The Role of Revenue Volatility in Local Expenditure Volatility:

A Comparison of Tokyo Metropolitan Local Governments

Abstract

Local expenditure volatility can have significant implications for the health of local economies. It is therefore essential to understand how fluctuations in the various components of municipal revenue translate into expenditure volatility. We examine the association between revenue and expenditure volatility for Tokyo Metropolitan Governments – which are comprised of both Special Wards and Tama Cities – through recourse to a six-year panel of fiscal data (2010 to 2015 inclusive). We find evidence of statistically significant positive associations between the volatility of most local taxes and expenditure volatility, but negative associations between the volatility of grants and expenditure volatility. This suggests that grants play an important role in smoothing out local government expenditures in Tokyo and that the prescription for greater reliance on local taxation, found in much of the literature, may not be appropriate for Japanese local governments.

Keywords: revenue volatility, local expenditure volatility, Tokyo Metropolitan local governments, Special wards, Tama cities.

1. Introduction

There has been much recent attention on decentralisation of government in most advanced economies in response to a widespread belief that fiscal decentralisation reforms – assigning autonomy from the central government to local governments in terms of raising revenues and controlling expenditures – can offer potential gains in economic growth (Martinez-Vazquez & McNab, 2003), social welfare improvement (McLure & Martinez-Varquez, 2001), and efficient provision of public services (Oates, 2008; Martinez-Vazquez & McNab, 2003). Fiscal decentralisation principally relates to matters of revenue raising and taxation powers, decisions on spending, and intergovernmental relations (Vo, 2010). The merit of fiscal decentralisation has been shown in recent empirical studies: In particular, it has been asserted that 'more tax autonomy would improve the budget of all tiers of government' and expenditure decentralisation could improve responsiveness in the face of financial crises or economic shocks (Bartolini *et al.*, 2017). Moreover, as pointed out by Foremy (2014), tax decentralisation can help sub-national governments to avoid deficits (and this has been shown for several European countries), while expenditure decentralisation can help to reduce regional income disparities (Sacchi & Salotti, 2016). However, because devolution of autonomy falls most heavily upon local governments, there may be unanticipated consequences for this tier of government (Tanzi, 2001) and it is, therefore, important to empirically investigate expenditure volatility for local government systems.

In some countries, the devolution of spending responsibilities is not matched by corresponding devolution of tax revenues and this can exacerbate vertical fiscal imbalance

(Eyraud & Lusinyan, 2011). According to McLure and Martinez-Vazquez (2000), it is important to clearly determine expenditure portfolios in advance before designing revenue assignments and transfers, to ensure that local governments have adequate revenues to match expenditure responsibilities. There is evidence to suggest that residents are increasingly demanding more public services, thus expanding local expenditures, despite low willingness to pay (Eyraud & Lysinyan, 2011; Grant & Drew 2017, p.274). If this is indeed the case, the other sources of revenue (and other cash flows) may hence be required to match expenditures. Thus, there is good reason for supposing that the variance of taxes and transfers might be related to local spending, but few scholarly studies, so far, have explored the potential associations.

In general, measures of volatility can provide a picture of an entity's economic progress since this approach allows for an understanding of the fluctuations from equilibrium (Staley, 2017). ~~The volatility of revenue and expenditure~~Expenditure volatility is~~, hence,~~ defined as the standard deviation of the annual growth rate of ~~revenue and expenditure deviating from equilibrium over the years~~local spending for a given fiscal year (Staley, 2015; Sacchi and Salotti, 2017). Research on expenditure volatility at the local level is particularly salient, given the need for local authorities and policymakers to arrive at efficacious public policy prescriptions. For instance, Sacchi and Salotti (2017) argue that local spending volatility probably impedes the health of local economies. If expenditure tends to be volatile and unpredictable, then it makes it hard for local business to plan their spending (with respect to staffing needs, inventory and the like). This is especially the case if local government staff numbers are volatile – which is likely to be felt most keenly by casualised staff − because less money is being injected into the local economy. Moreover, expenditure volatility, even revenue volatility, might give rise to uncertainty concerning future fiscal periods, which will hamper the 'selection of efficient production processes' (Crain, 2003, p.96). Local expenditure volatility is thus worthy of study given its implications for local economic performance.

The nascent scholarly literature on expenditure volatility ~~and some of its determinants has identifiedexpenditure~~ has identified some of its determinants.~~volatility has identified some of the determinants of same.~~ Potential determinants of expenditure volatility can be attributable to variation in taxes and intergovernmental grants (Sacchi & Salotti, 2017), the degree of fiscal decentralisation in most developed and developing countries (Furceri *et al.*, 2016), the quality of fiscal institutions (Albuquerque, 2011), and revenues and debt outstanding (Dension & Guo, 2015). However, these academic works have largely been focused on Europe and America, and there is a gap in the scholarly literature relating to the local expenditure volatility in Japan, which is generally considered to have the highest degree of decentralisation among the Organisation for Economic Co-operation and Development (OECD) countries (Mochida, 2008). Our paper is motivated by a desire to address this gap, especially concerning business cycle fluctuations in the Tokyo metropolis sequent to the 2008 Global Financial Crisis (GFC).

