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Public investment, economic stabilization, and regionally discordant business cycles in Japan: Toward an effective fiscal stimulus

Yoshito Funashima
Faculty of Economics, Aoyama Gakuin University

Abstract

This paper examines the cyclicality of Japanese public investment for the prefectural-level business cycles as well as for the aggregate ones. We estimate the public investment reaction function, in which regional business cycles are explicitly discriminated from national business fluctuations using both the aggregate time series data and prefectural panel data during the 1990s. We uncover a particular public investment inclination such that policymakers tend to pay attention only to the macroeconomic variables, whereas they disregard individual situations of the regional economies. This means that there is room for policymakers to stabilize the regional business cycles, while attaining the resultant macroeconomic stabilization as well.

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Contact: Yoshito Funashima - t61395@aoyamagakuin.jp.
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1. Introduction

Public investment has been utilized as a primary stimulus means in Japan.[1] So far a vast empirical literature has studied the effects of Japanese public investment policy from both short- and long-run aspects especially after the 1990s. Yet, excluding the recent works by Brückner and Tuladhar (2010), Kondoh (2011), and Miyazaki (2013), there is no empirical work in which the short-run impact of Japanese public investment on the intranational regions is assessed.[2]

Brückner and Tuladhar (2010) estimate the government expenditure multiplier using Japanese regional data, indicating that the values decrease through the 1990s. Based on a vector autoregressive framework, Kondoh (2011) also shows that the influence of the fiscal expenditure such as government consumption and public investment on the regional economy becomes minimal after the 1990s. In addition to such evidence after the collapse of the bubble economy, Miyazaki (2013) prolongs the period to include more recent years and points out that Japanese public investment intensifies the regional economic fluctuations in recent decades. Their outcomes have great relevancy especially to the rural areas that depend strongly on public investment.

It is not certain, however, that Japanese fiscal authorities really integrate an understanding of regionally discordant business cycles into public investment policies in the first place. Japan is a unitary state, and it is well-recognized that the local finance system is centralized so that public investment is implemented under central government's initiative, although portions of fiscal policies are the province of local (prefectural and municipal) governments.[3] As in Wall (2007), phases of intranational business cycles are uneven over the Japanese economy, and if so, Keynesian demand management policy only for macroeconomic stabilization is not necessarily effective for regional economic stabilization.[4]

In other words, it is conceivable that the short-run public investment policy is executed with some particular inclination under which the central government thinks a great deal of smoothing national business fluctuations, whereas the authorities do not pay adequate attention to such unevenness across regions. To begin with, before examining and discussing the policy effects, it is necessary for us to study whether or not public investment is actually countercyclical for each region, because, if not, public investment could not give rise to regional economic stabilization.[5]

[1] As shown in Funashima (2012), Japanese public investment in recent decades is countercyclical in the national-level time series data, but another main menu of the government spending, i.e. public consumption, does not exhibit evident countercyclicality.

[2] Many of researchers have long been endeavored to measure the long-run effects of public investment on both national and regional economies by estimating production function. See, e.g., Mera (1973) for Japan, and Aschauer (1989) for the United States. Using national-level time series data, measuring the short-run effects of Japanese public investment only on the aggregate economy is also conducted for example by Bayoumi (2001) and Ihori *et al.* (2003).

[3] See, e.g., Doi and Ihori (2009) for more details of Japanese local finance system.

[4] On the contrary, because GDP is roughly sum of intranational productions, regional economic stabilization would be directly connected to macroeconomic stabilization.

[5] If public investment is not countercyclical in each region, regional economic stabilization is

To analyze such aspects on some econometric techniques, this paper focuses on two kinds of dataset related to Japanese public investment. First, ordinary construction works expenditure (henceforth OCWE) is considered as a proxy variable of public investment. Furthermore, since central government plays an important role in Japanese public investment policies as remarked above, the specific grants of OCWE (henceforth OCWESG) are also highlighted in this study. [6] The virtue of supplementing our analysis with OCWESG is that it enables us to identify the central government's stance toward economic stabilization.

