(0.100)		(0.222)
Debt Service	-0.255	6.618	0.384	-0.356	
	(0.113)	(61.764)	(0.092)	(0.162)	

Table 7: Present Value Responses (Panel A, 1977-2001, 3,210 municipalities)

Note. Standard errors are in the parentheses.

	Innovation to				
Response of	Revenue	Invest.	Current	Grants	Debt Ser.
Own revenue	-0.432	0.092	0.055	-0.083	-0.052
	(0.047)	(0.031)	(0.049)	(0.030)	(0.049)
Investments	0.552	-0.929	-0.284	0.547	-0.669
	(0.103)	(0.077)	(0.118)	(0.082)	(0.173)
Current expend.	-0.006	0.042	-0.291	0.094	0.047
	(0.080)	(0.047)	(0.107)	(0.042)	(0.076)
Grants	0.011	-0.022	0.309	-0.219	-0.063
	(0.120)	(0.092)	(0.154)	(0.098)	(0.193)
Debt Service	-0.176	0.122	0.186	-0.071	-0.326
	(0.048)	(0.041)	(0.064)	(0.039)	(0.096)
	Response to permanent increase				
Own revenue		-0.421	0.078	-0.107	-0.078
		(15.206)	(0.068)	(0.036)	(0.070)
Investments	0.976		-0.403	0.701	-0.991
	(0.190)		(0.161)	(0.064)	(0.209)
Current expend.	-0.012	-0.808		0.120	0.065
	(0.144)	(12.503)		(0.050)	(0.102)
Grants	0.022	0.755	0.431		-0.089
	(0.217)	(9.109)	(0.198)		(0.285)
Debt Service	-0.312	-1.574	0.262	-0.091	
	(0.094)	(25.320)	(0.069)	(0.051)	

Table 8: Present Value Responses (Panel B, 1977-2010, 1,726 municipalities)

Note. Standard errors are in the parentheses.

	Innovation to				
	Own Revenue	Gov. Invest.	Current Expend.	Grants	Debt Service
Panel A	-1.007	1.033	1.025	-1.024	0.534
Panel B	-0.967	0.958	0.938	-0.943	0.507

Table 9: Present Value of Change in Primary Surplus

		Innovation to				
Response of	*Category*	Revenue	Invest.	Current	Grants	Debt Ser.
Own	City	-0.068	-0.208	-0.123	0.069	-0.165
revenue	Large	-0.108	-0.029	-0.088	-0.013	0.023
	Medium	-0.355	0.003	-0.038	-0.030	0.008
	Small	-0.413	0.021	-0.004	-0.008	0.007
Investment	City	0.810	-1.165	-0.454	0.694	-0.860
	Large	0.633	-1.067	-0.444	0.611	-0.535
	Medium	0.585	-1.082	-0.467	0.678	-0.609
	Small	0.350	-0.974	-0.281	0.547	-0.428
Current	City	0.188	-0.162	-0.426	0.227	-0.113
expend.	Large	0.115	-0.066	-0.357	0.182	-0.135
	Medium	0.085	-0.096	-0.447	0.214	-0.043
	Small	-0.036	0.008	-0.307	0.084	0.011
Grants	City	0.122	-0.183	0.191	-0.060	-0.240
	Large	-0.135	-0.096	0.271	-0.191	-0.044
	Medium	0.034	-0.191	0.100	-0.062	-0.046
	Small	-0.279	0.047	0.437	-0.382	0.145
Debt	City	-0.185	0.183	0.205	-0.160	-0.345
Services	Large	-0.098	0.104	0.154	-0.062	-0.372
	Medium	-0.109	0.111	0.141	-0.036	-0.369
	Small	-0.156	0.192	0.252	-0.140	-0.376
Primary	City	-0.915	0.931	0.908	-0.906	0.539
surplus	Large	-0.949	0.970	0.953	-0.937	0.671
	Medium	-0.948	0.977	0.954	-0.955	0.758
	Small	-1.012	0.975	0.983	-0.958	0.491

Table 10: Present Value Responses (1977-2001)

Note. The first upper row in each cell stands for the response of cities. The figures in the following rows stand for the response of large, medium, and small towns/villages.