Japan is a unitary democracy that has vigorously implemented fiscal decentralisation reforms − marked by the “Trininty Reform” in 2004 regarding the amendment of earmarked

grants, local taxes, and national subsidies, and accordingly improved the central-local relationship. However, local governments are still somewhat reliant on intergovernmental transfers and are restricted in terms of tax administration, as well as being subject to borrowing controls (Mochida, 2008). At the prefectural level, Tokyo metropolis, governed by the Tokyo Metropolitan Government (TMG), is a particularly important jurisdiction to study for a number of reasons. First, Tokyo is the locomotive of Japan's economy, contributing to 19.5% (JPY 92 trillion) of Japan Gross Domestic Product in 2014 − the highest portion of the prefectural contribution to the national economy (Bureau of Finance, 2014). Second, Tokyo's economy suffered from the 2008 GFC, and consequently, local taxes plummeted by as much as 20% of total revenue (JPY 1 trillion) in 2009 (see Figure 1). In responsive to the GFC, the TMG executed staff-cuts and implemented controls to public spending in the pursuit of financial soundness (Bureau of Finance, 2014). Third, there exist two disparate public administration systems within Tokyo local governments: 23 special wards and 26 cities (Tama area). ~~23 wards in the special urban area (Special wards) and 26 cities in the suburban area of western Tokyo (Tama cities).~~ Under *the Local Autonomy Law*, while the former are categorized as special public entities − enjoying some privileged financial coordinating grants from TMG to compensate the fiscal gap – the later are ordinary public entities, similar to other municipalities in Japan (Ohsugi, 2011). Additionally, the special wards are virtually limited in some public service responsibilities (e.g., fire prevention, water supply, and sewerage system), which are governed by TMG on their behalf (CLAIR, 2013; Ohsugi, 2011) . This unique fiscal system of Tokyo is our focus.

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In this study, we examine: (i) the association between the volatility of various revenues (e.g., local taxes and grants) and local spending volatility, and (ii) how the fiscal differences between special wards and cities affect the spending volatility in the context following the GFC in 2008. To do so, we employ fixed effects regression analysis over a six-year panel of data (2010 to 2015).

The remainder of the paper is organized as follows: In the next section, the related literature on ~~Japan's fiscal decentralisation and~~ Tokyo public finance will be introduced. Thereafter, we outline our empirical strategy and the data for analysis. Following this, we discuss the statistical results and findings. We conclude with a discussion on the public policy implications arising from this study.

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2. Tokyo Local Government Remit, Revenue, and Expenditure

Local government in Japan is organised according to two-tiers: Prefectures and municipalities. At the prefectural level, Tokyo Metropolitan Government administratively governs Tokyo metropolis. At the municipal level, there are 23 special wards, 26 cities, 5 towns, and 8 villages[1] ~~there are 49 administrative units, composed of 23 wards and 26 cities~~. The Tokyo metropolis covers an area of 2.191 square km and has an estimated population of

[1] The 5 towns and 8 villages − rural and island areas in Tokyo − are designated in the geographical area, but their ~~ir~~ scope~~s~~ of public services and finances performed by them are comparatively small ~~minuscule~~ as compared with those provided by the special wards and cities. Therefore, we eliminated these units from our analyses ~~considerations~~. ~~performwhen compared to, t~~

13.491 million as at October 2015 (TMG, 2018). While 9.241 million reside at the 23 wards with the population density of 14,746 persons per square km, 4.233 million live in 26 cities with 3,640 persons per square km (TMG, 2018).

In Japan, the national and local government assignment of responsibilities was clarified by *the Omnibus Local Autonomy Law* in 1999. The abolition of the system of delegated functions, and a representative agency as a head of the municipality appointed by the national government, lead to the elimination of intervention by the national government, and hence, local governments now have broad responsibilities for their administrative functions autonomously and comprehensively (CLAIR, 2013; Mochida, 2008). Prefectures are responsible for prefectural roads, high schools, public health centres, and police, whereas municipalities are responsible for urban planning, municipal streets, schooling for under 15, health care services, social welfare, garbage disposal, and fire services. In contrast to the 26 cities' responsibilities for public services, several public provisions such as water supply, sewerage, and fire protection in the 23 wards are co-shared and undertaken by TMG (TMG, 2018). Thus, an incorporated council between TMG and special wards has been established to facilitate continuous negotiations and discussions on the matters of co-sharing activities and other fiscal interrelation (TMG, 2018). Therefore, the relationship between TMG and special wards can be considered unique and mutually interdependent.

The primary local revenue sources for Japanese local governments are local taxes, intergovernmental grants, and local bonds. Local taxes are imposed by both prefectural and municipal governments with various types of taxes: inhabitant, business, consumption, and property tax, etc. In general, tax bases and tax rates are regulated consistently across local governments. Intergovernmental grants are composed of Central Government Subsidies (CGS) and Local Allocation Tax (LAT). The CGS, also known as the National Treasury Disbursement, is an obligatory share from the national government for specific purposes (e.g., educational assistance, post-natural disaster alleviation) (Bessho, 2016; MIC, 2017). The LAT, allocated as a fixed portion of national taxes such as income, corporate, alcohol, and consumption, plays an essential role for horizontal fiscal equivalence to narrow the gap between poor and affluent regions. Tokyo is such a wealthy region (the income per capita exceeds the national fiscal standard) that LAT grants are not allocated to municipals in Tokyo (MIC, 2017). However, they are still recipients of LAT grants from TMG. The LAT is estimated by the gap between basic fiscal needs and basic fiscal revenues. Finally, the Japanese principle of local autonomy allows local governments the authority to issue bonds (Tanaka, 2011). Local bonds perform a deficit adjusting function, thus shifting the debt burden to the next generation, and augmenting general revenue sources (Tanaka, 2011).

