

The LDP's Influence on the Redistribution of Public Investment

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Abstract

Does the Liberal Democratic Party (the LDP) really intervene in the budgetary process? The purpose of this paper is to examine the relationship between the LDP, which is the dominant governing party, and the redistribution of public investment. The LDP is widely regarded as having stronger influence over the budgetary process than bureaucrats, and being able to significantly affect the redistribution of public investment. Many political scientists and economists have examined the causal relationship between the LDP's political power and the redistribution of public capital. Most of them conclude that the LDP has a significant impact on the redistribution of public capital. However, identifying the precise effect of the LDP on the redistribution of public capital is difficult because of a simultaneity problem between electoral success and the redistribution of public investment, and because of the presence of possibly omitted variables like residents' preference for a specific party. When there are simultaneity problems and omitted variables, ordinary least-squares (OLS) estimates suffer from bias. However, many researches ignore the potential endogeneity of the LDP's political power. Therefore, there is possibility that the estimated results of previous studies are wrong. To tackle these problems, this paper uses fixed-effects instrumental variable estimation. Our estimates indicate that the LDP vote share had only a weak positive impact on the redistribution of public investment from 1987 to 1999. Moreover, when the sample was divided into the LDP-dominant period and the coalition period, the LDP vote share did not affect the redistribution of public investment. Thus, contrary to widely held beliefs, the LDP has only a weak influence on the redistribution of public investment.

1. Introduction

Do Japanese political parties really intervene in the budgetary process? This paper examines the relationship between the Liberal Democratic Party (the LDP), which is the dominant governing party, and budgetary decision-making. It is often claimed that the LDP has a strong influence over the budgetary process, and is able to significantly influence the redistribution of public investment. The graph in Figure (1) illustrates a negative relationship between the redistribution of public investment and the LDP vote share. However, it is possible that this negative relationship is spurious; thus, careful investigation of the relationship between the LDP and the redistribution of public investment is needed.

Many political scientists and economists have examined the causal relationship between electoral success and government spending. One of the problems in estimating an empirical link between electoral success and spending is that the majority party may spend money primarily where the election is competitive. Thus, the ordinary least-squares (OLS) regression result may be biased. This simultaneity problem is pointed out by Fiorina (1981), Rivers and Fiorina (1989), Stein and Bickers (1994), Levitt and Snyder (1997) and Evans (2005). Levitt and Snyder (1997) and Evans (2005) solve the simultaneity problem using instrumental variable estimation, and show that additional spending increases the share of the vote for the incumbent party. On the contrary, few studies take the simultaneity problem into consideration in examining the influence of electoral success on spending.

As for Japan, Mayer and Naka (1998), Doi (2000), and Nagamine (2001) have attempted to estimate the LDP's impact on the redistribution of public investment. Mayer and Naka (1998), and Doi (2000) show that the LDP has a positive impact on the redistribution of public investment; however, they ignore the simultaneity problem. Using system estimation, Nagamine (2001) solves the simultaneity problem, and shows that the LDP has a negative impact on the redistribution of public investment. The differences of these studies suggest that estimation results vary depending on whether the simultaneity problem is considered.

The purpose of this paper is to examine the impact of the LDP's electoral success on spending. This paper solves the simultaneity problem carefully by using fixed-effects instrumental variable estimation (FEIV).¹ A strong correlation between instrumental variables and explanatory variable and an absence of correlation between instrumental variables and the dependent variable

¹ For fixed effect estimation, see Appendix.

are the conditions for instrumental variable estimation. In this study, the amount of rainfall on election day is used as an instrumental variable because the LDP likely win when it is rain on election day. On the other hand, the amount of rainfall on election day does not affect public investment allocation. Furthermore, we deal with time-invariant unobserved prefecture effects. The LDP has been supported in rural areas for long time; thus, if such unobserved preference for the LDP is correlated with the share of vote of the LDP, the OLS estimator would be biased. The fixed-effect model solves the time-invariant unobserved prefecture effect problem.

We first show the public investment across prefectures over the period 1987-1999. Next, we divide the sample in various ways. First, we divide the data according to whether they fall under the LDP - dominant period or the coalition period. When the majority of the members of the congress are affiliated with the LDP, the LDP may have strong political power; thus, LDP legislators tend to decide public investment allocation in a more arbitrary manner. On the contrary, when a coalition is formed, the LDP loses its power, and might have difficulty intervening in the budgetary process. Second, we divide the sample according to work purpose. Public investment covers various activities, such as programs with formulas (e.g. education or welfare) and programs without formulas (e.g. roads or airport). Thus, the LDP's influence may differ by work purpose.

To preview the main findings of this paper, we show that the OLS estimator is biased, and that though it is widely believed that LDP strongly influences the redistribution of public investment, the estimation results indicate that LDP has had a weak influence even during the LDP - dominant periods. The estimation results by work purpose indicate similar results. Thus, contrary to widely held beliefs, the LDP has only a weak influence on the redistribution of public investment.

