Does local council size affect land development expenditure? Quasi-experimental evidence from Japanese municipal data

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Abstract

The purpose of this paper is to evaluate a fiscal common-pool problem in a Japanese local government. Especially, we focus on the relationship between council size and land development expenditure of local government using a dataset of 13,989 municipalities in Japan from FY2001 to FY2006. We deal with an identification of causal effects by applying regression discontinuity design's framework to address problem of endogeneity bias. Our results show that land development expenditure of small municipalities induce the fiscal common-pool problem over public projects.

JEL Classification: D72, H11, H72

Keywords: fiscal common-pool problem, council size, government expenditure, regression discontinuity design

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1 Introduction

The purpose of this paper is to evaluate a fiscal common-pool problem in a Japanese local government.[1] Especially, we focus on the relationship between council size and land development expenditure of local government using a dataset of 13,989 municipalities in Japan from FY2001 to FY2006. This is because the politicians tend to propose new public projects for the benefit of their political district in any country. Also, there might be a council members who work on behalf of specific industry groups and benefit from their efforts. If increase of the number of council member extends new public projects such as public parks and roads, local government expenditure may be increased by these project. However, expenditure of it's project is usually funded by the national subsidy system or debt. In other words, increase in expenditure of public project might be covered in other district's burden.

Council and local government size are discussed by Egger and Koethenbuerger (2010), Pettersson-Lidbom (2012) and Hirota and Yunoue(2012).The size of government is positively related to the number of council members. As required by law, local council size of previous study cases is a deterministic and discontinuous function of the municipal population size. Council law prescribes a maximum (or minimum) limit of the council size in relation to the population size. Particularly these studies deal with an identification of causal effects by applying regression discontinuity design's (RDD) framework to address problem of endogeneity bias. Egger and Koethenbuerger (2010) applied sharp RDD to Germany's municipal panel data. Pettersson-Lidbom (2012) estimated the Finland and Sweden municipal cases. Pettersson-Lidbom (2012) used sharp RDD in Finland and fuzzy RDD in Sweden. However, this result showed evidence for a negative effect of council size on government expenditure in both settings. Hirota and Yunoue (2012) used both sharp and fuzzy RDD in Japanese cases. They from the full sample showed that the increase of the number of council members causes increasing total expenditure by local government. In additionally, they results from the discontinuity sample also showed that the average treatment effect has a positive effect on the total expenditure around the thresholds of 10,000 and 20,000.

This paper results indicate that the larger the size of the local council drives the size of land development expenditure. In particular, we find that small municipalities tend to increase their expenditure more than large municipalities, such that increases in local council size lead to about 4.9 percent increases of expenditure in small municipalities. Thus, our results show that land development expenditure of small municipalities induce the

[1]The theory of fiscal common-pool problem was formalized by Weingast, Shepsle, and Johnsen(1981). The fiscal common-pool problem relates to the free rider problem, pork-barrel spending, and law of 1/n, which are all very similar phenomena.

fiscal common-pool problem.

2 Local council-size law: Japanese municipalities.

We briefly explain the system of the Japanese local government and council within municipalities.[2] There is a dual representation system in the Japanese local government and local council. It means the mayor and council members are directly elected as representative organs by voters in a public election that is held every four years. In Japan, being a local council member is a full-time job.

Table 1 shows the upper limit of the local council size depending on the size of the municipal population under the law of council size (Local Autonomy Act, Article 91). The Act prescribes a maximum council size in relation to a municipality's population size. The number of local council members might reach the upper limit in many cases. For example, if the population size is less than 50,000, then the number of council members should be at most 26 and so on. Therefore, there are 10 thresholds under Japanese municipal law.

The data describe Japanese local government spending from FY2001 to FY2006. However, we avoid the effect of municipal mergers in Japan, so we remove merged municipalities from our dataset. We quote the data from Annual Accounts of Local Government and the Accounts of Local Government in Japan. The descriptive statistics are reported in Table 2.

Figs. 1, 2 and 3 show the relationships between log expenditure and population size. These figures also show the window size as 5, 15, and 30 percent of the population size, respectively. For example, we pick a population size of 5,000 and a window size that is plus or minus 30 percent around threshold. This figure shows that both relationships have a positive correlation. According to the two regression lines, there is a discrete change of the average value. This effect shows that the increase of the number of council members affects local government expenditure when the population size exceeds the 5,000 threshold. This jump shows an average treatment effect. When the population size of the local government increases by one, local government spending increases radically. This phenomenon, the fiscal common-pool problem, is caused by the expanding council size.