[PLEASE INSERT FIGURE 1 HERE]

Importantly ~~for this study~~, there exist two main differences in the revenue-raising powers of the 23 wards and 26 cities. Regarding local taxes, there are sixteen types of charges for the 23 wards, but twenty-two for the cities (TMG, 2018). Moreover, the rate of corporation tax in the special wards is around four times larger than the rate imposed in the cities (Bureau of Taxation, 2017). Three kinds of charges (property tax, corporation tax, special land

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acquisition and holding tax) are collected by TMG on behalf of the special wards, while each city collects these taxes by themselves (Ohsugi, 2011). TMG separates the pool of these taxes collected for two functions: 55 percentage for grant allocations towards special wards and 45 percentage for co-sharing administrative works. The funds of grants are further divided into special grants (5%) and ordinary grants (95%). Special wards receive the financial coordinating grants from TMG, while cities do not. Therefore, special wards differ from cities regarding revenue sources.

The volatility of revenue and expenditure has been increasingly attracting the attention of scholars. On the revenue side, constant fluctuation of income can make it hard for local authorities and policymakers to plan, budget, and provide efficient and sustainable goods and services (Staley, 2017). Thus, it is considered essential to identify the factors affecting revenue volatility. For instance, tax limitations are positively linked with state revenue volatility in America (Staley, 2017; 2015). Moreover, the empirical study of Afonso (2017) asserts that greater reliance on local sales tax can increase the volatility of own source revenue, whereas more significant reliance on property tax can decrease the volatility of individual source revenue, consistent with the underlying theory of fiscal federalism (Oates, 2011). Additionally, it has been shown that increasing property tax can reduce capital expenditures, which are not affected by local sales tax (Afonso, 2017).

On the expenditure side, some critical factors have been identified. For example, as pointed out by Furceri (2007), and Afonso and Furceri (2010), the effect of government expenditure volatility on economic growth is generally negative and statistically significant for European countries. However, it seems that some advanced countries may be able to absorb expenditure volatility because of their better taxation system and powerful domestic stabilizers (Furceri, 2007). Similarly, Furceri and Poplawski-Ribeiro (2008) conclude that country size is negatively associated with government spending volatility, which is also consistent with the finding of Albuquerque (2011).

However, there is only a nascent literature regarding factors contributing to expenditure volatility at the local level. Sacchi and Salotti (2017) have investigated the influence of local taxes (income tax, property tax, and sales tax) and grants on local spending volatility in twenty OECD countries. Their results suggest that while volatilities of grants and income tax are positively associated with local spending volatility, the volatility of property tax has a negative effect on spending. Another study of Denison and Gou (2015) elaborates on the association between outstanding debt and expenditure volatility for local jurisdictions of the United States and found that debt had a statistically significant impact on the expenditure volatility for thirteen states.

The above literature suggests a number of factors that might be associated with revenue volatility and expenditure volatility. However, it also suggests that the relationship between revenue ~~volatility~~ and expenditure volatility is not uniform. Furthermore, only a few studies present a clear link between revenues and expenditure volatility, even though the importance of this issue has been stressed by Thompson and Gates (2007) who state that 'volatile,

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unpredictable revenue growth causes all sorts of unpleasant governmental responses, most commonly manic-depressive patterns of spending and taxing.'

In addition to the studies from abroad, some related empirical studies such as Bessho and Ogawa (2015), and Martin-Rodiguez and Ogawa (2017) in the Japanese context investigated local fiscal adjustments and found that own-source revenue plays a limited role in balancing provincial budgets because it tends to be offset by the supply of grants. Subsequently, it has been suggested that municipalities can induce grants by expanding current expenditure. These scholarly works provide some insight into the fiscal deficit associated with own-source revenues, grants, and debt; however, the specific association between revenue and expenditure still requires investigation. Moreover, this association has not yet been examined in detail at the specific local level of Tokyo, where the public finance system is rather unique in Japan. ~~(when compared with other local governments in Japan).~~ To address these gaps in the literature, we analyse the association between the volatilities of various revenue components (e.g., local tax, grants) and expenditure volatility of local governments in Tokyo. The next section will outline the empirical strategy that we employ.

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3. Empirical Strategy

Local expenditure volatility is defined as the standard deviation of the annual growth rate of local spending for a given fiscal year (Sacchi & Salotti, 2017). The measurement of volatility of revenue components is estimated in a similar manner. ~~Apart~~In contrast to ~~from~~the Sacchi and Salotti (2017) model − which examined~~ing~~ the expenditure volatility of local governments in the context of OECD nation~~al~~ ~~level~~states – ~~,~~ our specification instead concentrated~~was paid an attention~~ on local governments ~~at the regional level, particularly~~in the context of Tokyo metropolitan government, Japan. Hence, several revenue components from the Sacchi and Salotti (2017) model were~~are~~ modified to reflect the circumstances of ~~befit with the~~the Tokyo local governments~~ circumstances~~. Data were extracted from the cash-based accounting system of 49 administrative units in Tokyo ~~over six fiscal years~~ from 2010 to 2015~~, inclusive~~. Fixed effects panel regression for data analysis was adopted in this empirical study and is used because it controls for time-invariant latent variables that might influence the dependent variable. Although Random-Effect (RE) models might be more efficient, it needs to overcome the problem of a composite error that is possibly correlated with the explanatory variables (Drew & Dollery, 2016). According to Thompson and Gates (2007), there ~~could be a potential~~is a possibility that a feedback loop ~~that the expenditure volatility could influence the revenue one~~might operate between revenue and expenditure and readers should remain cognisant of this potential interaction when interpreting our results which are primarily ~~. However, we primarily~~ directed at investigating the association which runs from ~~e into the translation from~~ revenue to expenditure. The~~herefore, t~~The regression specification was estimated by the following equation:

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$$Exp_{i,t} = \alpha_{i,0} + \beta_1 LT_{i,t} + \beta_2 CT_{i,t} + \beta_3 OT_{i,t} + \beta_4 SG_{i,t} + \beta_5 G_{i,t} + \beta_6 S_{i,t} + \beta_7 FC_{i,t} + \beta_8 OR_{i,t} + \beta_9 B_{i,t} + \mu_{i,t} \quad (1)$$

Where independent variable $Exp_{i,t}$ is the annual volatility of *municipality i* expenditure at the period of *t* fiscal year. In the parsimonious model (1), the dependent variables − $LT_{i,t}$, $CT_{i,t}$, $OT_{i,t}$, $SG_{i,t}$, $G_{i,t}$, $S_{i,t}$, $FC_{i,t}$, $OR_{i,t}$, and $B_{i,t}$ − denote the volatility of local tax, consumption tax[2] (ln), other taxes (ln), special grants, grants (ln), subsidies, fees and charges (ln), other revenues, and local bonds (ln), respectively (transformations were applied to correct skewed distributions where indicated). The set of β_k (k =1,...,9) represents the estimated parameters in the regression model and $\mu_{i,t}$ is an independent identically distributed random error term. To ensure the robustness of the results, we also controlled for municipal specific features under an alternative specification. Therefore, specification (2) with additional control variables has been proposed:

$$Exp_{i,t} = \alpha_{i,0} + \beta_1 LT_{i,t} + \beta_2 CT_{i,t} + \beta_3 OT_{i,t} + \beta_4 SG_{i,t} + \beta_5 G_{i,t} + \beta_6 S_{i,t} + \beta_7 FC_{i,t} + \beta_8 OR_{i,t} + \beta_9 B_{i,t} + \sum_{i=1}^{s} Control_{i,t} + \mu_{i,t} \quad (2)$$

In this study, we employ Full-Time-Employees (FTE) as a proxy for municipal size (Drew *et al.*, 2016). This control variable is estimated by the natural logarithm of the number of FTE staff at each municipality *i* at year *t*. Some relevant empirical studies use different sets of control variables for instance: population to measure country size, urbanization as a percentage of each municipal population over the total population, population density (Sacchi & Salloti, 2017), population older than 65, population growth rate, or unemployment rate[3] (Staley, 2017). The population-related control variables seem inappropriate for the Tokyo case. The main reason is that Tokyo metropolis has a unique distribution of population because Tokyo is located at the centre of the Greater Tokyo Area, surrounded by three neighbours− Saitama, Chiba, and Kanagawa, which are the most populous areas in Japan. People in these neighbourhoods commute daily to their offices at the centre of Tokyo. Accordingly, Tokyo's population gap between daytime and night-time was around 2.89 million in 2010 (TMG, 2018). These commuters essentially export metropolitan corporation tax forwards to Tokyo, but rarely benefit from public services to the same degree as do Tokyo's residents. It is hence argued that control variables related to population parameters would fail to accurately reflect either the scale or the substance of the expenditures made by the Tokyo local governments. Therefore, FTE staff is considered ~~to be~~ a more accurate proxy for ~~local government~~ municipal scale in the Tokyo metropolis.

With respect to specification (1) and (2), we stratify each of the specifications into two groups (23 wards and 26 cities) and observe how the different fiscal arrangements across the two groups affect the volatility of local spending (please see Table 1 for disaggregated

[2] In Japan, 6.3% and 1.7% of the consumption tax pool go to ~~both~~ national and local governments, respectively. These tax rates are preset before collection of the tax, which is~~in advance be d~~foreon of the tax~~which is~~ ifferent from some OECD~~s~~ countries, such as Australia, where~~-~~ the national government collects the consumption tax first, and then ~~reallocate these pools to the lower tier~~transfers funds to state governments on the basis of horizontal fiscal equalization. In this study, we only took account of the 1.7% consumption tax that is directed to local government.

[3] The data of unemployment rate for the municipal level are basically published in 5 year interval. The availability of data accordingly did not fit with our panel.

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summary statistics). The summary statistics suggest that local spending volatility in the special wards is relatively higher than for the cities. Regarding local revenue compositions, while local tax for the 23 wards is more volatile than for 26 cities, income from consumption tax and other taxes in both areas are relatively stable. This is because the central part of the local tax is composed of corporation tax, to which most of Japan's large corporations located in the special wards or the Central Business Districts contribute. The corporation tax fluctuates according to corporation income, which is vulnerable to the business cycle. Hence, the local tax in the special wards seems less stable. For grants, the volatility in the special wards is lower than that of the cities. Moreover, the volatility of subsidies supplied to the special wards are somewhat higher than that of the cities, but the volatility of fees and charges in the special wards are quite stable relative to the cities. The volatilities of the two remaining revenues−other revenues and local bonds−are considerably higher in the special wards. In sum, the magnitude of volatility is quite disparate between the two groups when it comes to local tax, grants, other revenues, and local bonds.

[PLEASE INSERT TABLE 1 HERE]

4. Research Results and Findings

Turning first to Table 2 Model 1, which refers to the specification (1) for the entire Tokyo municipal cohort, we can see that local expenditure volatility was statistically significant and positively associated with the volatilities of other taxes, other revenues, and local bonds, but negatively associated with ~~the volatility~~ that of grants. However, as we have outlined the two systems of Tokyo local governments are very different in both their revenue streams and remits, thus it is necessary to stratify the regression into special wards (Model 2) and cities (Model 3), respectively.