The rest of this paper is organized as follows. Section 2 reviews the existing literature and introduces the LDP and budgetary process. Section 3 discusses the empirical methodology, and Section 4 describes the data. Section 5 reports the estimation results, and the last section concludes.

2. Background

2.1 The Existing Literature

The empirical literature searching for relationship between spending and electoral success is large. However, studies on parties' influence on spending are few because parties in the U.S. are widely regarded as weak organizations (Levitt and Snyder (1995)). Levitt and Snyder (1995),

using district data from 1984-1999, tested the influence of Democratic Party vote share on federal spending dividing the sample in various ways. Their results suggest that Democratic Party vote share has a positive impact on federal spending.

The estimation of the impact of political factors on spending in Japan was spurred by Yoshino and Yoshida (1988). They showed that the number of seats per capita positively affected the amount of public capital intended for industrial purposes that each region received.

As for research on the LDP's influence on spending, a large number of studies have accumulated.² Most of them conclude the LDP has a significant impact on the redistribution of public investment. Hori (1996) suggests that number of the LDP legislators positively affects public investment. Using prefectural data from 1957 to 1990, Meyer and Naka (1998) conclude that the LDP members peddled influence by providing public investment for their constituents. Doi (2000) and Doi and Ashiya (1997) show that the LDP seat share have a positive impact on government subsidies using prefectural data from 1956-1993. Nagamine (2001) solves the simultaneity problem using system estimation, and concludes that the LDP vote share have a negative impact on investment for road per capita using prefectural data on 1993. Horiuchi and Saito (2003), using municipal data from 1991 to 1999, show the LDP's seat share negatively affected the amount of public capital from 1991 to 1993; after 1993, the LDP's seat share have no effect on the amount of public capital. However, they do not provide a clear interpretation to this puzzle.

The difference in these results is possibly due to difficulties in defining political power. Nagamine (2001) uses the LDP's vote share, while Meyer and Naka (1998), Doi (2000), Doi and Ashiya (1997) and Horiuchi and Saito (2003) use the LDP's seat share as a proxy for political power. Furthermore, identifying the causal effect of the LDP on the redistribution of public capital is difficult because of the presence of possibly omitted variables like residents' preference for a specific party. When there are omitted variables and simultaneity problems, OLS estimates suffer from bias. However, most researches except for Nagamine (2001) ignore the potential simultaneity problem between the LDP's political power and spending, and use OLS estimation regardless. Even Nagamine (2001) misses the omitted variables problem. Therefore, there is possibility that the estimated results of previous studies are wrong. Their result tends to render imprecise estimates.

The simultaneity problem is well known in election studies on the United States and

² For more detailed survey, see Nagamine(2001)

Europe (Fiorina (1981), Rivers and Fiorina (1989), Stein and Bickers (1994), Levitt and Snyder (1997) and Evans (2005)). Levitt and Snyder (1998) and Evans (2005) solve this estimation problem by using an instrumental variable approach, and use spending around a district as an instrument variable. They show that spending has a positive impact on electoral success for incumbents. This paper solves these simultaneity and omitted variable problems using FEIV estimation, and examines the influence, not of spending on electoral success but of electoral success on spending.

2.2 The LDP and Budgetary Process

In the 1980's, the LDP retained the majority in Japan. In the election for Lower House in 1980, the LDP won the majority. When MITI (the Ministry of International Trade and Industry) announced a plan to build two or three technopolises in 1980, forty of Japan's forty-seven prefectures volunteered to host one of these high-technology towns. The LDP pressured MITI with the intention of benefiting its constituents. As a result, MITI had to alter its initial efficiency-oriented plan. Furthermore, the LDP intervened in choice of candidate prefecture (Calder (1988)).

The 1983 election was dominated by news of the Lockheed scandal. As a result, the LDP lost many seats even though the LDP won near majority. The LDP still had a great deal of influence in public policy. The next year, in 1984, it is said that Mitsuzuka Hiroshi, Chairman of the Special Committee on Promotion of Super Express Train Line (*Seibi-Shinkansen*) Construction and road policy "Tribe" said that the construction of Super Express Train Lines was "not a policy issue, but a political issue." They persuaded related ministers (Inoguchi and Iwai (1987)). In the 1986 election, the LDP candidates promised the early construction of Super Express Train Lines, which led the LDP's election victory.

After the 1990 election, a "money scandal," namely, the Rikuruuuto scandal and the Sagawa Kyubin case was exposed. The LDP was inevitably stressing political reform. Adding to that, important members of the LDP like Morihiro Hosokawa, Tsutomu Hata, Ichiro Ogawa and Masayoshi Takemura, defected to form new parties, the Japan New Party, Shinsei-to and Sakigake.

As a result, the LDP lost its majority in the 1993 election, and Morihiro Hosokawa, who was minister of the Japan New Party, came into power and enforced electoral reform. However, the Japan New Party soon dissolved, and the LDP returned to the helm of government. It is said that

the LDP legislator said “we do not allocate subsidy to districts where non-LDP members won.” (Doi (2000)). As has been noted, it would appear that the LDP has intervened in the budgetary process. After the 1994 electoral reform, the electoral system changed from a single non-transferable vote with multimember district (SNTV-MMD) to a hybrid of single-member plurality and a proportional representation system.