3 Estimation model

We estimate the relationship between the land development expenditure of the local government and the number of council members by the following equation. Our estimation models follow Hirota and Yunoue (2012). First,

[2]This section's explanation refer to Hirota and Yunoue(2012).

we use the sharp RDD model, which considers that the treatment variables are non-probabilistic. The reason is that the upper limit of the Japanese local council size is decided by the central government. The estimation model uses sharp RDD as follows.

$$Y_{it} = \alpha + \beta Csize_{it} + f(x_{it}) + \gamma X_{it} + \mu_i + \lambda_t + \epsilon_{it} \tag{1}$$

The dependent variable Y_{it} is the land development expenditure of the ith local government at time t. α is a constant term, and $Csize_{it}$ represents the size of the ith local council at time t as the treatment variable. We take the logarithms of the land development expenditure and council size of the municipality. The assignment variable is represented as $f(x_{it})$ and uses the size of the municipal population. We consider $f(x_{it})$ as a smooth nonlinear function of x. X_{it} denotes the control variables. [3] We also consider the fixed effect μ_i, and time effect λ_t. is the error term.

Second, we also consider the fuzzy RDD.

$$Y_{it} = \alpha + \beta Csize_{it} + \gamma X_{it} + \mu_i + \lambda_t + \epsilon_{it} \tag{2}$$

$$Csize_{it} = \alpha + \omega Z_{it} + \mu_i + \lambda_t + \psi_{it} \tag{3}$$

As mentioned earlier, the numbers of council members are only an upper limit depending on the size of the population of the municipality. It is not always true that all municipalities use upper limits on the number of local council members, because the council size law prescribes a maximum limit of council size in relation to the population size. This model assumes that the size of the local councils is a probabilistic discontinuous variable at the thresholds. Discontinuity is highly correlated with treatment. We employ the instrumental variables (IV) estimation. We estimate this model with population size as an instrumental variable (Z_{it}).

4 Estimation results

We estimate the equations for the full sample, which include every threshold, and the equations for the discontinuity sample, which show the window size as 5 percent, 15 percent, and 30 percent of the population size, respectively. In all estimation results, the coefficient of the council size is positive. These

[3] We control for the per capita wage, rate of the daytime population, rate of the population under 15, rate of the population over 65, and population size, because these are considered to be a dataset of control variables in the empirical literature on estimates of local government expenditure.

estimation results cover various statistical problems that previous research could not deal with.

The results using the full sample are reported in Table 3. Columns (1) and (2) show the results of Pooling OLS. Both results show the positive effects of local council size. Moreover, columns (3) and (4) represent the results of the fixed effect estimation. The results of sharp RDD are reported in columns (5) to (8). The estimated value of council size becomes much smaller than previous results. Of note, we consider the effect of assignment variables in these estimations. While the LR test of between the fourth and third degree polynomials is insignificant, the test between the fourth and second degree is significant. Similarly, the LR test between the fourth and first degrees is significant. As a result, column (7) shows the council size effect is 0.13.

The estimation results of fuzzy RDD are reported in column (9). We check the specification of the model by using the Durbin-Wu-Hausman test. This test shows that the fuzzy RDD specification is plausible. The estimated value is positively significant and this result shows that if the number of council members is marginally increased, then expenditure will increase. In other words, the increase of the local council size leads to about a 2.40 percent increase of expenditure by municipalities. Conclusively, the positive council size effect is supported by evidence from fuzzy RDD.

As a robustness check, we also consider the local effect of the number of local council members. It is necessary to check what happens in each threshold. Table 4 shows that the threshold is 20,000. We set the window size at a 30 percent of cutoff population. These results are similar to previous results and the fuzzy RDD (column 9) is the most plausible. The estimated value of the size of the local councils is 4.91. As a result, the discontinuity sample shows similar findings to the full sample estimation model.

5 Conclusion

Our results from the full sample show that the increase of the number of council members causes increasing land development expenditure by local government. This result supports the results of Egger and Koethenbuerger (2010) and Hirota and Yunoue (2012). Our results also from the discontinuity sample show that the average treatment has a positive effect on the expenditure around the thresholds of 20,000. According to our estimation, the main source of common-pool problem on Japanese local public finance is originated the expenditure of land development. These results imply that relatively smaller governments face the fiscal common-pool problem in Japanese local government over public projects.

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Table 1: Local council-size law: Japanese municipalities.

City		Town and village	
Population size	Number of council members	Population size	Number of council members
-50,000	26	-2,000	12
50,000-100,000	30	2,000-5,000	14
100,000-200,000	34	5,000-10,000	18
200,000-300,000	38	10,000-20,000	22
300,000-500,000	46	20,000-	26
500,000-900,000	56		
900,000-	56-96		

Table 2: Descriptive statistics.