When we do so, we find that, in Model 2, the statistically significant and positive explanatory variables for the special wards are volatilities of local tax (β=0.193, $p<0.10$), subsidies (β=0.173, $p<0.05$), other revenues (β=0.022, $p<0.001$), and local bonds (β=0.082, $p<0.05$). Specifically, the volatility of public spending is associated with an increase of 19.3% for an additional one standard deviation in volatility of local taxes, reflecting the critical role of special ward local tax, rather than the consumption tax and other taxes, in financing expenditures. Next, a change of one standard deviation in the volatility of subsidies is associated with an increase in expenditure volatility of around 17.3%, *ceteris paribus*. For the other revenues, the local expenditure volatility is expected to increase by just 2.2% in response to a one standard deviation increase in other revenues. Next, a 1% increase in the volatility of local bonds is associated with a mere 0.08% increase in volatility of local expenditure and implies that local bonds have little effect on public spending. It is also important to note that the volatility of grants has a significantly negative association with the volatility of local spending (β=-0.704, $p<0.001$). Thus, a 1% increase in the volatility of grants is associated with a relatively strong response of 0.7% (decrease) in the volatility of local spending, *ceteris paribus*. This result does not support the common pool theory, being ~~and is~~ inconsistent with the findings of Sacchi and Salotti (2017). In general, it is expected that ~~local governments~~ municipalities will increase their expenditures in response to offerings from higher tier governments. However, this behaviour is not recognised in the case of

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special wards. In this sense, they differ from other Japanese municipalities to induce grants by expanding expenditure (Bessho & Ogawa, 2015; Martin-Rodiguez & Ogawa, 2017). To provide further illumination we present additional analysis in the subsection.

In Model 3, we found evidence of statistically significant positive associations for consumption tax (β=0.093, $p<0.05$), other taxes (β=0.267, $p<0.001$), and other revenues (β=0.062, $p<0.01$) concerning the local expenditure volatility in the cities. Specifically, our results suggest that increases in the ~~volatility of~~ consumption tax volatility of 1%, are associated with local spending increases of just 0.09%. For other taxes, a 1% increase in volatility is expected to lead to a relatively strong response of 0.26% increase in the volatility of local spending. We can see that compared to the consumption tax, fluctuations to other taxes (e.g., golf course tax, vehicle tax) tend to elicit a stronger expenditure response by local governments. By virtue of cities being located in the suburban areas, where land is more available for development of recreational facilities (e.g., golf courses) and transportation infrastructure, then expenditures for these public works are significantly higher and are financed by other taxes. Next, the ~~volatility of~~ local spending volatility is associated with an increase of 6.2% for every additional one standard deviation in the volatility of other revenues.

[PLEASE INSERT TABLE 2 HERE]

Our results confirm that there are clear differences between the two local systems of ~~local government in~~ Tokyo. In terms of positive and statistically significant associations, special wards are associated with local taxes, subsidies, other revenues, and local bonds while cities are associated with consumption tax, other taxes and other revenues. The positive relationship between the volatility of various kinds of taxes and that of local spending seems to fit with the findings of Sacchi and Salotti (2017). However, the negative association between the volatility of grants and local spending found in the special wards (but not in the cities) seems inconsistent with much of the literature. Moreover, the associations with volatility of subsidies and local bonds (with respect to public spending) in the special wards is significant at the conditional level, but this pattern does not appear in cities. Finally, in both areas, we found evidence of a positive association between the volatility of other revenues and that of public spending. It might be argued that both types of local governments can utilize other revenues, whose principal part is the saving of money from the previous year, as a possible policy instrument to stabilise ~~local~~ public spending volatility.

In addition to the parsimonious specification (1), the literature presents a strong *prima facie* case to suggest that local ~~government~~ size may affect the volatility of both revenues and expenditures (Sacchi & Salotti, 2017). Therefore in Table 3, we repeat our estimations with the addition of our size proxy (FTE staff). Turning first to Table 3 Model 4, positive statistically significant associations persist between the volatility of local spending and other taxes, other revenues, and local bonds. Moreover, the volatility of expenditures is still negatively associated with the volatility of grants for the entire Tokyo municipality ~~local government~~ cohort. In general, the magnitude of the coefficients attenuates only slightly when the local governmental size proxy is included.

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We also stratified specification (2) and report same in Table 3 Model 5 for the special wards and Model 6 for the cities. In Model 5, statistically significant associations persist between the volatility of local spending and those of subsidies (β=0.164, p<0.05), other revenues (β=0.023, p<0.001), local bonds (β=0.084, p<0.05), and grants (β=-0.707, p<0.001). Once again, despite the inclusion of local government size variable, the magnitude of coefficients attenuates only slightly. Similarly, we found with Model 6, that statistically significant associations persisted for consumption tax (β=0.093, p<0.05), other taxes (β=0.267, p<0.001), and other revenues (β=0.062, p<0.01)), and the size of the coefficients attenuated only slightly.

[PLEASE INSERT TABLE 3 HERE]

Further evidence on grants

To delve further into the negative association between volatility of local spending and grants of the special wards, local spending volatility and grant volatility in the special wards, we conduct additional analysis as follows. In general, intergovernmental grants transferred from TMG to the special wards rely on the fiscal gap between basic fiscal needs and basic fiscal revenues. Hence, the intergovernmental relationship is a crucial issue in grant allocation, and there appears to be a constant tension between competing objectives of the special wards and TMG respectively. From the perspective of the special wards, the emphasis tends to be on expanding basic fiscal needs, by incorporating expected expenditures, to maximize the grants received, while basic fiscal revenues derived from fixed percentages of some principal taxes are relatively unchangeable. However, from the perspective of TMG, the main focus is on constraining growth in grant distributions.