Let us briefly look at the budgetary process. Government bureaucrats draft the fiscal budget plan in year $t-1$. The fiscal budget plan is introduced to the Diet and after discussion in the Diet, the plan is executed in year t . Politics are involved in the public investment allocation decision-making process. Bureaucrats decide on overall expenses for each area such as industry or agriculture; however, they do not decide how much to expend on specific investments. Thus, legislators can and do intervene in the budgetary process. The Constitution stipulates that the Lower House overrides the Upper House on issues of budgetary decision-making. Hence, we focused on the Lower House members in our analysis.

3. Empirical Model

We estimated the following model:

$$GShare_{it} = \beta_0 + \beta_1 LDPVoteShare_{it-1} + LDP_{it-1}\beta_2 + Politics_{it-1}\beta_3 + X_{it-1}\beta_4 + year_dummy\beta_5 + c_i + u_{it}, \quad (1)$$

where $GShare$ is public investment in a prefecture divided by total public investment, $LDPVoteShare$ is votes for the LDP divided by the total votes in a prefecture, LDP is other variables about the LDP, $Politics$ is political variables, X is economic and demographic variables, $year_dummy$ is the set of year dummy variables, i is the subscript for prefecture, and t is the subscript for year. The error term consists of time-invariant prefecture effects c_i and idiosyncratic error u_{it} . As for dependent variables, the share of public investment in each prefecture is used because the redistribution of public investment is a scramble for block expenses. We used the LDP vote share as a key explanatory variable because vote share can measure support for the LDP, and also measure the LDP’s electoral success.

If the prefecture effects do not correlate with the explanatory variables, and the idiosyncratic error term is strictly exogenous, then the OLS renders a consistent estimation. The

first assumption is likely to be violated although this rarely has been pointed out in previous studies. In Japan, central government tends to allocate public capital to permanently stagnant regions, and people in such regions tend to support the LDP. Thus, unobserved time-invariant prefecture effects, such as unobserved prefectoral preference for the LDP, possibly correlates with the LDP vote share, and unobserved prefecture effects are likely omitted; thus, the OLS estimates are larger than the fixed-effects estimates.

The second assumption also may be violated because as Fiorina (1981), Rivers and Fiorina (1989), Stein and Bickers (1994) and Evans (2005) point out, the link between government discretionary spending and electoral success of majority parties causes a simultaneity problem. The majority party spends more money in order to buy off voters, and high expenditure brings electoral success. Thus, the OLS estimates are smaller than the instrumental variable estimates. The FEIV estimate is consistent even if two assumptions are violated. Hence, we take the FEIV estimate as our preferred estimation method because it resolves both the simultaneity and the unobserved omitted variable problem. We call both unobserved omitted-variables problems and simultaneity problems “endogeneity problems,” for descriptive purposes.

The condition for a good instrumental variable is that the instrumental variable correlates with an explanatory variable, but does not correlate with the dependent variable. The amount of rainfall on election day is used as a good instrumental variable for public investment allocation in the corresponding prefecture and year. The relationship between amount of rainfall and the LDP vote share is explained as follows. It is said that the LDP, which largely depends on the organized vote, likely win when it is rain on election day. If it rains on election day, unaffiliated voters, who has tendency to vote non-LDP candidates, tend not to go and vote. As a result, turnout is likely to be low, and low turnout has an advantage for because the LDP tend to get high share of vote for the LDP. Furthermore, the amount of rainfall on election day does not affect public investment. Because we do not have the theoretical guidance of functional form to relate the amount of rainfall and the LDP vote share, we tried several specifications, and decided to include amount of rainfall on election day.

This paper examines the LDP’s influence on the redistribution of public investment rather than the influence of any particular legislators. Thus, in order to measure the LDP’s power correctly, we need remove particular legislators’ political power. Some legislators have very strong political power, and can intervene in decisions of the redistribution of public investment. We

considered The President and these “Big Three” as legislators who have strong political power and power to control other individuals’ political power. Adding to that, the LDP’s chairman of Agriculture and Forestry Division, chairman of the Commerce and Industry Division and chairman of the Construction Division are considered most important posts in the LDP. The LDP chairmen of these three divisions are most popular and powerful because they peddle influence on the redistribution of types of public investment that could have direct benefits to electoral districts (Inoguchi and Iwai (1987)). Thus, prefectures that produce legislators who have strong political power receive more public investment than other prefectures. Previous studies, such as Hori (1996) use number of times elected as an indicator of political power. However, not all the legislators who win election more than five times hold key positions. Therefore, it is doubtful whether legislators who win more than five times have strong political power.