It is worth noting also that there are a lot of previous works regarding Japan's government expenditures in the 1990s (e.g., Bayoumi, 2001; Ihori *et al.*, 2003; Brückner and Tuladhar, 2010; Kondoh, 2011). This is because the Japanese economy experiences the so-called lost decade despite the large stimulative packages for rejuvenating the economy during the 1990s. For example, Ihori *et al.* (2003), Brückner and Tuladhar (2010), and Kondoh (2011) report that the effect of Japan's fiscal policy deteriorates after 1990 by performing the subsample analysis of the 1990s. A relevant causation of their outcomes may lie in the insufficient magnitudes of countercyclicality in public investment for each region.

Motivated by the above backgrounds, this paper aims to explore the cyclical properties of Japanese public investment using prefectural panel data over FY 1990 through FY 1999. The present work builds on and contributes to a number of literatures in which fiscal cyclicality is estimated for OECD countries and for other than Japan from both inter- and intranational perspectives (e.g., Sorensen *et al.*, 2001; Lane, 2003; Hines, 2010). [7] That is, our paper provides the first empirical analysis, which is in line with previous works and focuses on the cyclical behavior of Japanese public investment. It also differs from earlier empirical papers in an important way that public investment reaction function is estimated by discriminating explicitly national business fluctuations from the regionally disaggregated ones.

The remainder of the paper is structured as follows. In Section 2 we preliminarily overview the basic properties of Japanese business cycles and public investment in the 1990s. Section 3 describes the empirical model and data. Section 4 presents our

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not accomplished, and then the effect of public investment as a fiscal stimulus on the aggregate economy is also weakened (e.g., Bayoumi, 2001; Ihori *et al.*, 2003). In this sense, macroeconomic stabilization is a necessary but not sufficient condition for the intranational economic stabilization. Little attention is hitherto paid to this point in assessing the Japanese fiscal stimuli, and we hence emphasize that certain regional disaggregation that provides us more specified insights is important for comprehensive policy evaluations.

[6] Both OCWE and OCWESG include not only the specific grants from central government to prefectural government but also those to municipal governments. OCWE and OCWESG can be found in 'Annual Report on Local Public Finance' published by Japan's Ministry of Internal Affairs and Communications.

[7] The focus of Lane (2003) is the fiscal cyclicality for OECD countries, whereas Sorensen *et al.* (2001) and Hines (2010) are for US state-level regions. In this regard the present study is similar to Sorensen *et al.* (2001) and Hines (2010) rather than Lane (2003). Unlike the case of international perspectives such as Lane (2003), intergovernmental transfer is deemed to be more relevant to our intranational perspectives. Further elaborate discussion about the differences between these two perspectives should be pursued in the future study.