	Mean	St.Dev.	Min	Max
Land development Expenditure(thousand yen)	2756848.00	14100000.00	11291.00	472000000.00
Council size	15.96	7.29	4.00	93.00
Population size	40840.70	139679.70	211.00	3562983.00
Per capita wage	6007.91	661.83	2496.07	10368.99
The rate of daytime population	0.94	0.24	0.57	22.59
The rate of population under 15	0.14	0.03	0.05	2.86
The rate of population over 65	0.24	0.09	0.07	6.33

Table 3: Estimation results (full sample).

ln(Land Dev. Expenditure)	OLS		FE		Sharp				Fuzzy
Indepnedent var.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment variable	2.807***	2.314***	0.864***	0.190***	0.132***	0.132***	0.132***	0.132***	2.403***
ln(Council size)	(0.015)	(0.019)	(0.030)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.244)
Assignment variables									
ln(pop)					1.856***	3.862***	12.817***	16.958	
					(0.168)	(0.997)	(4.805)	(19.398)	
ln(pop)*2						-0.112**	-1.122**	-1.803	
						(0.055)	(0.533)	(3.137)	
ln(pop)*3							0.037*	0.086	
							(0.019)	(0.222)	
ln(pop)*4								-0.001	
								(0.006)	
Controls									
ln(per capita wage)		0.810***		-0.240***	-0.250***	-0.249***	-0.247***	-0.248***	0.261***
		(0.056)		(0.057)	(0.056)	(0.056)	(0.056)	(0.056)	(0.087)
The rate of daytime pupulation		1.385***		0.087	-0.079	-0.103	-0.093	-0.093	0.305*
		(0.041)		(0.139)	(0.139)	(0.140)	(0.140)	(0.140)	(0.168)
The rate of population under 15		-3.478***		1.765***	-0.834	-0.727	-0.743	-0.745	-0.172
		(0.233)		(0.648)	(0.686)	(0.688)	(0.688)	(0.688)	(0.801)
The rate of population over 65		-3.542***		-1.101***	0.690	0.728	0.702	0.703	-1.034**
		(0.092)		(0.421)	(0.449)	(0.450)	(0.450)	(0.450)	(0.502)
Constant	6.070***	0.402	11.300***	15.251***	-2.107	-10.883**	-36.732**	-45.979	4.882***
	(0.041)	(0.470)	(0.082)	(0.513)	(1.656)	(4.607)	(14.328)	(44.352)	(1.283)
Sample size	13,989	13,989	13,989	13,989	13,989	13,989	13,989	13,989	13,989
R-squared	0.716	0.753	0.070	0.203	0.212	0.212	0.212	0.212	
Degree of polynomial in pop size	None	None	None	None	First	Second	Third	Fourth	First
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Likelihood-ratio Test					LR chi2(3)	LR chi2(2)	LR chi2(1)		
					=10.18***	= 4.77*	=0.06		
Hausman Test				chi2(10)	chi2(11)	chi2(12)	chi2(10)	chi2(8)	
				=-3090.20***	=262.59***	=160.29***	= 114.95***	=117.87***	
((9) Durbin-Wu-Hausman test)									chi2(10) = 83.89***

Note:Heteroskedasticity robust standard errors are in parentheses. The degree of freedom of the Hausman, LR and Durbin-Wu-Hausman tests are also in parentheses.Variables whose coefficients are significant at the 10, 5, and 1percent levels are indicated by *, **, and ***, respectively.

Table 4: Estimation results (discontinuity sample: 20,000, 30 percent).

ln(Land Dev. Expenditure)	OLS		FE		Sharp				Fuzzy
Indepnedent var.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment variable	0.705***	0.690***	0.757***	0.116	0.0979	0.0958	0.0946	0.0942	4.913*
ln(Council size)	(7.989)	(8.409)	(6.629)	(0.924)	(0.792)	(0.778)	(0.773)	(0.771)	(1.668)
Assignment variables					2.094***	26.78	6,794***	1,733	
ln(pop)					(2.629)	(0.645)	(2.852)	(0.275)	
						-1.262	-689.9***	96.03	
ln(pop)*2						(-0.597)	(-2.848)	(0.101)	
							23.35***	-30.86	
ln(pop)*3							(2.844)	(-0.474)	
								1.402	
ln(pop)*4								(0.828)	
Controls	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Sample size	1,993	1,993	1,993	1,993	1,993	1,993	1,993	1,993	1,976
R-squared	0.044	0.158	0.057	0.197	0.203	0.204	0.210	0.210	
Degree of polynomial in pop size	No	No	No	No	First	Second	Third	Fourth	First

Note:Heteroskedasticity robust standard errors are in parentheses. Variables whose coefficients are significant at the 10, 5, and 1percent levels are indicated by *, **, and ***, respectively.