When excluding the grants, basic fiscal revenues reflect 39.5 percentage of actual revenues, and they are significantly correlated with a coefficient of 0.898 (the t-test value is =28.54), whereas basic fiscal needs account for 59.5 percentage of actual expenditures, less than transfers to reserve funds, and their correlation coefficient is significant with a coefficient of 0.987 (the t-test value is =28.01). This suggests that the gap between the basic fiscal revenues and actual revenues is greater than that of the basic fiscal needs and actual expenditures. Hence, expected deficits to be covered by grants seem to be overestimated, as compared with the actual deficits. It therefore seems possible for special wards to save funds from grants, creating a significant amount of surplus.

[PLEASE INSERT FIGURE 2 HERE]

The special wards do not seem to be disposed to expanding local spending despite strong surpluses. Perhaps this reticence arises because of previous experiences such as when the local tax revenues of TMG plummeted by 20% in 2009 as a result of the GFC in 2008 GFC. Consequently, TMG lost around JPY 1 trillion, suffering fiscal difficulties, which also brought about a significantly reduced pool for grant distribution. Indeed, the special wards' grants decreased by around 15% in 2009 as a response to the reduction in local taxes revenues collected TMG (Figure 1). It seems that special wards may have become fearful of

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similar sudden decreases associated with future unpredictable shocks. If this is the case, then what we observe may be a rational response by the authorities of special wards to accumulate surpluses by saving a certain part of the grants. Our analysis suggests that, over the period 2010-2015, the surplus per expenditure by the special wards (3.92%) was higher than that of the cities (3.22%) (Figure 2). There is a significant difference between the two systems (~~the~~ t-test ~~value is =~~ 3.77). Also, the authorities of the special wards tend to prefer to accumulate reserve funds for non-specific purposes (e.g., reserve funds can be withdrawn to compensate for future income shortages). The ratio of reserve funds per expenditure for the special wards is around four times higher than it is for the cities (Figure 3). Indeed, by 2015 preserved reserves for special wards (JPY 128 billion) were over six times greater than those of cities (JPY 19 billion). There is also a significant difference between the two systems (~~the~~ t-test ~~value is =~~ 9.58). It can be inferred that special wards tend to finance their expenditure by using tax revenues and other revenues rather than grants, which are saved for reserve funds. In sum, this data seems to point to the special wards directing expanded grant revenues to reserves as a way of insulating against future financial shocks, rather than responding with higher levels of local expenditure.

[PLEASE INSERT FIGURE 3 HERE]

~~It should be noted that the policy for grant allocation was revised by TMG in 2007. Prior to 2007, the fixed percentage of grant allocation was 52%, in which 98% was for ordinary grants and the remaining 2% for special grants. However, the former ratio was increased to 55% while the latter decreased to 95% (Ohsugi, 2011), leading to an increase in the entire quantum of funds available because a tax collection of 1 yen contribute to the increase of the funds for the grant allocation from 1×52%×98% (0.5096 yen) to 1×55%×95% (0.5225 yen). TMG thus became more flexible in fiscal adjustments dealing with horizontal fiscal balances for special wards. In view of the saving tendency of the special wards (as identified above), TMG is considered to be in a better position to control the special wards' spending volatility through the fiscal adjustments made by grant allocations.~~

In this study, we examined the association between local expenditure volatility and the volatilities of various revenues for the Tokyo local governments through panel data covering the period 2010-2015. The evidence confirms that there are distinct differences in the determinants of volatility between the special wards and the cities due to the different fiscal systems. A number of public policy implications arise from our major findings.

First, local tax volatility was found to be positively associated with local expenditure volatility in the special wards and a similar association was determined for the volatility of consumption tax and other taxes with respect to the volatility of local spending in the cities. It might be generalised that local expenditures become volatile when they are financed by tax revenues. This finding is somewhat congruous with the extant study of Sacchi and Salotti (2017), ~~who argued that the volatility of local public spending is positively associated with the volatilities of income tax and consumption tax~~ arguing that there are positively significant linkages between volatility of local expenditure and that of various own sources (local tax and consumption tax). To mitigate volatility in local expenditures in the special wards, it

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might be necessary for the local governments to control the volatilities of these tax-revenues by placing a focus on tax bases, that are less volatile, such as property tax rather than income taxes (Oates, 2011; Afonso, 2017).

Second, ordinary grants volatility had a statistically significant negative association with local expenditure volatility in the special wards. It implies that the response to greater volatility of ordinary grants is lower volatility in local spending. The evidence suggests that the special wards may be exercising anticipatory resilience concerning future economic shocks (Steccolini *et al.*, 2017). Specifically, the special wards have attempted to accumulate reserves from the source of ordinary grants in the aftermath of the GFC, while making an effort to maintain public expenditures at a certain level. This finding argues against much of the existing literature which tends to suggest that provision of intergovernmental grants exacerbate local government spending (Sacchi & Salotti, 2017; Martin-Rodriguez & Ogawa, 2016; Bessho & Ogawa, 2015). Given this evidence of a saving tendency amongst special wards, TMG might respond by increasing the weight to the grant allocation (while maintaining subsidies) and thus mitigate spending volatility. Moreover, the practice of accumulating reserves could put the special wards in a dilemma: If ordinary grants (95%) for non-earmarked expenditures are overestimated with the intention of preserving part of same for future contingencies, then this may result in the special grant quantum (5%) being insufficient to cover specific purpose expenditures, such as disaster recovery. To cope with this possible antinomy, TMG needs to either transfer some funds from ordinary grants to special wards where there is a surplus of the former and an insufficient of the latter or to make the allocation rate between ordinary and special grants for purposes in special wards flexible where appropriate. In so doing, TMG could exert influence over special ward spending (stabilization) as well as achieve a more efficient allocation of the grants (to attain horizontal fiscal equalisation) among the local governments. Moreover, TMG might strengthen its justification with respect to the *raison d'etre* of tax collection on behalf of the special wards without being reconciled to tax reduction.