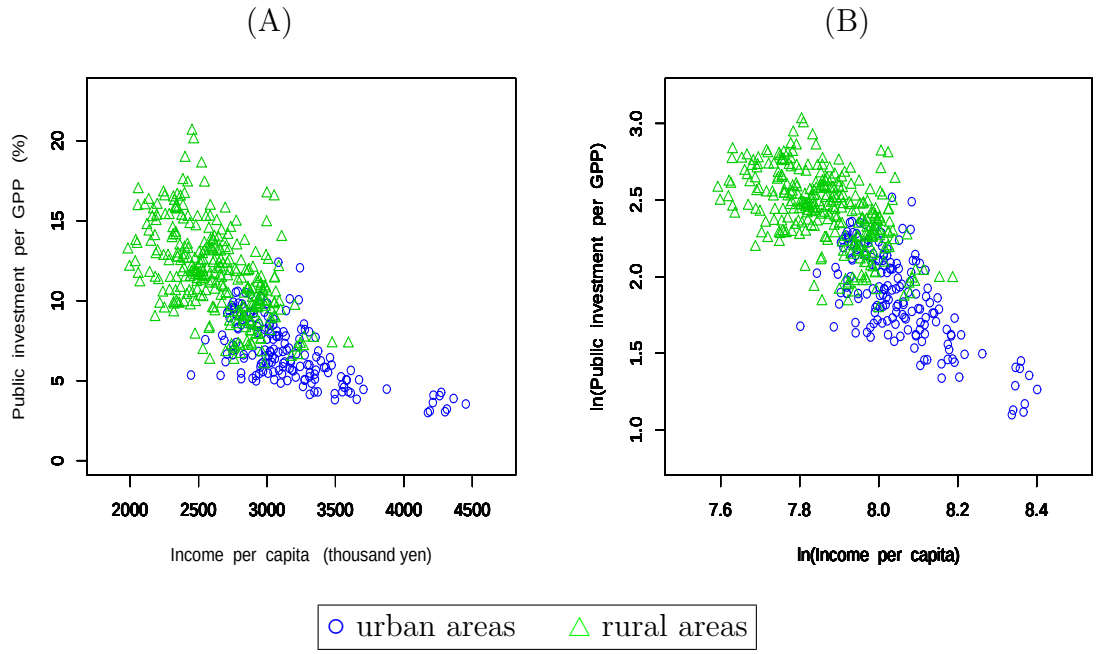

Figure 1: Scatter plots of income per capita and public investment per GPP

Note: The correlation coefficients of Panels (A) and (B) are approximately calculated as -0.7310 and -0.7691, respectively.

Source: Japan's Cabinet Office, Annual Report on Prefectural Accounts

empirical results. Section 5 concludes the paper.

2. Public Investment and Intranational Business Fluctuations

We begin by affirming a common recognition of the Japanese regional structure that the rural areas depend strongly on public investment. Panel (A) of Fig. 1 shows the scatter plot of income per capita and public investment per prefectural production (GPP) during the 1990s for 47 Japanese prefectures. [8] Likewise, their relationship in the natural logs is plotted in Panel (B) of the figure. Actually, those two scatter plots indicate strongly negative correlation between them, and imply that the rural economies more strongly hinge on public investment in comparison with non-rural areas.

In order to confirm whether the observed business fluctuations are actually discordant across regions, we next review the associations between national- and prefectural-level business fluctuations during the 1990s. The scatter plot of GDP growth rates (GROWTH) and prefectural growth rates (RGROWTH) is shown in Fig. 2. As one can see from the figure, the GDP growth rate is positively correlated with the prefectural growth rates, although it is quite natural because GDP is

[8]Urban areas include Miyagi, Ibaraki, Tochigi, Gunma, Saitama, Chiba, Tokyo, Kanagawa, Shizuoka, Aichi, Kyoto, Osaka, Hyogo, Nara, Okayama, Hiroshima, and Fukuoka, and we count the remaining 30 prefectures as rural areas.

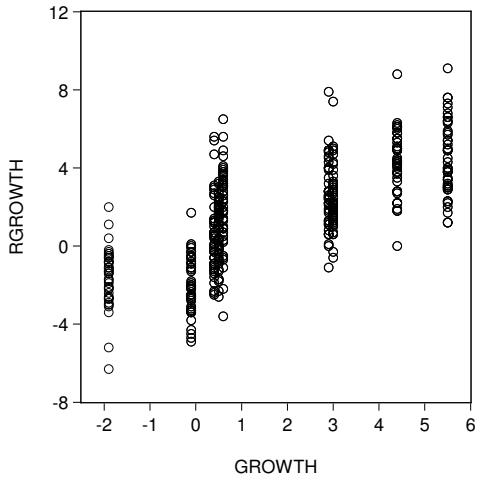

Figure 2: GDP and prefectural growth rates

Note: The correlation coefficient is approximately calculated as 0.7322.

roughly sum of the intranational production. Second, and more important, we detect that there are quantitative differences in the growth rates across the prefectures in the 1990s.