In addition to the LDP-related variable, the apportionment of seats is considered. Horiuchi and Saito (2003) point out that electoral reform of 1994 equalized voting strength, and caused the equalization of public investment distribution. Hence, the coefficient of the apportionment of seats is expected to be positive.

In order to control economic and demographic conditions, we consider the following variables. First, we use the municipality fiscal strength index to describe the prefecture’s economic condition. The municipality fiscal strength index indicates the fraction of fiscal demand financed by local tax. Thus, high the municipality fiscal strength index in a prefecture suggests that the prefecture is rich. For a long time, public investment was concentrated heavily in the poor regions of rural Japan. Thus, the municipality fiscal index is expected to have a negative effect on the redistribution of public investment.

Second, to capture the industrial structure in each prefecture, we use the gross primary product ratio and the gross secondary product ratio. Both sectors receive a gain in public investment because both agriculture and manufacturing sectors need roads or highways. Therefore, the agriculture and manufacturing sector ratios are expected to have a positive effect on the redistribution of public investment.

Third, the active job openings-to-applicants ratio is used as an index of economic cycle. Japanese government tends to expend public funds during economic depressions. Thus, the active job openings-to-applicants ratio is expected to have a negative impact on the redistribution of public investment.

As a demographic factor, first, we consider population. If prefectures have a large population, the prefectures need more formulaic public investment. Second, demographic structure is important because prefectures that have large dependent populations need more formulaic public investment than prefectures with small dependent populations. The population under 14 demands educational spending and the population over 65 demands welfare spending like nursing homes. Thus, the share of dependent population is expected to have a positive effect on the redistribution of public investment.³

4. Data

We used the aggregate data of 46 prefectures excluding Tokyo. We use prefectoral data because ten out of Japan's forty-seven prefectures formed single electoral districts during SNTV-MMD, and the scope of the benefit of public investment is larger using such data rather than municipal-level data, especially after SNTV-MMD.⁴ For instance, construction of a highway in a constituency benefits citizens around that constituency. The reason to exclude Tokyo is that Tokyo is differs in having a higher income and is not receiving general subsidies (“*Chiho Kofuzei kofukin*”).

The sample period was between 1987 and 1999. These years were chosen in order to include data from both the LDP's - dominant period and the coalition period. In the 1993 election, the LDP lost their power in the Lower House; hence, we have seven years of observation during the LDP's - dominant period and six years of observation after the coalition was established.

We use administrative investment (“*Gyosei Toshi*”) share as a dependent variable. Moreover, we use administrative investment by work purpose because the LDP would have different effects on different kinds of administrative investment. There are five administrative investment categories: livelihood investment; industrial investment; agricultural, forest and fishery investment; investment in conservation of national land; and other investment.⁵ The data are taken

³ Three key person of the LDP Sanyaku: “*Seimu Chosa Kaicho*”, Chairman, Policy Research Council President, “*Kanji-cho*”, Secretary-General, “*Somu Kaicho*”, Chairman, General Council The Policy Affairs Research Council(“PARC”)

⁴ Prefectures formed single electoral districts are as follows; Fukui, Yamanashi, Shiga, Nara, Tottori, Shimane, Tokushima, Kochi, Saga, Okinawa.

⁵ Breakdown of each investment is as follows;
Livelihood investment: city, town and village roads, streets, city planning, housing environment, sanitation, welfare, educational facilities, water supplies and public sewerage.

Industry investment: national highways, prefectoral roads, harbors, airport, industrial water

from the Local Administration Bureau, Ministry of Internal Affairs and Communications (Each Year). The LDP's vote share in a prefecture, the key explanatory variable in this paper, is measured in terms of the vote of the LDP Lower House members divided by the total vote in the prefecture. As for other political variables, we use dummy variables for the LDP's president, the "Big Three" and the LDP's chairman of Agriculture and Forestry Division, Commerce and Industry Division and Construction Division. These variables take one when prefectures produce important legislators and take zero otherwise. For example, if a legislator from a prefecture becomes the LDP's president in year t, the dummy variable for the LDP's president takes one from year t to 1999 in the prefecture. The apportionment of seats is measured in terms of the number of seats divided by prefectoral population. The data are taken from the Handbook of Diet ("Kokkai Benran").

The municipality fiscal strength index is taken from "Chiho Zaisei Chosa Kenkyu Kai" (Each Year). The prefectoral population, the share of population under 14 and the share of population over 65 are taken from Census ("Kokusei Chosa"). Since census data is collected every five years, the data for non-census years are linearly interpolated. The taxable income per capita is taken from "Nippon Makettingu Kyoiku Senta" (Each Year). The gross primary product ratio in each prefecture and the gross secondary product ratio in each prefecture are measured in terms of the gross prefectoral primary or secondary products divided by gross prefectoral products. These data are taken from Department of National Accounts, Economic and Social Research Institute, Cabinet Office (Each Year). The active job openings-to-applicants ratio used as index of the economic cycle is taken from the Employment Security Bureau, Ministry of Health, Labour and Welfare (Each Year). We used explanatory variable in year t-1 to explain the redistribution of public investment in year t because legislators in year t-1 decide the budget plan of year t.