ThirdFinally, local bonds of special wards have a statistically significant positive impact on expenditure volatility, although the magnitude of the association is relatively small. Several municipalities can utilise bonds as fiscal adjustments to redress short-run deficits. However, the result suggests that a side-effect of this practice might be to exacerbate local spending volatility. Therefore, this suggests that careful consideration of trade-off issues between costs and benefits should be made before the bonds are issued.

Finally, the methodology outlined in this paper would be suitable for studies abroad and examining expenditure volatility in other contexts would allow scholars to identify the effect of different revenue structures. In particular, comparative analyses with jurisdictions such as Australia which operate distinct intergovernmental grant transfer systems would allow scholars to further explore the importance of grants as a determinant of expenditure volatility. As similar to our focus on the distinction of revenue and public service provisions' structures between the urban (special wards) and suburban area (cities), a further potential of researching on the case of New South Wales-a sister city of Tokyo-should seek to the fiscal difference between the Greater Sydney and rural areas.

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Table 1. *Summary statistics of 23 special wards and 26 cities*

Variables	*23 special wards (n =92)*				*26 cities (n = 104)*			
	Mean	*Std. Dev.*	*Min*	*Max*	*Mean*	*Std. Dev.*	*Min*	*Max*
Dependent variable								
Expenditure	3.973	5.098	0.0174	31.77	3.539	2.256	0.119	10.741
Independent variables								
Local tax	1.610	1.277	0.250	7.768	1.176	0.837	0.0008	3.888
Consumption tax	8.856	10.640	0.150	32.525	11.080	12.461	0.111	33.106
Other taxes	14.959	7.835	1.477	27.882	12.426	6.256	0.166	26.117
Special grants	40.672	8.934	24.055	68.044	28.95	9.899	8.949	55.659
Grants	6.562	13.012	0.254	81.4182	70.736	152.491	0.838	783.317
Subsidies	6.145	5.468	0.473	28.166	5.940	5.014	0.262	21.613
Fees and charges	2.389	1.573	0.158	9.057	3.679	4.231	0.144	25.524
Other revenues	25.36	27.082	2.595	150.615	8.269	4.410	0.079	19.927
Local bonds	330.31	1366.55	0.000	8237.91	35.655	28.624	0.158	139.014
Control variables								
FTE	2478.576	1011	901	4856	787.644	524.437	310	2656

Table 2. *Results of the parsimonious model with FE*

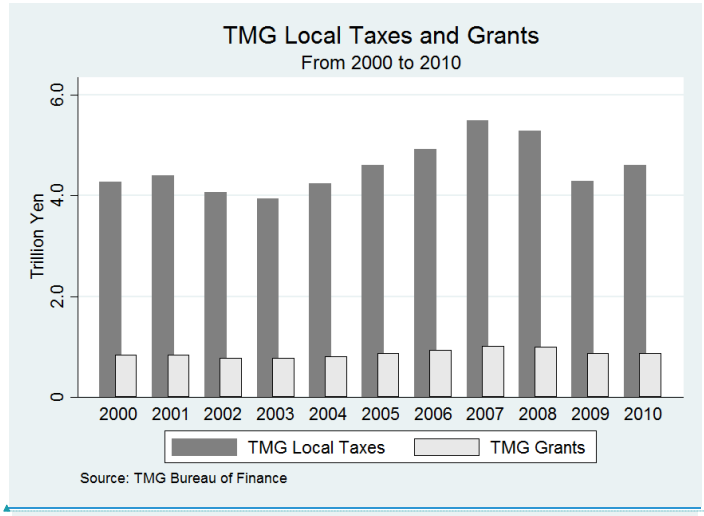
Total expenditure *(ln)*	***Model 1***	***Model 2*** (Special wards)	***Model 3*** (Tama cities)
Local tax	0.0990	0.1930^{+}	-0.0659
	(0.0698)	(0.1021)	(0.0892)
Consumption tax *(ln)*	0.0667^{+}	0.1512	0.0935*
	(0.0395)	(0.0949)	(0.0385)
Other taxes *(ln)*	0.2182**	0.2452	0.2670***
	(0.0766)	(0.1660)	(0.0697)
Special grants	-0.0216	-0.0123	0.0106
	(0.0167)	(0.0360)	(0.0186)
Grants *(ln)*	-0.4081**	-0.7039***	-0.0709
	(0.1301)	(0.1943)	(0.1607)
Subsidies	0.0206	0.1729*	-0.0004
	(0.0216)	(0.0791)	(0.0187)
Fees and charges *(ln)*	0.0140	0.0607	-0.1276
	(0.0899)	(0.1703)	(0.0935)
Other revenues	0.0216***	0.0221***	0.0620**
	(0.0033)	(0.0041)	(0.0202)
Local bonds *(ln)*	0.0729**	0.0821*	0.1401
	(0.0273)	(0.0335)	(0.0903)
Observations	196	92	104
Coefficient of Determination	0.6116	0.7285	0.5736
n	49	23	26

Note: Significant level are *** p< 0.001, ** p<0.01, * p<0.05, + p<0.1. The denote (ln) represents the natural logarithm. Numbers in parentheses are standard errors.