Turning to the bilateral cross-correlation coefficients which are calculated for all pairs of prefectures, such as that presented in Artis and Okubo (2011), the interregional comovement of prefectural business fluctuations is verified. In what follows, we also calculate those of prefectural public investment to analyze the comovement across regions.

The box plots in Fig. 3 summarize the results during the 1990s. When seeing the box plot in the top of Fig. 3, there exists in fact strong positive correlation between prefectural growth rates (RGROWTH), and we cannot ascertain that their timing is different from one another (i.e., negative correlation) insofar as the present period is concerned. This can arguably be traced to the nature of annual observations in which information about business fluctuations within a year is not included.

In this connection, Wall (2007) for instance indicates that such timing inconsistency arises in the Japanese economy by utilizing quarterly growth rates of regional indices of industrial production (RIIP).[9] It should be noted, therefore, that the prefectural growth rates have the information of their quantitative difference, whereas they do not have the information of their timing inconsistencies. Since the prefectural growth rate is viewed as a proxy variable of regional business indicator in the present study, we must keep in mind such properties of the data.

The box plot in the middle of Fig. 3 reports the cross-correlation coefficients

[9]The regional classification of RIIP adopts more widespread areas than what we use (i.e., prefectures). The reason for choosing to use annual data is that the prefectural panel data of public investment in this paper are available only in annual observations, although quarterly or monthly ones are useful to capture the regional business fluctuations minutely.

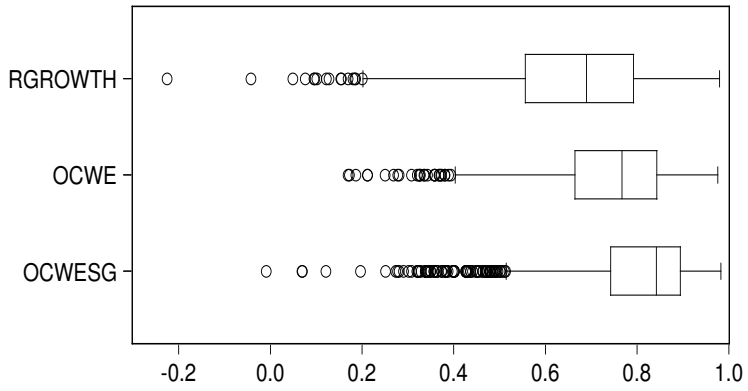

Figure 3: Cross-correlation coefficients of the growth rate of prefectural production, public investment, and the specific grants

of the growth rate of OCWE. This indicates that the positive correlation of public investment is stronger than that of the prefectural growth rate, meaning the possibility that the public investment is uniform throughout the nation and it is not sufficiently countercyclical for the prefectural-level economies.

The remainder of Fig. 3 shows the box plot of the cross-correlation coefficients of the growth rate of OCWESG, which exhibits the strongest positive correlation. It probably implies that regional public investment is uniformly induced by the central government, who plays a crucial role in regulating the public investment policies as mentioned in our introduction, to be countercyclical only for the aggregate business cycles.

The simplest analysis above, while shedding a little light on the issues, can of course provide only a very preliminary investigation. So we need to address more elaborate analysis in which other key factors of public investment are properly controlled.