Table 1 reports the descriptive statistics. It is possible that there is not much variation in explanatory variables after fixed-effect transformation. Small variation of explanatory variables renders imprecise estimation. However, even after fixed-effect transformation, the standard deviation of key variables, the LDP vote share and amount of rainfall on the election days, does not decrease so much. Thus, we can exploit FEIV.

Agricultural, forest, and fishery investment
 Investment in Conservation of National Land: forest and river conservation, seashore conservation.
 Other investment: unemployment measures, disaster restoration, government office repairs, railways, subways, electricity, gas, residential land formation and other.

5. Results

5-1. Total Public Investment

First, we show the estimation results for total period (1987-1999). Table (2) tabulates the estimation results of the redistribution of public investment function during 1987-1999. Column (1) reports the OLS regression result. This result indicates that 10-percent point rise in the share of the vote for the LDP decreases the share of public investment by 0.09 percentage point. The sign of the coefficient for the LDP vote share is changed after the possible endogeneity of the LDP vote share is taken care of by the FEIV, whose result is reported in Column (2). The results of the FEIV estimation using amount of rainfall on the election day as the instrumental variable indicates that a 10-percent point rise in the LDP vote share increases the share of the public investment by 0.22 of a percent. The fact that the sign of the coefficient differs between the OLS estimation and the FEIV estimation implies that simultaneity and the unobserved omitted variable problem should be taken care of. However, the size of coefficient of the LDP vote share is small, which suggests that the LDP has a weak influence on the redistribution of public investment.

Let us now briefly look at the estimates of control variables in the FEIV. The coefficients of dummy for the LDP president and chairman of the LDP's Commerce and Industry Division and Construction Division are statistically significant but are not the expected sign. These results can be interpreted to show that legislators who have strong political power may need not "bring home the bacon" because they face an easy campaign in the coming election due to their strong electoral power base. The coefficient of seats per capita is negative and significant. This result suggests that over-represented prefectures received less public investment from the central government. A possible interpretation is that all the legislators in a prefecture need not be for increase of public investment. The existence of legislators who are against increased investment may lead to a decrease of public investment. An increase in the industrial sector ratio increases public investment.

The coefficient of municipality fiscal strength index is positive and significant, which is contrary to the hypothesis. A possible interpretation is that the explanatory variable, total public investment, includes investment whose burden of expense is on the prefectures; in these cases, rich prefecture are more able to afford the investment.

Increase of the share of population over 65 years of age decreases public investment;

this result can be interpreted by assuming that the part of the total public investment that is needed by elderly people is fairly small.

Next, the results of the redistribution of the public investment function during the LDP dominant period (1987-1993) can be found in Table (2). Column (3) shows the OLS regression result. This result indicates that the LDP vote share did not affect the redistribution of public investment. The coefficient of prefecture population is positive and significant in Column (3). The FEIV regression result is shown in Column (4). The LDP vote share also does not influence the redistribution of public investment. All the coefficients of control variables are insignificant in the FEIV estimation.

Third, the results of public investment allocation function during the coalition period (1994-1999) can be found in Table (2). Column (5) reports the OLS regression result. The LDP vote share does not affect public investment allocation. The FEIV regression result, which is shown in Column (6), suggests that the LDP vote share does not affect public investment allocation. All the control variables are insignificant in the FEIV regression.

5-2. Public Investment by Work Purpose

Because the LDP would have different effects on different kinds of public investment, we divided public investment according to work purpose. The results can be found in Table (3). In Table (3), the coefficient and standard error for the LDP vote share are shown in the Table and the results of other control variables are omitted.⁶ Columns (1) - (10) show the estimation results during 1987-1999, Columns (11) - (20) show the estimation results during 1987-1993 and Columns (21)- (30) show the estimation results during 1994-1999. The OLS regression results during 1987-1999 show that the LDP vote share did not tend to affect public investment. The only exception is for “other investment”. The coefficient for the LDP vote share is negative and significant. When it comes to the FEIV regression result, the coefficients of the LDP vote share become positive and significant when explanatory variables are the share of investment in conservation of national land and other investment, although the magnitude of the coefficient is small. This means that when the “endogeneity problems” are taken into consideration, the sign of the coefficient of the LDP vote share changes. Therefore, it is important to solve the “endogeneity problems.”

⁶ Actual regression results are available from the author upon request.

The results for the LDP-dominant period can be found in Columns (11) - (20). The OLS regression results suggest that the LDP vote share do not affect public investment. The FEIV regression results show that the LDP vote share did not affect public investment. The results for the coalition can be found in Columns (21) - (30). During the coalition period, the OLS regression results suggest that the LDP vote share did not affect public investment except when the explanatory variable is the share of investment in conservation of national land. The FEIV regression results show that the LDP vote share did not affect public investment.