Figure 1: Log land development expenditure and population around a threshold window of 5 percent

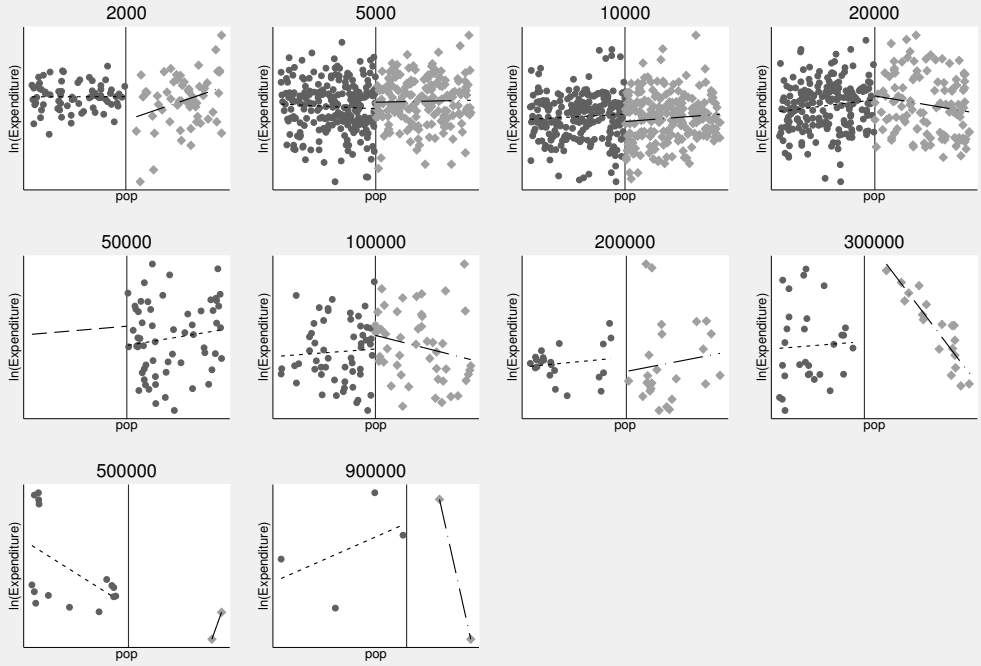

Figure 2: Log land development expenditure and population around a threshold window of 15 percent

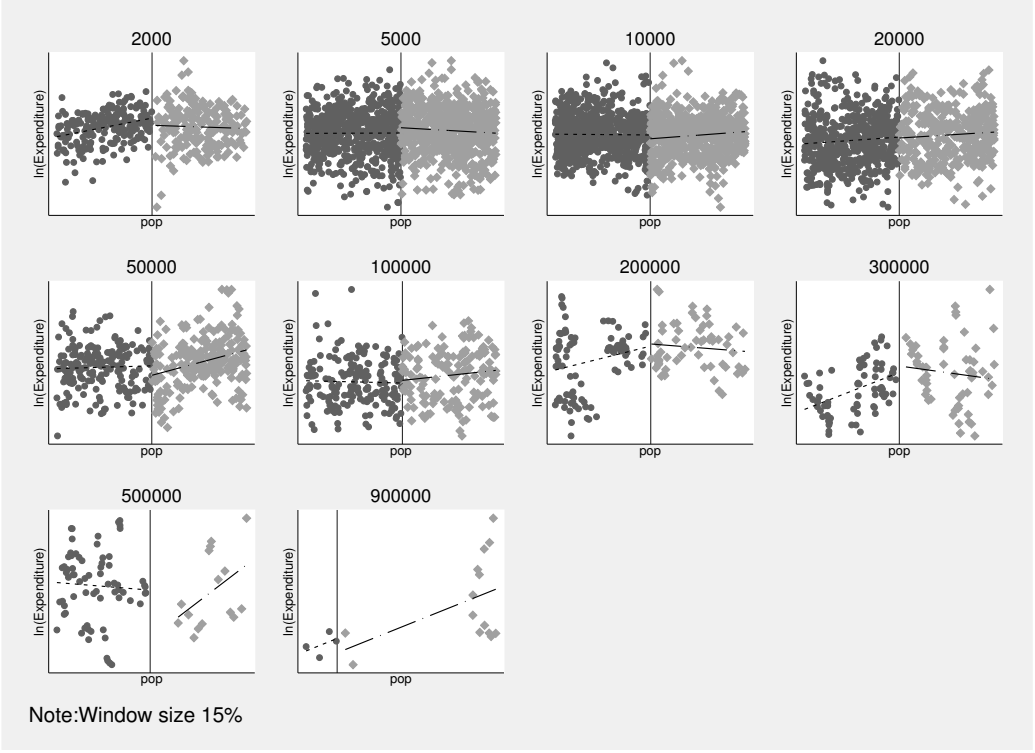

Figure 3: Log land development expenditure and population around a threshold window of 30 percent