3. Model and Data

To investigate formally how public investment (OCWE) and the specific grants (OCWESG) vary over business cycles, following Lane (2003), we suppose their relation between the first diffirences in natural log. In doing so, pursuant to our introduction, national production (GDP) is also considered in addition to prefectural production (GPP).[10] Because of the endogeneity between public investment (i.e., OCWE or OCWESG) and output (i.e., GDP and GPP), these two production variables are used in one-year lags. Hence, the basic specifications are of the form:

$$\begin{aligned} \Delta \ln \mathrm{OCWE}_{it} &= \alpha + \beta_c \Delta \ln \mathrm{GPP}_{i,t-1} + \boldsymbol{x}_{it}'\boldsymbol{\beta} \\ &\quad + \gamma_c \Delta \ln \mathrm{GDP}_{t,t-1} + \boldsymbol{z}_t'\boldsymbol{\gamma} + \mu_i + \nu_{it}, \end{aligned} \tag{1}$$

[10]Both GDP and GPP are based on the System of National Accounts 1968 (68SNA), and these are evaluated in real terms on a fixed-base method (base year = 1990). The series can be obtained from the website of Japan's cabinet office.

$$\begin{aligned}\Delta \ln \mathrm{OCWESG}_{it} &= \alpha + \beta_c \Delta \ln \mathrm{GPP}_{i,t-1} + \boldsymbol{x}_{it}'\boldsymbol{\beta} \\ &\quad + \gamma_c \Delta \ln \mathrm{GDP}_{t,t-1} + \boldsymbol{z}_t'\boldsymbol{\gamma} + \mu_i + \nu_{it},\end{aligned} \tag{2}$$

where $\boldsymbol{x}_{it}$ generally denotes a vector of control variables depending on both prefecture (i) and time (t), $\boldsymbol{z}_t$ generally denotes a vector of ones depending only on time (i.e., $\boldsymbol{z}_t$ are some underlying macroeconomic variables), μ_i denotes the individual effects, and Δ denotes the first difference operator. [11] The coefficients β_c and γ_c, which are our main concern, represent the elasticity of public investment or the specific grants with respect to prefectural and national outputs, respectively.

Regarding $\boldsymbol{x}_{it}$ the Hanshin-Awaji earthquake dummy variable (EDUMMY), which takes 1 in Osaka and Hyogo prefectures in 1995, otherwise takes 0, is supposed to control the precipitated rise of public investment aimed at rehabilitating the affected areas in 1995.

Turning to $\boldsymbol{z}_t$ a few macroeconomic policy variables, i.e., the call rate (CALLRATE), the money supply (MONEY), and the public debt to GDP ratio (LIABILITY), are supposed. These variables matter when the Japanese central government determines to set the level of public investment. [12] The underlying variables of monetary policy, the call rate or the money supply, are considered to take the policy mix into account. If fiscal policy keeps step with monetary policies, then their variables must affect public investment. The growing fiscal deficit gives rise to an incentive for policymakers to cut public works.

As shown by Kondoh (2008) and Funashima (2012), incumbent government's opportunistic behavior for re-election is relevant to public investment as political factors of $\boldsymbol{z}_t$. Specifically, we consider two national elections, i.e., the House of Representatives elections and the House of Councillors elections. The House of Representatives election dummy (HRDUMMY) and the House of Councillors election dummy (HCDUMMY)—these take 1 in the election years, and 0 in other years—are prepared for our investigation.

In addition to Eqs. (1) and (2), the model with time effects (denoted λ_t) that is assumed in Sorensen *et al.* (2001) is also estimated. The two-way error component regression model relates public investment or the specific grants to prefectural output, individual effects, and time effects:

$$\Delta \ln \mathrm{OCWE}_{it} = \alpha + \beta_c \Delta \ln \mathrm{GPP}_{i,t-1} + \boldsymbol{x}_{it}'\boldsymbol{\beta} + \mu_i + \lambda_t + \nu_{it}, \tag{3}$$

$$\Delta \ln \mathrm{OCWESG}_{it} = \alpha + \beta_c \Delta \ln \mathrm{GPP}_{i,t-1} + \boldsymbol{x}_{it}'\boldsymbol{\beta} + \mu_i + \lambda_t + \nu_{it}. \tag{4}$$

In the following regression analysis, excluding the Hanshin-Awaji earthquake and election dummies, all independent variables of $\boldsymbol{x}_{it}$ and $\boldsymbol{z}_t$ are used with their lagged variables by one-year to circumvent the problem of simultaneity: that is, $\boldsymbol{x}_{it}$

[11] Our model is similar to Hines (2010) and Afonso and Jalles (2013) rather than Sorensen *et al.* (2001) and Lane (2003) in a manner such that some control variables are included.