As a result, we show that the LDP vote share had a positive impact on public investment allocation from 1987 to 1999; however, when we divided sample into the LDP-dominant and coalition periods, we could not find any evidence that the LDP had an impact on public investment allocation. This is likely because a large part of the variance of the LDP vote share is parceled out when dividing the sample into two periods.

This paper's results are different from those of Nagamine (2001), which shows that the LDP vote share has a positive impact on the redistribution of subsidies on 1993. Nagamine (2001) addresses the simultaneity problem; however, he ignores unobserved prefectural effects. In this paper, the LDP vote share is shown to have had a weak positive impact on redistribution of public investment during 1987-1999. When the sample was divided according to period and work purpose, the LDP vote share did not have any influence on redistribution of public investment, which suggests the importance of considering "endogeneity problems".

6. Conclusion

This paper has investigated the LDP's influence on the redistribution of public investment from 1987 to 1999. The estimation of the LDP vote-share influence is difficult because the majority party may spend money where an election is competitive. Adding to that, unobserved prefectural preference for the LDP may affect the LDP vote share. To tackle this problem, fixed-effect instrumental variable estimation is used. The amount of rainfall on election day for Lower House members is used as an instrumental variable, and unobserved prefectural preference for the LDP is eliminated by fixed-effect estimation. Careful estimation is executed by dividing the sample according to the year the LDP lost their power in the Lower House and according to work purpose. Contrary to a widely held belief among the general public and the media that the redistribution of public investment is affected by the LDP, our estimates indicate that the LDP vote share had only a

weak positive impact on the redistribution of public investment from 1987 to 1999. However, when the sample was divided into the LDP-dominant and coalition periods, the LDP vote share did not affect the redistribution of public investment. It should be noted that these results are caused by a decrease in the variation of the LDP vote share.

The future direction of this paper will be taking consideration of bureaucrats' influence. In Japan, it is often claimed that bureaucrats have important role on the redistribution of public investment. Hence, taking not only the LDP's influence but bureaucrats' influence into consideration is desirable. Furthermore, examination using municipal data is needed. In this paper, prefectural-level data is used because the scope of the SNTV-MMD district is similar to that of a prefecture; however, estimation results using municipal data might produce different results.

Appendix Fixed Effect Estimation

The use of data with time-series and cross-section dimensions enables consideration of unobserved effects. In this section, we explain Fixed-effect Estimation.⁷ First, consider a model with one explanatory variable.

$$y_{it} = \beta x_{it} + c_i + u_{it}, \quad (2)$$

where i denotes the cross-sectional unit and t denotes the time period. c_i captures all unobserved, time-invariant factors that affect y_{it} and x_{it} and is generically called the fixed effect. The OLS estimators of (2) do not render precise estimation because c_i correlates with x_{it} . Then, for each i , average this equation over time. We get

$$\bar{y}_{it} = \beta \bar{x}_{it} + c_i + \bar{u}_{it}. \quad (3)$$

Because c_i is fixed over time, it appears in both (2) and (3). If we subtract (2) from (3), the fixed effect, c_i , has disappeared.

$$y_{it} - \bar{y}_{it} = \beta (x_{it} - \bar{x}_{it}) + u_{it} - \bar{u}_{it} \quad (4)$$

⁷ For further details, see Wooldridge (2003).

Then, we estimate (4) by OLS. The OLS estimator of (4) is called the fixed-effects estimator and this transformation is called fixed-effect transformation.

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Figure 1 The Public Investment Share v.s. The LDP Vote Share