Table 3. *Results of FE models with government size*

Total expenditure *(ln)*	***Model 4***	***Model 5*** (Special wards)	***Model 6*** (Tama cities)
Local tax	0.1062	0.1932^{+}	-0.0654
	(0.0698)	(0.1029)	(0.0911)
Consumption tax *(ln)*	0.0675^{+}	0.1486	0.0934*
	(0.0394)	(0.0960)	(0.0388)
Other taxes *(ln)*	0.210**	0.2376	0.2667***
	(0.0766)	(0.169)	(0.0706)
Special grants	-0.0203	-0.0117	0.0106
	(0.0167)	(0.0363)	(0.0188)
Grants *(ln)*	-0.4127**	-0.7068***	-0.0708
	(0.1298)	(0.196)	(0.1619)
Subsidies	0.0202	0.1639*	-0.0003
	(0.0215)	(0.0849)	(0.0189)
Fees and charges *(ln)*	0.0076	0.0699	-0.1279
	(0.0897)	(0.1742)	(0.0945)
Other revenues	0.0221***	0.0225***	0.0618**
	(0.0033)	(0.0042)	(0.0212)
Local bonds *(ln)*	0.0778**	0.0839*	0.1404
	(0.0275)	(0.0342)	(0.0918)
FTE *(ln)*	-4.5505	-2.5894	-0.1077
	(3.3702)	(8.3743)	(3.1352)
Observations	196	92	104
Coefficient of Determination	0.6167	0.7289	0.5736
n	49	23	26

Note: Significant level are ***p<0.001, ** p<0.01, * p<0.05, + p<0.1. The denote (ln) represents the natural logarithm. Numbers in parentheses are standard errors.



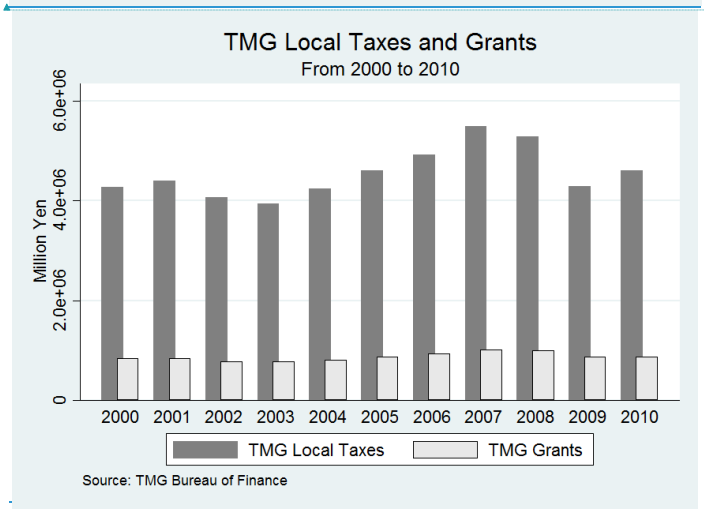


Figure 1. *The TMG Local Taxes and Grants for Special Wards from 2000 to 2010*

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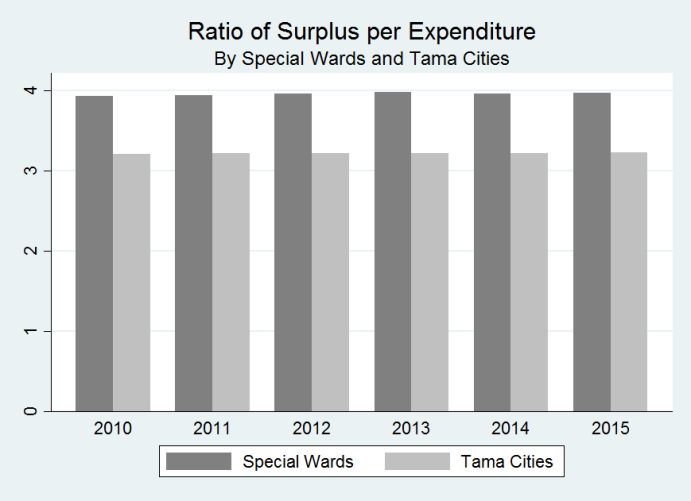

Figure 2. *The ratio of surplus per expenditure between special wards and cities*

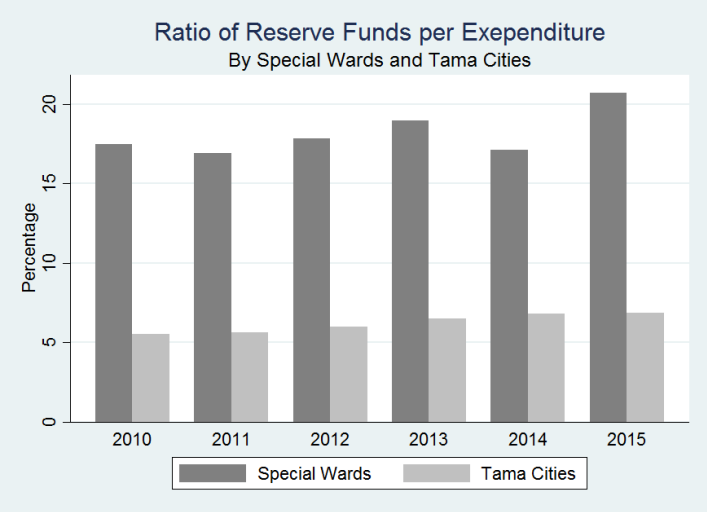

Figure 3. *The ratio of reserve funds per expenditure between special wards and cities*