[12] All the series (i.e., the call rate, the money supply, and the public debt) can be retrieved from the website of the Bank of Japan.

$= \text{EDUMMY}_{it}$ and $\boldsymbol{z}_t = (\Delta \ln \text{LIABILITY}_{t-1}, \Delta\text{CALLRATE}_{t-1}, \Delta \ln \text{MONEY}_{t-1}, \text{HRDUMMY}_t, \text{HCDUMMY}_t)'$. Just to be safe, we moreover test the stationarity of $\ln$ OCWE, $\ln$ OCWESG, and $\ln$ GPP in first differences. We perform two panel unit root tests, namely LLC (Levin, Lin and Chu) and IPS (Im, Pesaran and Shin) tests proposed by Levin *et al.* (2002) and Im *et al.* (2003), respectively. Both tests reject their null in all the variables, and strongly suggest the nonexistence of unit roots.

4. Estimation Results

Panel (A) of Table 1 reports estimates of Eqs. (1) and (2) with individual-fixed effects. The coefficient estimates of all the independent variables except for $\Delta \ln$ GPP are statistically significantly different from zero at the 1 percent level, and same between columns (I) and (II). One clear pattern that emerges from Panel (A) of the table is that the effects of national-level economic environments rather than regionally specific ones on the prefectural-level public investment are significant.

More specifically, both of Japanese public investment and the specific grants are countercyclical for the aggregate business fluctuations, and they respond to monetary policies toward the same direction for attaining macroeconomic stabilization, while the fiscal deficit refrains from their expansion. [13] In stark contrast, there is no evidence in favor of regional economic stabilization stances of Japanese fiscal authorities. [14] That is, public investment is not sufficiently countercyclical for prefectural-level business fluctuations, and it is rather procyclical for them. [15] Somewhat interestingly, on the other hand, any significant response cannot be seen in the specific grants, indicating that central government disregards short-run regional disparities. The inconsistency between OCWE and OCWESG is similarly ascertained in Panel (B) of Table 1, in which empirical results with time-fixed effects from the estimation of Eqs. (3) and (4) are reported.

As some robustness checks of the estimates for $\Delta \ln$ GPP, we further conducted sensitivity analyses on additional specifications with two concerns: the cross-sectional dependence and heterogeneous coefficient across regions. The first robustness check is related to the so-called common correlated effects. If they are subsistent, the above estimations come to be inconsistent. To check a particular possibility of them, in Panel (C) of Table 1 we introduce cross-sectional averages of dependent and independent variables as portions of dependent variables on the basis of Pesaran (2006). In both columns (V) and (VI), the results remain the same so far.

[13] As expected, the coefficient of EDUMMY is positive and significant. In regard to the election dummies, it is suggested that prefectural-level public investment is manipulated for the House of Councillors elections, and it is consistent with the findings of Kondoh (2008) and Funashima (2012).

[14] The reason why central government tends to pay attention only to GDP might be involved with a propensity of the mass media that it is less likely to cover GPP than GDP.

[15] When including additional control variables of $\boldsymbol{x}_{it}$, such as population, younger population share, aged population share, per capita income, financial capability index, primary industry ratio, and secondary industry ratio, the estimated coefficients are not statistically significantly different from zero, and the above-mentioned results hardly change.