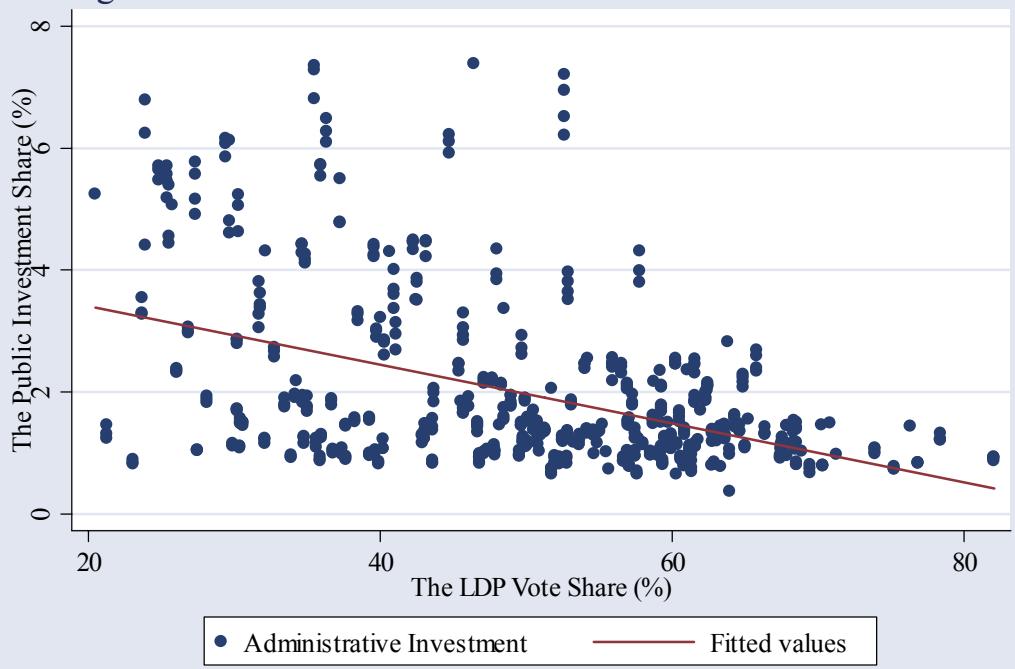


Table 1 Descriptive Statistics

Variable		Mean	Std. Dev.	Min	Max
Administrative Investment	overall	1.951	1.380	0.361	7.346
	within		0.224	0.721	3.674
Industry Investment	overall	1.878	1.775	0.367	20.562
	within		0.755	0.245	18.521
Livelihood Investment	overall	2.046	1.426	0.614	8.809
	within		0.395	0.463	3.956
Agricultural Investment	overall	1.837	1.830	0.435	14.670
	within		0.205	0.315	3.583
Investment in Conservation of National Land	overall	2.159	1.230	0.626	8.662
	within		0.192	1.170	3.440
Other Investment	overall	1.837	1.567	0.407	11.461
	within		0.515	-0.338	6.390
The LDP Vote Share	overall	49.858	13.210	21.300	82.042
	within		9.413	21.039	73.167
Dummy for Big Three	overall	0.380	0.486	0.000	1.000
	within		0.139	-0.159	1.072
Dummy for the LDP President	overall	0.182	0.386	0.000	1.000
	within		0.149	-0.664	0.952
Dummy for Director of the LDP's Agriculture and Forestry Division	overall	0.140	0.348	0.000	1.000
	within		0.153	-0.783	1.064
Dummy for Director of the LDP's Commerce and industry Division	overall	0.154	0.361	0.000	1.000
	within		0.189	-0.769	1.077
Dummy for Director of the LDP's Construction Division	overall	0.796	0.403	0.000	1.000
	within		0.274	-0.127	1.334
Seats Per Capita (log)	overall	-12.405	0.318	-13.095	-11.948
	within		0.255	-13.116	-12.133
Prefecture Population (log)	overall	14.453	0.670	13.334	15.969
	within		0.017	14.363	14.514
Taxable Income per Capita (log)	overall	7.036	0.259	6.309	7.607
	within		0.176	6.680	7.273
Active Job Opening-to-applicants Ratio Index	overall	0.889	0.444	0.170	2.440
	within		0.329	0.248	1.968
Agricultural Sector Ratio	overall	3.403	2.208	0.081	10.256
	within		0.874	0.289	7.022
Industrial Sector Ratio	overall	35.895	7.946	17.560	60.228
	within		1.904	26.985	41.764
Municipality Fiscal Strength Index	overall	0.476	0.213	0.207	1.220
	within		0.032	0.110	0.648
Age under 14/prefecture population	overall	18.105	2.084	14.124	26.793
	within		1.757	15.093	22.546
Age over 65/prefecture population	overall	14.863	3.131	7.390	23.546
	within		1.949	10.708	19.465
Amout of Rainfall on the Election Day	overall	4.212	10.737	0.000	106.500
	within		9.314	-24.826	81.674

Observations are 592.