Table 1: Estimates of the public investment reaction function

Variable	Panel (A) Without time effects		Panel (B) With time effects		Panel (C) With common correlated effects	
	(I)	(II)	(III)	(IV)	(V)	(VI)
	$\Delta \ln$ OCWE	$\Delta \ln$ OCWESG	$\Delta \ln$ OCWE	$\Delta \ln$ OCWESG	$\Delta \ln$ OCWE	$\Delta \ln$ OCWESG
CONST	-19.416^{***}	-22.375^{***}	2.420^{***}	4.960^{***}	0.000	0.000
	(1.822)	(7.675)	(0.282)	(0.439)	(0.000)	(0.000)
Prefectural-level variables:						
$\Delta \ln \text{GPP}_{-1}$	0.342^{***}	-0.147	0.374^{**}	0.102	0.429^{***}	0.065
	(0.120)	(0.395)	(0.157)	(0.240)	(0.148)	(0.279)
EDUMMY	20.408^{***}	26.853^{***}	20.375^{***}	32.524^{***}	17.954^{***}	30.944^{***}
	(1.189)	(4.578)	(1.443)	(4.068)	(0.652)	(1.227)
National-level variables:						
$\Delta \ln \text{GDP}_{-1}$	-1.491^{***}	-2.280^{***}				
	(0.092)	(0.740)				
$\Delta \ln \text{LIABILITY}_{-1}$	-1.028^{***}	-1.667^{***}				
	(0.049)	(0.294)				
$\Delta \text{CALLRATE}_{-1}$	-14.252^{***}	-22.284^{***}				
	(0.767)	(3.250)				
$\Delta \ln \text{MONEY}_{-1}$	6.108^{***}	8.438^{***}				
	(0.365)	(1.421)				
HRDUMMY	-7.376^{***}	-18.556^{***}				
	(0.649)	(3.151)				
HCDUMMY	9.303^{***}	15.325^{***}				
	(0.402)	(3.270)				
Observations	470	470	470	470	470	470
Adjusted R-squared	0.712	0.691	0.712	0.739	0.708	0.760

Notes: White cross section standard errors in parenthesis. The subscript "−1" denotes one-year lags.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

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Table 2: Estimates of the public investment reaction function (heterogeneous coefficient between urban and rural areas)

Variable	Panel (A) Without time effects		Panel (B) With time effects		Panel (C) With common correlated effects	
	(I)	(II)	(III)	(IV)	(V)	(VI)
	$\Delta \ln$ OCWE	$\Delta \ln$ OCWESG	$\Delta \ln$ OCWE	$\Delta \ln$ OCWESG	$\Delta \ln$ OCWE	$\Delta \ln$ OCWESG
CONST	-18.638^{***}	-21.823^{***}	2.576^{***}	5.036^{***}	0.000	0.000^{*}
	(1.668)	(7.559)	(0.255)	(0.400)	(0.000)	(0.000)
Prefectural-level variables:						
$\Delta \ln \text{GPP}_{\text{urban}-1}$	0.613^{***}	0.045	0.630^{***}	0.227	0.460^{**}	0.135
	(0.181)	(0.430)	(0.201)	(0.315)	(0.224)	(0.330)
$\Delta \ln \text{GPP}_{\text{rural}-1}$	0.114	-0.308	0.129	-0.018	0.405^{**}	0.012
	(0.123)	(0.376)	(0.159)	(0.188)	(0.161)	(0.244)
EDUMMY	21.504^{***}	27.629^{***}	21.256^{***}	32.955^{***}	17.999^{***}	31.044^{***}
	(0.925)	(4.388)	(1.162)	(4.022)	(0.728)	(1.292)
National-level variables:						
$\Delta \ln \text{GDP}_{-1}$	-1.472^{***}	-2.266^{***}				
	(0.085)	(0.734)				
$\Delta \ln \text{LIABILITY}_{-1}$	-1.036^{***}	-1.672^{***}				
	(0.049)	(0.291)				
$\Delta \text{CALLRATE}_{-1}$	-13.995^{***}	-22.102^{***}				
	(0.711)	(3.210)				
$\Delta \ln \text{MONEY}_{-1}$	5.963^{***}	8.335^{***}				
	(0.335)	(1.398)				
HRDUMMY	-7.177^{***}	-18.416^{***}				
	(0.606)	(3.139)				
HCDUMMY	9.140^{***}	15.210^{***}				
	(0.412)	(3.215)				
Observations	470	470	470	470	470	470
Adjusted R-squared	0.718	0.692	0.718	0.739	0.707	0.759

Note: Same as Table 1.