Table 2 Determinant of the Redistribution of Public Investment

Independent Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Administrative Investment					
	OLS 1987-1999	FEIV 1987-1999	OLS 1987-1993	FEIV 1987-1993	OLS 1994-1999	FEIV 1994-1999
The LDP Vote Share	-0.009 (0.004)*	0.022 (0.011)*	-0.009 (0.007)	0.253 (0.797)	-0.006 (0.004)	-0.059 (0.133)
Dummy for Big Three	-0.018 (0.147)	0.080 (0.083)	-0.111 (0.144)	0.846 (2.950)	0.014 (0.177)	0.158 (0.381)
Dummy for the LDP President	-0.220 (0.284)	-0.418 (0.122)**	-0.084 (0.287)	1.316 (4.173)	-0.346 (0.276)	0.923 (2.591)
Dummy for Director of the LDP's	0.220 (0.194)	0.003 (0.087)	0.125 (0.195)	0.054 (0.667)	0.329 (0.250)	-0.030 (0.453)
Agriculture and Forestry Division	Dummy for Director of the LDP's	-0.309 (0.159)	-0.251 (0.088)**	-0.195 (0.191)	-0.367 (1.204)	-0.291 (0.178)
Commerce and industry Division	Dummy for Director of the LDP's	-0.286 (0.159)	-0.096 (0.054)	-0.291 (0.143)*	0.224 (0.815)	-0.359 (0.257)
Construction Division	Construction Division	0.218 (0.418)	-0.588 (0.248)*	0.915 (0.814)	-0.517 (1.803)	0.000 (0.417)
Seats Per Capita (log)	Seats Per Capita (log)	0.218 (0.418)	-0.588 (0.248)*	0.915 (0.814)	-0.517 (1.803)	0.612 (0.417)
Prefecture Population (log)	Prefecture Population (log)	2.132 (0.493)**	0.329 (1.751)	2.004 (0.498)**	-1.862 (11.371)	2.323 (0.469)**
Taxable Income per Capita (log)	Taxable Income per Capita (log)	1.699 (1.095)	0.529 (0.597)	1.868 (1.351)	14.200 (42.249)	0.932 (1.236)
Active Job Opening-to-applicants Ratio Index	Active Job Opening-to-applicants Ratio Index	-0.174 (0.210)	-0.020 (0.073)	-0.193 (0.233)	0.124 (0.401)	-0.201 (0.553)
Agricultural Sector Ratio	Agricultural Sector Ratio	0.037 (0.055)	0.051 (0.031)	0.066 (0.055)	0.437 (1.253)	-0.020 (0.086)
Industrial Sector Ratio	Industrial Sector Ratio	-0.020 (0.012)	0.073 (0.015)**	-0.025 (0.012)*	0.169 (0.466)	-0.010 (0.015)
Municipality Fiscal Strength Index	Municipality Fiscal Strength Index	-0.773 (1.929)	2.607 (0.497)**	-0.082 (1.657)	-12.872 (49.889)	-2.134 (2.105)
Age under 14/prefecture population	Age under 14/prefecture population	0.007 (0.080)	0.108 (0.076)	-0.027 (0.101)	0.253 (0.871)	-0.079 (0.116)
Age over 65/prefecture population	Age over 65/prefecture population	0.088 (0.064)	-0.216 (0.089)*	-0.005 (0.102)	-0.555 (1.814)	0.042 (0.083)
Dummy for Hanshin-Awaji Earthquake	Dummy for Hanshin-Awaji Earthquake	1.507 (0.614)*	0.867 (0.190)**	0.000 (0.000)	0.000 (0.000)	1.803 (0.571)**
Constant	Constant	-37.096 (11.641)**	-18.499 (29.496)	-26.248 (13.799)	-88.587 (273.269)	-27.768 (12.847)*
Observations	Observations	598	598	322	322	276
R-squared	R-squared	0.85	-	0.87	-	0.84
Year dummy	Year dummy	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

* significant at 5%; ** significant at 1%

Table 3 Determinant of the Redistribution of Public Investment by Work Purpose

Independent Variable	(1) Industry Investment		(3) Livelihood Investment		(5) Agricultural Investment		(7) Investment in Conservation of National Land		(9) Other Investment		(10)
	OLS	FEIV	OLS	FEIV	OLS 1987-1999	FEIV	OLS	FEIV	OLS	FEIV	
Method Period											
The LDP Vote Share	-0.007 (0.006)	0.022 (0.018)	-0.007 (0.004)	0.006 (0.034)	0.002 (0.008)	0.011 (0.009)	-0.008 (0.004)	0.027 (0.012)*	-0.011 (0.005)*	0.065 (0.029)*	
Observations	598	598	598	598	598	598	598	598	598	598	
R-squared	0.69	-	0.76	-	0.59	-	0.71	-	0.77	-	
Robust standard errors in parentheses											
* significant at 5%; ** significant at 1%											
Independent Variable	(11) Industry Investment		(13) Livelihood Investment		(15) Agricultural Investment		(17) Investment in Conservation of National Land		(19) Other Investment		(20)
	OLS	FEIV	OLS	FEIV	OLS 1987-1993	FEIV	OLS	FEIV	OLS	FEIV	
The LDP Vote Share	-0.007 (0.010)	0.651 (2.054)	-0.012 (0.008)	0.245 (1.192)	0.019 (0.013)	-0.162 (0.529)	0.003 (0.010)	0.227 (0.683)	-0.015 (0.007)*	0.546 (1.729)	
Observations	322	322	322	322	322	322	322	322	322	322	
R-squared	0.75	-	0.70	-	0.58	-	0.69	-	0.83	-	
Robust standard errors in parentheses											
* significant at 5%; ** significant at 1%											
Independent Variable	(21) Industry Investment		(23) Livelihood Investment		(25) Agricultural Investment		(27) Investment in Conservation of National Land		(29) Other Investment		(30)
	OLS	FEIV	OLS	FEIV	OLS 1994-1999	FEIV	OLS	FEIV	OLS	FEIV	
The LDP Vote Share	-0.002 (0.007)	-0.075 (0.180)	-0.006 (0.005)	0.028 (0.087)	-0.001 (0.010)	-0.009 (0.072)	-0.014 (0.005)*	-0.016 (0.062)	-0.007 (0.006)	-0.170 (0.393)	
Observations	276	276	276	276	276	276	276	276	276	276	
R-squared	0.67	-	0.88	-	0.67	-	0.76	-	0.75	-	
Robust standard errors in parentheses											
* significant at 5%; ** significant at 1%											