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The second robustness check is on the indication of Pesaran and Yamagata (2008). Up to this point slope homogeneity of $\Delta \ln \mathrm{GPP}$ across all the prefectures is supposed, but it is possible that this supposition is wrong and leads to certain estimation bias. We then classify the prefectures of GPP into urban and rural groups (denoted by $\mathrm{GPP}_{\mathrm{urban}}$ and $\mathrm{GPP}_{\mathrm{rural}}$, respectively) and present the estimation results in Table 2.[16] While in columns (I) and (III) of Table 2 coefficients of $\Delta \ln \mathrm{GPP}$ are significantly positive only in urban areas, this alternative specification has little impact on the results most notably in Panel (C), compared to Table 1.

Then what does the difference between the responses of OCWE and OCWESG to GPP mean? Or what is the cause of it? To answer these questions, we need to distinguish between granted and non-granted projects, both of which are reflected in OCWE. When taking account of the fact that granted projects are corresponding to OCWESG, we notice that non-granted projects that are discretionary expenditures of local governments would result in the above difference. That is, it turns out that non-granted projects are implemented to be procyclical by local governments.

Concerning the procyclicality of fiscal policies in the literature, we are aware of some potential explanations, which are referred to as borrowing constraints (e.g., Gavin and Perotti, 1997), the voracity effect (e.g., Tornell and Lane, 1999), and starving the Leviathan (e.g., Alesina *et al.*, 2008). Although econometric or quantitative analysis is not conducted so far, Miyazaki (2010) for instance argues that the Japanese local public finance deteriorates in the 1990s, and as a result, local governments have no other choice but to reduce the non-granted projects. In other words, it is highly likely that almost all the local governments had been facing certain borrowing constraints so that they had been forced to diminish the non-granted projects in the extended economic slump over the 1990s. Behind such a situation, there is a relevant aspect of the Japanese centralized system that the local governments are not free to issue local bonds. In particular, before FY 2006 most of them were impossible to issue local bonds, whose funds were mostly used for public investment, without central government's approval. Consequently, they tried to stimulate their regional economies but failing to be financed by local bonds and thereby failing to conduct countercyclical policies for regional economies.

5. Conclusion

While our analysis is quite simple, it nonetheless offers some suggestive results. We have shown that Japanese public investment in the 1990s is carried out for countervailing the aggregate business fluctuations, whereas it is rather procyclical for the regional ones. This suggests that public investment intensifies the regional business fluctuations, especially in rural areas where the output is heavily dependent on public investment. Such a suggestion is consistent with the findings of Miyazaki (2013); further, it can be an item of evidence supporting the results of Brückner and Tuladhar (2010) and Kondoh (2011), both of which indicate that the short-run

[16] See footnote 8 for the classification by area.

effect of public investment on regional economies is dampened during the 1990s. It also underscores the possibility that more moderate macroeconomic environments are realized through minutely adjusted fiscal stimuli into which the information of intranational diversity across regions is built.

In most situations the well-established term "economic stabilization" would be tacitly tantamount to "macroeconomic stabilization." However, in reality many are influenced by business conditions not in aggregate but in their daily living areas. Perhaps the Japanese central government is prone to respond only to GDP or the other important macroeconomic variables in order to moderate the aggregate business cycle, and accordingly, the public investment becomes countercyclical only for the macroeconomic variables. This may be justified so long as the magnitudes of discrepancy of intranational business cycles across regions are negligible. When it becomes a matter, however, given the scale of fiscal stimulus, policymakers should utilize the information to make more effective packages.

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